Draft Study Material

विद्यया ऽ मृतमश्नुते

एन सी ई आर टी
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Preface

Vocational Education is a dynamic and evolving field, and ensuring that every student has access to quality learning materials is of paramount importance. The journey of the PSS Central Institute of Vocational Education (PSSCIVE) toward producing comprehensive and inclusive study material is rigorous and time-consuming, requiring thorough research, expert consultation, and publication by the National Council of Educational Research and Training (NCERT). However, the absence of finalized study material should not impede the educational progress of our students. In response to this necessity, we present the draft study material, a provisional yet comprehensive guide, designed to bridge the gap between teaching and learning, until the official version of the study material is made available by the NCERT. The draft study material provides a structured and accessible set of materials for teachers and students to utilize in the interim period. The content is aligned with the prescribed curriculum to ensure that students remain on track with their learning objectives.

The contents of the modules are curated to provide continuity in education and maintain the momentum of teaching-learning in vocational education. It encompasses essential concepts and skills aligned with the curriculum and educational standards. We extend our gratitude to the academicians, vocational educators, subject matter experts, industry experts, academic consultants, and all other people who contributed their expertise and insights to the creation of the draft study material.

Teachers are encouraged to use the draft modules of the study material as a guide and supplement their teaching with additional resources and activities that cater to their students' unique learning styles and needs. Collaboration and feedback are vital; therefore, we welcome suggestions for improvement, especially by the teachers, in improving upon the content of the study material.

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Module 1 RDBMS CONCEPTS IN MYSQL

Module Overview

RDBMS stands for Relational Database Management System. It is a type of database management system (DBMS) that stores data in a row-based table structure which connects related data elements. It is called relational because the values within each table are related to each other. This makes it easy to locate and access specific values within the database.

In this Module, you will understand the various data models and various concepts associated with RDBMS. There are various database management software available in the market. Popular examples of RDBMSs include MySQL, Oracle, and SQL Server. The RDBMS concepts using MySQL is covered in this unit.

SQL stands for Structured Query Language, is a special-purpose programming language designed to manage data in a relational database management system (RDBMS) or stream processing in a relational data stream management system (RDSMS). SQL is used to search, store, modify records in database management system. SQL queries are used to retrieve the data needed for specific job functions. It is a standardized way to request information from relational databases. In this unit, you will be able to create database objects, insert data in database and use various types of commands to retrieve the required data from the database.

SQL function is used to perform particular tasks and it returns zero or more values as a result. Functions are useful while writing SQL queries. Functions can be applied to work on single or multiple records (rows) of a table. There are various readily available functions in SQL that can be used in queries. It includes single row functions, multiple row functions, group records based on some criteria. The use of these functions is illustrated in this Module.

Learning Outcomes

After completing this module, you will be able to:

- Understand the fundamental concepts of Relational Database Management Systems (RDBMS), including tables, relationships, normalization, and data integrity.
- Learn the basics of SQL for querying, updating, and managing data within relational databases, including SELECT, INSERT, UPDATE, and DELETE commands.
- Explore and apply various SQL functions for data manipulation and retrieval, including aggregate functions, string functions, and date functions.

Module Structure

Session 1: RDBMS Concepts

Session 2: Structured Query Language (SQL)

Session 3: Functions In SQL

Session 1: RDBMS Concepts

Kushaal was playing with his father's mobile phone. Accidentally all the contacts on the phone deleted by him. To recover these contacts his father consulted a technician. The technician recovered all the contacts available using the Google contacts as these contacts are linked with the Google account. Thus, it is possible to save and manage the contacts in smartphone. This is possible with the use of database application available with Google. You can easily understand that the data can be saved and managed through database application.

Fig. 1.1 Illustration

In this session, you will understand the concept of database and how data is organised in the database. The various data models and the various concepts associated with database application such as constraints, primary key, foreign key is also discussed. There is various database management software available in the market. We will discuss about MySQL which is a popular relational database management system (RDBMS).

1.1 INTRODUCTION TO DATABASE SYSTEMS

The word data is taken from *"Datum"*, means raw facts. Datum is a single piece of factual information of interest to us. Data, the plural of datum, is a collection of information. Data is the name given to basic raw facts and entities such as names, numbers and quantity. Data can be defined as a collection of facts and records. Data, representing facts, figures, and ideas, are commonly used in everyday life. Data needs to be managed to use it effectively.

Data items are organised or processed to produce the information. It can be used for processing some useful information from it. The examples of data are weights, prices, costs, numbers of items sold, employee names, product names, addresses, tax codes, registration fees, obtained marks, reservation details, images, sounds, multimedia and animated data. Data can exist in form of text, graphics, sound, video that represents every kind of information. The data items can be stored manually in a diary. But is difficult to retrieve and process the data items when there are large number of data items. Through the relational database systems, users can access a view of data called relations. With relational database management systems (RDBMS), programmers can perform database operations without knowing data storage details.

It is observed that the schools are maintaining the student data and that is stored in the register. After several years of leaving the school, the student can get the duplicate of school leaving certificate. For issuing such certificate the office staff check the student data from the registers which is maintained year-wise and class-wise. By checking the student record, the office staff

can easily give the certificate to the student. This is how the schools are maintaining the student data in the register.

The office staff also manually maintain student details who are presently learning. Their Admission number, Name, Date of Birth, Address, Contact Number are stored in the school register.

There are two major types of databases – relational and non-relational. Relational databases are the most commonly used databases today. The following are several types of databases in use.

Flat file databases – Stores data in permanent files that mostly are in text form;

Hierarchical databases – Arranges data in a tree-like structure;

Network databases – Arranges data in network-like structure;

Relational databases – Contains a set of tables in which data are related;

Object databases – Represents information in the form of objects as used in object-oriented programming;

1.2 FILE SYSTEM

Now you must have noticed that maintaining such type of records manually does not allow to correct, modify or delete the data in the register. Also searching the details of the student is difficult. To overcome the hassles faced in manual record keeping, this data can be stored in computer. The student details are stored in computer in the form of separate file.

In computer, any contents are stored in the form of file, which is opened and viewed in the respective software. In computer, file is a container to store data or information. These files are stored on the storage device of computer, such as hard disk drive or pen drive.

The student data can be stored in the document file or spreadsheet file. These files stored on computer can be accessed quickly. To process or manipulate this data, it is required to write the program in computer programming languages. The various operations can be performed through computer programming. It includes searching, sorting, computing the percentage of marks, number of days attendance, retrieving the data.

1.2.1 Limitations of a File System

There are certain limitations to maintain and manipulate such type of data when there are several hundreds or thousands of students. It also becomes difficult to maintain the number of files as it increases the volume when data grows. There are certain limitations of file system to maintain such type of data. The limitations of file system are,

Difficulty in Access **–** Files themselves do not provide any mechanism to retrieve data. Data maintained in a file system are accessed through application programs. While writing such programs, the developer may not anticipate all the possible ways in which data may be accessed. So, sometimes it is difficult to access data in the required format and one has to write application program to access data.

Data Redundancy **–** Redundancy means same data are duplicated in different files. For example, if we are maintaining students data for the various purpose then data such as student names are maintained in different files. The common data in all such files are required to be maintained number of times. This may cause the data redundancy which is difficult to avoid in a file system. Redundancy leads to excess storage use and may cause data inconsistency also.

Data Inconsistency **–** Data inconsistency occurs when same data maintained in different places do not match. If a student wants to get changed the spelling in name, it needs to be changed in the number of files where it appears. Likewise, if a student leaves school, the details need to be deleted from these files. As the files are being maintained by different people, the changes may not happen in one of the files. In that case, the student name will be different (inconsistent) in both the files.

Data Isolation **–** Although these files are maintained for the students of the same class, but there is no link or mapping between these files. The school will have to write separate programs

to access these files. This is because data mapping is not supported in file system. In a more complex system where data files are generated by different person at different times, files being created in isolation may be of different formats. In such case, it is difficult to write new application programs to retrieve data from different files.

Data Dependence – Data are stored in a specific format or structure in a file. If the structure or format itself is changed, all the existing application programs accessing that file also need to be changed. Otherwise, the programs may not work correctly. This is data dependency. Hence, updating the structure of a data file requires modification in all the application programs accessing that file.

Controlled Data Sharing – There can be different category of users like teacher, office staff and parents. Ideally, not every user should be able to access all the data. It means different types of users should be given different types of access, such as read only. It is very difficult to enforce this kind of access control in a file system while accessing files through application programs.

1.3 DATABASE MANAGEMENT SYSTEM

Limitations faced in file system can be overcome by storing the data in a database where data are logically related. A database management systems (DBMSs) is used as an interface to manage databases.

A database is an *organized collection of data*, generally stored and accessed electronically from a computer system. It supports the storage and manipulation of data. In other words, databases are used by an organization as a method of storing, managing and retrieving information. It is possible to store and organise related data in a database so that it can be managed in an efficient and easy way.

A DBMS is a collection of software components designed to create and maintain databases and control all access to them. DBMS allows to create a database, store, manage, update/modify and retrieve data from that database by users or application programs. DBMS is used to provide an effective method of performing database operations, troubleshooting database issues, and restricting data access. Relational Database Management System (RDBMS), which is still popular today, is an advanced version of a DBMS system. Dr. E. F. Codd defined the criterias to determine whether a DBMS is a relational database management system or not. These criteria are knowing as twelve rules Codd's (E. F. Codd, 1985).

Some examples of open source and commercial DBMS include MySQL, Oracle, PostgreSQL, SQL Server, Microsoft Access, MongoDB as presented in Table 1.1.

Table 1.1 Popular DBMS

DBMS	Primary Database Model	License
Oracle	RDBMS	Commercial (restricted free version is available)
MySQL	RDBMS	Open Source
Microsoft SQL Server	RDBMS	Commercial (restricted free version is available)
PostgreSQL	RDBMS	Open Source
MangoDB	Document store	Open Source

Fig: 1.2 Different type of DBMS/RDBMS available in market

Some database management systems include a graphical user interface for users to create and manage databases. Other database systems use a command line interface that requires users to use programming commands to create and manage databases.

A database system hides certain details about how data are actually stored and maintained. Thus, it provides users with an abstract view of the data. A database system has a set of programs through which users or other programs can access, modify and retrieve the stored data.

The DBMS serves as an interface between the database and end users or application programs. Retrieving data from a database through special type of commands is called querying the database. In addition, users can modify the structure of the database itself through a DBMS.

Databases are widely used in various fields. Some applications are given in Table 1.2.

Table 1.2 Use of Database in Real-life Applications

Application	**Database to maintain data about**
Banking	customer information, account details, loan details, transaction details.
Crop Loan	kisan credit card data, farmer's personal data, land area and cultivation data, loan history, repayment data.
Inventory	Management product details, customer information, order details, delivery data.
Organisation Resource Management	employee records, salary details, information, branch locations.
Online Shopping	items description, user login details, users preferences details,

1.3.1 Limitations of DBMS

Increased Complexity **–** Use of DBMS increases the complexity of maintaining functionalities like security, consistency, sharing and integrity.

Increased data vulnerability **–** As data are stored centrally, it increases the chances of loss of data due to any failure of hardware or software. It can bring all operations to a halt for all the users.

1.3.2 Application of the DBMS system

Here, are few important applications of the DBMS system:

1. Student Admission System, School Examination System, Library Management System
2. Payroll, HR, Sales & Personnel Management System
3. Accounting System, Hotel Reservation System and Airline Reservation System

4. It is used in the Banking system for Customer information, account activities, Payments, deposits, loans etc.
5. Insurance management system
6. DBMS system also used by universities to keep all records
7. Finance for storing information about stock, sales, and purchases of financial instruments like stocks and bonds.

1.3.2 Advantages of DBMS system

The advantages of DBMS system are:

1. DBMS offers a variety of techniques to store & retrieve data.
2. Uniform administration procedures for data storage and retrieval.
3. Application programmers never exposed to details of data representation and Storage.
4. A DBMS uses various powerful functions to store and retrieve data efficiently.
5. Offers Data independence, Data Integrity and Data Security and reduce data redundancy.
6. The DBMS implies integrity constraints to get a high level of protection against prohibited access to data.
7. Reduced Application Development Time and occupy lesser space

1.3.4 Disadvantages of the DBMS system

The disadvantages of DBMS system are:

1. Cost of Hardware and Software of a DBMS is quite high, which increases the budget of your organization.
2. Most database management systems are often complex systems, so the training for users to use the DBMS is required.
3. The use of the same program at a time by many users sometimes lead to the loss of some data.
4. DBMS can't perform sophisticated calculations
5. Data-sets begins to grow large as it provides a more predictable query response time.
6. It required a processor with the high speed of data processing.
7. The database can fail because or power failure or the whole system stops.
8. The cost of DBMS is depended on the environment, function, or recurrent annual maintenance cost.

1.3.5 Comparison of Database Management System (DBMS) with File System

The comparative points of DBMS) with File System are given in Table 1.3.

Table 1.3: Comparison of DBMS with File System

File System	**DBMS**
A file system is a software that manages and organizes the files in a storage medium. It controls how data is stored and retrieved.	DBMS or Database Management System is a software application. It is used for accessing, creating, and managing databases.
The file system provides the details of data representation and storage of data.	DBMS gives an abstract view of data that hides the details
Storing and retrieving of data can't be done efficiently in a file system.	DBMS is efficient to use as there are a wide variety of methods to store and retrieve data.
It does not offer data recovery processes.	There is a backup recovery for data in DBMS.
The file system doesn't have a crash recovery mechanism.	DBMS provides a crash recovery mechanism
Protecting a file system is very difficult.	DBMS offers good protection mechanism.

In a file management system, the redundancy of data is greater.	The redundancy of data is low in the DBMS system.
Data inconsistency is higher in the file system.	Data inconsistency is low in a database management system.
The file system offers lesser security.	Database Management System offers high security.
File System allows you to stores the data as isolated data files and entities.	Database Management System stores data as well as defined constraints and interrelation.
Not provide support for complicated transactions.	Easy to implement complicated transactions.
The centralization process is hard in File Management System.	Centralization is easy to achieve in the DBMS system.
It doesn't offer backup and recovery of data if it is lost.	DBMS system provides backup and recovery of data even if it is lost.
There is no efficient query processing in the file system.	You can easily query data in a database using the SQL language.
This system doesn't offer concurrency.	DBMS system provides a concurrency facility.

1.4 Key Concepts in DBMS

It is important to understand the following concepts to efficiently manage data using a DBMS.

1.4.1 Database schema

A database schema is a set of schema for a database's relations. It consists of table with all attributes with their data types and constraints if any. It also represents the relationships among the tables. It is also used to visualize the logical architecture of database and how the data are organized in a database. It is shown in Figure 1.3. The schema of a relation may not change, but the relation, which is a variable, changes over time.

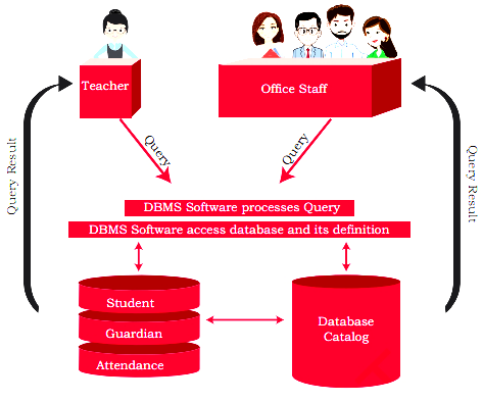

Fig. 1.3 Database schema for Student Attendance system

1.4.2 Data Constraint

Sometimes it is required to put certain restrictions or limitations on the type of data to be inserted in the columns of a table. This is done by specifying constraints on that column(s) while creating the tables. For example, the constraint that the column *mobile number* can only have non-negative integer values of exactly 10 digits. Since each student shall have one unique roll number, we can put the NOT NULL and UNIQUE constraints on the *RollNumber* column. Constraints are used to ensure accuracy and reliability of data in the database

1.4.3 Meta-data or Data Dictionary

The database schema along with various constraints on the data is stored by DBMS in a database catalog or dictionary, called meta-data. A meta-data is data about the data.

1.4.4 Database Instance

When we define database structure or schema, state of database is empty. After loading data, the state or snapshot of the database at any given time is the database instance. We may then retrieve data through queries or manipulate data through updation, modification or deletion. Thus, the state of database can change, and thus a database schema can have many instances at different times.

1.4.5 Query

A query is a request to a database for obtaining information in a desired way. Query can be made to get data from one table or from a combination of tables. For example, *"find names of all those students present today"* is a query to the database. To retrieve or manipulate data, the user needs to write query using a query language called Structured Query Language (SQL).

1.4.6 Data Manipulation

Modification of database consists of three operations viz. Insertion, Deletion or Updation. Suppose Rivaan joins as a new student in the class then the student details need to be added in ***StudentRecord*** as well as in ***ParentRecord*** files of the **STUDENTATTENDANCE** database. This is called Insertion operation on the database. In case a student leaves the school, then student as well as parent data need to be removed from ***StudentRecord***, ***ParentRecord*** and ***AttendanceRecord*** tables, respectively. This is called Deletion operation on the database. Suppose Rivaan's Parent has changed his mobile number, his *Par_Phone* should be updated in ***ParentRecord*** file. This is called Update operation on the database.

1.4.7 Database Engine

Database engine is the underlying component or set of programs used by a DBMS to create database and handle various queries for data retrieval and manipulation.

1.5 RELATIONAL DATA MODEL

A data model describes the structure of the database and represent data. It defines and represents relationships among relations. In database design, first the conceptual data model is designed for non-technical users. Then based on the conceptual data models, the logical data models are designed by the technical users. It represents how to store and retrieve data logically. Finally, the logical design models is converted into physical data models that show all table structures. Relational data model is the most commonly used data model. So here we will focus on relational data model.

1.5.1 Key terms in Relational Data Model

In relational model, tables are called relations that store data for different entities. Each relation in a relational model represents a specific type of entity. An entity is an object and we store data about the object. In other words, a relation is a two-dimensional table used to store data.

Let us consider, the relational database **SCHOOLRECORD** along with the three relations (tables) ***StudentRecord***, ***AttendanceRecord*** and ***ParentRecord***, as shown in Figure 1.4.

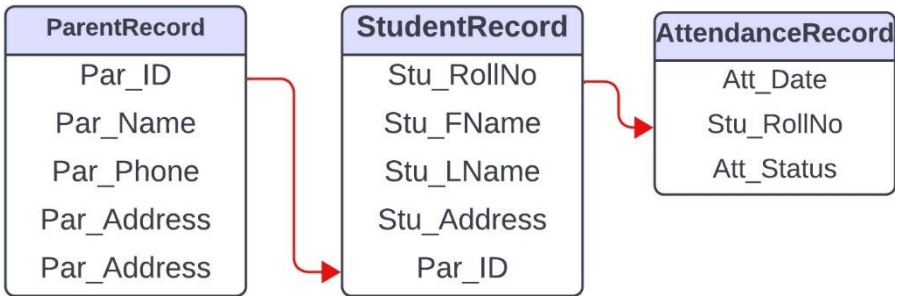

Fig. 1.4 Representing SchoolRecord database using Relational Data Model

Observe that, a relation ***AttendanceRecord*** has attribute Stu_RollNo which links it with corresponding student record in relation ***StudentRecord***. Similarly, attribute Par_ID is placed with ***StudentRecord*** table for extracting parent details of a particular student. If linking

attributes are not there in appropriate relations, it will not be possible to keep the database in correct state and retrieve valid information from the database.

Table 1.4 Relation schema along with its description of Student Attendance database

Relation Schema	Description of attributes
StudentRecord (Stu_RollNo, Stu_FName, Stu_LName, Stu_DOB, Stu_Address, Par_ID)	Stu_RollNo : unique id of the student Stu_FName : First name of the student Stu_LName : Last name of the student Stu_DOB : Student's date of birth Stu_Address : Home address of the student Par_ID : unique id of the parent of the student
AttendanceRecord (Att_Date, Stu_RollNo, Att_Status)	Att_Date : date on which attendance is taken Stu_RollNo : roll number of the student Att_Status : Either P (for present) or A (for absent) **Note:** Combination of Att_Date and Stu_RollNo will be unique in each record of the table
ParentRecord (Par_ID, Par_Name, Par_Phone, Par_Address, Par_Email)	Par_ID : unique id of the parent Par_Name : Name of the parent Par_Phone : Contact number of the parent Par_Address : Address of the parent Par_Email : Email id of the parent

Each tuple (row) in a relation (table) corresponds to data of a real-world entity as in ***StudentRecord***, ***ParentRecord***, and ***AttendanceRecord***. In the ***ParentRecord*** relation (Table 1.4), each row represents the facts about the parent and each column name in the ***ParentRecord*** table is used to interpret the meaning of data stored under that column. A database that is modeled on relational data model concept is called *Relational Database*. Figure 1.5 shows relation ***ParentRecord*** with some populated data.

Let us now understand the commonly used terminologies in relational data model using Figure 1.5.

Relation ParentRecord with 5 Attribute/Columns

Par_ID	Par_Name	Par_Phone	Par_Address	Par_Email
111122223333	Manu P Singh	9834567890	203, Khandari, Agra, UP	mpsingh@xyz.com
222233331111	Ashok K Sharma	9845678910	144 Gr Kailash, New Delhi	aksharmaji@abc.com
333311112222	Ashutosh Gaur	9856789120	JP Greens, Noida, UP	ashutoshgaur@lat.com
112233445566	Sachin Agrawal	9812389120	Kanda, Bagheshwar, UK	sachinag@bby.com
223344556611	Chandra Roy	9891201238	Fortune Somya, Bhopal, MP	Ch.roy@pqr.com
334455661122	Dinesh Dixit		Lajpat Nagar, Mathura, UP	dinesh.dixit@hpq.com
445566112233	Rizwan Alam	9255614563	Deep Nagar, Sahrsa, Bihar	riz.alam@ppc.com
556611223344	Ashish Gupta	8544556978	T Nagar, Hyderabad, Telangana	ashish.gupta@drdd.com
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991122334455	Michal DeSousa	8554658958	Guindy, Chennai, TN	michal.don@abc.com

Record or Tuple or Row

Facts about Relation ParentRecord

1. Degree (Number of attributes) = 5
2. Cardinality (Number of rows / tuple/ records) = 10
3. Relation is a flat file having single value in each column and each record has same number of column.

Fig 1.5 Relation ParentRecord with its attributes (Columns) and tuples (Rows)

Attribute – Characteristic or parameters for which data are to be stored in a relation. Simply stated, the columns of a relation are the attributes which are also referred as fields. For example, Par_ID, Par_Name, Par_Phone and Par_Address are attributes of relation ***ParentRecord***.

Tuple – Each row of data in a relation (table) is called a tuple. In a table with n columns, a tuple is a relationship between the n related values.

Domain – It is a set of values from which an attribute can take a value in each row. Usually, a data type is used to specify domain for an attribute. For example, in ***StudentRecord*** relation, the attribute Stu_RollNo takes integer values and hence its domain is a set of integer values. Similarly, the set of character strings constitutes the domain of the attribute Stu_Fname.

Degree – The number of attributes in a relation is called the Degree of the relation. For example, relation ***ParentRecord*** with four attributes is a relation of degree 5.

Cardinality – The number of tuples in a relation is called the Cardinality of the relation. For example, the cardinality of relation ***ParentRecord*** is 10 as there are 10 tuples in the table.

1.5.2 Three Important Properties of a Relation

In relational data model, following three properties are observed with respect to a relation which makes a relation different from a data file or a simple table.

Property 1: imposes following rules on an attribute of the relation.

- Each attribute in a relation has a unique name.
- Sequence of attributes in a relation is immaterial.

Property 2: governs following rules on a tuple of a relation.

- Each tuple in a relation is distinct. For example, data values in no two tuples of relation ***AttendanceRecord*** can be identical for all the attributes. Thus, each tuple of a relation must be uniquely identified by its contents.

- Sequence of tuples in a relation is immaterial. The tuples are not considered to be ordered, even though they appear to be in tabular form.

Property 3: imposes following rules on the state of a relation.

- All data values in an attribute must be from the same domain (same data type).
- Each data value associated with an attribute must be atomic (cannot be further divisible into meaningful subparts). For example, Par_Phone of relation ***ParentRecord*** has ten digits numbers which is indivisible.
- No attribute can have many data values in one tuple. For example, any Parent cannot specify multiple contact numbers under Par_Phone attribute.
- A special value "NULL" is used to represent values that are unknown or non-applicable to certain attributes. For example, if a parent does not share his or her contact number with the school authorities, then Par_Phone is set to NULL (data unknown).

1.6 KEYS IN A RELATIONAL DATABASE

The tuples within a relation must be distinct. It means no two tuples in a table should have same value for all attributes. That is, there should be at least one attribute in which data are distinct (unique) and not NULL. That way, we can uniquely distinguish each tuple of a relation. So, relational data model imposes some restrictions or constraints on the values of the attributes and how the contents of one relation be referred through another relation. These restrictions are specified at the time of defining the database through different types of keys as given below:

1.6.1 Candidate Key

A relation can have one or more attributes that takes distinct values. Any of these attributes can be used to uniquely identify the tuples in the relation. Such attributes are called candidate keys as each of them are candidates for the primary key.

As shown in Figure 1.5, the relation ***ParentRecord*** has five attributes out of which Par_ID and Par_Phone always take unique values. No two parents will have same phone number or same Par_ID. Hence, these two attributes are the candidate keys as they both are candidates for primary key.

1.6.2 Primary Key

Out of one or more candidate keys, the attribute chosen by the database designer to uniquely identify the tuples in a relation is called the primary key of that relation. The remaining attributes in the list of candidate keys are called the alternate keys.

In the relation ***ParentRecord***, suppose Par_ID is chosen as primary key, then Par_Phone will be called the alternate key.

1.6.3 Composite Primary Key

If no single attribute in a relation is able to uniquely distinguish the tuples, then more than one attributes are taken together as primary key. Such primary key consisting of more than one attribute is called ***Composite Primary key***. In relation ***AttendanceRecord***, Roll Number cannot be used as primary key as roll number of same students will appear in another row for a different date. Similarly, in relation ***AttendanceRecord***, Att_Date cannot be used as primary key because same date is repeated for each roll number.

However, combination of these two attributes Stu_RollNo and Att_Date together would always have unique value in ***AttendanceRecord*** table as on any working day, of a student would be marked attendance only once. Hence {Stu_RollNo, Att_Date} will combine to make the of ***AttendanceRecord*** relation composite primary key.

1.6.4 Foreign Key

A foreign key is used to represent the relationship between two relations. A foreign key is an attribute whose value is derived from the primary key of another relation. This means that any attribute of a relation (referencing), which is used to refer contents from another (referenced)

relation, becomes foreign key if it refers to the primary key of referenced relation. The referencing relation is called Foreign Relation. In some cases, foreign key can take NULL value if it is not the part of primary key of the foreign table.

The relation in which the referenced primary key is defined is called primary relation or master relation. In Figure 1.6, two foreign keys in **STUDENTATTENDANCE** database are shown using schema diagram where the foreign key is displayed as a directed arc (arrow) originating from it and ending at the corresponding attribute of the primary key of the referenced table. The underlined attributes make the primary key of that table.

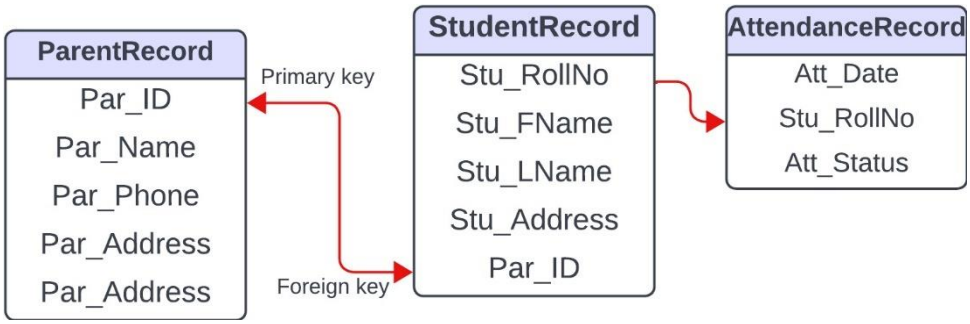

Fig. 1.6 StudentAttendance database with the Primary and Foreign keys

Summary

- A file in a file system is a container to store data in a computer.
- File system suffers from Data Redundancy, Data Inconsistency, Data Isolation, Data Dependence and Controlled Data sharing.
- Database Management System (DBMS) is a software to create and manage databases. A database is a collection of tables.
- Database schema is the design of a database
- A database constraint is a restriction on the type of data that that can be inserted into the table.
- Database schema and database constraints are stored in database Catalog. Whereas the snapshot of the database at any given time is the database instance.
- A query is a request to a database for information retrieval and data manipulation (insertion, deletion or update). It is written in Structured Query Language (SQL).
- Relational DBMS (RDBMS) is used to store data in related tables. Rows and columns of a table are called tuples and attributed respectively. A table is referred to as a relation.
- Restrictions on data stored in a RDBMS is applied by use of keys such as Candidate Key, Primary Key, Composite Primary Key, Foreign Key.
- Primary key in a relation is used for unique identification of tuples.
- Foreign key is used to relate two tables or relations.
- Each column in a table represents a feature (attribute) of a record. Table stores the information for an entity whereas a row represents a record.
- Each row in a table represents a record. A tuple is a collection of attribute values that makes a record unique.
- A tuple is a unique entity whereas attribute values can be duplicate in the table.

Check Your Progress

A. Multiple choice questions

1. A database is a (a) organized collection of information that cannot be accessed, updated, and managed (b) collection of data or information without organizing (c) organized collection of data or information that can be accessed, updated, and managed (d) organized collection of data that cannot be updated
2. Which of the following is not a valid SQL type? (a) float (c) numeric (c) decimal (d) character
3. In DBMS, table is known as _____ and row is known as _____. (a) relation, tuple (b) tuple, tuple (c) tuple, relation (d) relation, relation
4. In any table, the data types describe the kind of _____ that it can contain. (a) table (b) data (c) number (d) column
5. The SQL statement used to select data items from the database is (a) SELECT (b) USE (c) ALTER (d) CREATE
6. The database can be renamed using _____ SQL statement (a) CREATE DATABASE (b) RENAME DATABASE (c) DROP DATABASE (d) SELECT DATABASE
7. The syntax used to show all databases is (a) USE DATABASES (b) SELECT DATABASES (c) SHOW DATABASES (d) DISPLAY DATABASE
8. In a database table the field which uniquely identifies each row in the table is known as _____ (a) primary key (b) unique key (c) composite key (d) foreign key
9. Foreign key is a _____ key in another table. (a) primary (b) unique (c) composite (d) candidate key
10. The multiple columns that are used as primary key is known as (a) unique key (b) composite key (c) foreign key (d) candidate key
11. Which of the following key is used to link between two tables (a) primary (b) foreign (c) composite (d) unique
12. A primary key cannot be (a) Zero (b) foreign key (c) duplicate (d) NULL

B. Fill in the blanks

1. In DBMS, table is known as _____and row is known as _____.
2. Organized collection of data or information for accessing, updating and management is known as _____ .
3. A relational database consists of a collection of _____.
4. To see all available databases in MySQL; _____ command is used.
5. Data Definition language is the language which is used to defining the _____of relation.
6. In order to build a link between two tables, _____is used.
7. In order to make multiple columns as a Primary Key, _____ can be used.
8. Foreign key is a field in a table that is _____ in another table.
9. A Key which uniquely identifies each row in the table is known as _____.
10. A foreign key can be _____ or _____. (null, duplicate)

C. State whether True or False

1. DBMS is an interface between Database application and database.
2. Using the SQL statement RENAME DATABASE; a database can be renamed.
3. To see all existing databases; SHOW DATABASES; syntax is used.
4. A Primary Key is basically a Column or Columns.
5. To make a link between two tables, we can use foreign key constraints.
6. A Primary Key can be NULL
7. A Foreign Key cannot be Duplicate.
8. If multiple columns are used as Primary Key, it is known as Composite Key.
9. There could be two Primary keys constraints in a single table.
10. A Foreign Key cannot have NULL value

D. Short answer questions.

1. What is file system? Write down limitations of file system.
2. Why foreign keys are allowed to have NULL values? Explain with an example.
3. What are the limitations of file system and how that are overcome by DBMS?
4. What is database schema?
5. What is data redundancy and its associated problems?
6. How data redundancy problem is solved in DBMS?
7. What is MYSQL and its features?
8. What are various data types available in MYSQL?
9. Differentiate between: (a) Database state and database schema (b) Primary key and foreign key (c) Degree and cardinality of a relation
10. Explain the terms (a) Relation (b) Domain (c) Tuple (d) Attribute (e) Degree (f) Cardinality (g) Primary Key (h) Foreign Key
11. Describe the various integrity constraints?

E. Practical Exercises

1. Considering the following three tables Student, Teacher and Subject, answer the following questions.

Table Name: Student

Field Name	Description
Reg_No	Student Register Number
First_Name	Name of the Student
Sur_Name	Surname of the Student
Address	Address of the Student
City	City of Student
Pincode	Pincode of city
Birthdate	Date of Birth
Gender	Male or Female
Standard	Studying in which standard
Join_Date	Date of Joining School
Leaving_Date	Date of Leaving School

Table Name: Teacher

Field Name	Description
Teacher_No	Teacher Number
First_Name	Name of the Teacher
Sur_Name	Surname of the Teacher
Address	Address of the Teacher
City	City of teacher
Pincode	Pin code of the city
Phone_no	Phone number of teacher
Email_id	E-mail id of teacher
Mobile_No	Mobile number of teacher

Table Name: Subject

Field Name	Description
Sub_Name	Name of the Subject
Details	Description of the subject

1. Write data type for each field in each table.
2. Write Primary Key and other key constraints if any in each table.
3. Whether it is possible to relate any two tables. If yes, justify your answer.
4. What is the degree of each relation.

2. The medical shop wants to maintain a database "Medicos" to keep track of all medicines in the shop. Design a database by answering the following questions.

1. Create a realation "medicine" to the medicine details such as medicine name, company, price, batch no, mfd date, qty available and expiry date.
2. Assign the appropriate attribute names with their data type.
3. Store the medicine and its price at once.
4. Assign the contraints if required.

3. Canteen Store Department wants to create a database CSD_Customer to maintain details of all working as well as their dependent family member details.

WORKING_EMPLOYEE(Emp_No, Emp_Name, Address, Aadhar_Number, Dept, DOJ)
DEPENDENT (SNo, Dep_Name, Relationship, Emp_No, Valid_Date)

1. Name the attributes of WORKING_EMPLOYEE, which can be used as primary key and candidate keys.
2. The CSD wants to retrieve details of dependent of any specific employee. Name the tables and the key which are required to retrieve this information.
3. What is the degree and cardinality of WORKING_EMPLOYEE and DEPENDENT relation?

4. Considering the following three tables Student, Project_Assigned Teacher and Project, answer the following questions.

Table: STUDENT

Roll_No	Name	Class	Section	Regi_ID
11	Anshika	XII	B	CS-101-10
12	Hiba	XII	A	CS-103-14
21	Kushaal	XI	B	IP-104-15
22	Manmeet	XII	B	CS-101-14
23	Vibhanshu	XI	A	IP-101-15

Table: PROJECT_ASSIGNED

Regi_ID	Project_No
IP-101-15	101
IP-104-15	102
CS-103-14	103
CS-101-14	104
CS-101-10	105

Table: PROJECT

Proj_No	**Project_Name**	**Sub_Date**
101	Airline Reservation System	12-01-22
102	Library Automation System	12-01-22
103	Employee Management System	15-01-22
104	Student Management System	12-01-22
105	Inventory Management System	15-01-22

106	Railway Reservation System	15-01-22

Answer the following questions:

1. Write the name of primary key of each table.
2. Write the name of foreign key(s) in table PROJECT_ASSIGNED.
3. Is there any alternate key in table STUDENT? Give justification for your answer.
4. Can a user assign duplicate value to the field Roll_No of STUDENT table? Justify.

5. Consider the database STUDENT_PROJECT given above and answer the following questions with justification.

1. Can you insert a new student record with missing roll number.
2. Can you insert a new student record with missing registration id value.
3. Can you insert a new project detail without Sub_date.
4. Can you insert a new project detail without Proj_no.
5. Can you insert a new record with Regi_ID as IP-101-19 and Project_No 206 in table PROJECT_ASSIGNED.

Session 2: Structured Query Language (SQL)

Once the result date is declared, Shyam was eager to see the result on website. (Figure 2.1) He opened the website to enter his Roll number to see the result. After entering Roll number, he pressed the OK button. Immediately score card of Shyam got displayed on the screen and passed with first division marks. Shyam was very happy and also surprised, how a computer searches the Roll number so fast among approximately 5 lacs students records. Later on, Shyam understand that it was possible because of the database query language which is also known as Structured Query Language (SQL). SQL is used to search, store, modify records in data base management system. In this chapter, you will understand to create database objects, insert data in database and various types of commands used to retrieve the required data from the database.

Fig. 2.1 Checking result online

2.1 Structured Query Language (SQL)

In file system it is required to write programs to access data. However, in DBMS there exists a Structured Query Language (SQL), is a special kind of query language used to access and manipulate data from the database. SQL is the most popular query language used by major relational database management systems (RDBMS), such as MySQL, Oracle, Informix, PostGre SQL, SQL server, MS Access, and Sybase.

SQL is easy to learn as the statements comprise of descriptive English words. It is possible to interact with a database using SQL very easily. It is simply required to specify what is to be retrieved rather than how to retrieve data from the database. SQL provides statements for

defining the structure of data, manipulating data in the database, declaring constraints and retrieving data from the database in various ways, depending on requirement.

2.1.1 Installing MySQL

MySQL is an open source RDBMS software which can be easily downloaded from its official website https://dev.mysql.com/downloads. After installing MySQL, start MySQL service. It is shown in Figure 2.2. The appearance of mysql> prompt as shown below. MySQL is ready to accept SQL statements on this prompt.

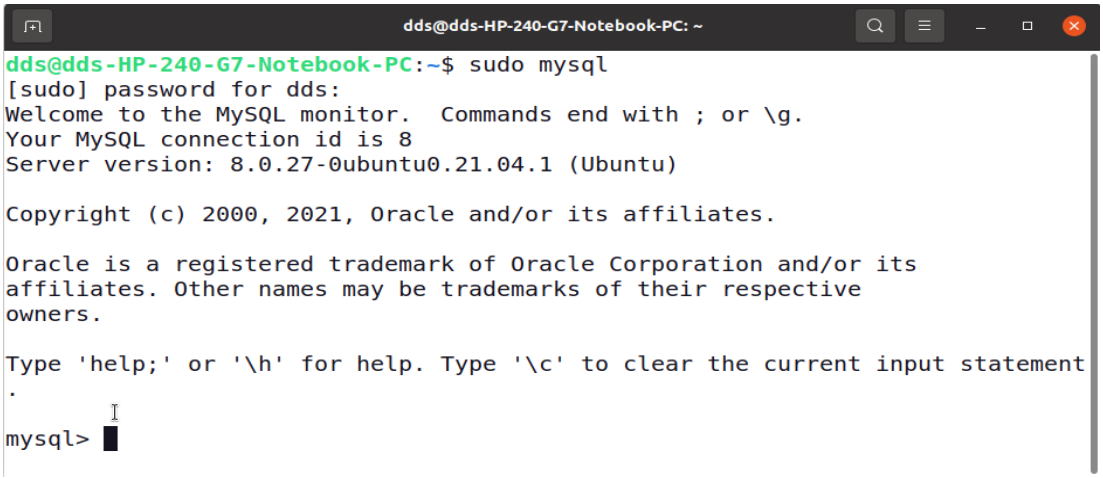

Fig. 2.2: MySQL Shell

Following are some important points to be kept in mind while using SQL.

- SQL is not case insensitive. For example, the column names 'salary' and 'SALARY' are the same for SQL.
- SQL statements terminates with a semicolon (;). In multi-line SQL statements, the ";" is not required after the first line. Just press the Enter key to continue on the next line. The prompt mysql> then changes to "->", indicating that statement is continued to the next line. Only at the end of SQL statement, put ";" and press Enter.

2.2 Data Types and Constraints in MySQL

We know that a database consists of one or more relations and each relation (table) is made up of attributes (column). Each attribute has a data type. It is also possible to specify constraints for each attribute of a relation.

2.2.1 Data type of Attribute

Data type of an attribute indicates the type of data value that an attribute can have. It also decides the operations that can be performed on the data of that attribute. For example, arithmetic operations can be performed on numeric data but not on character data. Commonly used data types in MySQL are numeric types, date and time types, and string types as shown in Table 2.1.

Table 2.1 Commonly used data types in MySQL

Data Type	Description
CHAR (n)	Specifies character type data of length n where n could be any value from 0 to 255. CHAR is of fixed length, means, declaring CHAR (10) implies to reserve spaces for 10 characters. If data does not have 10 characters (for example, 'city' has four characters), MySQL fills the remaining 6 characters with spaces padded on the right.

VARCHAR (n)	Specifies character type data of length 'n' where n could be any value from 0 to 65535. But unlike CHAR, VARCHAR is a variable-length data type. That is, declaring VARCHAR (30) means a maximum of 30 characters can be stored but the actual allocated bytes will depend on the length of entered string. So 'city' in VARCHAR (30) will occupy the space needed to store 4 characters only.
INT	INT specifies an integer value. Each INT value occupies 4 bytes of storage. The range of values allowed in integer type are -2147483648 to 2147483647. For values larger than that, we have to use BIGINT, which occupies 8 bytes.
FLOAT	Holds numbers with decimal points. Each FLOAT value occupies 4 bytes.
DATE	The DATE type is used for dates in 'YYYY-MM-DD' format. YYYY is the 4 digits year, MM is the 2 digits month and DD is the 2 digits date. The supported range is '1000-01-01' to '9999-12-31'.

2.2.2 Constraints

Constraints are the certain types of restrictions on the data values that an attribute can have. Table 2.2 lists some of the commonly used constraints in SQL. They are used to ensure correctness of data. However, it is not mandatory to define constraints for each attribute of a table.

Table 2.2 Commonly used SQL Constraints

Constraint	Description
NOT NULL	Ensures that a column cannot have NULL values where NULL means missing/ unknown/not applicable value.
UNIQUE	Ensures that all the values in a column are distinct/unique.
DEFAULT	A default value specified for the column if no value is provided.
PRIMARY KEY	The column which can uniquely identify each row or record in a table.
FOREIGN KEY	The column which refers to value of an attribute defined as primary key in another table.

2.2.3 Types of Structured Query Language (SQL)

SQL is a standardized language used for making communication with relational databases and performing various operations on it. According to ANSI (American National Standards Institute), it is the standard language for relational database management systems. SQL statements are used to perform tasks such as insert, update delete data in any database. On the basis of different types of operation, SQL commands are divided into five categories.

1. Data Definition Language (DDL)
2. Data Manipulation Language (DML)
3. Data Query Language (DQL)
4. Transaction Control Language (TCL)
5. Data Control Language (DCL)

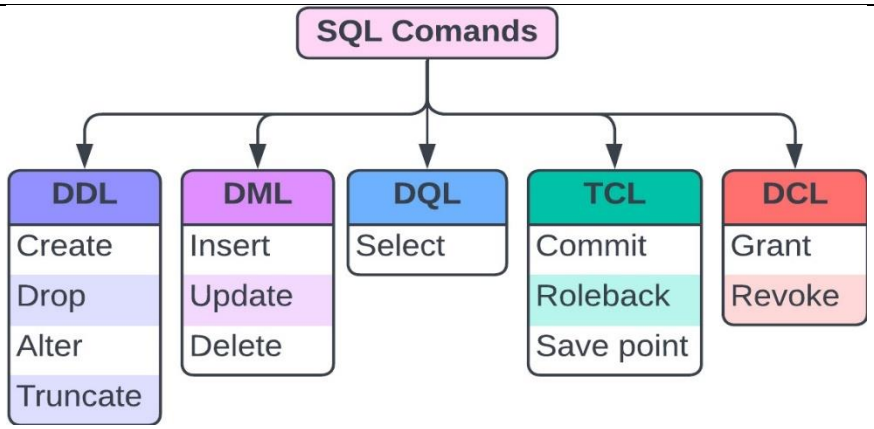

Fig. 2.3: Types of SQL command

2.3 SQL – Data Definition Language (DDL)

It is first necessary to define the relation schema to store data in database. Defining a schema includes creating a relation and giving name to a relation, identifying the attributes in a relation, deciding upon the datatype for each attribute and also specify the constraints as per the requirements. Sometimes, it may require to make changes to the relation schema also. SQL provides commands for defining the relation schema, modifying relation schema and deleting relations. These are called as Data Definition Language (DDL).

As you know that the data are stored in relations or tables in a database. Database is a collection of database object such as tables, queries and views. The CREATE statement is used to create a database and its tables (relations). Before creating a database, it should be clear about the number of tables in the database, the columns (attributes) in each table along with the data type of each column. This is how we decide the relation schema. This category of SQL provides a set of commands to create the database structure or schema.

2.3.1 CREATE Database

This SQL command is used to create various database objects. The syntax and example for creating database is given below.

Syntax:

CREATE DATABASE databasename;

Example 2.1: The following command is used to create a database with the name *"SchoolRecord"*.

mysql> CREATE DATABASE SchoolRecord;

After successful execution of the command a message "Query OK" is displayed on the sql prompt. It is also possible to see the newly created database by using the "show" command. The show command display the newly created database along with some default databases of MySQL as shown in Figure 2.4.

```
Copyright (c) 2000, 2021, Oracle and/or its affiliates.

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create database SchoolRecord;
Query OK, 1 row affected (0.23 sec)

mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| SchoolRecord       |
| information_schema |
| mysql              |
| performance_schema |
| sys                |
+--------------------+
5 rows in set (0.00 sec)

mysql>
```

Note: In any RDBMS, it is possible to manage multiple databases on a single computer. USE command is used to select the specific database. After selecting the database, it is possible to create tables or querying data from this database.

To select the database *SchoolRecord*, issue the "USE" command followed by database name.

```
mysql> use SchoolRecord;
Database changed
mysql>
```

Note/Tip: In LINUX OS environment, names for database and tables are case-sensitive whereas in WINDOWS OS, there is no such differentiation. However, as a good practice, it is suggested to write database or table name in the same letter cases that were used at the time of their creation.

2.3.2 CREATE Table

After creating database ***SchoolRecord***, it is required to define relations (create tables) in this database. In each relation specify attribute (column name) for each attribute with their required data types. The syntax for CREATE TABLE statement is as follows.

Syntax:

CREATE TABLE tablename (
Col_name1 datatype constraint,
Col_name2 datatype constraint,
:
Col_nameN datatype constraint);

Let us understand how to choose attribute names and their respected data types. First identify data types of the attributes in table *"StudentRecord"* along with their constraint, if any. Let us assume that there are total 100 students in a class and values of Roll number are in a sequence from 1 to 100. Since the data values of attribute *"Stu_RollNo"* is stored in digits, the data type integer (INT) is appropriate for this attribute. In the same way total number of characters in student First name and Last name can be upto 20 characters. Since the number of characters can vary for different students, the data type VARCHAR is used for these columns. In the same the data type VARCHAR is used for student address upto 50 characters in length. The specific data type DATE is used for specifying any type of date. So DATE data type is used for attribute *"Date of Birth"*. For student's parent id, Aadhaar number is used which is a 12 digit number. Since Aadhaar number is of fixed length and it is not required to perform any mathematical

operation, the character data type with fixed length of 12 character, CHAR (12) is used for this attribute.

Table 2.3 Data types and constraints for the attributes of relation StudentRecord

Attribute	Data expected to be stored	Data type	Constraint
Stu_RollNo	Numeric value consisting of maximum 3 digits	Int	Primary Key
Stu_FName	Variable length string of maximum 20 characters	Varchar (20)	Not Null
Stu_LName	Variable length string of maximum 20 characters	Varchar (20)	Not Null
Stu_DOB	Date value	Date	Not Null
Stu_Address	Variable length string of maximum 50 characters	Varchar (50)	Not Null
Par_ID	Fixed length string of 12 digits for Aadhaar Number	Char (12)	Foreign Key

Table 2.4 Data types and constraints for the attributes of relation ParentRecord

Attribute	Data expected to be stored	Data type	Constraint
Par_ID	Fixed length string of 12 digits Aadhaar number	Char (12)	Primary Key
Par_Name	Variable length string of maximum 20 characters	Varchar (20)	Not Null
Par_Phone	Numeric value consisting of 10 digits	Char (10)	Null Unique
Par_Address	Variable length string of size 30 characters	Varchar (30)	Not Null
Par_Email	Variable length string of size 30 characters	Varchar (30)	

Table 2.5 Data types and constraints for the attributes of relation AttendanceRecord

Attribute	Data expected to be stored	Data type	Constraint
Att_Date	Date value	Date	Primary Key*
Stu_RollNo	Numeric value consisting of maximum 3 digits	Int	Primary Key* Foreign Key
Att_Status	'P' for present and 'A' for absent	Char(1)	Not Null

Table 2.3, 2.4 and 2.5 show the chosen data type and constraint for each attribute of the relations *StudentRecord, ParentRecord* and *AttendanceRecord* respectively.

Example 2.2: The following command is used to create table ***StudentRecord.*** To create the table in SchoolRecord database, first open the database with USE SchoolRecord command. Then create the table under StudentRecord database by using the CREATE TABLE command.

```
mysql> USE SchoolRecord;
Database changed
mysql> CREATE TABLE StudentRecord (
    -> Stu_RollNo INT,
    -> Stu_FName VARCHAR(20),
    -> Stu_LName VARCHAR(20),
    -> Stu_DOB DATE,
    -> Stu_Address VARCHAR(50),
    -> Par_ID CHAR(12),
    -> PRIMARY KEY (Stu_RollNo) );
Query OK, 0 rows affected (3.17 sec)

mysql>
```

Note: "," is used to separate two attributes and each statement terminates with a semi-colon (;). The arrow (->) is an interactive continuation prompt. If we enter an unfinished statement, the SQL shell will wait for us to enter the rest of the statement.

Example 2.3: The following command is used to Create table ***ParentRecord.***

```
mysql> CREATE TABLE ParentRecord (
    -> Par_ID CHAR(12),
    -> Par_Name VARCHAR(20),
    -> Par_Phone CHAR(10),
    -> Par_Address VARCHAR(50),
    -> Par_Email VARCHAR(30) );
Query OK, 0 rows affected (2.57 sec)

mysql>
```

Example 2.4: The following command is used to Create table **AttendanceRecord.**

```
mysql> CREATE TABLE AttendanceRecord (
    -> Att_Date DATE,
    -> Stu_RollNo INT,
    -> Att_Status CHAR(1) );
Query OK, 0 rows affected (2.81 sec)

mysql>
```

2.3.3 DESCRIBE Table

DESCRIBE or DESC command is used to view the structure of an already created table.

Syntax:

DESCRIBE tablename;

Example 2.5: The following SQL command is used to show the structure of *StudentRecord* table.

```
mysql> DESCRIBE StudentRecord;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| Stu_RollNo  | int         | NO   | PRI | NULL    |       |
| Stu_FName   | varchar(20) | YES  |     | NULL    |       |
| Stu_LName   | varchar(20) | YES  |     | NULL    |       |
| Stu_DOB     | date        | YES  |     | NULL    |       |
| Stu_Address | varchar(50) | YES  |     | NULL    |       |
| Par_ID      | char(12)    | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
6 rows in set (0.01 sec)
mysql>
```

The SHOW TABLES statement is used to display all the table in database. We have created three tables in the database SchoolRecord.

Example 2.6: The following SQL command is used to display the tables created in the database SchoolRecord. It shows all the three tables created so far.

```
mysql> show tables;
+------------------------+
| Tables_in_SchoolRecord |
+------------------------+
| AttendanceRecord       |
| ParentRecord           |
| StudentRecord          |
+------------------------+
3 rows in set (0.01 sec)
mysql>
```

2.3.4 ALTER Table

After creating a table, it is possible to add or remove an attribute or modify the datatype of existing attribute or to add constraint in attribute. ALTER statement is used to change or alter the structure of the table.

Syntax:

ALTER TABLE tablename ADD/Modify/DROP attribute1, attribute2,..

(a) Add primary key to a relation

Example 2.7: The following SQL command is used to add a primary key to the relation *"ParentRecord"*

```
mysql> ALTER TABLE ParentRecord ADD PRIMARY KEY (Par_ID);
Query OK, 0 rows affected (3.91 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

A composite primary key is made up of two attributes. The primary key to the *"AttendanceRecord"* relation will be composite primary key of two attributes. *"AttendanceDate"* and *"Stu_RollNo"*.

Example 2.8: The following SQL command is used to add the composite primary key to the relation *"AttendanceRecord"*.

```
mysql> ALTER TABLE AttendanceRecord ADD PRIMARY KEY (
    -> Att_Date, Stu_RollNo);
Query OK, 0 rows affected (4.34 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

(b) Add foreign key to a relation

It is also possible to add foreign keys to the relation, if any. A relation may have multiple foreign keys and each foreign key is defined on a single attribute. Note the following points while adding foreign key to a relation.

- The referenced relation must be already created.
- The referenced attribute must be a part of primary key of the referenced relation.
- Data types and size of referenced and referencing attributes must be same.

Syntax:

ALTER TABLE table_name ADD FOREIGN KEY (attribute name)

REFERENCES referenced_table_name (attribute name);

Let us now add foreign key to the table StudentRecord.

In table *"StudentRecord"*, the attribute Par_ID (the referencing attribute) is a foreign key and it refers to attribute Par_ID (the referenced attribute) of table *"ParentRecord"*. Hence, *"StudentRecord"* is the referencing table and *"ParentRecord"* is the referenced table.

Example 2.9: The following SQL command is used to add the foreign key. The ALTER statement change the table StudentRecord.

```
mysql> ALTER TABLE StudentRecord ADD FOREIGN KEY(Par_ID)
    -> REFERENCES ParentRecord(Par_ID);
Query OK, 0 rows affected (5.16 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

(c) Add constraint unique to an existing attribute

In *"ParentRecord"* table, attribute *"Par_Phone"* has a constraint **UNIQUE,** means no two values in that column should be same.

Syntax:

ALTER TABLE table_name ADD UNIQUE (attributename);

Example 2.10: The following SQL command is used to add the constraint UNIQUE with attribute *"Par_Phone"* of the table *"ParentRecord"*.

```
mysql> ALTER TABLE ParentRecord ADD UNIQUE(Par_Phone);
Query OK, 0 rows affected (1.56 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

(d) Add an attribute to an existing table

Sometimes, it is required to add an additional attribute in a table. The syntax for this is.

Syntax:

ALTER TABLE table_name ADD attribute_name DATATYPE;

Suppose the Principal of the school has decided to award scholarship to some needy students for which income of the parents must be known. But school has not maintained income attribute with table *"ParentRecord"* so far.

Example 2.11: The following command is used to add a new attribute income of data type INT in the table *"ParentRecord"*.

```
mysql> ALTER TABLE ParentRecord ADD Par_Income INT;
Query OK, 0 rows affected (1.38 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

The newly added attribute *"income"* with data type INT in the table *"ParentRecord"* can be viewed using DESC command as follows.

```
mysql> desc ParentRecord;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| Par_ID      | char(12)    | NO   | PRI | NULL    |       |
| Par_Name    | varchar(20) | YES  |     | NULL    |       |
| Par_Phone   | char(10)    | YES  | UNI | NULL    |       |
| Par_Address | varchar(60) | YES  |     | NULL    |       |
| Par_Email   | varchar(30) | YES  |     | NULL    |       |
| Par_Income  | int         | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
6 rows in set (0.00 sec)

mysql>
```

(e) Modify datatype of an attribute

It is possible to modify the data types of the existing attributes of a table using the following statement.

Syntax:

ALTER TABLE table_name MODIFY attribute DATATYPE;

Suppose, to change the size of attribute *"Par_Address"* from VARCHAR (30) to VARCHAR (40) of the *"ParentRecord"* table.

Example 2.12: The following command is used to change the size of attribute *"Par_Address"* in *"ParentRecord"* table.

```
mysql> ALTER TABLE ParentRecord MODIFY Par_Address VARCHAR(60);
Query OK, 0 rows affected (0.51 sec)
Records: 0  Duplicates: 0  Warnings: 0
mysql>
```

(f) Modify constraint of an attribute

When creating a table, by default each attribute takes null value except for the attribute defined as primary key. It is possible to change an attribute's constraint from NULL to NOT NULL using ALTER statement.

Syntax:

ALTER TABLE table_name MODIFY attribute DATATYPE NOT NULL;

Note: It is required to specify the data type of the attribute along with constraint NOT NULL while using MODIFY.

Example 2.13: The following command is used to associate NOT NULL constraint with attribute *"Stu_FName"* of table *"StudentRecord"*.

```
mysql> ALTER TABLE StudentRecord MODIFY Stu_FName
    -> VARCHAR(20) NOT NULL;
Query OK, 0 rows affected (4.23 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

(g) Add default value to an attribute

The syntax to specify the default value for an attribute is,

Syntax:

ALTER TABLE table_name MODIFY attribute

DATATYPE DEFAULT default_value;

To set default value of *"Stu_DOB"* of *"StudentRecord"* to 15th May 2000, write the following statement.

```
mysql> ALter Table StudentRecord MODIFY Stu_DOB DATE
    -> DEFAULT '2000-05-15';
Query OK, 0 rows affected (0.61 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

Note: It is required to specify the data type of the attribute along with DEFAULT while using MODIFY.

(h) Remove an attribute

It is possible to remove attributes from a table using ALTER.

Syntax:

ALTER TABLE table_name DROP attribute;

Example 2.14: The following command is used to remove the attribute income from the table *"ParentRecord"*.

```
mysql> ALTER TABLE ParentRecord DROP Par_Income;
Query OK, 0 rows affected (3.91 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

(i) Remove primary key from the table

Sometimes it may be required to remove the primary key constraint from the table. In such case, the syntax for ALTER TABLE command is.

Syntax:

ALTER TABLE table_name DROP PRIMARY KEY;

Example 2.15: The following command is used to remove primary key of table *"ParentRecord"*

```
mysql> ALTER TABLE StudentRecord DROP PRIMARY KEY;
Query OK, 0 rows affected (5.61 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql>
```

Note: The primary key is dropped from StudentRecord table, but each table should have a primary key to maintain uniqueness. Hence, to use ADD command to specify primary key for the StudentRecord table as shown in earlier examples

2.3.5 DROP TABLE Command

Sometimes it may require to remove a table in a database or the database itself. DROP statement is used to remove a database or a table permanently from the system. Since this command will delete the table or database permanently, you have to be cautious while using this statement as it cannot be undone. Let us assume that you have created a table with name *"ParantRecord"* instead of *"ParentRecord"*. DROP command can be used to delete the table created with wrong name.

Syntax:

DROP TABLE table_name;

It is also possible to drop the entire database.

Syntax:

DROP DATABASE database_name;

Example 2.16: The following command is used to delete the table name *"ParantRecord"* from the current database.

Cautions:

- Using the Drop statement to remove a database will ultimately remove all the tables within it.
- DROP statement will remove the tables or database created by you. Hence you may apply DROP statement at the end of the chapter.

2.3.6 TRUNCATE TABLE Command

It is possible to remove all records form a table using TRUNCATE command. Later on, you can insert new records in the same table. This command will delete all records from the table but table structure will exist in database. While using DROP command, all the records with table structure will be deleted from the database. So care should be taken while using both TRUNCATE and DROP command in SQL.

Syntax:

Truncate Table Table_Name;

Example 2.17: The following command is used to Truncate the table *"StudentRecordBackup"*.

```
mysql> Select * from STUDENTBACKUP;
+------------+------------+-----------+------------+-----------------------------+
| Stu_RollNo | Stu_FName  | Stu_LName | Stu_DOB    | Stu_Address                 |
+------------+------------+-----------+------------+-----------------------------+
|          1 | Rajvardhan | Singh     | 2003-05-15 | 203, Khandari, Agra UP      |
|          2 | Trilok     | Sharma    | 2004-08-15 | 144 Gr Kailash, New Delhi   |
|          3 | Aditi      | Gaur      | 2005-06-04 | JP Greens, Noida, UP        |
|          4 | Anshika    | Agrawal   | 2003-05-17 | Kanda, Bagheshwar, UK       |
|          6 | Pawani     | Dixit     | 2004-12-11 | Lajpat Nagar, Mathura, UP   |
|          7 | Hiba       | Rizwan    | 2006-12-03 | Deep Nagar, Sahrsa, Bihar   |
|          8 | Riddhi     | Gupta     | 2005-11-01 | TNagar, Hyderabad, Telangana |
|         10 | John       | DeSousa   | 2005-08-17 | Guindy, Chennai, TN         |
+------------+------------+-----------+------------+-----------------------------+
8 rows in set (0.00 sec)

mysql> TRUNCATE STUDENTBACKUP;
Query OK, 0 rows affected (3.49 sec)

mysql> Select * from STUDENTBACKUP;
Empty set (0.01 sec)

mysql>
```

2.3.7 CREATE TABLE From Existing Table

If you want to create a new table from existing table with partial or additional fields, then you can use the CREATE table command with SELECT statement. The new table is created with the result of SELECT statement with results provided by it.

Syntax:

mysql> Create table NewTableName AS

(Select Field 1, Field 2, Field 3, …Field N from Old_Table_Name)

Example 2.18: The following command is used to Create table *"NewStudentRecord"* from the existing table *"StudentRecord"*.

```
mysql> Create table NewStudentRecord AS (Select Stu_RollNo, Stu_FName, Stu_LName,
 Stu_DOB, Stu_Address from StudentRecord);
Query OK, 9 rows affected (2.40 sec)
Records: 9  Duplicates: 0  Warnings: 0

mysql>
```

It will create a new table named as *"NewStudentRecord"* with only 5 attributes and all the records which are inserted in this table earlier.

```
mysql> Show tables;
+------------------------+
| Tables_in_SchoolRecord |
+------------------------+
| AttendanceRecord       |
| NewStudentRecord       |
| ParentRecord           |
| StudentRecord          |
+------------------------+
4 rows in set (0.00 sec)

mysql>
```

It is possible to create a new table with all attributes and all records available in the existing table.

Example 2.19: The following command is used to create a new table "*StudentRecord1*" with all attributes and all records available in the existing table "*StudentRecord*".

```
mysql> CREATE TABLE StudentRecord1 AS(Select * from StudentRecord);
Query OK, 9 rows affected (3.39 sec)
Records: 9  Duplicates: 0  Warnings: 0

mysql> SELECT * FROM StudentRecord1;
+------------+------------+-----------+------------+-----------------------------+--------------+
| Stu_RollNo | Stu_FName  | Stu_LName | Stu_DOB    | Stu_Address                 | Par_ID       |
+------------+------------+-----------+------------+-----------------------------+--------------+
|          1 | Rajvardhan | Singh     | 2003-05-15 | 203, Khandari, Agra UP      | 452695874564 |
|          2 | Trilok     | Sharma    | 2004-08-15 | 144 Gr Kailash, New Delhi   | 252154687451 |
|          3 | Aditi      | Gaur      | 2005-06-04 | JP Greens, Noida, UP        | 362115264625 |
|          4 | Anshika    | Agrawal   | 2003-05-17 | Kanda, Bagheshwar, UK       | 602125125261 |
|          6 | Pawani     | Dixit     | 2004-12-11 | Lajpat Nagar, Mathura, UP   | 268953264578 |
|          7 | Hiba       | Rizwan    | 2006-12-03 | Deep Nagar, Sahrsa, Bihar   | 485466192343 |
|          8 | Riddhi     | Gupta     | 2005-11-01 | TNagar, Hyderabad, Telangana| 521556651761 |
|         10 | John       | DeSousa   | 2005-08-17 | Guindy, Chennai, TN         | 954891122475 |
|          5 | Nandini    | Roy       | 2003-12-19 | Fortune Somya, Bhopal, MP   | 225423344657 |
+------------+------------+-----------+------------+-----------------------------+--------------+
9 rows in set (0.00 sec)

mysql>
```

2.3.8 RENAME TABLE command

Sometime it may be required to change the name of existing table. It is possible to do so by using RENAME or ALTER command.

Syntax:

RENAME TABLE `old_table_name` TO `new_table_name`;

Example 2.20: The following command is used to rename the table *"NewStudentRecord"* to *"StudentRecord1"*

mysql> RENAME TABLE **NewStudentRecord** TO **StudentRecord1;**

It is possible to rename multiple tables using single command as under.

Syntax:

RENAME TABLE Old_tableA TO New_tableA, Old_tableB TO New_tableB, Old_tableC TO New_tableC;

It is also possible to use ALTER command to rename the table as given below.

Syntax:

ALTER TABLE Old_table_name RENAME TO new_table_name;

Example 2.21: The following is the command to alter the table *"StudentRecord1"* to *"StudentRecord2"*

mysql> ALTER TABLE **StudentRecord1** RENAME TO **StudentRecord2;**

2.3.9 CREATE VIEW command

Like table, view is another database objects. It is a special kind of virtual table. It does not hold its own data. A view can has rows and columns just like in table. It is possible to create a view using CREATE VIEW command, by selecting fields from one or more tables present in the database. A View can either have all the rows of a table (s) or specific rows based on certain criteria. The syntax to create a view is as under.

Syntax:

CREATE VIEW view_name AS

SELECT column1, column2 ..... columnN

FROM table_name WHERE condition;

Example 2.22: The following is the command to create a view from single table.

```
mysql> CREATE VIEW EMP_VIEW AS  Select * FROM emp where SAL>10000;
Query OK, 0 rows affected (0.54 sec)

mysql>
```

Now the view named EMP_VIEW will be created with only those employee records who have salary more than 10000. You can use this view similar to Employee table to see all records using SELECT command. To see all records from EMP_VEW, use the SELECT command as under.

```
mysql> CREATE VIEW EMP_VIEW AS  Select * FROM emp where SAL>10000;
Query OK, 0 rows affected (0.54 sec)

mysql> Select * from EMP_VIEW;
+-------+-----------+-----------+------+------------+-------+------+--------+
| empno | ename     | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+-----------+------+------------+-------+------+--------+
|  7216 | Jawahar   | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7348 | Balwinder | Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7432 | Chetana   | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin    | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal   | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7552 | Farhan    | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
+-------+-----------+-----------+------+------------+-------+------+--------+
6 rows in set (0.00 sec)

mysql>
```

Activity 1

Practical Activity 2.1 – Create the table "Employee" and "Department" in MySQL with the following attributes specification.

Employee Table

Attribute	Data expected to be stored	Data type	Constraint
empno	Numeric value consisting of 4 digits	Int	Primary Key
ename	Variable length string of max 30 characters	Varchar (30)	Not Null
job	Variable length string of max 15 characters	Varchar (15)	Not Null
mgr	Numeric value consisting of 4 digits	Int	Not Null
hiredate	Date of joining the company	Date	Not Null
sal	Numeric value consisting of 6 digits	Int	Not Null
comm	Numeric value consisting of 4 digits	Int	Not Null
Deptno	Dept no which is Numeric type consisting of maximum 2 digits	Int	

Department Table

Attribute	Data expected to be stored	Data type	Constraint
deptno	Numeric value consisting of 4 digits	Int	Primary Key
dname	Variant length string of max 20 characters	Varchar (20)	Not Null
loc	Variant length string of max 25 characters	Varchar (25)	Not Null

2.4 SQL FOR DATA MANIPULATION LANGUAGE (DML)

In the previous section, we created the database **SchoolRecord** with three relations (or tables) i.e. *StudentRecord, ParentRecord* and *AttendanceRecord*. Creating ab table, creates its structure only. It is required to manipulate the data in the table by entering, deleting and updating the data records. The commands or statements used to insert, delete and update the records comes under SQL Data Manipulation Language (DML).

Data Manipulation means either retrieval (access) of existing data, insertion of new data, removal of existing data or modification of existing data in the database. Updation and deletion of data records are also important in SQL. These data manipulation methods are discussed in the following section.

2.4.1 INSERTION of Records

INSERT INTO statement is used to insert new records in any table or relation.

Syntax:

INSERT INTO tablename VALUES (value 1, value 2,....);

Here, value 1 corresponds to attribute 1, value 2 corresponds to attribute 2 and so on. It is required to specify attribute names in INSERT statement if there are exactly same number of values in the INSERT statement as the total number of attributes in the table.

Caution: *While populating records in a table with foreign key, ensure that records in referenced tables are already populated.*

Let us insert some records in the ***SchoolRecord*** database. First insert the records in *ParentRecord* table first as it does not have any foreign key. A set of sample records for *ParentRecord* table is shown in Table 2.6.

Table 2.6 Records to be inserted into the ParentRecord Table

Par_ID	Par_Name	Par_Phone	Par_Address	Par_Email
452695874564	Manu P Singh	9834567890	203, Khandari, Agra, UP	mpsingh@gmail.com
252154687451	Ashok K Sharma	9845678910	144 Gr Kailash, New Delhi	aksharmaji@mail.com
362115264625	Ashutosh Gaur	9856789120	JP Greens, Noida, UP	ashutoshgaur@gmail.com
602125125261	Sachin Agrawal	9812389120	Kanda, Bagheshwar, UK	sachinag@gmail.com
225423344657	Chandra Roy	9891201238	Fortune Somya, Bhopal, MP	Ch.roy@rediff.com
268953264578	Dinesh Dixit		Lajpat Nagar, Mathura, UP	dinesh.dixit@hp.com
485466192343	Rizwan Alam	9255614563	Deep Nagar, Sahrsa, Bihar	riz.alam@gmail.com
521556651761	Ashish Gupta	8544556978	T Nagar, Hyderabad, Telangana	ashish.gupta@hotmail.com
686113652987	Gurmeet Singh	9635214789	Shahid Nagar, Amritsar, PB	gurmeet.007@ymail.com
954891122475	Michal DeSousa	8554658958	Guindy, Chennai, TN	michal.don@gmail.com

Example 2.23: The following command is used to insert the record in the "*ParentRecord*" table.

```
mysql> INSERT INTO ParentRecord VALUES (45269587456,'Manu P Singh',
    -> 9834567890,'203, Khandari, Agra, UP','mpsingh@gmail.com');
Query OK, 1 row affected (0.25 sec)

mysql>
```

We can use the SQL statement ***"SELECT * from table_ name;"*** to view the inserted record after any statement to see the current changes in table.

```
mysql> select * from ParentRecord;
+-------------+--------------+------------+--------------------------+-------------------+
| Par_ID      | Par_Name     | Par_Phone  | Par_Address              | Par_Email         |
+-------------+--------------+------------+--------------------------+-------------------+
| 45269587456 | Manu P Singh | 9834567890 | 203, Khandari, Agra, UP | mpsingh@gmail.com |
+-------------+--------------+------------+--------------------------+-------------------+
1 row in set (0.01 sec)

mysql>
```

It is also possible to provide values only for some of the attributes in a table by just specifying the attribute name alongside each data value as per the following syntax.

Syntax:

INSERT INTO tablename (column1, column2, ...)

VALUES (value1, value2, ...);

Suppose to insert the sixth record in "*ParentRecord*" table (Table 2.6) keeping the value of *"Par_Phone"* to NULL. Then it is required to insert the values for other four fields. In this case, specify the names of attributes in which the values are to be inserted. The values must be given in the same order in which attributes are written in INSERT command.

Example 2.24: The following command is used to insert the record in "*ParentRecord*" table by specifying the field name and corresponding values.

```
mysql> INSERT INTO ParentRecord(Par_ID, Par_Name, Par_Address, Par_Email)
    -> VALUES(268953264578,'Dinesh Dixit','Lajpat Nagar, Mathura, UP',
    -> 'dinesh.dixit@hp.com');
Query OK, 1 row affected (0.25 sec)

mysql>
```

Now observe that all the four values has been inserted in the table *ParentRecord* except *"Par_Phone"* which is being set to NULL at the time of creating a table.

```
mysql> SELECT * FROM ParentRecord;
+-------------+--------------+------------+--------------------------+--------------------+
| Par_ID      | Par_Name     | Par_Phone  | Par_Address              | Par_Email          |
+-------------+--------------+------------+--------------------------+--------------------+
| 268953264578 | Dinesh Dixit | NULL       | Lajpat Nagar, Mathura, UP | dinesh.dixit@hp.com |
| 452695874564 | Manu P Singh | 9834567890 | 203, Khandari, Agra, UP   | mpsingh@gmail.com   |
+-------------+--------------+------------+--------------------------+--------------------+
2 rows in set (0.00 sec)

mysql>
```

Note: Text and date values must be enclosed in ' ' (single quotes).

Activities

Practical Activity 2.2 – Insert the records in the *ParentRecord* table using INSERT command and check the records inserted in *ParentRecord* as below.

```
mysql> Select * from ParentRecord;
+--------------+-----------------+------------+-------------------------------+---------------------------+
| Par_ID       | Par_Name        | Par_Phone  | Par_Address                   | Par_Email                 |
+--------------+-----------------+------------+-------------------------------+---------------------------+
| 225423344657 | Chandra Roy     | 9891201238 | Fortune Somya, Bhopal, MP     | Ch.roy@rediff.com         |
| 252154687451 | Ashok K Sharma  | 9845678910 | 144 Gr Kailsh, New Delhi      | aksharmaji@mail.com       |
| 268953264578 | Dinesh Dixit    | NULL       | Lajpat Nagar, Mathura, UP     | dinesh.dixit@hp.com       |
| 362115264625 | Ashutosh Gaur   | 9856789120 | JP Greens, Noida, UP          | ashutoshgaur@gmail.com    |
| 452695874564 | Manu P Singh    | 9834567890 | 203, Khandari, Agra, UP       | mpsingh@gmail.com         |
| 485466192343 | Rizwan Alam     | 9255614563 | Deep Nagar, Sahrsa, Bihar     | riz.alam@gmail.com        |
| 521556651761 | Ashish Gupta    | 8544556978 | T Nagar, Hyderabad, Telangana | ashish.gupta@hotmail.com  |
| 602125125261 | Sachin Agrawal  | 9812389120 | Kanda, Bagheshwar, UK         | sachinag@gmail.com        |
| 686113652987 | Gurmeet Singh   | 9635214789 | Shahid Nagar, Amritsar, PB    | gurmeet.007@ymail.com     |
| 954891122475 | Michal DeSousa  | 8554658958 | Guindy, Chennai, TN           | michal.don@gmail.com      |
+--------------+-----------------+------------+-------------------------------+---------------------------+
10 rows in set (0.00 sec)

mysql>
```

Practical Activity 2.3 – Insert the records in StudentRecord table (Table 2.7).

Table 2.7 Records to be inserted into the StudentRecord table

Stu_ RollNo	Stu_FName	Stu_LName	Stu_DOB	Stu_Address	Par_ID
1	Rajvardhan	Singh	5/15/2003	203, Khandari, Agra UP	452695874564
2	Trilok	Sharma	8/15/2004	144 Gr Kailash, New Delhi	252154687451
3	Aditi	Gaur	4/6/2005	JP Greens, Noida, UP	362115264625
4	Anshika	Agrawal	5/17/2003	Kanda, Bagheshwar, UK	602125125261
5	Nandini	Roy	12/29/2003	Fortune Somya, Bhopal, MP	225423344657
6	Pawani	Dixit	11/12/2004	Lajpat Nagar, Mathura, UP	268953264578
7	Hiba	Rizwan	12/3/2006	Deep Nagar, Sahrsa, Bihar	485466192343
8	Riddhi	Gupta	1/11/2005	T Nagar, Hyderabad, Telangana	521556651761
9	Manpreet	Singh	9/8/2005	Shahid Nagar, Amritsar, Punjab	686113652987
10	John	DeSousa	8/17/2005	Guindy, Chennai, TN	954891122475

Example 2.25: The following command is used to insert the first record in table *"StudentRecord"*.

```
mysql> INSERT INTO StudentRecord VALUES(1,'Rajvardhan','Singh','2003-05-15','203, Khandari,
Agra UP',452695874564);
Query OK, 1 row affected (0.22 sec)

mysql> select * from StudentRecord;
+------------+------------+-----------+------------+-----------------------+--------------+
| Stu_RollNo | Stu_FName  | Stu_LName | Stu_DOB    | Stu_Address           | Par_ID       |
+------------+------------+-----------+------------+-----------------------+--------------+
|          1 | Rajvardhan | Singh     | 2003-05-15 | 203, Khandari, Agra UP | 452695874564 |
+------------+------------+-----------+------------+-----------------------+--------------+
1 row in set (0.00 sec)

mysql>
```

When column names are not mentioned in the INSERT command, then it is necessary to mention the values for all the columns. So if there is no *"ParentID"* for Trilok, then mention the NULL value for the *"Par_ID"*.

Example 2.26: The following command inserts the second record with *"Par_ID"* value as NULL.

mysql>INSERT INTO StudentRecord VALUES (2,'Trilok','Sharma','8/15/2004', '144 Gr Kailash','New Delhi' NULL);

```
mysql> select * from studentrecord;
+------------+------------+-----------+------------+--------------------------+--------------+
| Stu_RollNo | Stu_FName  | Stu_LName | Stu_DOB    | Stu_Address              | Par_ID       |
+------------+------------+-----------+------------+--------------------------+--------------+
|          1 | Rajvardhan | Singh     | 2003-05-15 | 203, Khandari, Agra UP   | 452695874564 |
|          2 | Trilok     | Sharma    | 2004-08-15 | 144 Gr Kailash, New Delhi | NULL         |
+------------+------------+-----------+------------+--------------------------+--------------+
2 rows in set (0.00 sec)
```

Note/Tip: *Please be careful while entering date in INSERT command. Use the 'YYYY-MM-DD' format to write date.*

Practical Activity 2.4 – Use INSERT command

Insert the records in employee table using INSERT command and display it after inserting all record using SELECT statement.

```
mysql> select * from emp;
+-------+----------+-----------+------+------------+-------+------+--------+
| empno | ename    | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+----------+-----------+------+------------+-------+------+--------+
|  7019 | Smita    | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7049 | Alam     | Salesman  | 7348 | 1995-02-17 |  9600 | 1800 |     30 |
|  7171 | Wasim    | Salesman  | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7216 | Jawahar  | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7304 | Manoj    | Salesman  | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7348 | Balwinder| Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7432 | Chetana  | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin   | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal  | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7494 | Tarun    | Salesman  | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7526 | Amar     | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7550 | Jyoti    | Clerk     | 7348 | 1995-11-30 |  8950 | NULL |     30 |
|  7552 | Farhan   | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7584 | Mohan    | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7984 | Lalitha  | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+----------+-----------+------+------------+-------+------+--------+
15 rows in set (0.00 sec)

mysql>
```

Insert the records in Department table using INSERT command and display it after inserting all record using SELECT statement.

```
mysql> select * from dept;
+--------+------------+-----------+
| deptno | dname      | loc       |
+--------+------------+-----------+
|     10 | Accounting | New Delhi |
|     20 | Research   | Banglore  |
|     30 | Sales      | Mumbai    |
|     40 | Operation  | Hyderabad |
|     50 | HR         | Noida     |
+--------+------------+-----------+
5 rows in set (0.00 sec)

mysql>
```

2.4.2 UPDATION of Records using UPDATE and DELETE Command

UPDATE and DELETE are also the part of SQL Data Manipulation Language (DML).

UPDATE command is used to make changes in existing data value(s) of one or more columns of existing records in a table. For example, we may require some changes in address, phone number or spelling of name.

Syntax:

UPDATE table_name

SET attribute1 = value1, attribute2 = value2, ...

WHERE condition;

In ParentRecord table, Phone number is not available for Parent Name Dinesh Dixit. So, it is required to update Phone number of Dinesh Dixit, update the table *ParentRecord* use the command.

Example 2.27: The following command is used to update the Phone number of Dinesh Dixit in *ParentRecord* table.

```
mysql> UPDATE ParentRecord SET PAr_Address = 'WZ-68, Azad Avenue, Boriwali, Mumbai',
    -> Par_Phone = 9988776644 WHERE Par_ID = 485466192343;
Query OK, 1 row affected (0.61 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql>
```

The updated data can be verified using the statement.

SELECT * FROM ParentRecord.

It is also possible to update values for more than one column using the UPDATE statement.

Suppose, the ParentRecord with Par_ID 485466192343 has requested to change Address to 'WZ - 68, Azad Avenue, Boriwali, Mumbai' and Phone number to '9988776644'.

Example 2.28: The following SQL statement will update this record.

mysql> UPDATE ParentRecord SET Par_Address = 'WZ - 68, Azad Avenue, Boriwali, Mumbai', Par_Phone = 9988776644 WHERE Par_ID = 485466192343;

The changes affected can be verified by using the SELECT statement as below.

```
mysql> Select * from ParentRecord;
+--------------+---------------+------------+-----------------------------------+-------------------------+
| Par_ID       | Par_Name      | Par_Phone  | Par_Address                       | Par_Email               |
+--------------+---------------+------------+-----------------------------------+-------------------------+
| 225423344657 | Chandra Roy   | 9891201238 | Fortune Somya, Bhopal, MP         | Ch.roy@rediff.com       |
| 252154687451 | Ashok K Sharma | 9845678910 | 144 Gr Kailsh, New Delhi          | aksharmaji@mail.com     |
| 268953264578 | Dinesh Dixit  | 9956895689 | Lajpat Nagar, Mathura, UP         | dinesh.dixit@hp.com     |
| 362115264625 | Ashutosh Gaur | 9856789120 | JP Greens, Noida, UP              | ashutoshgaur@gmail.com  |
| 452695874564 | Manu P Singh  | 9834567890 | 203, Khandari, Agra, UP           | mpsingh@gmail.com       |
| 485466192343 | Rizwan Alam   | 9988776644 | WZ-68, Azad Avenue, Boriwali, Mumbai | riz.alam@gmail.com   |
| 521556651761 | Ashish Gupta  | 8544556978 | T Nagar, Hyderabad, Telangana     | ashish.gupta@hotmail.com |
| 602125125261 | Sachin Agrawal | 9812389120 | Kanda, Bagheshwar, UK             | sachinag@gmail.com      |
| 686113652987 | Gurmeet Singh | 9635214789 | Shahid Nagar, Amritsar, PB        | gurmeet.007@ymail.com   |
| 954891122475 | Michal DeSousa | 8554658958 | Guindy, Chennai, TN               | michal.don@gmail.com    |
+--------------+---------------+------------+-----------------------------------+-------------------------+
10 rows in set (0.00 sec)

mysql>
```

2.4.3 DELETION of Records using DELETE

DELETE statement is used to delete or remove one or more records from a table.

Syntax:

DELETE FROM table_name WHERE condition;

Suppose the student with roll number 2 has left the school.

Example 2.29: The following SQL statement is used to delete that record from the STUDENT table.

The changes affected can be verified by using the SELECT statement as below.

```
mysql> SELECT * from StudentRecord;
+------------+------------+-----------+------------+-----------------------------+--------------+
| Stu_RollNo | Stu_FName  | Stu_LName | Stu_DOB    | Stu_Address                 | Par_ID       |
+------------+------------+-----------+------------+-----------------------------+--------------+
|          1 | Rajvardhan | Singh     | 2003-05-15 | 203, Khandari, Agra UP      | 452695874564 |
|          2 | Trilok     | Sharma    | 2004-08-15 | 144 Gr Kailash, New Delhi   | 252154687451 |
|          3 | Aditi      | Gaur      | 2005-06-04 | JP Greens, Noida, UP        | 362115264625 |
|          4 | Anshika    | Agrawal   | 2003-05-17 | Kanda, Bagheshwar, UK       | 602125125261 |
|          6 | Pawani     | Dixit     | 2004-12-11 | Lajpat Nagar, Mathura, UP   | 268953264578 |
|          7 | Hiba       | Rizwan    | 2006-12-03 | Deep Nagar, Sahrsa, Bihar   | 485466192343 |
|          8 | Riddhi     | Gupta     | 2005-11-01 | TNagar, Hyderabad, Telangana | 521556651761 |
|         10 | John       | DeSousa   | 2005-08-17 | Guindy, Chennai, TN         | 954891122475 |
|          5 | Nandini    | Roy       | 2003-12-19 | Fortune Somya, Bhopal, MP   | 225423344657 |
+------------+------------+-----------+------------+-----------------------------+--------------+
9 rows in set (0.00 sec)

mysql>
```

Caution: The WHERE clause should be used in the UPDATE and DELETE statement, otherwise it will apply on all the records.

2.5 SQL FOR DATA QUERY LANGUAGE (DQL)

So far we have learned to create a database, store and manipulate data in the database tables. The data stored in a database can be retrieved using a mechanism called as *Query*. SQL provides efficient mechanisms to retrieve data stored in multiple tables in MySQL database (or any other RDBMS). The SQL statement SELECT is used to retrieve data from the tables in a database and is also called a query statement. One of the most commonly used DQL is SELECT statement.

2.5.1 SELECT Statement

In SQL, the SELECT statement is used to retrieve data from tables in a database and output is displayed as per the specified parameter on successful execution of statement.

Syntax:

SELECT attribute1, attribute2,... attribute N

FROM table_name

WHERE condition;

Here, attribute1, attribute2, ... attributeN are the names of columns of the table table_name from which data is to be retrieved. The FROM clause is always written with SELECT clause as it specifies the name of the table from which data has to be retrieved. The WHERE clause is optional and is used to retrieve data to meet any specified condition(s).

To select all the columns and rows available in a table, use the following select statement.

SELECT * FROM table_name;

Here * is used to retrieve all columns/attributes available in the table.

Let us use SELECT statement to retrieve names of the student whose name are starting with alphabet "D".

Example 2.30: The following SQL query statement is used to retrieve the name and date of birth of student whose roll number is 1.

```
mysql> SELECT Stu_RollNo, Stu_DOB FROM studentrecord WHERE Stu_RollNo = 1;
+------------+------------+
| Stu_RollNo | Stu_DOB    |
+------------+------------+
|          1 | 2003-05-15 |
+------------+------------+
1 row in set (0.00 sec)

mysql>
```

In the above query, observe that the Student Roll Number and Date of birth of the of the student whose roll number is 1 is retrieved using WHERE clause.

2.5.2 Querying using database OFFICE

Let us consider an EMP table of employee database with the following fields. The *"empno"* is a primary key and *"deptno"* as foreign key. Table 3.1 shows the data entered in the Emp table.

Table 2.8 Records available in EMP table

empno	ename	job	mgr	hiredate	sal	comm	deptno
7019	Smita	Clerk	7552	12/14/1994	8800	NULL	20
7049	Alam	Salesman	7348	02/17/1995	9600	1800	30
7171	Wasim	Salesman	7348	02/19/1995	9250	2000	30
7216	Jawahar	Manager	7489	03/30/1995	10975	NULL	20
7304	Manoj	Salesman	7348	09/25/1995	9250	2900	30
7348	Balwinder	Manager	7489	04/28/1995	10850	NULL	30
7432	Chetana	Manager	7489	06/06/1995	10450	NULL	10
7438	Sachin	Analyst	7216	12/05/1996	11000	NULL	20
7489	Kushaal	President	NULL	11/14/1995	13000	NULL	10
7494	Tarun	Salesman	7348	09/05/1995	9500	0	30
7526	Amar	Clerk	7438	01/08/1997	9100	NULL	20
7550	Jyoti	Clerk	7348	11/30/1995	8950	NULL	30
7552	Farhan	Analyst	7216	10/27/1995	11000	NULL	20
7584	Mohan	Clerk	7432	01/20/1996	9300	NULL	10
7984	Lalitha	Clerk	7432	05/23/1998	10300	NULL	10

Now if you wish to retrieve the desired data from the table, let us see how to apply the SELECT clause to retrieve the data.

(a) Retrieve selected columns – It is possible to retrieve the data of one column of table.

```
mysql> SELECT empno FROM emp;
+-------+
| empno |
+-------+
|  7019 |
|  7049 |
|  7171 |
|  7216 |
|  7304 |
|  7348 |
|  7432 |
|  7438 |
|  7489 |
|  7494 |
|  7526 |
|  7550 |
|  7552 |
|  7584 |
|  7984 |
+-------+
15 rows in set (0.00 sec)

mysql>
```

Example 2.31: The following SQL query statement is used to retrieve employee number of all employees in the table.

Observe that the above query retrieve *empno* of all the employee from *Emp* table as only one column is specified to retrieve.

Let us see another query that select two columns such as *emp no* and corresponding *employee name*. Modify the same query by specifying two fields of table as *"empno"* and *"ename"*. and observe the desired output as below.

```
mysql> SELECT empno, ename FROM emp;
+-------+-----------+
| empno | ename     |
+-------+-----------+
|  7019 | Smita     |
|  7049 | Alam      |
|  7171 | Wasim     |
|  7216 | Jawahar   |
|  7304 | Manoj     |
|  7348 | Balwinder |
|  7432 | Chetana   |
|  7438 | Sachin    |
|  7489 | Kushaal   |
|  7494 | Tarun     |
|  7526 | Amar      |
|  7550 | Jyoti     |
|  7552 | Farhan    |
|  7584 | Mohan     |
|  7984 | Lalitha   |
+-------+-----------+
15 rows in set (0.00 sec)

mysql>
```

Example 2.32: The following SQL query statement will retrieve the data of employee number and name in two columns.

(b) Renaming of columns – There is specific naming conventions of the fields in table. It is possible to rename any column while displaying the output by using the alias *'AS'*.

Example 2.33: The following SQL query statement selects *Employee name* as "Name" in the output for all the employees.

```
mysql> SELECT ename as Name FROM emp;

+-----------+
| Name      |
+-----------+
| Smita     |
| Alam      |
| Wasim     |
| Jawahar   |
| Manoj     |
| Balwinder |
| Chetana   |
| Sachin    |
| Kushaal   |
| Tarun     |
| Amar      |
| Jyoti     |
| Farhan    |
| Mohan     |
| Lalitha   |
+-----------+
15 rows in set (0.00 sec)

mysql>
```

Example 2.34: The following SQL query statement will calculate and to display the annual salary of employee. Annual salary is calculated as "sal*12".

```
mysql> SELECT ename as Name, sal*12 FROM emp;
+-----------+--------+
| Name      | sal*12 |
+-----------+--------+
| Smita     | 105600 |
| Alam      | 115200 |
| Wasim     | 111000 |
| Jawahar   | 131700 |
| Manoj     | 111000 |
| Balwinder | 130200 |
| Chetana   | 125400 |
| Sachin    | 132000 |
| Kushaal   | 156000 |
| Tarun     | 114000 |
| Amar      | 109200 |
| Jyoti     | 107400 |
| Farhan    | 132000 |
| Mohan     | 111600 |
| Lalitha   | 123600 |
+-----------+--------+
15 rows in set (0.00 sec)

mysql>
```

Now it doesn't look nice to display the caption as "sal*12" in the table. It is possible to display it with new caption as *"Annual Salary"* for *"sal*12"*. The revised query and its output is given below.

```
mysql> SELECT ename as Name, sal*12 AS 'Annual Income' FROM emp;
+-----------+---------------+
| Name      | Annual Income |
+-----------+---------------+
| Smita     |        105600 |
| Alam      |        115200 |
| Wasim     |        111000 |
| Jawahar   |        131700 |
| Manoj     |        111000 |
| Balwinder |        130200 |
| Chetana   |        125400 |
| Sachin    |        132000 |
| Kushaal   |        156000 |
| Tarun     |        114000 |
| Amar      |        109200 |
| Jyoti     |        107400 |
| Farhan    |        132000 |
| Mohan     |        111600 |
| Lalitha   |        123600 |
+-----------+---------------+
15 rows in set (0.00 sec)

mysql>
```

Observe that *"ename"* is shown with the caption as *"Name"* and *"sal*12"* is shown with the caption as *"Annual Income"*.

Note – Annual Income is just the caption to display. It will not add as a new column in the database table. It is just for displaying the output of the query. If an aliased column name has space as in the case of *Annual Income*, it should be enclosed in quotes as ***'Annual Income'.***

(c) Distinct Clause – The SELECT clause retrieves all the data through query as output. There may be a chance of duplicate values such as 2 persons with the same name working in the department. The DISTINCT clause has provision to retrieve the unique records by omitting the duplicate records. The DISTINCT clause is used for this purpose.

Example 2.35: The following SQL query statement shows the different departments available in the "*emp*" table.

```
mysql> SELECT DISTINCT deptno FROM emp;
+--------+
| deptno |
+--------+
|     20 |
|     30 |
|     10 |
+--------+
3 rows in set (0.01 sec)

mysql>
```

Let us understand, how to retrieve different types of jobs available using DISTINCT clause in the following example.

Example 2.36: The following SQL query statement will use DISTINCT clause to retrieve different types of jobs available in the *"emp"* table.

```
mysql> SELECT DISTINCT(job) FROM emp;
+-----------+
| job       |
+-----------+
| Clerk     |
| Salesman  |
| Manager   |
| Analyst   |
| President |
+-----------+
5 rows in set (0.00 sec)

mysql>
```

Observe that there are 5 different job titles although more number of records exists.

(d) WHERE Clause – It retrieves data that meet some specified conditions. In our OFFICE database, more than one employee can have the same salary.

Example 2.37: The following SQL query statement will give distinct salaries of the employees working in the department number 10.

```
mysql> SELECT DISTINCT sal FROM emp WHERE deptno=10;
+-------+
| sal   |
+-------+
| 10450 |
| 13000 |
|  9300 |
| 10300 |
+-------+
4 rows in set (0.01 sec)

mysql>
```

Observe in the output that all the records of employee working in dept no. 10 and having the distinct salary are retrieved.

In the above example, = operator is used in the WHERE clause. Other relational operators like (<, <=, >, >=, !=) can also be used to specify conditions as per your requirement. The logical operators AND, OR, and NOT are used to combine multiple conditions.

Let us see, how to compare columns/fields value/s to specific required records or columns.

Example 2.38: The following SQL query statement will display all the details of those employees of 30 departments who earn more than 5000.

```
mysql> SELECT * FROM emp WHERE sal > 5000 AND deptno = 30;
+-------+-----------+----------+------+------------+-------+------+--------+
| empno | ename     | job      | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+----------+------+------------+-------+------+--------+
|  7049 | Alam      | Salesman | 7348 | 1995-02-17 |  9600 | 1800 |     30 |
|  7171 | Wasim     | Salesman | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7304 | Manoj     | Salesman | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7348 | Balwinder | Manager  | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7494 | Tarun     | Salesman | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7550 | Jyoti     | Clerk    | 7348 | 1995-11-30 |  8950 | NULL |     30 |
+-------+-----------+----------+------+------------+-------+------+--------+
6 rows in set (0.00 sec)

mysql>
```

Note: Observe the output, two different conditions are being tested separately. First condition tested for Salary is greater than 5000 and second condition is for department number is 10. AND operator used to join both conditions.

Let us make a comparison of salary like who is getting more then 8000 and less than 11000.

Example 2.39: The following SQL query statement will select the name and department number of all those employees who are earning salary between 8000 and 11000 inclusive of both values.

```
mysql> SELECT ename, deptno FROM emp WHERE sal>=8000 AND sal<=11000;
+-----------+--------+
| ename     | deptno |
+-----------+--------+
| Smita     |     20 |
| Alam      |     30 |
| Wasim     |     30 |
| Jawahar   |     20 |
| Manoj     |     30 |
| Balwinder |     30 |
| Chetana   |     10 |
| Sachin    |     20 |
| Tarun     |     30 |
| Amar      |     20 |
| Jyoti     |     30 |
| Farhan    |     20 |
| Mohan     |     10 |
| Lalitha   |     10 |
+-----------+--------+
14 rows in set (0.01 sec)

mysql>
```

The query in example 2.39 defines a range of salary between 8000 and 11000 that can also be achieved using a comparison operator **BETWEEN**, in the query as below. The output of this query will be same as above.

```
mysql> SELECT ename, deptno FROM emp WHERE sal BETWEEN 8000 AND 11000;

+-----------+--------+
| ename     | deptno |
+-----------+--------+
| Smita     |     20 |
| Alam      |     30 |
| Wasim     |     30 |
| Jawahar   |     20 |
| Manoj     |     30 |
| Balwinder |     30 |
| Chetana   |     10 |
| Sachin    |     20 |
| Tarun     |     30 |
| Amar      |     20 |
| Jyoti     |     30 |
| Farhan    |     20 |
| Mohan     |     10 |
| Lalitha   |     10 |
+-----------+--------+
14 rows in set (0.00 sec)

mysql>
```

Note: The BETWEEN operator defines the range of values in which the column value must fall into, to make the condition true.

Example 2.40: The following SQL query statement will select details of all the employees who work in any of the department number 10, 20, or 40.

```
mysql> SELECT * FROM emp WHERE deptno = 10 OR deptno = 20 OR deptno = 40;
+-------+---------+-----------+------+------------+-------+------+--------+
| empno | ename   | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+---------+-----------+------+------------+-------+------+--------+
|  7019 | Smita   | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7216 | Jawahar | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7432 | Chetana | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin  | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7526 | Amar    | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7552 | Farhan  | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7584 | Mohan   | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7984 | Lalitha | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+---------+-----------+------+------------+-------+------+--------+
9 rows in set (0.00 sec)

mysql>
```

(E) Membership operator IN

The IN operator compares a value with a set of values and returns true if the value belongs to that set. The query given in *Example 2.40* can be rewritten using IN operator as below.

mysql> SELECT * FROM emp WHERE deptno IN (10, 20, 40);

It will give the same output as above.

Example 2.41: The following SQL query statement selects details of all the employees except those working in department number 10 or 20.

```
mysql> SELECT * FROM emp WHERE deptno IN (10, 20, 40);
+-------+---------+-----------+------+------------+-------+------+--------+
| empno | ename   | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+---------+-----------+------+------------+-------+------+--------+
|  7019 | Smita   | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7216 | Jawahar | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7432 | Chetana | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin  | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7526 | Amar    | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7552 | Farhan  | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7584 | Mohan   | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7984 | Lalitha | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+---------+-----------+------+------------+-------+------+--------+
9 rows in set (0.00 sec)

mysql>
```

Note: Here NOT operator is used in combination with IN to retrieve all records except with deptno 10 and 20.

(F) ORDER BY Clause – It is used to display data in an ordered form with respect to a specified column. By default, ORDER BY displays records in ascending order of the specified column values. The DESC keyword is used to display the records in descending.

Let us arrange the records in ascending or descending order using the ORDER BY clause with DESC clause example 2.42.

Example 2.42: The following SQL query statement selects details of all the employees in ascending order of their salaries.

```
mysql> SELECT * FROM emp ORDER BY sal;
+-------+-----------+-----------+------+------------+-------+------+--------+
| empno | ename     | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+-----------+------+------------+-------+------+--------+
|  7019 | Smita     | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7550 | Jyoti     | Clerk     | 7348 | 1995-11-30 |  8950 | NULL |     30 |
|  7526 | Amar      | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7171 | Wasim     | Salesman  | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7304 | Manoj     | Salesman  | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7584 | Mohan     | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7494 | Tarun     | Salesman  | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7049 | Alam      | Salesman  | 7348 | 1995-02-17 |  9600 | 1800 |     30 |
|  7984 | Lalitha   | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
|  7432 | Chetana   | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7348 | Balwinder | Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7216 | Jawahar   | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7438 | Sachin    | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7552 | Farhan    | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7489 | Kushaal   | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
+-------+-----------+-----------+------+------------+-------+------+--------+
15 rows in set (0.01 sec)

mysql>
```

Observe that the records are displayed in ascending order of Salary of each employee. To arrange records in descending order, use DESC clause with ORDER BY as in example 2.43.

Example 2.43: The following SQL query statement selects details of all the employees in descending order of their salaries.

```
mysql> SELECT * FROM emp ORDER BY sal DESC;
+-------+-----------+-----------+------+------------+-------+------+--------+
| empno | ename     | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+-----------+------+------------+-------+------+--------+
|  7489 | Kushaal   | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7438 | Sachin    | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7552 | Farhan    | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7216 | Jawahar   | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7348 | Balwinder | Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7432 | Chetana   | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7984 | Lalitha   | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
|  7049 | Alam      | Salesman  | 7348 | 1995-02-17 |  9600 | 1800 |     30 |
|  7494 | Tarun     | Salesman  | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7584 | Mohan     | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7171 | Wasim     | Salesman  | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7304 | Manoj     | Salesman  | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7526 | Amar      | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7550 | Jyoti     | Clerk     | 7348 | 1995-11-30 |  8950 | NULL |     30 |
|  7019 | Smita     | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
+-------+-----------+-----------+------+------------+-------+------+--------+
15 rows in set (0.00 sec)

mysql>
```

Note: DESC clause used after the column name on which the records to be displayed in descending order.

(G) Handling NULL Values – SQL supports a special value called NULL to represent a missing or unknown value. For example, the *"Par_Phone"* column in the table *"ParentRecord"* can have missing value for certain records. Hence, NULL is used to represent such unknown values. It is important to note that NULL is different from value 0 (zero). Also, any arithmetic operation performed with NULL value gives NULL. For example, 5 + NULL = NULL because NULL is unknown hence the result is also unknown. In order to check for NULL value in a column, use **IS NULL** operator in particular statement. Example 2.44 illustrates the use of NULL clause.

Example 2.44: The following SQL query statement selects details of all employees who have not been given a bonus. This implies that the bonus column will be blank.

```
mysql> SELECT * FROM emp WHERE comm IS NULL;
+-------+-----------+-----------+------+------------+-------+------+--------+
| empno | ename     | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+-----------+------+------------+-------+------+--------+
|  7019 | Smita     | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7216 | Jawahar   | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7348 | Balwinder | Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7432 | Chetana   | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin    | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal   | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7526 | Amar      | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7550 | Jyoti     | Clerk     | 7348 | 1995-11-30 |  8950 | NULL |     30 |
|  7552 | Farhan    | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7584 | Mohan     | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7984 | Lalitha   | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+-----------+-----------+------+------------+-------+------+--------+
11 rows in set (0.00 sec)

mysql>
```

Observe the output and see column mgr and comm where NULL is present.

It is also possible to join NULL statement with any other condition. Example 3.11 shows how to use it in statement.

Example 2.45: The following SQL query statement selects selects emp number, employee names and job of all those employees who have been given a comm (i.e., comm is not null) and works in the department 30.

```
mysql> Select empno, ename, job
    -> FROM emp WHERE comm IS NOT NULL
    -> AND deptno=30;
+-------+-------+----------+
| empno | ename | job      |
+-------+-------+----------+
|  7049 | Alam  | Salesman |
|  7171 | Wasim | Salesman |
|  7304 | Manoj | Salesman |
|  7494 | Tarun | Salesman |
+-------+-------+----------+
4 rows in set (0.02 sec)

mysql>
```

(H) Having clause – It is used in SELECT statement to make group with certain condition in result of query.

Syntax:

SELECT expression1, expression2, ... expression_n,
aggregate_function (expression)
FROM tables
[WHERE conditions]
GROUP BY expression1, expression2, ... expression_n
HAVING condition;

Example 2.45 shows how to use Group by and Having clause jointly. The HAVING clause must follow the GROUP BY clause in any SELECT query and must also preceded by ORDER BY clause if used.

Example 2.45: The following SQL query statement selects jobs, number of employees in that job, their total salary and department number wise list where minimum 3 employee of same type of job are working.

```
mysql> SELECT job, COUNT(*), SUM(sal)
    -> FROM emp GROUP BY job
    -> HAVING COUNT(*)>2;
+----------+----------+----------+
| job      | COUNT(*) | SUM(sal) |
+----------+----------+----------+
| Clerk    |        5 |    46450 |
| Salesman |        4 |    37600 |
| Manager  |        3 |    32275 |
+----------+----------+----------+
3 rows in set (0.00 sec)

mysql>
```

(I) Substring pattern matching – Many times it may require that the query should not retrieve that exact text or value, rather it should retrieve the matching of few characters or values. For example, to find out names starting with "M" or to find out pin codes starting with "11", is called substring pattern matching. Such patterns cannot match using = operator. SQL provides a LIKE operator that can be used with the WHERE clause to search for specified pattern in a column.

The LIKE operator makes use of the following two wild card characters - (%) and (-). The percent (%) is used to represent zero, one, or multiple characters. The underscore (_) is used to represent exactly a single character.

There are several situations when we search data records for some pattern matching. A very common situation when you search any contacts in your smart phone, you just start typing first few characters of the name, then immediately list appears with these characters and you tap on the required name to call. Example 3.46 to 3.51 demonstrates such situations to search some patterns in text values of records using LIKE clause.

Example 2.46: The following SQL query statement selects details of all those employees whose name starts with 'K'.

```
mysql> SELECT * FROM emp WHERE ename like 'K%';
+-------+---------+-----------+------+------------+-------+------+--------+
| empno | ename   | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+---------+-----------+------+------------+-------+------+--------+
|  7489 | Kushaal | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
+-------+---------+-----------+------+------------+-------+------+--------+
1 row in set (0.00 sec)
mysql>
```

Example 2.47: The following SQL query statement selects details of all those employees whose name whose name ends with 'a', and gets a salary more than 8500.

```
mysql> SELECT * FROM emp WHERE ename like '%a' AND sal > 8500;
+-------+---------+---------+------+------------+-------+------+--------+
| empno | ename   | job     | mgr  | hiredate   | sal   | comm | deptno |
+-------+---------+---------+------+------------+-------+------+--------+
|  7019 | Smita   | Clerk   | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7432 | Chetana | Manager | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7984 | Lalitha | Clerk   | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+---------+---------+------+------------+-------+------+--------+
3 rows in set (0.00 sec)
mysql>
```

Example 2.48: The following SQL query statement selects details of all those employees whose name consists of exactly 5 letters and starts with any letter but has 'mita' after that.

```
mysql> SELECT * FROM emp WHERE ename like '_mita';
+-------+-------+-------+------+------------+------+------+--------+
| empno | ename | job   | mgr  | hiredate   | sal  | comm | deptno |
+-------+-------+-------+------+------------+------+------+--------+
|  7019 | Smita | Clerk | 7552 | 1994-12-14 | 8800 | NULL |     20 |
+-------+-------+-------+------+------------+------+------+--------+
1 row in set (0.00 sec)

mysql>
```

You can also match a particular character or string in between the text simply by using wild card character as shown in example 2.49.

Example 2.49: The following SQL query statement selects all columns of all employees containing '**ma**' as a substring in name.

```
mysql> SELECT * FROM emp WHERE ename like '%ma%';
+-------+-------+----------+------+------------+------+------+--------+
| empno | ename | job      | mgr  | hiredate   | sal  | comm | deptno |
+-------+-------+----------+------+------------+------+------+--------+
|  7304 | Manoj | Salesman | 7348 | 1995-09-25 | 9250 | 2900 |     30 |
|  7526 | Amar  | Clerk    | 7438 | 1997-01-08 | 9100 | NULL |     20 |
+-------+-------+----------+------+------------+------+------+--------+
2 rows in set (0.00 sec)

mysql>
```

Example 2.50: The following SQL query statement selects all columns of employees containing 'a' as the second character in their names.

```
mysql> SELECT * FROM emp WHERE ename like '_a%';
+-------+-----------+----------+------+------------+-------+------+--------+
| empno | ename     | job      | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+----------+------+------------+-------+------+--------+
|  7171 | Wasim     | Salesman | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7216 | Jawahar   | Manager  | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7304 | Manoj     | Salesman | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7348 | Balwinder | Manager  | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7438 | Sachin    | Analyst  | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7494 | Tarun     | Salesman | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7552 | Farhan    | Analyst  | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7984 | Lalitha   | Clerk    | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+-----------+----------+------+------------+-------+------+--------+
8 rows in set (0.00 sec)

mysql>
```

Example 2.51: The following SQL query statement selects records of all the employees except Alam.

2.6 SQL FOR DATA CONTROL LANGUAGE (DCL)

```
mysql> SELECT * FROM emp WHERE NOT ename= 'Alam';
+-------+-----------+-----------+------+------------+-------+------+--------+
| empno | ename     | job       | mgr  | hiredate   | sal   | comm | deptno |
+-------+-----------+-----------+------+------------+-------+------+--------+
|  7019 | Smita     | Clerk     | 7552 | 1994-12-14 |  8800 | NULL |     20 |
|  7171 | Wasim     | Salesman  | 7348 | 1995-02-19 |  9250 | 2000 |     30 |
|  7216 | Jawahar   | Manager   | 7489 | 1995-03-30 | 10975 | NULL |     20 |
|  7304 | Manoj     | Salesman  | 7348 | 1995-09-25 |  9250 | 2900 |     30 |
|  7348 | Balwinder | Manager   | 7489 | 1995-04-28 | 10850 | NULL |     30 |
|  7432 | Chetana   | Manager   | 7489 | 1995-06-06 | 10450 | NULL |     10 |
|  7438 | Sachin    | Analyst   | 7216 | 1996-12-05 | 11000 | NULL |     20 |
|  7489 | Kushaal   | President | NULL | 1995-11-14 | 13000 | NULL |     10 |
|  7494 | Tarun     | Salesman  | 7348 | 1995-09-05 |  9500 |    0 |     30 |
|  7526 | Amar      | Clerk     | 7438 | 1997-01-08 |  9100 | NULL |     20 |
|  7550 | Jyoti     | Clerk     | 7348 | 1995-11-30 |  8950 | NULL |     30 |
|  7552 | Farhan    | Analyst   | 7216 | 1995-10-27 | 11000 | NULL |     20 |
|  7584 | Mohan     | Clerk     | 7432 | 1996-01-20 |  9300 | NULL |     10 |
|  7984 | Lalitha   | Clerk     | 7432 | 1998-05-23 | 10300 | NULL |     10 |
+-------+-----------+-----------+------+------------+-------+------+--------+
14 rows in set (0.01 sec)

mysql>
```

Data Control Language is the part of SQL, which have commands to manage users for their work permission. The user will be able to work as per the permissions granted to them by DBA

(Database Administrator). DCL includes the commands GRANT and REVOKE, which are used to provide rights & permissions to user.

GRANT statement – The GRANT statement is used to give access privileges to a specific user to work with any selected database only.

Syntax:

GRANT SELECT, UPDATE ON Test_Table TO NewUser1, NewUser2;

Example:

GRANT SELECT, UPDATE, DELETE ON carshowroom TO 'WebUser';

Here the user *'WebUser'* will be able to use only three SELECT, UPDATE and DELETE SQL statements when working on carshowroom database.

REVOKE statement – The REVOKE statement is used to withdraw privileges from a specific user so that specific user could not use specific statement on selected database. In other words it is useful to take back the given permission/s from the user.

Syntax:

REVOKE Privilege_Name ON Object_Name FROM User_Name.

Example:

REVOKE DELETE ON carshowroom FROM WebUser;

2.7 SQL FOR TRANSACTION CONTROL LANGUAGE (TCL)

Transaction control language (TCL) is the part of SQL commands that allows to permanently change the databases or undo the databases transactions. It is similar to save the database or undo the current changes. The COMMIT, ROLLBACK and SAVEPOINT statements comes under this category.

COMMIT – Commit command is used to save all the transactions to the database. After completing any operation or SQL statement, you can simply write COMMIT as the next statement to permanently save data in the database.

Syntax:

Commit;

Example: *DELETE FROM ClassStudents WHERE RollNo =25;*

Commit;

Here, after DELETE statement, the COMMIT statement is used. It means the student record whose RollNo is 25 is permanently deleted. Now after COMMIT statement, it is not possible to rollback the record of that student.

ROLLBACK – ROLLBACK command allows to undo transactions that have not already been saved to the database. This statement is useful to restore the database to the state where last commit statement was used. Rollback statement is also used with SAVEPOINT statement to jump to specific Savepoint in the database transactions.

Syntax:

ROLLBACK;

SAVEPOINT – This command helps to sets a Savepoint within a transaction. Basically SAVEPOINT statement is used to save a transaction temporarily so that user can rollback to that point as and when required.

Syntax: SAVEPOINT Savepoint_Name;

SUMMARY

- SQL is a domain-specific language that is used to manage relational databases.
- Currently almost all RDBMS such as MySQL, Oracle, Informix, SQL server, MS Access, and Sybase uses SQL as their standard database language.

- SQL is easy to learn as the statements comprise of descriptive English words.
- SQL is a open source, interactive, portable, faster query processing, standardized and universal language to work with with RDBMS.
- SQL is divided into five types like DDL, DML, DQL, TCL and DCL.
- DDL (Data Definition Language) includes SQL statements such as, Create table, Alter table and Drop table.
- Create command is used to create database and its further objects like Table, View.
- DML (Data Manipulation Language) includes SQL statements such as, insert, select, update and delete.
- A table is a collection of rows and columns, where each row is a record and columns describe the feature of records.
- DESCRIBE TABLE statement is used to view the structure of an already existing table
- ALTER TABLE statement is used to make changes in the structure of a table like adding, removing column and changing datatype of column(s). It is also used to apply/remove any constraints like Primary Key, Foreign Key etc.
- DROP statement is used to remove a database or a table permanently from the database system.
- TRUNCATE statement is used to delete all records from the table but table structure will exist in database.
- INSERT INTO statement is used to insert new records in any existing table
- UPDATE statement is used to make required changes in records of any table.
- DELETE statement is used to delete/remove one or more records from a table.
- CREATE TABLE statement can also be used to create new table from existing tables/s.
- RENAME statement is used to change the name of existing tables of other database objects.
- Views in any database is a special kind of virtual table that is created from one or more table and having no data of its own.
- WHERE clause in SQL query is used to enforce condition(s).
- DISTINCT clause is used to eliminate repetition and display the values only once.
- The BETWEEN operator defines the range of values inclusive of boundary values.
- The in operator selects values that match any value in the given list of values.
- NULL values can be tested using IS NULL and IS NOT NULL.
- ORDER BY clause is used to display the result of a SQL query in ascending or descending order with respect to specified attribute values. By default, the order is ascending.
- LIKE operator is used for pattern matching. % and _ are two wild card characters. The per cent (%) symbol is used to represent zero or more characters. The underscore (_) symbol is used to represent a single character.

Check Your Progress

A. Multiple choice questions

1. Which of the following is not a valid aggregate function? (a) COUNT (b) COMPUTE (c) SUM (d) MAX
2. DDL stands for (a) Data Describe Language (b) Definition Data Language (c) Data Definition Language (d) Data Distinct Language
3. Which of the following SQL command is used to remove data from table (a) Collapse (b) Remove (c) Alter (d) Delete
4. The records and structure of a table may be removed or deleted from the database using which command? (a) Remove (b) Delete (c) Drop (d) Truncate
5. SQL ___ statement can be used to delete or drop existing databases in a SQL schema. (a) Create Database (b) Rename Database (c) Drop Database (d) Select Database
6. Using DROP TABLE command in SQL (a) Drop the table structure (b) Drop the Integrity constraints (c) Drop the Relationship (d) All of the above
7. Using DROP TABLE command in SQL (a) Drop the table structure (b) Drop the Integrity constraints (c) Drop the Relationship (d) Noe of the above
8. TRUNCATE TABLE requires (a) Where Clause (b) Having Clause (c) Both A And B (d) None of the above
9. Which of the following clause is used to add a Primary Key constraint after creating table (a) Update (b) Add (c) Alter (d) Join
10. Which of the following clause is used to remove a primary key constraint (a) Delete (b) Drop (c) Alter (d) Remove
11. Which of the following SQL statement is used to give result in sorted order (a) Sort By (b) Order (c) Order By (d) Sort
12. Commands under DCL are (a) GRANT (b) REVOKE (c) Both A. and B. (d) None of the above
13. The SQL command to retrieve table records is (a) RETRIEVE (b) SELECT (c) CREATE (d) ALTER
14. Which of the following operator is used for pattern matching in SQL? (a) BETWEEN operator (b) LIKE operator (c) EXISTS operator (d) None of these
15. Which operator is used to check the absence of data in any column (a) EXISTS operator (b) NOT operator (c) IS NULL operator (d) None of these
16. Which of the following keyword is used to select only unique values from any column (a) DISTINCTIVE (b) UNIQUE (c) DISTINCT (d) DIFFERENT

B. Fill in the blanks

1. SQL is divided in _____ category.
2. The _____ command is used to see the structure of table.
3. The _____ command is used to remove all records.
4. The _____ command is used to add an attribute in an existing table.
5. The _____ command is used to remove all records only from a table.
6. The _____ command is used to remove a attribute from a table.
7. A view is a special kind of _____ table.
8. Views can be created form _____ or more tables.
9. Grant and Revoke are part of _____ in SQL.
10. Commit and Savepoint are part of _____ in SQL.
11. To sort the result of a query in descending order, we can use clause _____
12. To extract unique values from a column, user can use _____ clause.

C. State whether True or False

1. INSERT clause is used to add a Foreign key constraint.

2. ALTER clause is used to add a Primary key constraint after table is created.
3. DROP command is used to delete the structure of a table from the database.
4. Updation and deletion of records are part of DDL.
5. Insert into statement is useful to insert a new field in any table.
6. Aggregate functions are used to perform calculations on multiple values and returns a single value.
7. Aggregate functions are mostly used with the SELECT statement.
8. DML is used to create a new database objects like table and view.
9. A new table can be created from existing table(s).
10. The name of any tables once its created and records are inserted cannot be change.

D. Short answers questions

1. What do you understand by SQL?
2. SQL Statements are classified in how many ways?
3. Differentiate between DDL and DML?
4. Differentiate between DCL and TCL?
5. What is the difference between ALTER and UPDATE command.
6. Differentiate between DELETE and DROP command
7. What is create statement? How many database objects can be created using this?
8. Write the CREATE statement to create the following relations with given constraints.
   Book(ISBN (Text), Title (Text), Author (Text), PubID(Text), Price (Numeric), Pages (Numeric)).
   Here ISBN is Primary Key field and remaining all are Not Null.
9. Modify the Book table in previous question and add one more new field Discount (Numeric).
10. Shyam has created one database name Mycontacts but he is not able to create new table in this database. What command should Shyam be used before creating the table?
11. Mr. Sachin Agrawal created two tables with Course as Primary Key in Table1 and Foreign key in Table2 while inserting new row in second Table2 Mr Agrawal is not able to insert new value in the column City. What could be the possible reason for this?

E. Practical Exercises

1. Based on employee table, write SQL queries to –

- display the list of employee belonging to the department 30.
- display the list of employee number and name of mangers.
- display the list of clerks working in department 10
- display the detailed list of those employees who have joined before the July 1995
- display the the names of employees who are not mangers.
- display the List of employees whose employees numbers are 7438, 7216, 7019 and 7984
- display the employee name and salary whose salary is between 9000 and 10500.
- display the employee name who have joined after 30 June 1995.
- display the List of different job available in the emp table
- display the List of employee who are not getting/eligible commission.
- display the list of employee whose name start with “M”
- display the list of employee whose name has 6 characters.
- display the List of employee having 'a' as second character.
- display the List of all employee in descending order of salary.

- display the List of employee in ascending order of hire date.
- display the employee name, Salary, PF, HRA, DA and Gross; order the result in descending order of gross. Here PF is 10% of Salary, HRA is 50% of Salary and DA is 30% of Salary and Gross is sum of Salary, HRA and DA.
- display the unique jobs available in emp table.
- display the total salary which is sum of salary and commission.
- create new table named NewEmp from existing table emp with all same field and records.
- add a new column address and mobno to the newly created table NewEmp.
- Suppose the DBMS admin forget to make empno as primary key and deptno as foreign key. Write the SQL query to make these changes.
- change emp name with your name for empno=7034 in table NewEmp
- change emp name with your friend name for empno=7550 in table NewEmp.
- insert mob no and address in your record and of and your friend's records.
- delete the column address from the new table NewEmp.
- to delete the newly created table NewEmp.

2. Consider the following table named "Product", showing details of products being sold in a grocery shop.

PCode	PName	UPrice	Manufacturer
P01	Washing Powder	130	Surf
P02	Toothpaste	58	Colgate
P03	Soap	29	Lux
P04	Toothpaste	75	Pepsodent
P05	Soap	44	Dove
P06	Shampoo	275	Dove
P08	Toothpaste	44	Patanjali
P09	Soap	48	Hamam
P10	Washing Powder	90	Henko

Write SQL queries for the following.

- Create the table Product with appropriate data types and constraints.

a) Identify the primary key in Product.

b) List the Product Code, Product name and price in descending order of their product name. If PName is same, then display the data in ascending order of price.

c) Add a new column Discount to the table Product.

d) Calculate the value of the discount in the table Product as 10 per cent of the UPrice for all those products where the UPrice is more than 100, otherwise the discount will be 0.

e) Increase the price by 12 per cent for all the products manufactured by Dove.

f) Display the total number of products manufactured by each manufacturer.

3. Consider the following MOVIE table and write the SQL queries based on it.

MID	MovieName	Category	ReleaseDate	ProdCost	BusiCost
1	Hindi_Movie	Musical	4/23/2018	124500	130000
2	Tamil_Movie	Action	5/17/2016	112000	118000
3	English_Movie	Horror	8/6/2017	245000	360000
4	Bengali_Movie	Adventure	1/4/2017	72000	100000

5	Telugu_Movie	Action			100000
6	Punjabi_Movie	Comedy			30500

a) Display all the information from the Movie table.

b) List business done by the movies showing only MID, MovieName and Total_Earning. Total_Earning to be calculated as the sum of ProdCost and BusiCost.

c) List the different categories of movies.

d) Find the net profit of each movie showing its MID, MovieName and NetProfit. Net Profit is to be calculated as the difference between BussCost and ProdCost.

e) List MID, MovieName and Cost for all movies with ProdCost greater than 10,000 and less than 1,00,000.

f) List details of all movies which fall in the category of comedy or action.

g) List details of all movies which have not been released yet.

4. Suppose your school management has decided to conduct cricket matches between students of Class XI and Class XII. Students of each class are asked to join any one of the four teams – Team Titan, Team Rockers, Team Magnet and Team Hurricane. During summer vacations, various matches will be conducted between these teams. Help your sports teacher to do the following:

- 1. Create a database "Sports".

12. Create a table "TEAM" with following considerations:
    - It should have a column TeamID for storing an integer value between 1 to 9, which refers to unique identification of a team.
    - Each TeamID should have its associated name (TeamName), which should be a string of length not less than 10 characters.
13. Using table level constraint, make TeamID as the primary key.
14. Show the structure of the table TEAM using a SQL statement.
15. As per the preferences of the students four teams were formed as given below. Insert these four rows in TEAM table:

    Row 1: (1, Team Titan)

    Row 2: (2, Team Rockers)

    Row 3: (3, Team Magnet)

    Row 3: (4, Team Hurricane)
16. Show the contents of the table TEAM using a DML statement.
17. Now create another table MATCH_DETAILS and insert data as shown below. Choose appropriate data types and constraints for each attribute.

Table: MATCH_DETAILS

MatchID	MatchDate	FirstTeamID	SecondTeamID	FirstTeamScore	SecondTeamScore
M1	7/17/2022	1	2	90	86
M2	7/18/2022	3	4	45	48
M3	7/19/2022	1	3	78	56
M4	7/19/2022	2	4	56	67
M5	7/18/2022	1	4	32	87
M6	7/17/2022	2	3	67	51

Session 3: Functions in SQL

There are various readily available functions in SQL that can be used in queries. It includes single row functions, multiple row functions, group records based on some criteria, and working on multiple tables using SQL.

A function is used to perform some particular tasks and it returns zero or more values as a result. Functions are useful while writing SQL queries also. Functions can be applied to work on single or multiple records (rows) of a table.

3.1 SQL functions

SQL functions are categorized as Single Row functions and Aggregate functions, depending on their application in one or multiple rows.

Single Row Functions are also known as Scalar functions. Single row functions are applied on a single value and return a single value. These are used in SELECT, WHERE, and ORDER BY clause. MATH, STRING and DATE functions are examples of single row functions.

Aggregate functions are also called Multiple Row functions. These functions work on a set of records as a whole and return a single value for each column of the records on which the function is applied. These are used with SELECT clause only. MAX ( ), MIN ( ), AVG ( ), SUM ( ), COUNT ( ) and COUNT (*) are examples of multiple row fun.

To demonstrate the use of SQL function, let us create database called CARSHOWROOM having the schema with four relations as shown in Figure 3.1.

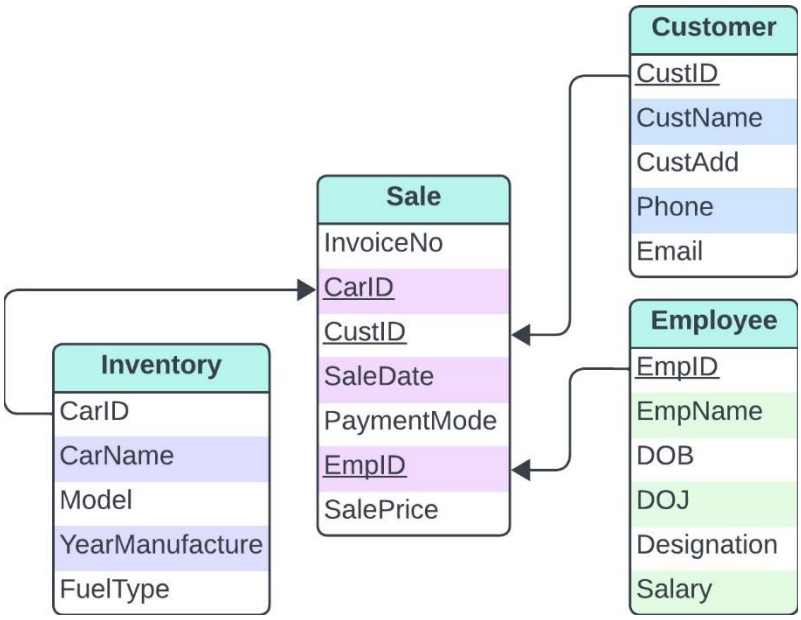


Fig 3.1: Car showroom database schema

Inventory – Stores Car id, Car Name, Price, Model, Year of manufacturing and fuel type for each car in inventory of the showroom.

Table 3.1: Attribute specification of "Inventory" table

Attribute	Data expected to be stored	Data type	Constraint
CarID	Alpha-Numeric value consisting of maximum 4 digits	Varchar (4)	Primary Key
CarName	Variant length string of maximum 20 characters	Varchar (20)	Not Null

Price	Numeric value consisting of car price.	Int	Not Null
Model	Variable length string of maximum 4 characters	Varchar (10)	Not Null
YearManufacturer	Variable length string of maximum 4 characters	Varchar (4)	Not Null
FuelType	Variable length string of max 10 characters	Varchar (10)	Not Null

Customer – Stores Customer id, name, address, phone number and email for each customer.

Table 3.2: Attribute specification of "Customer" table

Attribute	Data expected to be stored	Data type	Constraint
CustID	Alphanumeric value consisting of characters and digits, max 5 chars	Varchar (5)	Primary Key
CustName	Variable length string of max 30 characters	Varchar (30)	Not Null
CustAdd	Variable length string of max 50 characters	Varchar (50)	Not Null
Phone	Numeric value consisting of 10 digits	Char (10)	Not Null
Email	Variable length string of max 50 characters	Varchar (20)	Not Null

Sale – Stores the invoice number, car id, customer id, sale date, mode of payment, sales person's employee id and selling price of the car sold,

Table 3.3: Attribute specification of "Sale" table

Attribute	Data expected to be stored	Data type	Constraint
InvoiceNo	Alpha-Numeric value consisting of Characters and digits, max 6 chars	Varchar (6)	Primary Key
CarID	Alpha-Numeric value consisting of maximum 4 digits	Varchar (4)	Foreign Key
CustID	Alpha-Numeric value consisting of Characters and digits, max 5 chars	Varchar (5)	Foreign Key
SaleDate	Date value	Date	Not Null
PaymentMode	Variant length string of max 20 characters	Varchar (20)	Not Null
EmpID	Alpha-Numeric value consisting of maximum 4 chars only	Varchar (4)	Foreign Key
SalePrice	Car price will be as Numeric Value	Int	Not Null

Employee – Stores employee id, name, date of birth, date of joining, designation and salary of each employee in the showroom.

Table 3.4: Attribute specification of "Employee" table

Attribute	Data expected to be stored	Data type	Constraint
EmpID	Alpha-Numeric value consisting of maximum 4 chars only	Varchar (4)	Primary Key
EmpName	String of max 20 characters	Varchar (20)	Not Null
DOB	Date value	Date	Not Null
DOJ	Date value	Date	Not Null
Designation	String of max 20 characters	Varchar (20)	Not Null
Salary	Numeric value	Int	Not Null

To proceed further, create database CARSHOWROOM and create all four tables as per the above specification.

Insert the records in tables *Inventory, Customer, Sale* and *Employee* using INSERT command. The records of these four relations can be viewed using the SELECT command.

Execute the following query to view the records of *"inventory"* table. After successful execution of the query, the records entered in the "*inventory"* table will be displayed.

```
mysql> SELECT * FROM inventory;
+-------+---------+--------+-----------+------------------+----------+
| CarID | CarName | Price  | Model     | YearManufacturer | FuelType |
+-------+---------+--------+-----------+------------------+----------+
| B001  | Baleno  | 567031 | Sigma1.2  | 2019             | Petrol   |
| B002  | Baleno  | 647858 | Delta1.2  | 2018             | Petrol   |
| D001  | Dzire   | 582613 | LXI       | 2017             | Petrol   |
| D002  | Dzire   | 673112 | VXI       | 2018             | Petrol   |
| E001  | EECO    | 355205 | 5 STR STD | 2017             | CNG      |
| E002  | EECO    | 654914 | CARE      | 2018             | CNG      |
| S001  | SWIFT   | 514000 | LXI       | 2017             | Petrol   |
| S002  | SWIFT   | 614000 | VXI       | 2018             | Petrol   |
+-------+---------+--------+-----------+------------------+----------+
8 rows in set (0.00 sec)
```

Execute the following query to view the records of *"customer"* table. After successful execution of the query, the records entered in the *"customer"* table will be displayed.

```
mysql> SELECT * FROM customer;
+--------+--------------+------------------------+------------+--------------------+
| CustID | CustName     | CustAdd                | Phone      | Email              |
+--------+--------------+------------------------+------------+--------------------+
| C0001  | Amit Saha    | L-10, Pitampura        | 4564587852 | amitsaha2@gmail.com |
| C0002  | Rehnuma      | J-12, SAKET            | 5527688761 | rehnuma@hotmail.com |
| C0003  | Charvi Nayyar | 10/9, FF, Rohini      | 6811635425 | charvi123@yahoo.com |
| C0004  | Gurpreet     | A-10/2, SF Mayur Vihar | 3511056125 | gur_singh@yahoo.com |
+--------+--------------+------------------------+------------+--------------------+
4 rows in set (0.00 sec)
```

Execute the following query to view the records of *"sale"* table. After successful execution of the query, the records entered in the *"sale"* table will be displayed.

```
mysql> SELECT * FROM sale;
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
| InvoiceNo | CarID | CustID | SaleDate   | PaymentMode | EmpID | SalePrice | Commission |
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
| I00001    | D001  | C0001  | 2019-01-24 | Credit Card | E004  |    613248 |   73589.76 |
| I00002    | S001  | C0002  | 2018-12-12 | Online      | E001  |    590321 |   70838.52 |
| I00003    | S002  | C0004  | 2019-01-25 | Cheque      | E010  |    604000 |   72480.00 |
| I00004    | D002  | C0001  | 2018-10-15 | Bank Finance | E007 |    659982 |   79197.84 |
| I00005    | E001  | C0003  | 2018-12-20 | Credit Card | E002  |    369310 |   44317.20 |
| I00006    | S002  | C0002  | 2019-01-30 | Bank Finance | E007 |    620214 |   74425.68 |
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
6 rows in set (0.00 sec)
```

Execute the following query to view the records of *"employee"* table. After successful execution of the query, the records entered in the *"employee"* table will be displayed.

```
mysql> SELECT * FROM employee;
+-------+----------+------------+------------+-------------+--------+
| EmpID | EmpName  | DOB        | DOJ        | Designation | Salary |
+-------+----------+------------+------------+-------------+--------+
| E001  | Rushil   | 1994-07-10 | 2017-12-12 | Salesman    |  25550 |
| E002  | Sanjay   | 1990-03-12 | 2016-06-05 | Salesman    |  33100 |
| E003  | Zohar    | 1975-08-30 | 1999-01-08 | Peon        |  20000 |
| E004  | Arpit    | 1989-06-06 | 2010-12-02 | Salesman    |  39100 |
| E006  | Sanjucta | 1985-11-03 | 2012-07-01 | Receptionist |  27350 |
| E007  | Mayank   | 1993-04-03 | 2017-01-01 | Salesman    |  27352 |
| E010  | Rajkumar | 1987-02-26 | 2013-10-23 | Salesman    |  31111 |
+-------+----------+------------+------------+-------------+--------+
7 rows in set (0.00 sec)
```

3.2 Single Row Functions

Figure 3.2 lists different single row functions under three categories — Numeric (Math), String, Date and Time.

1. Math Functions accept numeric value as input and return a numeric value as a result.
2. String Functions accept character value as input and return either character or numeric values as output.
3. Date and Time functions accept date and time value as input and return numeric or string or Date and Time as output.

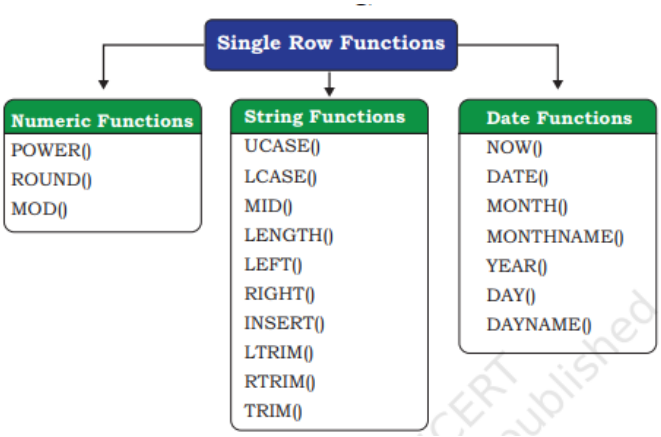


Fig 3.2: Categories of single row functions in SQL

C) 3.2.1 Math Functions

d) Three commonly used numeric functions are POWER (), ROUND () and MOD (). Their usage along with syntax is given below.

1. POWER (X, Y) or POW (X, Y) – calculates X to the power Y

```
mysql> SELECT POWER (5,3);
+-------------+
| POWER (5,3) |
+-------------+
|         125 |
+-------------+
1 row in set (0.00 sec)
```

2. ROUND (N, D) – Rounds off number N to D number of decimal places. If D=0, then it rounds off the number to the nearest integer.

```
mysql> SELECT ROUND (3412.567, 1);
+---------------------+
| ROUND (3412.567, 1) |
+---------------------+
|              3412.6 |
+---------------------+
1 row in set (0.00 sec)

mysql> SELECT ROUND (412.56);
+----------------+
| ROUND (412.56) |
+----------------+
|            413 |
+----------------+
1 row in set (0.00 sec)
```

3. MOD (A, B) – Returns the remainder after dividing number A by number B.

```
mysql> SELECT MOD (44, 3);
+-------------+
| MOD (44, 3) |
+-------------+
|           2 |
+-------------+
1 row in set (0.00 sec)
```

Practical Activity 3.1 – Demonstrate to use math function ROUND

In order to increase sales, suppose the car dealer offers the customers to pay the total amount in 10 easy EMIs (equal monthly installments). Assume that EMIs are required in multiples of 10000. For that, the dealer wants to list the CarID and Price along with the following data from the Inventory table.

Step 1. Calculate GST as 12 per cent of Price and apply ROUND function to it. Execute the query to round off the GST to one decimal place and display the records with the fields CarID, CarName and GST.

```
mysql> SELECT CarID, CarName, ROUND (12/100*Price,1) "GST" FROM inventory;
+-------+---------+---------+
| CarID | CarName | GST     |
+-------+---------+---------+
| B001  | Baleno  | 68043.7 |
| B002  | Baleno  | 77743.0 |
| D001  | Dzire   | 69913.6 |
| D002  | Dzire   | 80773.4 |
| E001  | EECO    | 42624.6 |
| E002  | EECO    | 78589.7 |
| S001  | SWIFT   | 61680.0 |
| S002  | SWIFT   | 73680.0 |
+-------+---------+---------+
8 rows in set (0.00 sec)
```

Step 2. Add a new column *"FinalPrice"* to the table *"inventory"*. Update the table *"inventory"* with *"FinalPrice"* as the sum of Price and 12 percent of the GST. Apply the ROUND function to round off the GST to one decimal place. Execute the following query to do this.

```
mysql> ALTER TABLE inventory ADD(FinalPrice Numeric(10,1));
Query OK, 0 rows affected (0.09 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE inventory SET FinalPrice=Price+Round(Price*12/100,1);
Query OK, 8 rows affected (0.02 sec)
Rows matched: 8  Changed: 8  Warnings: 0
```

Display the values of *"FinalPrice"* for all the record by using the SELECT command.

```
mysql> SELECT * FROM inventory;
+-------+---------+--------+-----------+------------------+----------+------------+
| CarID | CarName | Price  | Model     | YearManufacturer | FuelType | FinalPrice |
+-------+---------+--------+-----------+------------------+----------+------------+
| B001  | Baleno  | 567031 | Sigma1.2  | 2019             | Petrol   |   635074.7 |
| B002  | Baleno  | 647858 | Delta1.2  | 2018             | Petrol   |   725601.0 |
| D001  | Dzire   | 582613 | LXI       | 2017             | Petrol   |   652526.6 |
| D002  | Dzire   | 673112 | VXI       | 2018             | Petrol   |   753885.4 |
| E001  | EECO    | 355205 | 5 STR STD | 2017             | CNG      |   397829.6 |
| E002  | EECO    | 654914 | CARE      | 2018             | CNG      |   733503.7 |
| S001  | SWIFT   | 514000 | LXI       | 2017             | Petrol   |   575680.0 |
| S002  | SWIFT   | 614000 | VXI       | 2018             | Petrol   |   687680.0 |
+-------+---------+--------+-----------+------------------+----------+------------+
8 rows in set (0.00 sec)
```

Step 3. Calculate and display the amount to be paid each month in multiples of 1000, which is calculated after dividing the *FinalPrice* of the car into 10 installments. After dividing the amount into EMIs, find out the remaining amount to be paid immediately, by performing modular division. Use SELECT command to display the result. Execute the following query to do this.

```
mysql> SELECT CarId, CarName, FinalPrice,
    -> Round((FinalPrice-Round(mod(FinalPrice,1000),0))/10,0) 'EMI Amt',
    -> mod(FinalPrice,1000) 'Balance Amt' FROM inventory;
+-------+---------+------------+---------+-------------+
| CarId | CarName | FinalPrice | EMI Amt | Balance Amt |
+-------+---------+------------+---------+-------------+
| B001  | Baleno  |   635074.7 |   63500 |        74.7 |
| B002  | Baleno  |   725601.0 |   72500 |       601.0 |
| D001  | Dzire   |   652526.6 |   65200 |       526.6 |
| D002  | Dzire   |   753885.4 |   75300 |       885.4 |
| E001  | EECO    |   397829.6 |   39700 |       829.6 |
| E002  | EECO    |   733503.7 |   73300 |       503.7 |
| S001  | SWIFT   |   575680.0 |   57500 |       680.0 |
| S002  | SWIFT   |   687680.0 |   68700 |       680.0 |
+-------+---------+------------+---------+-------------+
8 rows in set (0.00 sec)
```

Step 4. Execute the following query to display the "*InvoiceNo*" and "*Commission*" value rounded off to zero decimal places.

```
mysql> Select InvoiceNo, round(Commission) from sale;
+-----------+-------------------+
| InvoiceNo | round(Commission) |
+-----------+-------------------+
| I00001    |             73590 |
| I00002    |             70839 |
| I00003    |             72480 |
| I00004    |             79198 |
| I00005    |             44317 |
| I00006    |             74426 |
+-----------+-------------------+
6 rows in set (0.00 sec)
```

Step 5. Execute the following query to display the details of *"sale"* table where payment mode is credit card.

```
mysql> Select * from sale where PaymentMode='Credit Card';
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
| InvoiceNo | CarID | CustID | SaleDate   | PaymentMode | EmpID | SalePrice | Commission |
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
| I00001    | D001  | C0001  | 2019-01-24 | Credit Card | E004  |    613248 |   73589.76 |
| I00005    | E001  | C0003  | 2018-12-20 | Credit Card | E002  |    369310 |   44317.20 |
+-----------+-------+--------+------------+-------------+-------+-----------+------------+
2 rows in set (0.02 sec)
```

Step 6. Execute the query to add a new column *"Commission"* with total length of 7 with 2 decimal places to the *"sale"* table.

Step 7. Execute the query to calculate commission for sales agents as 12% of *"SalePrice"*.

```
mysql> ALTER TABLE sale ADD(Commission Numeric(7,2));
Query OK, 0 rows affected (0.05 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> UPDATE sale SET Commission=12 / 100 * SalePrice;
Query OK, 6 rows affected (0.09 sec)
Rows matched: 6  Changed: 6  Warnings: 0
```

Step 8. Execute the following query to insert the values to the newly added column *"Commission"* and then display all records of the *"sale"* table where Commission > 73000.

```
mysql> SELECT * FROM sale WHERE Commission > 73000;
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
| InvoiceNo | CarID | CustID | SaleDate   | PaymentMode  | EmpID | SalePrice | Commission |
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
| I00001    | D001  | C0001  | 2019-01-24 | Credit Card  | E004  |    613248 |   73589.76 |
| I00004    | D002  | C0001  | 2018-10-15 | Bank Finance | E007  |    659982 |   79197.84 |
| I00006    | S002  | C0002  | 2019-01-30 | Bank Finance | E007  |    620214 |   74425.68 |
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
3 rows in set (0.00 sec)
```

Step 9. Execute the following query to display InvoiceNo, EmpID, SalePrice and Commission such that commission value is rounded off to 0.

```
mysql> SELECT InvoiceNo, EmpID,SalePrice, Round(Commission,0) FROM sale;
+-----------+-------+-----------+----------------------+
| InvoiceNo | EmpID | SalePrice | Round(Commission,0) |
+-----------+-------+-----------+----------------------+
| I00001    | E004  |    613248 |                73590 |
| I00002    | E001  |    590321 |                70839 |
| I00003    | E010  |    604000 |                72480 |
| I00004    | E007  |    659982 |                79198 |
| I00005    | E002  |    369310 |                44317 |
| I00006    | E007  |    620214 |                74426 |
+-----------+-------+-----------+----------------------+
6 rows in set (0.00 sec)
```

3.2.2 String Functions

String functions can perform various operations on alphanumeric data which are stored in a table. They can be used to change the case such as uppercase to lowercase or vice-versa, extract a substring, calculate the length of a string and so on. Some of the string functions with examples are given below.

1. UCASE (string) OR UPPER (string) – converts string into uppercase.

```
mysql> SELECT UCASE ('Vocational Education');
+---------------------------------+
| UCASE ('Vocational Education') |
+---------------------------------+
| VOCATIONAL EDUCATION           |
+---------------------------------+
1 row in set (0.00 sec)

mysql> SELECT UPPER ('Vocational Education');
+---------------------------------+
| UPPER ('Vocational Education') |
+---------------------------------+
| VOCATIONAL EDUCATION           |
+---------------------------------+
1 row in set (0.00 sec)
```

2. LCASE (string) OR LOWER (string) – converts string into lowercase.

```
mysql> SELECT LCASE ('Computer SCIENCE');
+----------------------------+
| LCASE ('Computer SCIENCE') |
+----------------------------+
| computer science           |
+----------------------------+
1 row in set (0.00 sec)

mysql> SELECT LOWER ('Computer SCIENCE');
+----------------------------+
| LOWER ('Computer SCIENCE') |
+----------------------------+
| computer science           |
+----------------------------+
1 row in set (0.00 sec)
```

3. MID (string, pos, n) OR SUBSTRING (string, pos, n) OR SUBSTR (string, pos, n) – Returns a substring of size n starting from the specified position (pos) of the string. If n is not specified, it

returns the substring from the position pos till end of the string.

```
mysql> SELECT MID('Vocational', 3, 4);
+-------------------------+
| MID('Vocational', 3, 4) |
+-------------------------+
| cati                    |
+-------------------------+
1 row in set (0.00 sec)

mysql> SELECT MID('Vocational', 7);
+----------------------+
| MID('Vocational', 7) |
+----------------------+
| onal                 |
+----------------------+
1 row in set (0.00 sec)
```

4. LENGTH (string) – Return the number of characters in the specified string.

```
mysql> SELECT LENGTH ('Voc Edu');
+--------------------+
| LENGTH ('Voc Edu') |
+--------------------+
|                  7 |
+--------------------+
1 row in set (0.00 sec)
```

5. LEFT (string, N) – Returns N number of characters from the left side of the string.

```
mysql> SELECT LEFT ('Computer', 4);
+----------------------+
| LEFT ('Computer', 4) |
+----------------------+
| Comp                 |
+----------------------+
1 row in set (0.00 sec)
```

6. RIGHT (string, N) – Returns N number of characters from the right side of the string.

```
mysql> SELECT RIGHT('Practical', 3);
+-----------------------+
| RIGHT('Practical', 3) |
+-----------------------+
| cal                   |
+-----------------------+
1 row in set (0.00 sec)
```

7. INSTR (string, substring) – Returns the position of the first occurrence of the substring in the given string. Returns 0, if the substring is not present in the string.

```
mysql> SELECT INSTR ('Vocational', 'na');
+----------------------------+
| INSTR ('Vocational', 'na') |
+----------------------------+
|                          8 |
+----------------------------+
1 row in set (0.00 sec)
```

8. LTRIM (string) – Returns the given string after removing leading white space characters.

```
mysql> SELECT LENGTH(' AGRA'),LENGTH(LTRIM(' AGRA'));
+-----------------+------------------------+
| LENGTH(' AGRA') | LENGTH(LTRIM(' AGRA')) |
+-----------------+------------------------+
|               5 |                      4 |
+-----------------+------------------------+
1 row in set (0.00 sec)
```

9. RTRIM (string) – Returns the given string after removing trailing white space characters.

```
mysql> SELECT LENGTH('PENCIL'), LENGTH (RTRIM ('PENCIL  '));
+-----------------+----------------------------+
| LENGTH('PENCIL') | LENGTH (RTRIM ('PENCIL  ')) |
+-----------------+----------------------------+
|               6 |                          6 |
+-----------------+----------------------------+
1 row in set (0.00 sec)
```

10. TRIM (string) – Returns the given string after removing both leading and trailing white space characters.

```
mysql> SELECT LENGTH('MADAM '),LENGTH(TRIM('MADAM '));
+------------------+-------------------------+
| LENGTH('MADAM ') | LENGTH(TRIM('MADAM ')) |
+------------------+-------------------------+
|                6 |                       5 |
+------------------+-------------------------+
1 row in set (0.00 sec)
```

i.

Practical Activity 3.2 – Demonstrate to use string function

Let us use *Customer* relation to understand the working of various string functions.

Step 1. Execute the following query to display customer name in lower case and customer email in upper case from *"customer"* table.

```
mysql> SELECT LOWER(CustName), UPPER(Email) FROM customer;
+-----------------+---------------------+
| LOWER(CustName) | UPPER(Email)        |
+-----------------+---------------------+
| amit saha       | AMITSAHA2@GMAIL.COM |
| rehnuma         | REHNUMA@HOTMAIL.COM |
| charvi nayyar   | CHARVI123@YAHOO.COM |
| gurpreet        | GUR_SINGH@YAHOO.COM |
+-----------------+---------------------+
4 rows in set (0.00 sec)
```

Step 2. Execute the following query to display the length of email and part of the email from the email id before the character '@'.

```
mysql> SELECT LENGTH(Email), LEFT(Email, INSTR(Email, "@")-1) FROM customer;
+--------------+---------------------------------+
| LENGTH(Email) | LEFT(Email, INSTR(Email, "@")-1) |
+--------------+---------------------------------+
|           19 | amitsaha2                       |
|           19 | rehnuma                         |
|           19 | charvi123                       |
|           19 | gur_singh                       |
+--------------+---------------------------------+
4 rows in set (0.00 sec)
```

The function INSTR will return the position of "@" in the email address. So, to print email id without "@" position -1 is used.

Let us assume that four-digit area code is reflected in the mobile number starting from position number 3. For example, 1851 is the area code of mobile number 9818511338.

Step 3. Execute the following query to display the area code of the customer living in Rohini.

```
mysql> SELECT MID(Phone,3,4) FROM customer WHERE CustAdd like '%Rohini%';
+----------------+
| MID(Phone,3,4) |
+----------------+
| 1163           |
+----------------+
1 row in set (0.00 sec)
```

Step 4. Execute the following query to display emails after removing the domain name extension ".com" from emails of the customers.

```
mysql> SELECT TRIM('.com' from Email) FROM customer;
+--------------------------+
| TRIM('.com' from Email) |
+--------------------------+
| amitsaha2@gmail          |
| rehnuma@hotmail          |
| charvi123@yahoo          |
| gur_singh@yahoo          |
+--------------------------+
4 rows in set (0.00 sec)
```

Step 5. Execute the following query to display details of all the customers having yahoo emails only.

```
mysql> SELECT * FROM customer WHERE Email LIKE '%yahoo%';
+--------+--------------+-----------------------+------------+--------------------+
| CustID | CustName     | CustAdd               | Phone      | Email              |
+--------+--------------+-----------------------+------------+--------------------+
| C0003  | Charvi Nayyar | 10/9, FF, Rohini      | 6811635425 | charvi123@yahoo.com |
| C0004  | Gurpreet     | A-10/2, SF Mayur Vihar | 3511056125 | gur_singh@yahoo.com |
+--------+--------------+-----------------------+------------+--------------------+
2 rows in set (0.00 sec)
```

Now let us use the table *"inventory"* from CARSHOWROOM database, write SQL queries for the following:

Step 6. Execute the following query to convert the *"CarMake"* to uppercase if its value starts with the letter 'B'.

```
mysql> SELECT Upper(CarName) from inventory where Carname Like 'b%';
+----------------+
| Upper(CarName) |
+----------------+
| BALENO         |
| BALENO         |
+----------------+
2 rows in set (0.00 sec)
```

Step 7. If the length of the car model is greater than 4 then Execute the following query to fetch the substring starting from position 3 till the end from attribute Model.

```
mysql> SELECT Model, SUBSTR(Model,3) FROM
    -> inventory WHERE Length(Model)>4;
+-----------+-----------------+
| Model     | SUBSTR(Model,3) |
+-----------+-----------------+
| Sigma1.2  | gma1.2          |
| Delta1.2  | lta1.2          |
| 5 STR STD | STR STD         |
+-----------+-----------------+
3 rows in set (0.00 sec)
```

3.2.3 Date and Time Functions

There are various functions that are used to perform operations on date and time data. Some of the operations include displaying the current date, extracting each element of a date (day, month

and year), displaying day of the week and so on. Some of the date and time functions with examples are given below.

1. NOW() – It returns the current system date and time.

```
mysql> SELECT NOW();
+---------------------+
| NOW()               |
+---------------------+
| 2022-03-09 10:04:07 |
+---------------------+
1 row in set (0.02 sec)
```

2. DATE() – It returns the date part from the given date/time expression.

```
mysql> SELECT DATE(NOW());
+--------------+
| DATE(NOW())  |
+--------------+
| 2022-03-09   |
+--------------+
1 row in set (0.00 sec)
```

3. MONTH(date) – It returns the month in numeric form from the date.

```
mysql> SELECT MONTH('2022-03-09');
+---------------------+
| MONTH('2022-03-09') |
+---------------------+
|                   3 |
+---------------------+
1 row in set (0.00 sec)
```

4. MONTHNAME(date) – It returns the month name from the specified date.

```
mysql> SELECT MONTHNAME(NOW());
+-------------------+
| MONTHNAME(NOW())  |
+-------------------+
| March             |
+-------------------+
1 row in set (0.00 sec)
```

5. YEAR(date) – It returns the year from the date.

```
mysql> SELECT YEAR('2022-03-09');
+--------------------+
| YEAR('2022-03-09') |
+--------------------+
|               2022 |
+--------------------+
1 row in set (0.00 sec)
```

6. DAY(date) – It returns the day part from the date.

```
mysql> SELECT DAY('2022-03-09');
+-------------------+
| DAY('2022-03-09') |
+-------------------+
|                 9 |
+-------------------+
1 row in set (0.00 sec)
```

7. DAYNAME(date) – It returns the name of the day from the date.

```
mysql> SELECT DAYNAME('2022-03-09');
+-----------------------+
| DAYNAME('2022-03-09') |
+-----------------------+
| Wednesday             |
+-----------------------+
1 row in set (0.00 sec)
```

Practical Activity 3.3 – Demonstrate to use DATE and Time function

Let us use the *"emp"* table of CARSHOWROOM database to illustrate the working of some of the date and time functions.

Step 1. Execute the following query to select the day, month number and year of joining of all employees.

```
mysql> SELECT DAY(DOJ), MONTH(DOJ), YEAR(DOJ) FROM employee;
+----------+-----------+-----------+
| DAY(DOJ) | MONTH(DOJ) | YEAR(DOJ) |
+----------+-----------+-----------+
|       12 |         12 |      2017 |
|        5 |          6 |      2016 |
|        8 |          1 |      1999 |
|        2 |         12 |      2010 |
|        1 |          7 |      2012 |
|        1 |          1 |      2017 |
|       23 |         10 |      2013 |
+----------+-----------+-----------+
7 rows in set (0.00 sec)
```

Step 1. Execute the following query to display the date in the format "Wednesday, 26, November, 1979", if the date of joining is not Sunday.

```
mysql> SELECT DAYNAME(DOJ), DAY(DOJ), MONTHNAME(DOJ), YEAR(DOJ) FROM
 employee WHERE DAYNAME(DOJ)!='Sunday';
+--------------+----------+----------------+-----------+
| DAYNAME(DOJ) | DAY(DOJ) | MONTHNAME(DOJ) | YEAR(DOJ) |
+--------------+----------+----------------+-----------+
| Tuesday      |       12 | December       |      2017 |
| Friday       |        8 | January        |      1999 |
| Thursday     |        2 | December       |      2010 |
| Wednesday    |       23 | October        |      2013 |
+--------------+----------+----------------+-----------+
4 rows in set (0.01 sec)
```

Step 2. Execute the following query to list the Employee Name, date of birth and Salary for all employees whose salary is more than 25000, in *"emp"* table.

```
mysql> Select EmpName, DayName(DOB), Salary
    -> FROM employee WHERE Salary>25000;
+----------+--------------+--------+
| EmpName  | DayName(DOB) | Salary |
+----------+--------------+--------+
| Rushil   | Sunday       |  25550 |
| Sanjay   | Monday       |  33100 |
| Arpit    | Tuesday      |  39100 |
| Sanjucta | Sunday       |  27350 |
| Mayank   | Saturday     |  27352 |
| Rajkumar | Thursday     |  31111 |
+----------+--------------+--------+
6 rows in set (0.00 sec)
```

Step 3. Execute the following query to list the invoice number, customer id and date of sale those payment are done using bank finance in *"Sale"* table.

```
mysql> Select InvoiceNo, CustId,SaleDate FROM sale
    -> WHERE PaymentMode = 'Bank Finance';
+-----------+--------+------------+
| InvoiceNo | CustId | SaleDate   |
+-----------+--------+------------+
| I00004    | C0001  | 2018-10-15 |
| I00006    | C0002  | 2019-01-30 |
+-----------+--------+------------+
2 rows in set (0.00 sec)
```

Step 4. Execute the following query to list all the employee without peon whose salary is more than 30000 in *"emp"* table.

```
mysql> Select * FROM employee WHERE Salary>30000 AND Designation!='Peon';
+-------+---------+------------+------------+-------------+--------+
| EmpID | EmpName | DOB        | DOJ        | Designation | Salary |
+-------+---------+------------+------------+-------------+--------+
| E002  | Sanjay  | 1990-03-12 | 2016-06-05 | Salesman    |  33100 |
| E004  | Arpit   | 1989-06-06 | 2010-12-02 | Salesman    |  39100 |
| E010  | Rajkumar| 1987-02-26 | 2013-10-23 | Salesman    |  31111 |
+-------+---------+------------+------------+-------------+--------+
3 rows in set (0.00 sec)
```

Step 5. Execute the following query to list all the records without LXI and VXI models in the table *"inventory"*.

```
mysql> SELECT * FROM inventory WHERE  Model NOT IN ('LXI', 'VXI');
+-------+---------+--------+-----------+------------------+----------+------------+
| CarID | CarName | Price  | Model     | YearManufacturer | FuelType | FinalPrice |
+-------+---------+--------+-----------+------------------+----------+------------+
| B001  | Baleno  | 567031 | Sigma1.2  | 2019             | Petrol   |   635074.7 |
| B002  | Baleno  | 647858 | Delta1.2  | 2018             | Petrol   |   725601.0 |
| E001  | EECO    | 355205 | 5 STR STD | 2017             | CNG      |   397829.6 |
| E002  | EECO    | 654914 | CARE      | 2018             | CNG      |   733503.7 |
+-------+---------+--------+-----------+------------------+----------+------------+
4 rows in set (0.00 sec)
```

3.3. Aggregate Functions

In aggregate functions the column must be of numeric type. Some of the aggregate functions are given below.

1. MAX (column) – Returns the largest value from the specified column.

```
mysql> SELECT MAX(Price)FROM inventory;
+------------+
| MAX(Price) |
+------------+
|     673112 |
+------------+
1 row in set (0.02 sec)
```

2. MIN (column) – Returns the smallest value from the specified column.

```
mysql> SELECT MIN(Price)FROM inventory;

+------------+
| MIN(Price) |
+------------+
|     355205 |
+------------+
1 row in set (0.00 sec)
```

3. AVG (column) – Returns the average of the values in the specified column.

```
mysql> SELECT AVG(Price)FROM inventory;
+-------------+
| AVG(Price)  |
+-------------+
| 576091.6250 |
+-------------+
1 row in set (0.00 sec)
```

4. SUM (column) – Returns the sum of the values for the specified column.

```
mysql> SELECT SUM(Price) FROM inventory;

+------------+
| SUM(Price) |
+------------+
|    4608733 |
+------------+
1 row in set (0.00 sec)
```

5. COUNT (*) – Returns number of records in a table. COUNT (*) is used with WHERE clause to display the number of records that matches some particular criteria in the table.

```
mysql> SELECT COUNT(*)FROM inventory WHERE Model='VXI';
+----------+
| COUNT(*) |
+----------+
|        2 |
+----------+
1 row in set (0.00 sec)
```

Practical Activity 3.4 – Demonstrate to use aggregate functions in SQL

Let us explore how can we use various aggregate functions in SQL statements to fulfil various requirements of real-world situations.

Step 1. Execute the following SQL query to display the total number of records from table *"inventory"* having a model as VXI.

```
mysql> SELECT COUNT(*)FROM inventory WHERE Model='VXI';
+----------+
| COUNT(*) |
+----------+
|        2 |
+----------+
1 row in set (0.00 sec)
```

Step 2. Execute the following SQL query to display the total number of different types of models available from table *"inventory"*.

```
mysql> SELECT COUNT(DISTINCT(Model)) FROM inventory;
+------------------------+
| COUNT(DISTINCT(Model)) |
+------------------------+
|                      6 |
+------------------------+
1 row in set (0.00 sec)
```

Step 3. Execute the following SQL query to display the average price of all the cars with model LXI from table *"inventory"*.

```
mysql> SELECT AVG(Price) FROM inventory WHERE Model='LXI';
+-------------+
| AVG(Price)  |
+-------------+
| 548306.5000 |
+-------------+
1 row in set (0.00 sec)
```

3.3 GROUP BY CLAUSE IN SQL

Sometimes it may require to fetch a group of rows on the basis of common values in a column. GROUP BY clause is a special clause in SQL to do this. It groups the rows together that contains

the same values in a specified column. The aggregate functions (COUNT, MAX, MIN, AVG and SUM) can be used with GROUP BY clause. HAVING Clause in SQL is used to specify conditions on the rows with GROUP BY clause.

Practical Activity 3.5 – Demonstrate to use GROUP BY and HAVING clause in SQL

Consider the *"sale"* table from the CARSHOWROOM database. Display the number of records in the *"sale"* table using the following SQL statement.

```
mysql> Select * from sale;
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
| InvoiceNo | CarID | CustID | SaleDate   | PaymentMode  | EmpID | SalePrice | Commission |
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
| I00001    | D001  | C0001  | 2019-01-24 | Credit Card  | E004  |    613248 |   73589.76 |
| I00002    | S001  | C0002  | 2018-12-12 | Online       | E001  |    590321 |   70838.52 |
| I00003    | S002  | C0004  | 2019-01-25 | Cheque       | E010  |    604000 |   72480.00 |
| I00004    | D002  | C0001  | 2018-10-15 | Bank Finance | E007  |    659982 |   79197.84 |
| I00005    | E001  | C0003  | 2018-12-20 | Credit Card  | E002  |    369310 |   44317.20 |
| I00006    | S002  | C0002  | 2019-01-30 | Bank Finance | E007  |    620214 |   74425.68 |
+-----------+-------+--------+------------+--------------+-------+-----------+------------+
6 rows in set (0.00 sec)
```

In these records, it is observed that, the columns, CarID, CustID, SaleDate, PaymentMode, EmpID, SalePrice can have rows with the same values in it. So, GROUP BY clause can be used in these columns to find the number of records of a particular type (column), or to calculate the sum of the price of each car type.

Step 1. Execute the following SQL query to display the number of Cars purchased by each Customer from SALE table.

```
mysql> SELECT CustID, COUNT(*) 'Number of Cars' FROM sale GROUP BY CustID;
+--------+----------------+
| CustID | Number of Cars |
+--------+----------------+
| C0001  |              2 |
| C0002  |              2 |
| C0003  |              1 |
| C0004  |              1 |
+--------+----------------+
4 rows in set (0.00 sec)
```

Step 2. Execute the following SQL query to display the Customer Id and number of cars purchased if the customer purchased more than 1 car from SALE table.

```
mysql> SELECT CustID, COUNT(*) FROM sale GROUP BY CustID HAVING Count(*)>1;

+--------+----------+
| CustID | COUNT(*) |
+--------+----------+
| C0001  |        2 |
| C0002  |        2 |
+--------+----------+
2 rows in set (0.02 sec)
```

Step 3. Execute the following SQL query to display the number of people in each category of payment mode from the table SALE.

```
mysql> SELECT PaymentMode, COUNT(PaymentMode) FROM sale GROUP BY
Paymentmode ORDER BY Paymentmode;
+--------------+--------------------+
| PaymentMode  | COUNT(PaymentMode) |
+--------------+--------------------+
| Bank Finance |                  2 |
| Cheque       |                  1 |
| Credit Card  |                  2 |
| Online       |                  1 |
+--------------+--------------------+
4 rows in set (0.00 sec)
```

Step 4. Execute the following SQL query to display the PaymentMode and number of payments made using that mode more than once.

```
mysql> SELECT PaymentMode, COUNT(PaymentMode) FROM sale GROUP BY
Paymentmode ORDER BY Paymentmode;
+--------------+--------------------+
| PaymentMode  | COUNT(PaymentMode) |
+--------------+--------------------+
| Bank Finance |                  2 |
| Cheque       |                  1 |
| Credit Card  |                  2 |
| Online       |                  1 |
+--------------+--------------------+
4 rows in set (0.00 sec)
```

3.4 OPERATIONS ON RELATIONS

It is possible to perform certain operations on relations like Union, Intersection and Set Difference to merge the tuples of two tables. These three operations are binary operations as they work upon two tables. Note here that these operations can only be applied if both the relations have the same number of attributes and corresponding attributes in both tables have the same domain.

3.4.1 Union (∪)

This operation is used to combine the selected rows of two tables at a time. If some rows are same in both the tables, then result of the Union operation will show those rows only once. Figure 3.3 shows union of two sets.

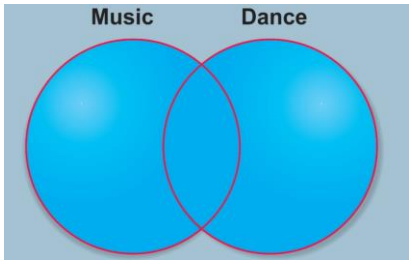


Fig 3.3: Union of two sets

Let us consider two relations DANCE and MUSIC shown in Tables 3.9 and 3.10 respectively.

Table 3.9 DANCE

Sno	Name	Class
1	Astha	7A
2	Pawani	6A
3	Mohit	7B
4	Vibhanshu	7A

Execute the following query to view the records of *"dance"* table. After successful execution of the query, the records entered in the *"dance"* table will be displayed.

```
mysql> SELECT * FROM dance;
+------+-----------+-------+
| Sno  | Name      | Class |
+------+-----------+-------+
|    1 | Astha     | 7A    |
|    2 | Pawani    | 6A    |
|    3 | Mohit     | 7B    |
|    4 | Vibhanshu | 7A    |
+------+-----------+-------+
4 rows in set (0.00 sec)
```

Table 3.10 MUSIC

Sno	Name	Class
1	Mahak	8A
2	Pawani	6A
3	Lavanya	7A
4	Vibhanshu	7A

5	Abhay	8A

Execute the following query to view the records of *"music"* table. After successful execution of the query, the records entered in the *"music"* table will be displayed.

```
mysql> SELECT * FROM music;
+------+-----------+-------+
| Sno  | Name      | Class |
+------+-----------+-------+
|    1 | Mahak     | 8A    |
|    2 | Pawani    | 6A    |
|    3 | Lavanya   | 7A    |
|    4 | Vibhanshu | 7A    |
|    5 | Abhay     | 8A    |
+------+-----------+-------+
5 rows in set (0.00 sec)
```

Step 1. Execute the following SQL query to find the list of students participating in either of events by using UNION operation on relations **DANCE** and **MUSIC**. After execution it will display the union of DANCE and MUSIC relations.

```
mysql> SELECT * FROM dance UNION SELECT * from music;
+------+-----------+-------+
| Sno  | Name      | Class |
+------+-----------+-------+
|    1 | Astha     | 7A    |
|    2 | Pawani    | 6A    |
|    3 | Mohit     | 7B    |
|    4 | Vibhanshu | 7A    |
|    1 | Mahak     | 8A    |
|    3 | Lavanya   | 7A    |
|    5 | Abhay     | 8A    |
+------+-----------+-------+
7 rows in set (0.01 sec)
```

3.4.2 Intersect (∩)

Intersect operation is used to get the common tuples from two tables and is represented by symbol ∩. Figure 3.9 shows intersection of two sets.

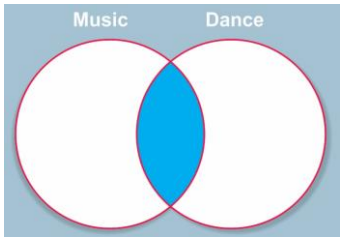


Fig 3.9: Intersection of two sets

Suppose, we have to display the list of students who are participating in both the events (DANCE and MUSIC), then intersection operation is to be applied on these two tables. The output of INTERSECT operation is shown in Table 3.11

Table 3.11 DANCE ∩ MUSIC

Sno	Name	Class
2	Pawani	6A
4	Vibhanshu	7A

3.4.3 Minus (-)

This operation is used to get tuples/rows which are in the first table but not in the second table and the operation is represented by the symbol - (minus). Figure 3.10 shows difference operation between two sets.

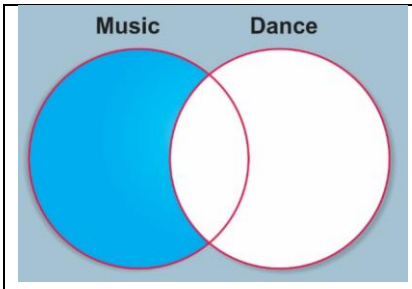


Fig 3.10: Difference of two sets

To find out the list of students who are only participating in MUSIC and not in DANCE event, use the MINUS operation. The output of MINUS operation is given in Table 3.12

Table 3.12 DANCE – MUSIC

Sno	Name	Class
1	Mahak	8A
3	Lavanya	7A
5	Abhay	8A

3.4.4 Cartesian Product (×)

Cartesian product operation combines tuples from two relations. It results in all pairs of rows from the two input relations, regardless of whether or not they have the same values on common attributes. It is denoted as '×'.

The degree of the resulting relation is calculated as the sum of the degrees of both the relations under consideration. The cardinality of the resulting relation is calculated as the product of the cardinality of relations on which Cartesian product is applied. Let us use the relations DANCE and MUSIC to show the output of Cartesian product. Note that both relations are of degree 3. The cardinality of relations DANCE and MUSIC is 4 and 5 respectively. Applying Cartesian product on these two relations will result in a relation of degree 6 and cardinality 20, as shown in the output of the following query.

```
mysql> SELECT * FROM dance, music;
+------+-----------+-------+------+-----------+-------+
| Sno  | Name      | Class | Sno  | Name      | Class |
+------+-----------+-------+------+-----------+-------+
|    4 | Vibhanshu | 7A    |    1 | Mahak     | 8A    |
|    3 | Mohit     | 7B    |    1 | Mahak     | 8A    |
|    2 | Pawani    | 6A    |    1 | Mahak     | 8A    |
|    1 | Astha     | 7A    |    1 | Mahak     | 8A    |
|    4 | Vibhanshu | 7A    |    2 | Pawani    | 6A    |
|    3 | Mohit     | 7B    |    2 | Pawani    | 6A    |
|    2 | Pawani    | 6A    |    2 | Pawani    | 6A    |
|    1 | Astha     | 7A    |    2 | Pawani    | 6A    |
|    4 | Vibhanshu | 7A    |    3 | Lavanya   | 7A    |
|    3 | Mohit     | 7B    |    3 | Lavanya   | 7A    |
|    2 | Pawani    | 6A    |    3 | Lavanya   | 7A    |
|    1 | Astha     | 7A    |    3 | Lavanya   | 7A    |
|    4 | Vibhanshu | 7A    |    4 | Vibhanshu | 7A    |
|    3 | Mohit     | 7B    |    4 | Vibhanshu | 7A    |
|    2 | Pawani    | 6A    |    4 | Vibhanshu | 7A    |
|    1 | Astha     | 7A    |    4 | Vibhanshu | 7A    |
|    4 | Vibhanshu | 7A    |    5 | Abhay     | 8A    |
|    3 | Mohit     | 7B    |    5 | Abhay     | 8A    |
|    2 | Pawani    | 6A    |    5 | Abhay     | 8A    |
|    1 | Astha     | 7A    |    5 | Abhay     | 8A    |
+------+-----------+-------+------+-----------+-------+
20 rows in set (0.00 sec)
```

3.5 USING TWO RELATIONS IN A QUERY

Till now we have written queries in SQL using a single relation only. Now let us see how to write queries using two relations.

3.5.1 JOIN on two tables

JOIN operation combines tuples from two tables on specified conditions. This is unlike Cartesian product which make all possible combinations of tuples. While using the JOIN clause of SQL,

specify conditions on the related attributes of two tables within the FROM clause. Usually, such attribute is the *primary key* in one table and *foreign key* in another table.

Let us create two tables UNIFORM (UCode, UName, UColor) and COST (UCode, Size, Price) in the SchoolUniform database. *"UCode"* is *primary key* in table UNIFORM. *"UCode"* and *"Size"* is the *composite key* in table COST. Therefore, UCode is a common attribute between the two tables which can be used to fetch the common data from both tables. Define UCode as *foreign key* in the *"Cost"* table while creating this table. Enter the records in these tables as shown in Table 3.13 and 3.14.

Table 3.13 Uniform table

UCode	Uname	UColor
1	Shirt	White
2	Pant	Grey
3	Tie	Blue

Table 3.14 Cost table

UCode	Size	Price
1	L	580
1	M	500
2	L	890
1	M	810

Practical Activity 3.6 – Demonstrate to join two tables in SQL

Let us consider two tables created, UNIFORM and COST to demonstrate the joining of two tables. The joining of two tables can be done in three different ways – using WHERE clause, JOIN clause and NATURAL JOIN clause

Step 1. Execute the following query to join the two tables using WHERE clause.

```
mysql> SELECT * FROM uniform U, cost C WHERE U.UCode = C.UCode;
+-------+-------+--------+-------+------+-------+
| UCode | Uname | UColor | UCode | Size | Price |
+-------+-------+--------+-------+------+-------+
|     1 | Shirt | White  |     1 | L    |   580 |
|     1 | Shirt | White  |     1 | M    |   500 |
|     2 | Pant  | Grey   |     2 | L    |   890 |
|     1 | Shirt | White  |     1 | M    |   810 |
+-------+-------+--------+-------+------+-------+
4 rows in set (0.00 sec)
```

As the attribute *"UCode"* appears in both *"uniform"* and *"cost"* tables. Hence alias is used to remove ambiguity by specifying qualifier U with attribute UCode in SELECT and FROM clauses to indicate its scope.

Step 2. Execute the following query to join the two tables using JOIN clause.

```
mysql> SELECT * FROM uniform U JOIN cost C WHERE U.UCode = C.UCode;
+-------+-------+--------+-------+------+-------+
| UCode | Uname | UColor | UCode | Size | Price |
+-------+-------+--------+-------+------+-------+
|     1 | Shirt | White  |     1 | L    |   580 |
|     1 | Shirt | White  |     1 | M    |   500 |
|     2 | Pant  | Grey   |     2 | L    |   890 |
|     1 | Shirt | White  |     1 | M    |   810 |
+-------+-------+--------+-------+------+-------+
4 rows in set (0.00 sec)
```

The output of the query is same as that of step 1. In this query the JOIN clause is used explicitly along with condition in FROM clause. Hence no condition is required in WHERE clause.

The output of queries in step 1 and 2 has a repetitive column UCode having exactly the same values. This redundant column provides no additional information. SQL provides the extension

of JOIN operation called as NATURAL JOIN, which works similar to JOIN clause in SQL to remove the redundant attribute. This operator can be used to join the contents of two tables if there is one common attribute in both the tables.

Step 3. Execute the following query to join the two tables using NATURAL JOIN clause.

```
mysql> SELECT * FROM uniform NATURAL JOIN cost;
+-------+-------+--------+------+-------+
| UCode | Uname | UColor | Size | Price |
+-------+-------+--------+------+-------+
|     1 | Shirt | White  | L    |   580 |
|     1 | Shirt | White  | M    |   500 |
|     2 | Pant  | Grey   | L    |   890 |
|     1 | Shirt | White  | M    |   810 |
+-------+-------+--------+------+-------+
4 rows in set (0.00 sec)
```

It is clear from the output that the result of this query is same as above in step 1 and 2, except that the attribute UCode appears only once.

It is important to note the following points while applying JOIN operations on two or more relations.

- If two tables are to be joined on equality condition on the common attribute, then one may use JOIN with ON clause or NATURAL JOIN in FROM clause. If three tables are to be joined on equality condition, then two JOIN or NATURAL JOIN are required.
- In general, N-1 joins are needed to combine N tables on equality condition.
- Any relational operators can be used with JOIN clause to combine tuples of two tables.

SUMMARY

- A Function is used to perform a particular task and return a value as a result.
- Single Row functions work on a single row of the table and return a single value.
- Multiple Row functions work on a set of records as a whole and return a single value. Examples include COUNT, MAX, MIN, AVG and SUM.
- GROUP BY function is used to group rows of a table that contain the same values in a specified column.
- Join is an operation which is used to combine rows from two or more tables based on one or more common fields between them.

Check Your Progress

A. Multiple choice questions

1. Which of the following is not an example of single row function (a) MATH (b) STRING (c) DATE (d) COUNT
2. Which of the following is not an example of multiple row function (a) MAX ( ) (b) MIN ( ) (c) STRING (d) COUNT (*)
3. What is the functionality of SQL COUNT? (a) It returns the no of record of table (b) It returns the no of record of database (c) It returns the no of record of row (d) It returns the no of record of column
4. Date and Time functions accept date and time value as input and return output as (a) numeric (b) string (c) Date and Time (d) Any of the above
5. String Functions accept character value as input and return output as (a) either character or numeric values (b) string values (c) numeric values (d) character values
6. Which of the following is aggregate function in SQL (a) LEFT (b) AVG (c) JOIN (d) LEN
7. The SQL statement Select Round (47.956,-1) from Dual; (a) is illegal in SQL (b) prints a garbage value (c) 045.926 (d) prints 50

8. Which of the following SQL operation cannot be performed on relations (a) Union, (b) Intersection (c) Difference (d) Merge
9. Which of the following is used to join two tables on equality condition on the common attribute (a) JOIN with ON clause (b) NATURAL JOIN in FROM clause (c) Any of a or b (d) NATURAL JOIN
10. What will be the Cartesian product of the two relations having 4 rows and 3 columns for first relation and 3 rows and 4 columns in second relation. (a) degree 7 cardinality 12 (b) degree 6 cardinality 16 (c) degree 7 cardinality 16 (d) degree 9 cardinality 16

B. Fill in the blanks

1. Single row functions are applied on a single _____ and return a single value.
2. Aggregate functions work on a _____ as a whole and return a single value.)
3. Math Functions accept numeric value as input and return a _____ value as a result.
4. MONTH (date) returns the month in _____ form from the date.
5. By default, the order by clause lists items in _____ order.
6. INSTR (string, substring) returns the position of the _____ of the substring in the given string.)
7. MID (string, pos, n) returns a substring of size ___ starting from the specified position _____ of the string. (n, pos).
8. LTRIM (string) returns the given string after removing _____ white space characters.
9. TRIM (string) returns the given string after removing both _____ and _____ white space characters.
10. The _____ operation is used to get common tuples from two tables.

C. State True or False

1. Aggregate functions are also called Scalar functions.
2. A function always returns a single value.
3. Functions can be applied to work on single or multiple records of a table.
4. INSTR (string, substring) returns 0, if the substring is not present in the string.
5. If n is not specified MID (string, pos, n), it returns the substring from the position 1 till end of the string.
6. RTRIM (string) returns the given string after removing leading white space characters.
7. NOW() returns the current system date and time.
8. Union operation eliminates the duplicate rows.
9. Cartesian product operation combines tuples from two relations.
10. Join statement is used to combine two tables on a specified condition.

C. Short answer questions

1. Differentiate between single row functions and aggregate functions.
2. List the single row functions with example.
3. Differentiate between TRIM( ), LTRIM( ) and RTRIM( ) functions.
4. Demonstrate the use of LCASE( ) and UCASE( ) function with example.
5. List the date functions with example.
6. What is the difference between NOW( ) and DATE( ) function?
7. Demonstrate the difference between SUM( ) and AVG( ) function?
8. A table Student has 4 rows and 2 column and another table has 3 rows and 4 columns. How many rows and columns will be there if we obtain the Cartesian product of these two tables?
9. What will be the output of following SQL functions.
   a) Select pow (3,2);
   b) Select round (342.9234, 2);
   c) Select length ('Vocational Education');

d) Select year ('1978/08/17'), month ('1978/08/17'), day ('1978/08/17'), monthname ('1978/08/17');
e) Select left ('Central', 3), right ('Institute', 4), mid ('Vocational', 3, 4), substr ('Education', 3);

10. Write the SQL functions to perform the following operations.
a) To display the day like "Monday", "Tuesday", from the date when India got independence.
b) To display the specified number of characters from a particular position of the given string.
c) To display the name of the month in which you were born.
d) To display your name in capital letters.

Practical Exercise

Consider the following table named "Product", showing details of products being sold in a grocery shop.

PCode	PName	UPrice	Manufacturer
P01	Washing Powder	120	Surf
P02	Toothpaste	54	Colgate
P03	Soap	25	Lux
P04	Toothpaste	65	Pepsodent
P05	Soap	38	Dove
P06	Shampoo	245	Dov

A. Write SQL queries for the following:

a) Create the table Product with appropriate data types and constraints.

b) Identify the primary key in Product.

c) List the Product Code, Product name and price in descending order of their product name. If PName is the same, then display the data in ascending order of price.

d) Add a new column Discount to the table Product.

e) Calculate the value of the discount in the table Product as 10 per cent of the UPrice for all those products where the UPrice is more than 100, otherwise the discount will be 0.

f) Increase the price by 12 per cent for all the products manufactured by Dove.

g) Display the total number of products manufactured by each manufacturer.

B. Write the output(s) produced by executing the following queries on the basis of the information given above in the table Product:

h) SELECT PName, Average (UPrice) FROM Product GROUP BY Pname;

i) SELECT DISTINCT Manufacturer FROM Product;

j) SELECT COUNT (DISTINCT PName) FROM Product;

k) SELECT PName, MAX(UPrice), MIN(UPrice) FROM Product GROUP BY PName;

Module 2 Customer Query Management

Module Overview

Customer Query Management is the method used by the customer to communicate directly with the company. This process has been facilitated by the software application known as Customer Relationship Management (CRM) software. The CRM system allows the customers to send their queries and enquiries. The Query Management System is one of the most important features of CRM. Organisation can customize their CRM as per the requirements. A centralized cloud-based Query Management can provide the best view to see Customer queries from multiple areas of the portal that can be then assigned to the concerned department to be resolved. This unit equips you with essential knowledge and skills in Customer Query Management.

In this unit, you will understand the concept of Query Management. You will learn about attending customer queries, the role and importance of Customer Service Associate, steps to take a call, and principles of active listening. We will also discover the Case Study: How to show proper empathy and acknowledgement. In the process of Query Management, we will focus on Tools for Query Management, Service Level Agreements (SLAs), and Case Study: Techniques for conveying concern and commitment. Then, we discuss "Documentation Process for Customer Queries", emphasizing Reference Guides or Support Materials to Resolve Queries, and Case Study: How to Refer to the Supporting Material Case Study: How to Refer to the Supporting Material. Lastly, we will discuss how to manage Query Resolution, by covering types of customers, Design templates to record a query, discuss different techniques used to obtain data/information and technologies used in a voice process.

Learning Outcomes

After completing this module, you will be able to:

- Understand how to effectively receive, interpret, and categorize customer queries for efficient handling and resolution.
- Learn to prioritize and manage customer queries using systematic approaches, ensuring timely responses and accurate solutions.
- Develop skills to accurately document customer queries, maintaining detailed records for tracking and improving customer service.
- Implement best practices for resolving customer queries, ensuring clear communication, effective solutions, and customer satisfaction.

Module Structure

Session 1. Customer Queries

Session 2. Query Management

Session 3. Documentation of Customer Queries

Session 4. Manage Query Resolution

Session 1. Customer Queries

Customer queries are inevitable. Even in the most expert organization, there will always be a lapse in quality control that leads to customer complaints. A customer complaint highlights a problem with the product, processes or services. By attending such queries from the customer, it is possible to investigate and improve to prevent further complaints in the future. So, it is always important to deal with these complaints to satisfy the customer and enrich the services. Customer queries are a time-consuming and frustrating process. However, by developing an efficient system, complaints can be resolved quickly and easily.

The effective communication skills are most useful to resolve the customer queries. Communication is the act of transferring information from one person to another. It may be voice or non-voice. Communication skills are needed to speak appropriately with a wide variety of people, maintain good eye contact, demonstrate a varied vocabulary and tailor your language to your audience, listen effectively, present your ideas appropriately, write clearly and concisely, and work well in a group (Figure 1.1)

Customer Relationship Management (CRM) Assistants need good communication skills to provide information by phone, or in person so that customers can understand them. They must have a good command of spoken English.

Fig. 1.1 Customer Relationship Management (CRM) Assistant

In this chapter, you will understand the role of a CRM executive in attending the customer queries, communicating with the customer, ways to greet, steps to take calls, listen to the customer actively and principles of active learning along with case study.

1.1 Role and Importance of CRM Voice Representative

A customer relationship management (CRM) representative manages the technology of a company to improve marketing. Their responsibility is to maximize the efficiency of the CRM data and software to improve customer care. They are the liaison between employees and the CRM software. The role of a CRM representative affects sales, customer service, and brand image. CRM representatives should have great analytical skills, solid communication, and organizational skills, to optimize complex CRM software, to market effectively the current and potential customers.

The CRM representative will support the CRM Manager and be responsible for the day-to-day execution of marketing campaigns, as well as data collection and list

segmentation. They require a strong understanding of digital marketing, best practices and the ability to effectively contribute to digital communication strategies through innovative creative design, setup and delivery, targeting, segmentation and personalization, end-to-end testing, analysis, and optimization.

1.2 Greeting a Customer

A CRM representative should also have good interpersonal skills to deal with complaints. In a call center, when CRM representatives receive calls, they manage the incoming calls, known as ***In-Bound*** calls and when they initiate calls, are known as ***Outbound*** calls, representing outgoing calls.

At the start of the conversation, it is important to introduce yourself and mention the company represented. This initial introduction helps to establish a clear connection and context for the conversation ahead. Greeting customers leaves a good impression. Creating a positive first impression is important. A first impression is the last impression. The way you communicate and present yourself for the first time determines how you are perceived by others.

1.2.1 Steps for Greeting a Customer

Following are the certain steps that may be followed to greet the customer

1. Acknowledge Presence

When greeting customers, acknowledge them to make a good first impression. With this, the customers feel valued and important. Simple acknowledgements such as ***"Welcome"*** or ***"Hello"*** indicate that a CRM representative noticed them. This step helps to start the relationship on a positive note.

Smile – Smiling is a powerful and effective technique to greet customers. Combining a smile with direct eye contact also communicates to a customer that CRM representatives are interested in what brings them into this business.

Build Rapport – Customer rapport helps to ease anxieties between the CRM representative and the customer. It also helps the customer become acquainted with the business with a personal touch. First-time customers are cautious and not familiar with your business. They need help in building trust in your business and products. Try ice-breakers such as discussing the weather, sports, traffic or family to build rapport and trust.

Ask Questions – Asking open-ended questions to customers helps them to determine their needs and how your organisation can address them. Questions such as, *"How may I assist you today?"* or *"What brings you in today?"* tell customers how you are attentive and ready to help them. Allow them to talk as you listen, determine their needs, then offer suggestions.

2. Answer Customer Service Calls

The way you answer your customer service call can determine whether the customer's experience is positive or negative. The greeting you provide the customer can set the tone for the entire call and determine whether the customer stays loyal or chooses not to return.

1. Answer customer service calls within the first three rings. Since the customer's interaction with the company usually starts before you get on the line, don't allow the phone to ring for long before you answer.

2. Address each customer as if he/ she is the most important caller. Greet your 100th caller with the same pleasant personality as the first call of the day.

3. Welcome the customer with a friendly, branded greeting. Greet them with something like *"Welcome to ..... How much will I help you?"* or *"Good morning, ..."* Provide the customer with an inviting greeting but don't go overboard, as this could make them uncomfortable.

1. Make sure that your tone of voice matches the pleasant words. Pay attention to your tone and pitch to ensure they reflect a person who is willing to help and serve the customer.

5. Give the full attention to the customer. Stop doing other work while answering the customer.

6. Speak clearly and professionally. Avoid using slang words or company jargon. Begin by speaking at a moderate pace and adjust your pace to the customer's pace once the conversation begins.

The following are some of the greeting scripts to start with:

Hello, [Customer Name]! Thank you for contacting [Business Name]. How can I help?

Hey there! We appreciate you using [Service Name]. We're happy to help you with any questions you have.

Hi, [Customer Name]! Thanks for reaching out. Give me just a moment to read your message and I'll do my best to help.

Welcome back, [Customer Name]! It's great to see you again. How can I assist you today?

Hi, [Customer Name]! Welcome back to [Business Name]. Did you manage to resolve [the previous issue]?

1.2.2 Call Opening (Flow)

General flow of call opening is:

- Greeting
- Caller's Name
- Brand/ Company Name
- Customer's Name (If available)

1.2.3 Ways to Greet

Hello by time of day – Adjusting your greetings according to the time of day adds a personal touch. Use "Bonjour" until noon, switch to "Good afternoon" until late afternoon, opt for "Bonsoir" early in the evening, and conclude with "Have a nice day" regardless of the time you end the call. As illustrated in Figure 1.2.

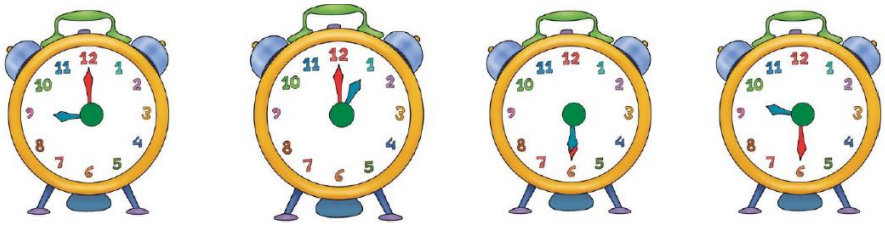


Fig. 1.2: Greet based on the time of the call

Stand up when you meet someone – This shows that you respect that person. It also helps you get to the point where you can make eye contact.

Introduce yourself immediately – When initiating contact, introduce yourself courteously by saying your name.

For instance, "Hello, I am Suresh.

Pleasure to meet you," for in-person conversations, or "Hello, I am Suresh calling from Global7 Telecom," during phone calls.

Handshake – When you say hello, offer your hand for a handshake. It shows you are friendly and confident.

Smile – Your facial expression can say a lot. A smile when meeting someone shows you are glad to see them, no matter how you feel.

Greet others by name – Addressing someone by their first name and consistently using it throughout the conversation helps them feel valued and shows your interest in them. For instance, *"Hi, Hari. Is this a good time to chat?"*

Focus on the customer, not yourself – When calling a customer, prioritize their needs and minimize background noise. Let them share their thoughts and concerns without interruptions from your end.

Do not be too casual when greeting – Instead of casual greetings like *"Hi"* or *"What's up,"* maintain a professional tone when addressing customers or superiors. This shows respect and professionalism, avoiding any confusion between friendly conversations and professional interactions.

Thank you – Always express gratitude before ending a call by saying *"Thank you for reaching out."* Adjust the level of gratitude based on the situation, whether it's with supervisors, friends, or customers.

Asking customers, *"How can I assist you?"* demonstrates your genuine concern for their needs as a customer service representative (CSR).

1.2.4 Steps to take a call

Let's follow Ravi, a customer service representative (CSR), as he begins his shift and takes a call.

Step 1. Ravi starts by logging into his computer using his user ID.

Following that, he enters his password to gain access.

Depending on the login credentials, different applications open up. For those handling orders, the CRM script appears, while customer service representatives are greeted with a screen featuring various search fields to access customer data.

Step 2. Next, he logs onto the Automatic Call Distributor or the *'hard phone'.*

At this point, Ravi is logged into both the application and the phone system.

Step 3. Now Ravi puts on his headset.

Step 1. Now Ravi is prepared to take calls.

He recognizes an incoming call when his headset beeps or the hard phone blinks.

Ravi begins conversing with the customer.

Step 5. After concluding the conversation with the customer:

Ravi expresses gratitude to the customer before ending the call.

He records the details of the call in the application.

Ravi is now prepared for the next call.

These steps outline the way CSR handles a call once it's received. But let's take a step back to understand how the call arrives at the call center in the first place.

1.2.4 Listen to the customer actively

Hearing captures sounds, but listening demands more—it necessitates concentration and attention to detail. When you listen, it's not just about grasping the words; it's about observing the narrative's delivery, language nuances, vocal tones, and body language. Effective listening involves being attuned to both verbal and non-verbal cues, enhancing your understanding and perception of the complete message.

1. Listening is a cognitive process.
2. Hearing is a sensory function.

A skilled listener pays attention not only to spoken words but also to unspoken or partially expressed thoughts. It involves interpreting body language and detecting inconsistencies between what is said and what is communicated nonverbally. For instance, if someone claims contentment but clenches their teeth or sheds tears, the mismatch suggests conflicting messages. Effective listening demands concentration and utilization of senses beyond just hearing the spoken words.

Your ability to listen deeply greatly affects how well you perform at work and the quality of your relationships with others. We listen:

1. To get information
2. To understand
3. To learn

1.3 Principles of Active Listening

If you try to follow these principles while listening, you will become a better listener.

Stop talking **–** We have two ears and one mouth for a reason: listen more than you speak, and if you need clarification, ask after the person has finished speaking.

Prepare to listen **–** Focus on the speaker. Forget other things.

Put the speaker at ease **–** Ensure the speaker feels at ease during the conversation, whether it's a customer, colleague, or boss. Acknowledge their needs and concerns, using gestures or words to signal encouragement for them to keep talking.

Eliminate distractions **–** Focus entirely on what's being said: avoid multitasking like doodling, shuffling papers, or any unnecessary activities that could interrupt the conversation.

Empathy **–** Open your mind to the other person's perspective. Clear away any preconceptions and make an effort to understand their viewpoint.

Be patient **–** A pause does not always signify the end of their thoughts. Avoid finishing sentences for them.

Avoiding personal bias **–** Attempt to maintain objectivity without letting personal emotions or biases affect your perception of someone based on their habits or behavior.

Listen to the sound **–** The tone and volume of one's voice are crucial aspects that complement the message being conveyed.

Listening to Ideas **–** More than Just Words: Focus on the larger perspective, rather than individual elements.

1.3.1 Scripts for active listening

About 96% of consumers say empathy is essential in a customer support interaction. Demonstrating **active listening** and making the customer feel heard might be the second most important part of providing support—second only to solving the actual problem.

Active listening is particularly important if there's a communication barrier you're trying to overcome. Here are some ways to start:

- Let me just make sure I understand you right. You'd like to [rephrase the customer's question]. Is that accurate?
- If my understanding is correct, you're looking for a way to [do this]?
- Sorry to hear you ran into that issue. The good news is: We can fix it! Here's how.
- Let me check that I have this right. You need help with [restated problem], correct?
- I can totally understand how frustrating that was. Would you mind waiting a couple of minutes while I look into that for you?
- I hear you, and I'm sorry to hear that didn't work as expected. Give me a second to look into it on my end and see what I can do.
- It looks like I can't reproduce this on my end. Would you mind sending me [a screenshot or video] so I can make sure I'm looking in the right place?
- Ah, I understand what you're trying to do. We don't offer this as a current feature but I do have a workaround. You can [do this instead].

1.3.2 Empathy

Successful customer service relies on empathy, the ability to perceive situations from the customer's viewpoint. It extends beyond just resolving issues; acknowledging a customer's emotions is crucial before presenting solutions.

Empathy involves grasping and validating a customer's feelings and requirements before providing a fitting solution.

1.3.3 Sympathy

Sympathy involves feeling pity or compassion for another person's misfortune.

Expressing empathy for another's hardships or misfortunes.

Compassionate understanding towards someone's negative emotions or situation.

An essential phase in social and moral growth and understanding.

Assignment 1.1.

- List and practice the principles of active listening.
- List and practice the steps to take a call as a customer service representative.

Case Study to show proper empathy and acknowledgement

Example 1

CRM: "Welcome to XYZ Ltd, this is Ankita speaking! How may I assist you today?"

Customer: "Hello, I am Ashok Sharma, a credit card holder from your bank. Yesterday at the shopping mall, my card declined. Is there an issue? I Do not think there's a problem on my end."

CRM: "I completely understand your concern, Mr. Sharma. Please allow me to check and resolve the issue for you. Before we proceed, could you kindly provide me with your ID number and your card number?"

Customer: "Certainly. My ID number is 1234, and my card number is 433677224455."

CRM: "Please stay on the line for about 2 minutes while I investigate this matter for you."

After 2 minutes

CRM: "Thank you for waiting, Sir. I regret to inform you that the last payment was declined due to insufficient funds in your bank account."

Customer: (Shocked) "Oh no! What am I going to do? The bill is substantial, and I just switched jobs. My salary won't arrive until the end of next month. I am in a tough spot here."

CRM: (Calmly) "Please Do not worry, Sir. I understand your predicament. I have been in a similar situation before. I will assist you by initiating a request on your behalf. Our company will cover the outstanding amount, and once your account has enough funds, the company will deduct it. However, during this period, your card will remain inactive. Once the amount is settled, your card will be reactivated."

Customer: "Thank you so much! Your help means a lot."

CRM: "Is there anything else I can assist you with?"

Customer: "No, that's all. Thank you again."

CRM: "Thank you for choosing ABC Ltd. Have a wonderful day."

The practical activity 1.1 illustrates the Empathy to be practiced in customer service using Role-Play

Activity 1

Practical Activity 1.1. Empathy in Customer Service Role-Play

Step 1. Divide students into pairs, with one as the customer and the other as the customer service representative (CRM).

Step 2. Provide each pair with a scenario or description (given below).

Step 3. Give pairs time to read and understand their scenario. Then, start the role-play sessions, encouraging authentic engagement.

Step 1. After each role-play, gather participants to discuss how effectively empathy was shown and how the situation was handled.

Solution: Scenario Script

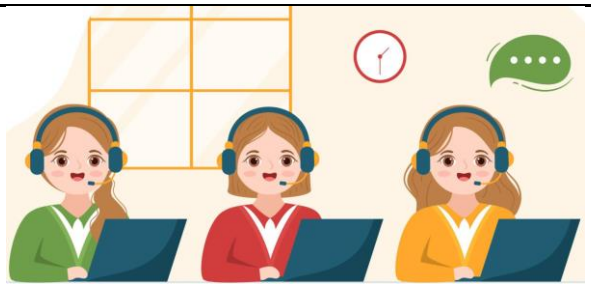


Fig. 1.3: Call center agent

Customer: (Dialing customer service) Hello, I have been facing constant issues with my internet service. This is becoming incredibly frustrating as it's affecting my work.

CRM: I understand your frustration, ma'am. I will do my best to assist you. Can you provide me with your account details, please?

Customer: Sure, my account number is 1234567890.

CRM: Thank you for that information. I'm sorry for the inconvenience this has caused you. Let me check the system to see what might be causing this issue. Please bear with me for a moment.

Customer: (Sighs) It's been really difficult to work efficiently. I hope there is a solution soon.

CRM: I completely understand how important it is to have a reliable internet connection, especially for work. It seems like there might be an outage in your area affecting the service. I am going to escalate this immediately and ensure a technician is dispatched to resolve this as soon as possible.

Customer: I appreciate your prompt action on this. I hope it gets fixed soon.

CRM: Absolutely, ma'am. Our aim is to get this sorted for you quickly. I will follow up personally to ensure it's resolved to your satisfaction. Thank you for your patience.

Customer: Thank you for your help. I will be waiting for the resolution.

Example 2

CRM: "Hello and welcome to ABC Ltd. I am Ankita, how may I assist you today?"

Customer: "Hello, my name is Ashok Sharma. I am a credit card holder with your bank. Yesterday, I tried using my card at a shopping mall and was told it was rejected. I am not sure what the issue might be."

CRM: "I completely understand your concern, Mr. Sharma. Let me check the details and resolve this for you. Before I proceed, could you please provide me with your ID number and card number?"

Customer: "Of course, my ID number is 1534, and my card number is 433677224455."

CRM: "Please stay on the line for a moment while I investigate this matter."

After 2 minutes

CRM: Thank you for being on hold Sir! I would like to inform you that due to low bank account balance, the last payment is yet due. Therefore, your card got rejected.

Customer: (Shocked) Oh my God! What am I to do now? I am not in a state to pay the last bill, if you check, it is huge. I just changed my job and have not received my salary. I will be drawing my salary at the end of next month. I will be in a great mess, you do not understand. Please do something.

CRM: (Sounding sympathetic) I understand Sir, but then you should have saved some money. Savings matters during this type of situation. You must be in such trouble now.

Customer: I do not need any advice from you. Just do your work.

CRM: I will go ahead and submit a requisition in your name, where our company will pay your last due amount and once you have sufficient balance in your account, the company will deduct the amount. However, till then your card will remain inactive, as soon as the amount is retrieved by the company, the card will be activated.

Customer: Good, now that's your job. Stop advising people. Bye

CRM: Is there anything else…

(The phone gets disconnected)

Summary

- Role of voice customer service associates: Establishing positive impressions and rapport through engaging calls and clear introductions.
- Effective call openings: Utilizing tailored greetings, professional tone, and precise introductions.
- Steps in handling calls: Logging in, headset setup, conversation, gratitude, call documentation, and readiness for the next call.
- Active listening: Discerning verbal/non-verbal cues and differentiating between hearing and understanding.
- Principles of active listening: Emphasizing listening over speaking, empathy, patience, objectivity, and understanding tone.
- Importance of empathy in customer service: Acknowledging and addressing customer emotions for effective solutions.
- Sympathy's role: Demonstrating compassionate understanding in social and moral growth.

Check Your Progress

A. Multiple Choice Questions

1. What is the primary purpose of an effective call opening? (a) To end the call promptly (b) To establish a positive tone and rapport (c) To rush through the conversation (d) To avoid greeting the customer
2. Which step is NOT part of handling a call? (a) Expressing gratitude (b) Recording call details (c) Making personal notes (d) Readiness for the next call
3. What does active listening involve? (a) Only hearing spoken words (b) Observing verbal cues (c) Concentrating on what's being said and unspoken cues (d) Ignoring body language
4. Which principle is essential in active listening? (a) Interrupting the speaker (b) Prioritizing speaking over listening (c) Focusing on larger perspectives (d) Showing impatience
5. What is the significance of empathy in customer service? (a) Ignoring customer emotions (b) Acknowledging and addressing customer feelings for better solutions (c) Focusing solely on company policies (d) Being indifferent to customer issues
6. What is the primary purpose of introducing yourself and mentioning the company you represent at the beginning of a call? (a) To confuse the customer (b) To establish

a connection and context (c) To avoid interaction (d) To rush through the conversation

7. What is a crucial step for a customer service representative before ending a call? (a) Expressing gratitude (b) Interrupting the customer (c) Making personal remarks (d) Avoiding any further conversation
8. Which factor does NOT contribute to effective listening? (a) Concentration (b) Bias (c) Patience (d) Interpretation of verbal and non-verbal cues
9. What does 'INCOME calls' typically refer to in a call center? (a) Outgoing calls made by CSRs (b) Calls received by CSRs from customers (c) Internal meetings (d) Call recordings
10. What does active listening primarily involve? (a) Hearing only the words spoken (b) Observing body language (c) Focusing on multitasking (d) Concentrating on both verbal and non-verbal cues

B. Fill in the Blanks

1. The initial moments of a conversation are crucial for forming a favorable first _____.
2. Effective call openings involve tailored greetings and maintaining a _____ tone.
3. Handling calls includes logging in, headset setup, expressing gratitude, and _____ for the next call.
4. Active listening involves discerning _____ cues.
5. Principles of active listening include empathy, patience, and understanding _____.
6. Creating a positive _____ is important.
7. Effective listening involves interpreting _____ cues.
8. Empathy involves understanding and acknowledging a customer's _____.

C. State whether the following statements are True or False

1. Effective call openings are relevant in customer interactions.
2. Active listening involves only focusing on spoken words.
3. Empathy in customer service disregards customer emotions.
4. Active listening involves interrupting the speaker to show engagement.
5. Sympathy and empathy hold the same significance in customer interactions.
6. Active listening only involves paying attention to verbal messages.
7. Expressing gratitude is necessary in customer interactions.
8. Sympathy and empathy have the same meaning in customer service.
9. Empathy in customer service focuses solely on resolving issues.
10. Call openings have minimal impact on customer interactions.

D. Answer the following questions in short

1. What role do voice customer service associates play in call centers?
2. Why are the initial moments of a conversation crucial in customer interactions?
3. What are some effective opening lines for a CRM Domestic (Voice) call?
4. List three ways to greet a customer effectively.

5. What are the steps involved in handling a call, as outlined in the chapter?
6. Explain the difference between hearing and active listening.
7. Name three principles of active listening discussed in the chapter.
8. Why is empathy considered crucial in customer service?
9. Define sympathy in the context of customer interactions.
10. How do CSRs typically recognize an incoming call?

Session 2: Query Management

Query management refers to a series of processes that are undertaken when queries are captured, escalated, and actioned in case a dispute arises. When queries are rejected, they're often routed back to the vendor for exception handling or for further queries. Query management is essential for ensuring data completeness and accuracy. It helps to identify and correct errors, inconsistencies, and discrepancies, improving the quality of data collected during clinical trials.

In this chapter you will understand the concept of query management. It includes the – tools for query management, how to resolve the queries within your area of competence, how to confirm that queries have been satisfactorily resolved, examine the objection handling skills.

2.1. Tools for query management

The company employs management systems and software tools to efficiently manage customer inquiries. Among the tools available, the Microsoft Office suite offers several applications like Word, Excel, PowerPoint, and Outlook. Specifically, MS Office and Excel are crucial for processing and tracking customer queries and complaints, ensuring a streamlined resolution process.

There are several types of general issues and queries that customers contact a customer service agent.

Table 2.1: Types of query and possible resolutions

Sn	***Type of Query***	***Mode of Resolution***
1	Product defect or confusion	Email/Chat
2	Shipping issues	Email/Chat
3	Billing issues	Email/Chat
4	Social interaction	Email/Chat
5	Purchasing	Email/Chat

Select the correct category of documentation as per the list mentioned in the query management tool.

Each company utilizes a distinct case management system that empowers customer service managers to categorize and streamline cases for quicker and more efficient issue resolution. It's essential to thoroughly comprehend the requirements of this management system before commencing operations to ensure effective utilization.

Carefully review the customer's concerns, summarize them, and seek confirmation of your understanding.

Restating important details to the customer with a phrase like "Let me recap to ensure I have got this right" helps assure them that you are attentive to their needs.

Refer queries outside your area of competence or authority promptly to appropriate people.

Call forwarding involves more than pressing buttons on your phone. It's about transparently explaining to the customer why their call needs to be redirected.

Potential reasons for call redirection may include:

- The customer received the incorrect service.
- Queries that necessitate the expertise of other services.
- Inability to authorize the decision the customer seeks.

Examples

Transferring the call – "May I please place your call on hold while I transfer this call." (Wait for their response) If Yes; "Thank you. Please hold while the call is being transferred".

Retention / Service Cancellation

Situation – The customer is upset because Technical Support can't replace her out-of-warranty DSL Modem/Router. She's expressing frustration about the cost of the modem and is considering switching to a different Internet Service Provider.

Customer's Profile – Female, Age is 75 years old, and very irate.

Goal – Pacify the irate caller, and save the customer from cancelling her Internet Service.

2.2. Resolve Queries within Your Area of Competence or Authority

2.2.1. Service Level Agreements (SLAs)

Service Level Agreements (SLAs) are the part of a service contract in which the service is formally defined.

In practice, the term SLA is occasionally used to refer to the agreed-upon service or performance delivery time in contracts. For instance, Internet Service Providers commonly incorporate a Service Level Agreement into their contracts with customers to outline the specific service levels being offered.

In this scenario, the SLA typically includes technical specifics like mean time between failures (MTBF), mean time to repair or recover (MTTR), various data rates, debit, jitter, or similar measurable details.

In simpler terms, a service level agreement is like a negotiated deal between two or more parties, where one party is the customer and the other is the service provider.

Customer based SLA – Collective agreements covering various services used by a group of individual customers.

For instance, SLAs between an IT service provider and a large organization's finance department, encompassing services like financial systems, payroll, invoicing, and procurement systems.

Service-based SLA – The agreement is accessible to all customers using the service offered by the service provider. For example:

An auto service station provides routine services to all customers and includes certain maintenance services within a comprehensive fee plan.

A mobile carrier extends ongoing service to all customers and includes some maintenance within a plan utilizing a shared payment method.

A single messaging system for the entire office presents challenges in its SLA as the service level provided can vary among different users. For instance, front office staff might require high-speed LAN connections, while local offices might rely on slower leased lines, leading to discrepancies in service levels.

Multilevel SLAs – SLAs are segmented into tiers, each serving specific customer groups but covering the same services within the overarching SLA.

Enterprise-Level SLA – Encompasses all Service Level Management (SLM) concerns pertinent to individual customers throughout the organization. These issues might be less prone to change and hence demand fewer frequent updates (SLA reviews).

Customer-level SLA – Includes all SLM issues related to a specific customer group, regardless of the service used.

Service Level SLA – Covers all minor issues related to specific services, relevant to this particular group of customers.

2.3. Obtain confirmation that queries have been satisfactorily resolved

Customer retention is a strategic effort by an organization to minimize customer loss. It starts from the initial interaction and extends throughout the customer-company relationship. The capability to both attract and maintain new customers is tightly connected to the quality of products or services offered by the company.

Customer retention surpasses meeting customer expectations; it's about exceeding them to foster brand loyalty. It focuses on delivering customer value over solely pursuing maximum profits, shaping a business strategy that prioritizes the customer's experience. Consistently providing top-notch customer service often stands out as a critical factor in a competitive market.

Customer satisfaction, a common marketing metric, gauges how well a company's offerings meet or surpass customer expectations. It's quantified as "the count or percentage of customers whose reported experience with a company, product, or service exceeds a specified satisfaction target." A survey of approximately 200 senior marketing executives revealed that 71% found measuring customer satisfaction highly beneficial for managing and monitoring their business.

2.4. Examine the objection handling skills to buy time for gauging the correct resolution

Case Study: **Techniques for conveying concern and commitment**

CCE: Thank you for choosing ABC Internet. I am Neha. How may I assist you today?

Customer: I was talking to Rahul earlier, and he mentioned that my modem might be malfunctioning. As a retired teacher, I cannot afford a new modem. I am considering canceling my Internet Service and switching to another provider. Can you transfer me to the cancellation department?

***CCE*:** I am really sorry to hear about your experience, ma'am. We truly value you as a customer and I am here to assist you. Let's start by confirming your account number. Is that alright with you?

Customer: I have already provided my number before, but here it is again: 860-995-****. My name is Rajshree Basu.

CCE: Thank you, Mrs. Basu. So, that's 860-995-****, correct?

Customer: Yes, and that's also my callback number.

CCE: Could I please verify the last four digits of your Social Security Number?

Customer: It is ****.

CCE: Thank you! I see you have been with Wishnet Internet for a long time. We genuinely Do not want to lose valued customers over a faulty modem. Let me offer some assistance...

Customer: (interrupting) If you check your records, I have been calling almost every other day for weeks. You folks wasted my time and I can't believe I am still with you!

CCE: I apologize for the inconvenience. As previously mentioned, your modem is malfunctioning. I can transfer you to my senior who can assist.

Customer: Oh, again with this. I am an elderly lady. No need for a senior, just cancel my connection.

CCE: Mrs. Basu, I understand your frustration. I will brief my senior on your situation. Let me help. Here's my plan: I will note down all the issues and transfer the call to my senior while placing you on hold for 2 minutes. Is that alright?

Customer: Fine, but if I am not happy, I am canceling.

CCE: I assure your satisfaction by the end. Please hold while I transfer the call.

CCE and Manager

Manager: This is Sanjukta, Customer Service Manager. How can I assist you?

CCE: Good Afternoon, Sanjukta. This is Neha, CCE. I have Mrs. Rajshree Basu on the line, and she's upset due to a malfunctioning modem, considering canceling her connection. I have verified her details, and she's a loyal, long-standing customer. I have documented and escalated the issue. Can I transfer the call to you?

Manager: Sure, go ahead and transfer it. Let me see what I can do to help.

CCE: Thank you. Transferring the call now.

Customer and Manager

Manager: Good Afternoon, Mrs. Basu. This is Sanjukta, the Customer Service Manager. Neha explained your modem issue and the desire to cancel the connection. Am I correct?

Customer: Yes, that's right. She mentioned you might be able to assist.

Manager: Okay, here's what I can offer. Given your more than 5 years with Wishnet Internet, I will arrange a complimentary modem upgrade with wireless capability, absolutely free! I will place the order for overnight shipping, so you'll have the new modem by tomorrow.

Customer: Wow, that's fantastic! Thank you so much!

Manager: Additionally, I will enroll you in a free 6-month trial Speed Upgrade. This means, instead of the previous 3 Mbps, you should now receive speeds of 6 Mbps. After the trial, you can continue with this for an extra INR 300 per month, or if it does not meet your needs, you can easily switch back to your old plan.

Customer: That's actually an amazing offer. I am impressed! I will definitely stay with your services for a long time and recommend you to all my friends!

Manager: I am delighted to hear that. Can you grab a pen and paper? I will give you your order number.

Customer: Sure, I am ready.

Manager: Your Free Modem Replacement Order Number is WN 893-7873. You will receive it by tomorrow. In case you need help with setup, we have our 24/7 Technical Support hotline available to guide you through it. Anything else I can help you with?

Customer: I am speechless, Sanjukta, all I can say now is THANK YOU!

Manager: You are most welcome, Mrs. Basu. I am glad I could assist you!

Customer: Yes, Sanjukta, you did, sweetie! Goodbye!

Manager: Thank you, Mrs. Basu, and once again, I am Sanjukta. Thank you for choosing ABC Internet! Have a great day!

Manager: Thanks again, and goodbye!

Activity 1

Practical Activity 2.1. Visit a customer care center and observe its working.

Step 1. Go to any nearby customer care center.

Step 2. Talk to any employee of that customer care center.

Step 3. Ask them how they handle the customer.

Step 4. Ask them the challenges they face while handling the customer.

Summary

- Each company employs a query-management system that helps customer care executives categorize and organize customer inquiries for quicker and more efficient issue resolution.
- Confirming crucial details back to the customer through phrases like "Okay, just to recap," assures them of your attentive approach.
- A service-level agreement (SLA) is a formal definition of services within a service contract.
- Agreements with specific customer groups encompassing the range of services they utilize.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Which software applications are crucial for processing and tracking customer queries in the Microsoft Office suite? (a) Word and PowerPoint (b) Excel and Outlook (c) Word and Excel (d) PowerPoint and Outlook
2. What are the primary modes of resolution for shipping issues according to the chapter? (a) Phone calls and letters (b) E-mail and chat (c) In-person meetings (d) Fax and social media
3. What is essential to understand before commencing operations for effective utilization in query management? (a) Customer preferences (b) Distinct case management systems (c) Market trends (d) Service product catalog
4. Which software tool in the Microsoft Office suite is primarily used for tracking customer queries? (a) Word (b) Excel (c) PowerPoint (d) Outlook
5. How are shipping issues typically resolved according to the chapter? (a) In-person meetings (b) Phone calls (c) E-mail/chat (d) Fax
6. What is vital before commencing operations for effective query management? (a) Customer preferences (b) Understanding distinct case management systems (c) Social media engagement (d) Technical skills
7. What is emphasized as essential for effective query management before commencing operations? (a) Customer testimonials (b) Familiarity with different programming languages (c) Understanding distinct case management systems (d) Marketing strategies
8. Which application in the Microsoft Office suite is crucial for processing customer queries but primarily used for creating presentations? (a) Word (b) Excel (c) PowerPoint (d) Outlook
9. What type of issues are usually addressed via e-mail or chat in query management? (a) Technical errors (b) Product defects (c) Invoicing concerns (d) Personnel complaints
10. Before starting operations for query management, what is necessary for efficient utilization? (a) Customer preferences (b) Technical proficiency (c) Understanding the company's branding (d) Familiarity with distinct case management systems

B. Fill in the Blanks

1. Different types of queries like product defects or shipping issues are resolved via _____.
2. Service Level Agreements (SLAs) formally define service delivery terms in _____.
3. Customer retention strategies prioritize exceeding customer _____.
4. Microsoft Office suite includes applications like Word, Excel, PowerPoint, and _____ for efficient query management.
5. Service Level Agreements (SLAs) in contracts formally define terms related to _____.
6. Customer retention strategies aim to exceed customer _____.
7. Microsoft Office's Outlook is crucial for managing _____ and ensuring streamlined resolution in query management.
8. Service Level Agreements (SLAs) detail the quality/standards of services provided and the metrics used to _____ them.
9. Customer retention strategies aim to foster brand _____ by exceeding customer expectations.
10. Each company utilizes a distinct case management system that empowers customer service managers to categorize and _____ cases for quicker and more efficient issue resolution.

C. State whether the following statements are True or False

1. The Microsoft Office suite doesn't play a significant role in query management.
2. Service Level Agreements (SLAs) only involve technical specifics.
3. Customer retention focuses solely on meeting customer expectations.
4. The Microsoft Office suite is irrelevant in query management.
5. Service Level Agreements (SLAs) solely focus on technical aspects.
6. Customer retention strategies concentrate only on meeting customer expectations.
7. Microsoft Office suite includes applications like Word, Excel, PowerPoint, and Outlook, among which Excel and Outlook are crucial for query management.
8. SLAs are occasionally used to refer to the agreed-upon service or performance delivery time in contracts.
9. Multilevel SLAs are segmented into tiers, each serving different customer groups but covering different services within the overarching SLA.
10. Customer retention is solely about meeting customer expectations to foster brand loyalty.

D. Answer the following questions in short

1. What are the key applications within the Microsoft Office suite that are crucial for processing and tracking customer queries and complaints?
2. How important is it to understand the requirements of a company's case management system for effective query resolution?
3. What steps can be taken to assure a customer that their concerns have been understood during an interaction?

4. Why is it essential to promptly redirect queries outside of one's area of competence or authority?
5. Explain the significance of call forwarding and its proper execution in customer service.
6. Describe a scenario where a customer might consider switching service providers and how this situation could be addressed to retain the customer.
7. What are Service Level Agreements (SLAs) in the context of customer service?
8. How do SLAs differ between customer-based and service-based agreements?
9. Explain the concept of multilevel SLAs and provide examples of their application.
10. Why is customer retention considered crucial for a company's success, and how does it differ from customer satisfaction?

Session 3: Documentation of Customer Queries

Documenting the customer interactions during service desk calls is essential. As shown in Figure 3.1. It should include the date, time, and duration of the call, the name, contact details, of the customer, and the reason for the call. Documenting customer interactions is a valuable tool that can improve service quality, customer satisfaction, and professional reputation. It allows to provide accurate and consistent information to customers and colleagues. This can help to avoid misunderstandings, errors, or conflicts that may arise from poor communication. Documenting customer interactions also allows you to follow up on unresolved issues, pending requests, or feedback, analyze and improve your performance, skills, and processes, and demonstrate your professionalism, accountability, and integrity.

Fig. 3.1: Customer service

In this chapter, you will learn about reference guides or support materials to resolve queries, case studies and raising service tickets.

3.1. Reference Guides or Support Materials to Resolve Queries

Each division within an organization deals with different products or services, leading to varied processes. For instance, a specific division collaborates with a laptop manufacturer, and another division interacts with customers using those laptops. Consequently, each wing or process requires specific documents to address customer issues. In the laptop-focused division, a robust knowledge base is crucial, focusing on laptop-related problems and their solutions.

Support can take many different forms. They are:

• User Guide

• Knowledge Base

• Issues and workarounds

Moderators should consistently refer to and review supporting documents before proposing solutions. Although a leader might believe certain steps can resolve a client's issue, it is prudent to consult the supporting documents every time to minimize the margin of error. Let's see a case study to illustrate this concept more effectively.

3.2. Case Study: How to Refer to the Supporting Material Case Study: How to Refer to the Supporting Material

Your organization's knowledge base and how to use this to identify solutions.

Mrs. Kapoor, a doctor, has been encountering issues with her XYZ Company laptop for the past two days. The laptop fails to boot, leaving her frustrated, prompting her to contact the customer care representative for assistance.

CCE: Good morning and welcome to XYZ Laptops. How can I assist you today?

Mrs. Kapoor: Good morning. I have been using an XYZ laptop for the last six months. Unfortunately, it stopped working a couple of days ago. Can you please fix it as soon as possible? It's urgent.

CCE: I apologize for the inconvenience you are facing with your XYZ laptop. Rest assured, we will do everything possible to resolve this issue urgently. We understand the urgency and frustration you are experiencing.

Mrs. Kapoor: Yes, I have not been able to boot it up since the day before yesterday.

CCE: I am truly sorry for the trouble. Could you provide more details about the exact issue so that we can resolve it promptly?

Mrs. Kapoor: I have already mentioned it is not booting up.

CCE: Ma'am, could you let me know if the laptop isn't turning on at all, or if it is powering up but not reaching the user interface?

***Mrs. Kapoor*:** I do not understand all the technical terms. When I turn it on, the logo appears, then the screen goes black.

CCE: Just to clarify, when you power on the laptop, it shows the initial logo, but then the screen goes blank.

Mrs. Kapoor: Yes, exactly. What should I do now? Should I take it to a service center and pay for repairs?

CCE: No, ma'am. This seems to be an issue with the operating system and the laptop not fully booting up. We can resolve this over the call, and there won't be any charges.

Mrs. Kapoor: Really? Please do that.

CCE: Ma'am, I would like to go through the problem in detail to provide the best solution. Give me 2 minutes to check my resources and fix this issue for you.

Mrs. Kapoor: Sure, but please be quick. I am in a hurry.

CCE: Absolutely, I will return in a couple of minutes.

Mrs. Kapoor: Okay.

The executive should use the time given by the customer to check helpful information for fixing the laptop issue. If the executive tries to solve the problem without looking at

this info, mistakes might happen. So, it is important for the executive to use this time wisely to find the right solution.

Now, the CCE looks for the solution in the knowledge base and is back to the customer.

CCE: Thanks for waiting, ma'am. After checking, I am confident we can fix this.

Mrs Kapoor: Yes, please hurry. I am in a rush.

CCE: It is an issue with the operating system. It might be damaged, preventing the laptop from starting. We will reload the operating system to solve it.

Mrs Kapoor: How do I do that? I am not good with tech stuff.

CCE: Do not worry. I will guide you through the steps. They are straightforward and would not take long.

Mrs Kapoor: What should I do?

CCE: When you got the laptop, did you receive a CD with the operating system?

Mrs Kapoor: Yes, I did, but a friend helped set it up. I Do not know much about it.

CCE: I understand. Could you get the CD you got when you bought the laptop?

Mrs Kapoor: Sure, it's here. Should I put it in the laptop?

CCE: Perfect. Insert the CD into the laptop's CD drive and turn it on.

Mrs Kapoor: Okay, give me a moment, please.

CCE: Of course, take your time.

(After a few seconds…)

Mrs Kapoor: I have put in the CD and turned it on. What's next?

CCE: Do you see a menu asking how you'd like to start the laptop—HDD, CD, USB drive?

Mrs Kapoor: Yes, it is asking to choose the boot option. Should I pick a CD/DVD?

CCE: Yes, exactly. Select that option and press enter.

Mrs Kapoor: Got it. Wait, it is asking if I want to install the OS. Yes or No?

CCE: Please click Yes. It will reload the operating system since the previous one is corrupted.

Mrs Kapoor: Alright, it's reloading now. Will it work again?

CCE: Yes, it should. Sometimes downloading corrupt files can damage the OS, but this should fix it.

Mrs Kapoor: Will I lose my files?

CCE: No worries. Your files would not be affected.

Mrs Kapoor: It's restarting. Should I stop it?

CCE: Let it restart. We will see if the issue is resolved.

Mrs Kapoor: It's working! That's a relief. Thank you so much.

CCE: Happy to help! Can you confirm if your files are still there?

Mrs Kapoor: Yes, they are all here. Thank you!

CCE: You are welcome. Anything else I can assist you with?

Mrs Kapoor: No, that's all.

CCE: Thank you for choosing XYZ Laptops. Have a great day!

Standard procedures often involve leveraging support materials, such as case studies, to illustrate various actions or tasks. These documents serve as guides and should be referenced regularly when carrying out specific actions or tasks.

When accessing support documents, it's crucial to note that they may contain multiple updates about a specific product or service. Being familiar with recent updates is essential. Therefore, revisiting the knowledge base regularly proves useful and necessary for employees to stay informed about these changes.

3.3. Raising service tickets

A service request typically involves a user seeking information, advice, or assistance related to a standard change or accessing a computer science service. An example of such a standard requirement is a password reset. These requests are typically managed by the Service Department and Do not necessitate the submission of an RFC (Request for Change). The process, starting from receiving a customer's call to generating a service request, involves multiple systems.

The process remains consistent:

Answer calls and welcome customers.

Listen attentively to customer concerns and document them.

Reassure customers that problems will promptly be addressed and resolved.

If the problem exceeds the designated scope, create a service request for review by the relevant individuals.

Inform the customer that the service request has been registered and provide the service request numbers for future reference.

When sharing information with customers about progress, like the status of a settlement, ensure it's factual. For example, if a customer reports a problem with their satellite dish and initial checks reveal technical issues requiring field technicians, inform the customer accordingly. Create a service request for the issue, check for available field technicians in the area, and gather all relevant details. Once you have a complete update, share the settlement progress with the customer without giving false expectations, as illustrated in Figure 3.2.

Fig. 3.2: Raise service ticket and share the exact information with the customer

Table 3.1: Essential fields of a service request

Field	***Description***
Summary	A short description of the request.
Reporter	The person who submitted the request

Component/s	Segments of your IT infrastructure that relate to the request. For example, "Billing services" or "VPN server". These are used for labelling, categorization, and reporting.
Attachment	Files or images added to the request.
Description	A long, detailed description of the request.
Linked Issues	A list of other requests that affect or are effected by the request. If your business uses other multiple products, this list may include linked development issues.
Assignee	The service desk agent assigned to fulfil the request.
Priority	The importance of the request's resolution to the service desk. Usually in regards to your business needs and goals. Sometimes calculated by impact and urgency.
Labels	A list of additional custom labels used for categorizing or querying records.
Request participants	A list of extra customers or vendors who take part in resolving the request.
Approvers	A list of business or financial contacts responsible for approving the service request.
Organizations	A list of customer or vendor groups interested in the request's resolution.
Impact	The effect of the service request, usually in regards to service level agreements.
Urgency	The time available before the business feels the service request's impact.
Pending reason	A short description or code that indicates why the service request is not progressing.
Product categorization	A category of IT asset or system that the request effects.
Operational categorization	A category of action or function required to fulfil the request.

Activity 1

Practical Activity 3.1. Handling Objections and Conveying Concern

Step 1. Divide students into pairs, assigning one as the Customer Service Representative (CSR) and the other as the Customer.

Step 2. Provide each pair with the following role-play scenario to enact.

Role-Play Scenario:

Role 1: Customer Service Representative (CSR)

Role 2: Customer

CSR: "Thank you for choosing XYZ Internet. I am Neha. How can I assist you today?"

Customer: "I have been facing internet issues and want to cancel."

CSR: "I understand. Let's confirm your details first. Can you provide your account number?"

Customer: "Sure, it's 123-456-7890."

CSR: "Thank you. And the last four digits of your SSN?"

Customer: "It's ****."

CSR: "I'll connect you with a senior rep to resolve this. Please hold on."

Manager (Joining the Call): "Hello, I am Sanjukta, the Customer Service Manager. What issues are you facing?"

Customer: "I've had recurring problems and thought of canceling."

Manager: "I apologize. Let's upgrade your modem and offer faster speeds for free. Would that help?"

Customer: "That's amazing! Thank you!"

Manager: "Here's your order number. Anything else?"

Customer: "I'm speechless, thank you!"

Manager: "Thank you for choosing XYZ Internet! Have a great day!"

Manager: "You're welcome! Your Free Modem Replacement Order Number is WN 893-7873. In case you need help with setup, our 24/7 Technical Support is available. Anything else I can assist you with?"

Customer: "I am speechless, thank you!"

Manager: "Thank you for choosing XYZ Internet! Have a great day!"

Summary

- Support materials may come in various forms. Those are:
- Users' Manual
- Knowledge Base
- Issues and Resolutions
- Executives should refer to supporting materials before offering resolutions.
- A Service Request involves a user seeking information, advice, a standard change (pre-approved and low-risk), or access to an IT service.
- The process from receiving a customer call to raising a service request involves multiple systems.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. What are the different forms of support mentioned in the chapter? (a) User Manual (b) Knowledge Base (c) FAQs (d) All of the above
2. What should moderators do before proposing solutions to customer issues? (a) Consult supporting documents every time (b) Rely on personal experience only (c) Avoid referencing documents (d) Consult documents occasionally
3. In the case study provided, Mrs. Kapoor faces an issue with her laptop. What is the specific problem? (a) Laptop not turning on at all (b) Laptop failing to load the operating system completely (c) Laptop screen displaying a blank screen after startup (d) All of the above

4. What is the purpose of referencing case studies or supporting documents regularly? (a) To memorize solutions for faster resolution (b) To stay informed about recent updates (c) To avoid seeking help from supervisors (d) To showcase expertise to customers
5. What are the essential fields in a service request, according to Table 5.1 in the chapter? (a) Summary, Reporter, Description, Impact, Urgency (b) Summary, Attachment, Linked Issues, Priority, Labels (c) Component/s, Assignee, Request participants, Approvers, Impact (d) Summary, Component/s, Description, Priority, Labels
6. What are some examples of support materials mentioned in the chapter? (a) Whitepapers (b) User Guides (c) Brochures (d) All of the above
7. How can referencing case studies or support documents benefit customer service representatives? (a) Improving response time (b) Enhancing customer satisfaction (c) Providing accurate solutions (d) All of the above
8. In the case study provided, what was the specific issue with Mrs. Kapoor's laptop? (a) Software malfunction (b) Hardware failure (c) Operating system issue (d) Connectivity problem
9. What is the significance of summarizing a customer's query during an interaction? (a) To confirm understanding (b) To stall for time (c) To redirect the conversation (d) None of the above
10. What is the primary purpose of raising service tickets as mentioned in the chapter? (a) Tracking customer complaints (b) Managing internal documentation (c) Organizing customer inquiries (d) Prioritizing customer requests

B. Fill in the Blanks

1. Each division within an _____ deals with different products or services.
2. Moderators should refer to and review supporting _____ before proposing solutions.
3. Revisiting the knowledge base regularly is necessary for _____ to stay informed about changes or updates.
4. A service request typically involves a user seeking _____, advice, or assistance related to a standard requirement.
5. The process of receiving a customer's call and generating a service request involves _____.
6. When sharing information with customers about progress, ensure it's _____.
7. Service requests are typically managed by the _____.
8. _____ is the person who submitted the service request.
9. _____ represents the importance of the request's resolution to the service desk.
10. Impact is the effect of the _____, usually in regards to service level agreements.

C. State whether the following statements are True or False

1. Supporting documents like case studies should be referenced occasionally to propose solutions.

2. Service requests typically involve users seeking information related to major system overhauls.
3. The process of handling a service request starts with listening attentively to customer concerns and documenting them.
4. A service request's priority indicates its urgency and impact on business needs and goals.
5. Referencing the knowledge base regularly is not necessary for staying informed about recent updates.
6. The Impact field in a service request refers to the time available before the business feels the request's impact.
7. The Reporter in a service request is the service desk agent assigned to fulfill the request.
8. Labels in a service request are used for categorizing or querying records.
9. Service Level Agreements (SLAs) are not affected by the urgency of a service request.
10. Service tickets are primarily raised to prioritize customer requests.

D. Answer the following questions in short

1. Why is it essential for customer service representatives to refer to support documents regularly?
2. How can referencing case studies or support materials benefit the resolution of customer issues?
3. What steps can be taken to ensure accurate understanding of a customer's query during an interaction?
4. In what ways does revisiting the knowledge base regularly prove beneficial for employees?
5. What are the key fields in a service request, and why are they crucial?
6. How does summarizing a customer's query help in effective query management?
7. Why is it important to accurately document customer concerns during service interactions?
8. What role does a service ticket play in the customer query resolution process?
9. How can service tickets aid in organizing and prioritizing customer inquiries?
10. What are the strategies to streamline the documentation process for customer queries?
11. Amount to be calculated as Price * Qty.

Session 4. Manage Query Resolution

Customer Query are the request received for information regarding the products, services or related processes, or to carry out a transaction or action in relation to any such product or service. A query can give you an answer to a simple question, perform calculations, combine data from different tables, add, change, or delete data from a database. There are different types of customer and the CRM representative need to understand their query and apply the appropriate technique to resolve their queries. It is shown in Figure 4.1. There are standard types of procedures available to resolve the customer queries.

Fig. 4.1: Angry customer

In this chapter, you will learn about different types of customers, advantages of creating and maintaining templates, rule-based analysis on the data/information and technologies used in a voice process.

4.1. Types of customers

As a Customer Support Agent, you will talk to lots of different people, each with their own way of behaving.

New customers – New customers often ask for advice on things that might seem easy to agents. Even though these tasks aren't usually the most difficult, it's important to handle them to the best of your ability.

Providing excellent support during a customer's initial experience creates a chance to foster brand loyalty and potentially convert them into returning customers. Patiently assisting new customers with their issues is crucial for your business success, demonstrating right from the start that your business values those it serves.

Attractive customer – This customer tends to make fast purchases when something grabs their attention but might not carefully read the details. When they receive a product that doesn't meet their expectations, they are likely to quickly reach out to customer support due to their impulsive nature.

Customers who act impulsively might encounter legal support concerns, so it is important to handle their requests just like any other ticket at the start. If a customer is not pleased with redirection, acknowledge their feelings, but avoid committing to anything beyond your role as a support agent. While retaining customers is crucial,

simply rescuing them from a mistaken purchase is not sufficient if they buy something without understanding it.

Angry customers – Having a clear strategy for upset customers is crucial, avoiding any sense of uncertainty that might worsen their frustration. Stay composed and articulate while explaining the steps to resolve their issue. When facing rudeness, try not to take it personally; the customer might view you as part of a system that causes them trouble. It is valuable to gather feedback from unhappy customers as it could highlight areas for enhancing their overall experience in the future.

Insistent customers – When handling a self-righteous customer, it is vital to demonstrate a more effective solution to their problem. Having readily available knowledge bases or informative content can significantly enhance this process.

Being nice and helpful to self-righteous customers is really important because they like feeling important. If they think the support is talking down to them, they might get upset and unhappy. Being respectful keeps them happier.

Loyal customers – Loyal customers bring immense joy to sales because they have been around for a long time. But this also means the support team faces extra pressure to know and handle all their particular needs.

When loyal customers share their experiences on social media, it can boost organic marketing for your business since they are already interested. But for this to happen, their support experience must be positive. Even if the issue is not entirely your company's fault, offering discounts or loyalty rewards can satisfy them and boost sales. This increases the chances of them recommending your business to potential customers.

4.2. Design various problem-solving approaches in different situations

Field	***Description***
Summary	A short description of the request.
Reporter	The person who submitted the request
Component/s	Segments of your IT infrastructure that relate to the request. For example, "Billing services" or "VPN server". These are used for labelling, categorization, and reporting.
Attachment	Files or images added to the request.
Description	A long, detailed description of the request.
Linked Issues	A list of other requests that affect or are effected by the request. If your business uses other multiple products, this list may include linked development issues.
Assignee	The service desk agent assigned to fulfil the request.
Priority	The importance of the request's resolution to the service desk. Usually in regards to your business needs and goals. Sometimes calculated by impact and urgency.
Labels	A list of additional custom labels used for categorizing or querying records.

Request participants	A list of extra customers or vendors who take part in resolving the request.
Approvers	A list of business or financial contacts responsible for approving the service request.
Organizations	A list of customer or vendor groups interested in the request's resolution.
Impact	The effect of the service request, usually in regards to service level agreements.
Urgency	The time available before the business feels the service request's impact.
Pending reason	A short description or code that indicates why the service request is not progressing.
Product categorization	A category of IT asset or system that the request effects.
Operational categorization	A category of action or function required to fulfil the request.

4.3. Design templates to record a query

Templates are great for saving queries fast. But before we explore specific patterns and examples, let's grasp the importance of understanding the need of patterns in the first place when dealing with queries.

If a customer complains about call drop issues, these problems often occur due to network issues affecting an entire area served by a faulty network tower, rather than being isolated to one or two individuals.

If you have a template to log call loss issues and create service requests, it helps manage the anticipated volume of requests from affected customers. Without a template, you would need to search for documentation, which can be time-consuming, tedious, and prone to errors, especially if you are handling a high volume of calls. That's why templates are always essential.

4.4. Advantages of Creating and Maintaining Templates

- Templates speed up your tasks.
- They help you work without errors.
- Standardize the handling of queries.
- Easy to create and effective for capturing and sharing essential details.
- Templates are crucial when raising service requests or generating tickets.

Templates serve as the standard format for recording observations, encompassing various aspects of a business. The model or key parameters within these templates vary based on the specific department or area being addressed. For instance, the model used by a transportation department would significantly differ from that used by an engineering department managing operations. The details submitted in the form contribute to evaluating performance.

4.5. Different techniques used to obtain data/information

Case Studies – This approach essentially relies on gathering information based on clients experiences.

Focus Groups – This method of data collection relies on thorough group discussions covering various topics, such as marketing strategies, the evolution of data, sources and searches, coding, programming languages, or even debugging.

Assignment 4.2.

- List down the different techniques used to obtain data/information.
- List down the advantages of creating and maintaining templates.
- List down the different types of customers.

4.6. Rule-Based Analysis on the Data/Information

Rule-based analysis essentially entails a decision-making process or conditional branching. It's a methodological production design grounded in software elements, analyzing techniques to make informed decisions for a new project.

This rule typically involves three or more conditions, resembling pseudo-code or if statements. The aim is to meet performance requirements through the application of a rule engine solution.

4.6.1. Process of Application

Select the input variables – When dealing with various variables in a new project, it is important to create a matrix that correlates methodologies with factors. This helps identify how factors are present within different methodologies.

Bad Sub Rules – Some types of factors cannot be linked to other types. Combining them might create ineffective sub-rules. This situation identifies two distinct rule categories. They are:

System rules with high stability requirements, low complexity, and small system size.

System rules with low stability requirements, medium complexity, and system size.

Variable Reduction – Identifying these factors is important, but removing them does not usually have a significant impact. These factors typically involve the application domain and project type.

Category Merge – To identify the methodology, various categories are formed, often based on the project type as their foundational element.

Hypothetical Examples – By examining extreme cases, we can observe the inception of hypothetical example sets. Rule-based analysis acknowledges factors such as lower complexity, high requirement stability, and smaller size as key components.

4.6.2. Check the Event of Inaccurate Data/Information

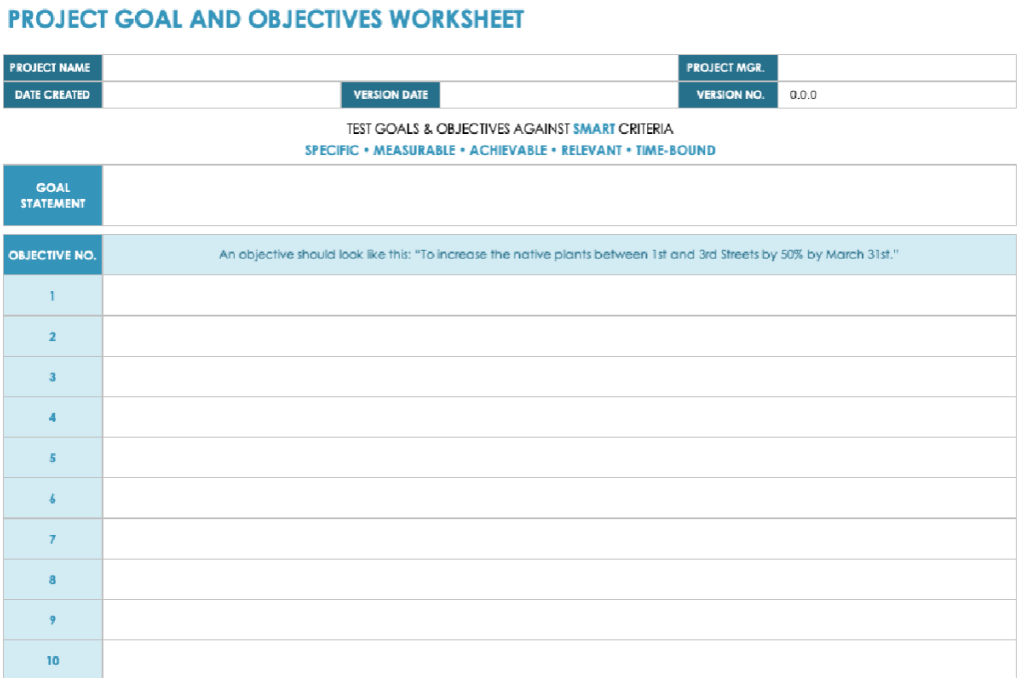
In most large organizations, a hierarchical structure prevails, characterized by a single or a group holding top power, followed by successive levels of authority. This setup is common among corporations, governments, and organized religions, establishing different tiers of management and power.

4.6.3. Check the accuracy of work, involving colleagues and the formats in which you need to provide it

Each project operates within a set timeline. It kicks off by establishing a goal and proceeds through stages such as development, testing, quality analysis, and ultimately, deployment.

4.6.4. Set-up Goals

Each stage requires a specific format for accurate information entry. A project goal template should be consistently used, and details need to be regularly updated. Here is an example format: As illustrated in Figure 4.2.



PROJECT GOAL AND OBJECTIVES WORKSHEET

PROJECT NAME				PROJECT MGR.	
DATE CREATED		VERSION DATE		VERSION NO.	0.0.0

TEST GOALS & OBJECTIVES AGAINST SMART CRITERIA
SPECIFIC • MEASURABLE • ACHIEVABLE • RELEVANT • TIME-BOUND

GOAL STATEMENT	

OBJECTIVE NO.	An objective should look like this: "To increase the native plants between 1st and 3rd Streets by 50% by March 31st."
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Fig. 4.2: Project goal template

4.4. Technologies used in a voice process

Advancements in computer hardware and software, combined with the internet's widespread adoption as a primary communication channel, have sparked numerous innovative approaches to fulfilling customer needs in the realm of customer service.

Businesses increasingly leverage Internet chat as a means to address customer queries. Traditionally, chat features manifest as pop-up windows initiated upon clicking a website link. However, modern technologies like AJAX enable chats directly within a website interface, eschewing pop-ups. These live chat sessions, whether in a separate window or integrated into a web page, facilitate real-time communication between company representatives and customers via text messages. Advanced features such as collaborative browsing or co-browsing empower service agents to navigate a customer's browser, delivering relevant web pages to offer tailored guidance, like Land's End providing clothing suggestions by manipulating the customer's screen view.

4.4.1. Technology: RSS Feeds

A rising technology in customer service is Really Simple Syndication (RSS), originally prominent in blogs and now prevalent on major websites. RSS streamlines information distribution, enabling businesses to effortlessly share updates in bulk and promptly. Customers can opt-in to a company's RSS feed, receiving immediate notifications whenever the company modifies connected information, like a web page update. Those with compatible software or online readers witness automatic updates. Customer service benefits from RSS for various purposes, including notifying customers about product updates, addressing technical concerns like product issues or recalls, and disseminating general corporate communications such as special promotion announcements.

4.4.2. Technology: Wireless data access

Customer service covers every interaction, even when a company representative meets the customer face-to-face. For instance, a business might send its sales or support team to meet customers directly, and how well they handle customer problems becomes really important for good service.

Companies are giving their field teams mobile devices that connect to the internet wirelessly. This helps the team access up-to-date information and customer data from anywhere they work.

4.4.3. Technology: Text Messaging

Text messaging, once seen as something just for teens, is now a tool for customer service. Lots of businesses and even colleges use it to talk to customers. For instance, colleges have text systems for quick alerts about emergencies or weather problems on campus.

4.4.4. Technology: Internet Phone Support

Even with the Internet available for customer queries, many people still prefer talking directly to someone on the phone or through a chat. To handle this, businesses use Voice over Internet Protocol (VoIP), which sends phone calls over the Internet. Multiple phones share the same connection, making calls cheaper. Although the call quality might not be as perfect as regular phones, recent improvements have made it hard for most customers to notice a difference.

4.4.5. Technology: Smart Call Routing

Technology for phone support has evolved to identify and sort incoming calls. Software can recognize the caller based on their phone number and then direct the call to the right service. For instance, an appliance company can separate callers who purchased a refrigerator from those who bought a microwave oven, guiding them to the relevant support team.

4.8. ACD Phone

The ACD phone, or Automatic Call Distributor phone, is more than just an ordinary phone. It is equipped with specific features to manage and route incoming calls effectively. As illustrated in Figure 4.3.

Fig. 4.3: ACD Phone

1. Mute button – It is used to mute the CSR's microphone to prevent the customer from hearing any sound from the CSR's end. It is used to communicate quickly with another CSR for inquiries or requests. When you put on the mute button, you can hear the customer. The customer will not be able to hear you.

2. Hold button – It is used to check information on your computer. Discuss with a colleague, or communicate with your supervisor. When you put on the mute button, The customer hears the hold music.

3. Transfer button – It is used to transfer a call to another division.

4. Not ready button – It is used to responsibly. It is intended for bathroom breaks or other essential pauses. Avoid using it at any other time as illustrated in Figure 4.4.

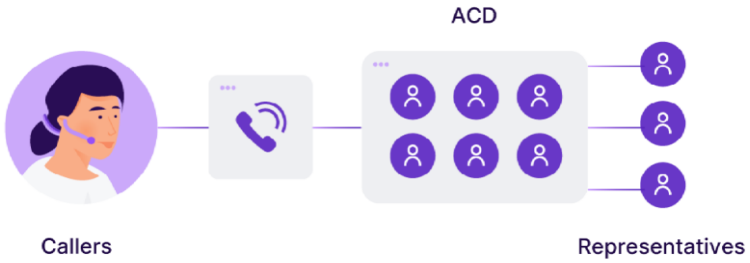


Fig. 4.4: Call in queue in the ACD system

4.9 Relevant standards, policies, procedures that apply when dealing with confidential data. Ensuring information security is crucial for your role. It involves safeguarding data from unauthorized access, modification, or destruction, whether it is in digital or physical formats.

Some rules to keep in mind when handling sensitive data are:

1. Never share personal or financial details with anyone other than the account holder.
2. Avoid sharing any written or oral customer information, such as customer profiles, with unauthorized individuals or competitors.
3. Refrain from sharing one customer's information with another.

Customers entrust organizations and CRMs with their personal information, emphasizing the importance of maintaining absolute confidentiality. Sharing such data with unauthorized individuals is not only a breach of trust but also a criminal offense. If caught and convicted, the perpetrator could face imprisonment for this violation.

Here are some ways that data can be protected:

- Once the processing of customer data is completed, whether in hardcopy or electronic form, it must either be destroyed or returned.
- Employees are prohibited from bringing any storage devices, such as memory cards, CDs/DVDs, external hard drives, floppy disks, USB drives, etc., into the workplace.
- Security personnel conduct checks at entry points to ensure employees do not bring in or take out any unauthorized devices.
- Personal computers, CDs, DVDs, USBs, or any storage device are not allowed in the office without prior permission from authorized management or team leaders.
- A professional firewall system restricts unauthorized internet access and website browsing.
- All users' rights within the company are limited by the firewall.
- Each employee is required to sign a Non-Disclosure Agreement (NDA) upon registration.
- Entry to the operational area is restricted using fingerprint software to comply with privacy standards and requirements.
- Website servers have robust protection measures in place, and it is crucial for CRMs to refrain from accessing unauthorized information.

- Restricted network access is permitted only with credentials and password protection.
- Stringent password policies and access controls are implemented for authorized personnel.
- Access to the network is limited and secured through credentials and password protection for authorized individuals.

Treat confidential information correctly

As CRMs, we handle projects containing confidential data. Respecting confidentiality is a vital part of our SLA, and any breach will lead to contract termination.

Clients prioritize confidentiality, and any information leaks can result in significant losses. To prevent security breaches, CRMs should install anti-spam, anti-spyware, and anti-phishing tools to safeguard against data leaks.

- To understand how to treat confidential information
- Ensure all new employees accept and sign the Confidentiality Agreement.
- Identify and acknowledge the pertinent organizational confidential information and handle it accordingly. These may be in the form of:
  - Verbally disclosed information
  - Written information
  - Slides and Handouts
  - Visual information
  - E-mail and file documents
  - Carefully reviewing the NDAs from 3rd Parties

Summary

- Companies are utilizing Internet chat as a customer support tool. This feature often appears as a pop-up browser window when customers click on a website link. Some newer technology, like AJAX, enables chat directly on a webpage instead of pop-up windows.
- Really Simple Syndication (RSS) is a fast-growing technology in customer service, widely used in blogs and popular websites. It enables quick and effortless information distribution to a large audience compared to traditional methods.
- Text messaging has become a communication tool for many organizations, including colleges and universities, to engage with their customers.
- Companies now provide their field teams with portable devices to access up-to-date information from anywhere via the Internet.
- CRM roles often involve handling confidential project information, and breaching confidentiality, even as outlined in SLAs, can result in contract termination.
- Information leaks can lead to significant losses, so it is crucial for CRMs to be cautious. Installing anti-spam, anti-spyware, and anti-phishing tools helps prevent potential security breaches.
- Templates serve as a quick way to document queries efficiently.
- Rule-based study involves decision-making processes or conditional branching.
- A project goal template needs regular implementation & updating with relevant details.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Which customer type tends to make impulsive purchases and might quickly seek customer support if dissatisfied? (a) Loyal customers (b) New customers (c) Angry customers (d) Attractive customers
2. How should one handle an insistent customer? (a) Be curt and direct to save time (b) Offer discounts immediately (c) Provide readily available informative content (d) Ignore their demands
3. What technology enables real-time communication between service agents and customers via text messages? (a) Wireless data access (b) Internet Phone Support (c) Text Messaging (d) Smart Call Routing
4. What is the purpose of an ACD Phone's "Hold" button? (a) Mute the CSR's microphone (b) Transfer a call to another division (c) Play hold music for the customer (d) Use for essential pauses or discussions
5. Which method of data collection relies on gathering information based on clients' experiences? (a) Case Studies (b) Focus Groups (c) Rule-Based Analysis (d) Technology: RSS Feeds
6. What is the primary advantage of using templates for query resolution? (a) Slows down your tasks for accuracy (b) Makes recording queries error-prone (c) Standardizes query handling (d) Makes queries time-consuming
7. What is the key strategy suggested for handling an angry customer? (a) Take their rudeness personally (b) Avoid gathering feedback (c) Stay composed and articulate (d) Express uncertainty in solutions
8. What is the main advantage of using RSS technology in customer service? (a) Facilitating real-time communication (b) Streamlining information distribution (c) Enabling wireless data access (d) Improving call quality
9. Which customer type requires extra attention due to their long-term association with the business? (a) Angry customers (b) New customers (c) Attractive customers (d) Loyal customers
10. What should be avoided when dealing with confidential data? (a) Sharing information within the company (b) Using secure password protection (c) Disclosing customer profiles (d) Implementing strict password policies

B. Fill in the Blanks

1. A rising technology in customer service is _____, streamlining information distribution.
2. The ACD phone's "Mute" button allows the CSR to _____ from the customer.
3. Handling loyal customers brings both joy and _____ due to their specific needs.
4. _____ analysis involves conditional branching and decision-making processes.
5. Templates are crucial for _____ and sharing essential details.
6. Confidential information should be treated with _____ to prevent breaches.

7. Focus groups rely on thorough group discussions to gather information based on clients' _____.
8. The "Hold" button on an ACD phone plays _____ for the customer.
9. The _____ button on an ACD phone is used for essential pauses.
10. Customers might quickly reach out to support if a product doesn't meet their _____.

C. State whether the following statements are True or False

1. Templates slow down query resolution processes.
2. Loyal customers might share experiences on social media, boosting organic marketing.
3. Wireless data access helps field teams access information from anywhere they work.
4. Text messaging is not commonly used for customer service purposes.
5. The ACD phone's "Transfer" button is used for muting the CSR's microphone.
6. It's acceptable to share one customer's information with another if needed.
7. Rule-based analysis involves decision-making processes grounded in hardware elements.
8. Confidentiality breaches in handling sensitive data could lead to criminal charges.
9. The ACD phone's "Not ready" button is primarily for regular breaks.
10. Angry customers' feedback is not valuable for improving future experiences.

D. Answer the following questions in short

1. How does handling new customers contribute to fostering brand loyalty?
2. What precaution is advised when dealing with an impulsive, attractive customer?
3. Describe a recommended approach for handling angry customers.
4. What's the significance of using templates in query resolution?
5. How do loyal customers influence organic marketing for a business?
6. Explain the purpose of Rule-Based Analysis in customer service.
7. What are the key advantages of utilizing text messaging for customer support?
8. How does wireless data access benefit field teams in customer service scenarios?
9. Describe the role of the ACD phone's "Hold" button in customer interactions.
10. What are the primary rules to observe when handling confidential data in customer service?

Module 3 | Working with Zoho CRM Application

Module Overview

Customer relationship management (CRM) is a technology for managing company's interactions with customers. CRM technology helps companies stay connected to customers, streamline processes, and improve profitability. CRM Software is designed to help businesses and customers for interaction. CRM software helps to track each interaction happened with a customer. It can include sales calls, customer service interactions, marketing emails, and more.

CRM tools can unify customer and company data from many sources and even use AI (artificial intelligence) to help better manage relationships across the entire customer life cycle, spanning departments like marketing, sales, digital commerce, and customer service interactions.

This software falls in three main types of CRM systems – collaborative, analytical, and operational. There are various examples of CRM software. It depends on the requirement of company to choose a best suitable CRM software. Many CRM software providers offer free trials, too, so you can test a free CRM and if it's right for your business.

Zoho Corporation is an Indian multinational technology company that makes computer software and web-based business tools. Zoho is a CRM software system that helps businesses with customer engagement, revenue generation and converting more leads. It is fully cloud-based, integrated, and offers a variety of features including lead management and scoring, workflow automation.

In this unit, you will learn about the most popular CRM software, "Zoho Desk". It covers introduction to Zoho Desk, Essential Functionalities of Zoho Desk, Specifications in Zoho CRM. We will also Creating a Zoho Sign account. Then, we move to Managing Data, focusing on Manage Data, Manage Data Storage Space, and Manage File Storage. Then, we discuss "Importing and Exporting Data," emphasizing Importing Data to Zoho CRM, and Export CRM Data. Lastly, we discuss " Creating Contacts" covering Creating Contacts, Create Contact Individually, and discussed about Work with the Contacts details page. This unit equips you with essential knowledge and skills in ZOHO CRM SOFTWARE.

Learning Outcomes

After completing this module, you will be able to:

- Understand the basic features and functionalities of Zoho Desk, including ticket management, customer interactions, and workflow automation.
- Learn how to efficiently organize, update, and manage customer data within Zoho Desk to streamline support processes.
- Demonstrate the process of importing and exporting data in Zoho Desk, ensuring seamless data integration and backup.

- Acquire skills in creating and managing contacts within Zoho Desk, ensuring accurate and up-to-date customer information.

Module Structure

Session 1: Zoho Desk

Session 2: Managing Data

Session 3: Importing and Exporting Data

Session 4: Creating Contacts

Session 1: Zoho Desk

1.1. Introduction to Zoho Desk

Zoho Desk, a web-based help desk software, empowers efficient management of customer support tasks. Beyond its core features of ticket management, diverse support channels, customizable branding, and crucial automations like SLA and workflows, Zoho Desk offers an array of additional capabilities. Collectively, these elements guarantee a superior customer support experience. The homepage of the Zoho Desk application is shown in Figure 1.1.

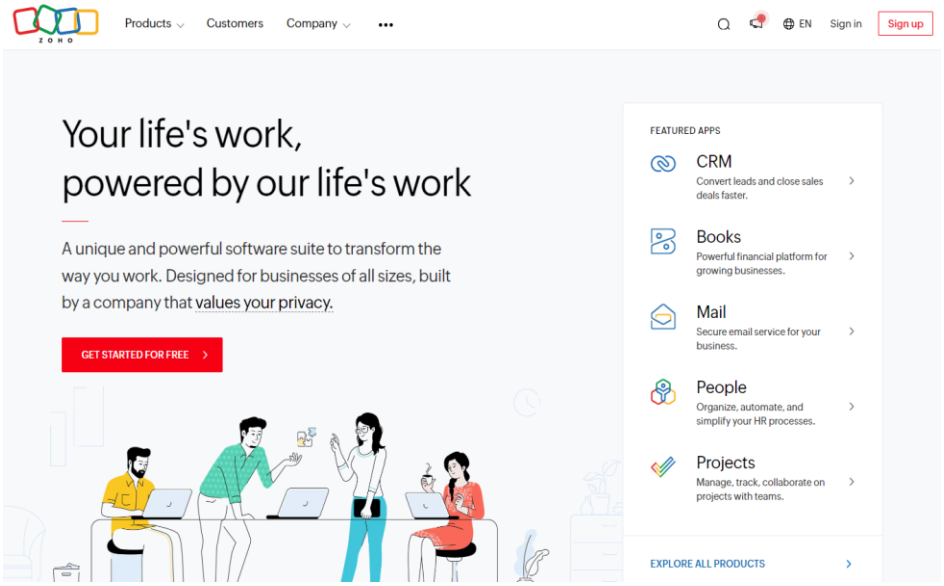


Fig. 1.1. Zoho Homepage

1.2. Essential Functionalities of Zoho Desk

Connecting with your customers via multiple touch points – Gather customer inquiries from various sources like phone, email, social media, or web forms and prioritize incoming tickets. Moreover, our community forums serve as a space for customer discussions, allowing seamless conversion of forum posts into actionable tickets.

Making use of various tools for agent's productivity – Enhance customer service efficiency and resolution times by establishing an internal repository of solutions and articles accessible to agents. This Help Desk Solution equips your support teams to swiftly offer tailored solutions for customer tickets, saving valuable time otherwise spent repeatedly crafting the same responses.

Providing a Help Center **–** Empower proactive customer assistance by developing a tailored self-service customer portal, eliminating the need for immediate support contact. This customizable platform aligns with your brand's identity and incorporates vital features such as an extensive knowledge base, a community forum, and a ticket management system for users to submit, monitor, and track their inquiries.

Automating essential and repeated tasks **–** Automate ticket handling by sending acknowledgment emails upon customer submissions, assigning tickets to agents based on specific criteria, and notifying both customers and agents through email or SMS alerts. Moreover, establish Service Level Agreements (SLAs) to set ticket deadlines and enable multi-level escalation for overdue tickets.

Create Standard and Customized Reports **–** Assess your help desk operations and vital statistics regarding your support center's performance through intuitive, in-built reporting tools. Easily generate tailored reports to gauge distinct elements of your ticketing process, including average resolution times, daily closures per agent, ticket openings, and additional relevant metrics.

Maintaining a secure database **–** Handle sensitive customer data with control by establishing profiles, roles, and groups within Zoho Desk. Customize data-sharing rules and field-level security settings to safeguard proprietary information, maintaining robust protection for sensitive data.

1.3. Specifications in Zoho CRM

1.3.1. Zoho CRM Editions

Zoho CRM, a cloud-based application, provides five distinct editions, each tailored with specific features designed to meet diverse business requirements.

1. Free
2. Standard
3. Professional
4. Enterprise
5. Ultimate

1.3.2. Supported Languages

Zoho CRM offers support for 28 languages. To select your preferred language, access it through Setup -> General -> Personal Settings within your CRM. In the Locale Information section, click on the Edit icon and choose your desired language from the available options listed under Language.

The languages supported in Zoho CRM are listed below:

Supported Languages	
Arabic	Arabic
Bahasa Indonesian	Bahasa Indonesian
Bulgarian	Bulgarian
Chinese (Simplified)	Chinese (Simplified)
Chinese (Traditional)	Chinese (Traditional)
Croatian	Croatian

Czech	Czech	

1.3.3. System Requirements

Zoho CRM operates as a cloud-based application, meaning the software and data aren't stored on your local computer's memory. Because it relies on remote servers, continuous internet connectivity is necessary to access Zoho CRM. No file downloads or installations are needed on your computer to utilize the CRM.

Zoho CRM is designed to be compatible with standard system configurations as per the following details.

System Configurations	
Operating System	Windows, Linux and Mac OS X
Web Browser	Safari 13 Google Chrome 73 Mozilla Firefox 69 Edge 79 Opera 60
Other requirements	Enable JavaScript Enable Cookies Install Acrobat reader (optional) Install Spreadsheet viewer (optional)

Note: You may not be able to access Zoho CRM if you have enabled the Compatibility mode in Internet Explorer.

1.3.4. Storage Space

In Zoho CRM, storage space is categorized into two sections: Data and File, providing a clearer breakdown. These categories are then subdivided into storage and usage details for better organization.

Data storage – Data storage encompasses the total space utilized by records within both standard and custom modules, inclusive of notes attached to these records. This measurement also accounts for the space occupied by data stored in your recycle bin.

File storage – File storage covers the space used by images, attachments (both in records and emails), email templates, and documents linked to specific records. Within file storage, you can view a breakdown of storage usage based on features such as mail-merge and documents. Additionally, this storage accounts for data and files stored in the recycle bin.

1.4. Creating a Zoho Sign account

To access Zoho Sign and other Zoho services as a new user, creating a Zoho account is necessary.

Step 1. Visit the website of Zoho Homepage as shown in Figure 1.2.

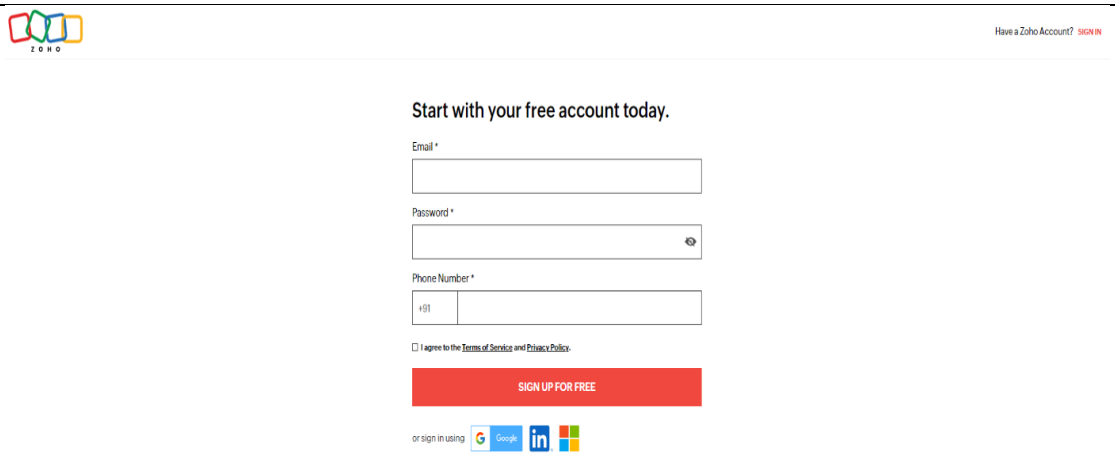


Fig. 1.2: Zoho login page

Step 2. Click on Free Sign Up at the top-right corner of your page. You will be directed to the Zoho signup page.

Step 3. You can create your Zoho account with your email or using your Google/ Linkedin/ Office365 account.

To create an account using an email address

Step 1. Enter your personal or organization's email address based on your requirement and select a robust password. The password must have a minimum of eight characters and include at least one character from each of the following categories: uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), and special characters (!, @, #, $, *, etc.).

Step 2. Once you have consented to the Terms of Service and Privacy Policy, click on "*SIGN UP FOR FREE*" to generate your Zoho Sign account. Upon successful creation, you'll be directed to the Zoho homepage.

To create an account using Google, LinkedIn, or Office365

Step 1. Click on the respective icon at the bottom of your page. The icons are shown in Figure 1.3.

Fig. 1.3: Icons

Step 2. Enter your login credentials, verify your location, and provide the necessary permissions to access Zoho Sign. Upon creating your account through Google, LinkedIn, or Office365, you will be redirected to the Zoho homepage.

Practical Activity 1.1. Create a Zoho Sign-in Account

Material Required: Laptop/Desktop, Internet Access

Step 1. Open Your Laptop/Desktop and check internet connectivity.

Step 2. Go to Zoho Homepage (www.zoho.com)

Step 3. Click on Free Sign Up at the top-right corner of your page.

Step 4. You will be directed to the Zoho signup page.

Step 5. Now you can create your Zoho account with your email or using your Google/Linkedin/Office365 account.

Step 6. Create your password. The password must have a minimum of eight characters and include at least one character from each of the following categories: uppercase letters (A-Z), lowercase letters (a-z), digits (0-9), and special characters (!, @, #, $, *, etc.).

Step 7. Next Checked to the Terms of Service and Privacy Policy.

Step 8: Click on "SIGN UP FOR FREE" to generate your Zoho Sign account.

Step 9: Your Zoho account has been created successfully.

1.5 Setting up Zoho Sign account

If you are a first-time user of Zoho Sign, these steps will help you establish your account.

1.5.1 User Profile

In this section, you can handle your profile particulars and configure your electronic signature for your Zoho Sign account.

1.5.2 Steps to access your user profile

Step 1. Place your cursor over the Settings menu situated on the left side of your Zoho Sign dashboard, then select "Profile" from the dropdown menu, as shown in Figure 1.4.

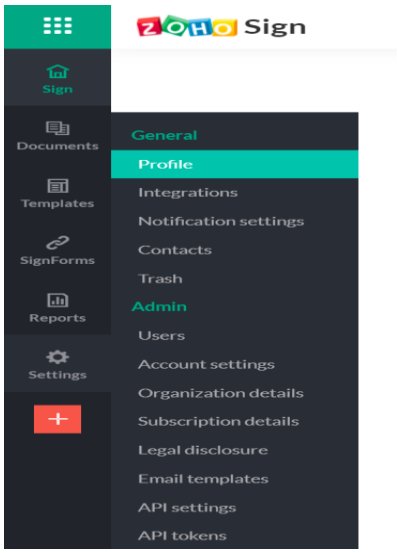


Fig. 1.4: Access your user profile

Step 2. Another way is to click on the user icon located at the top-right corner of your dashboard and then select *"Edit Profile"*, as shown in Figure 1.5.

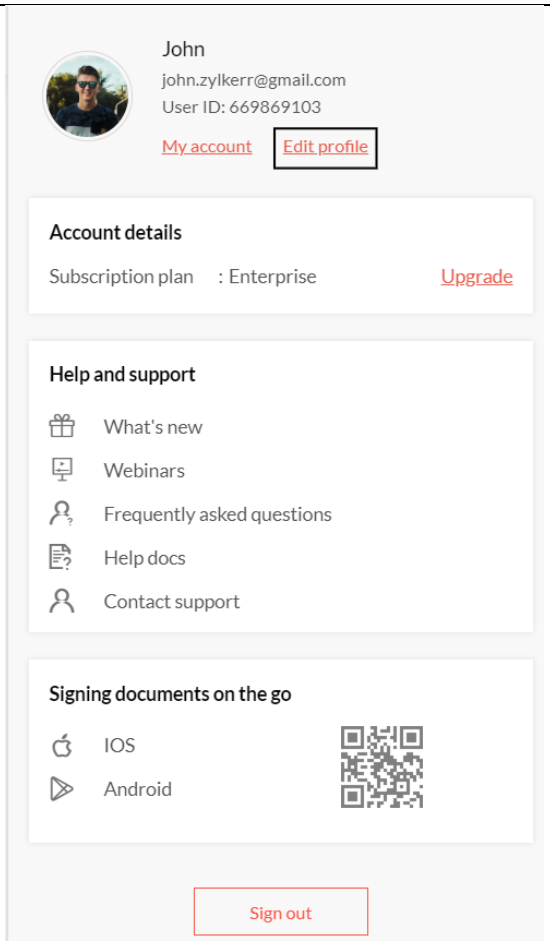


Fig. 1.5: Edit Profile

Step 3. At any time, you have the option to modify your company details and job title on the profile page. Additionally, you can choose your preferred date format from the dropdown menu, as shown in Figure 1.6.

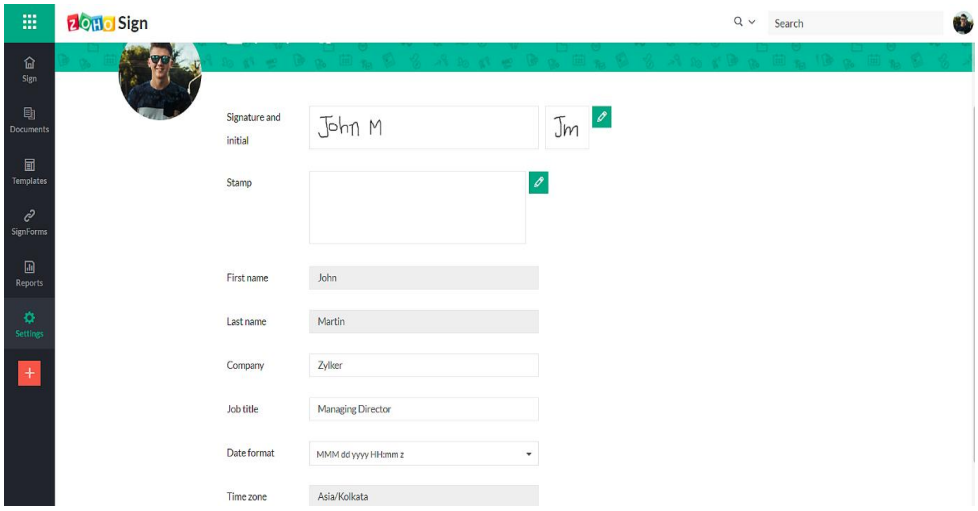


Fig. 1.6: Modify company details

Step 4. To include your company's stamp, either upload the document or simply drag and drop it onto the space below the signature and initial field. Click on the edit icon to proceed as shown in Figure 1.7.

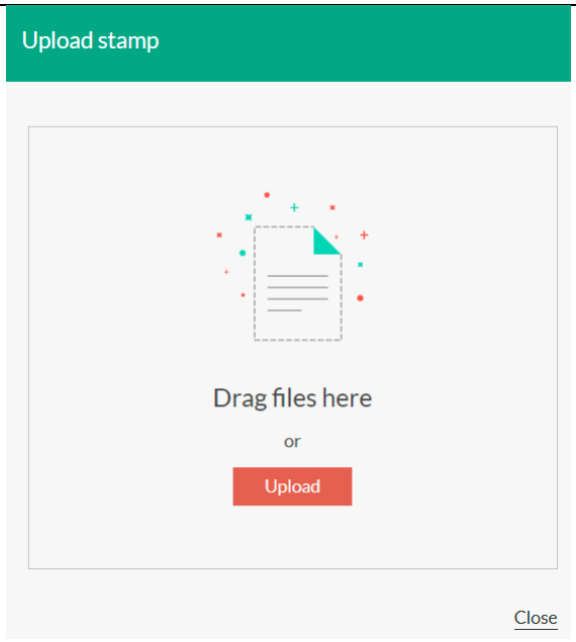


Fig. 1.7. Upload stamp

Step 5. Input the updated information into the respective fields and then select *"Update"* to save the changes.

Note...

Your first name, last name, and profile picture are auto-filled based on the information you provided when you created your Zoho account. These can only be changed through your Zoho account settings.

1.5.3 Set up your signature

The electronic signature (or e-signature) stands as a fundamental element in digital signing, representing your signature stored in a digital format. Zoho Sign provides three methods to set up your e-signature: Type, Draw, Upload.

To set up your signature

Step 1. Position your cursor over the settings menu located on the left side of your dashboard, then access your profile.

Step 2. Click on the pencil icon located beside the signature and initial fields to open the signature wizard as shown in Figure 1.8.

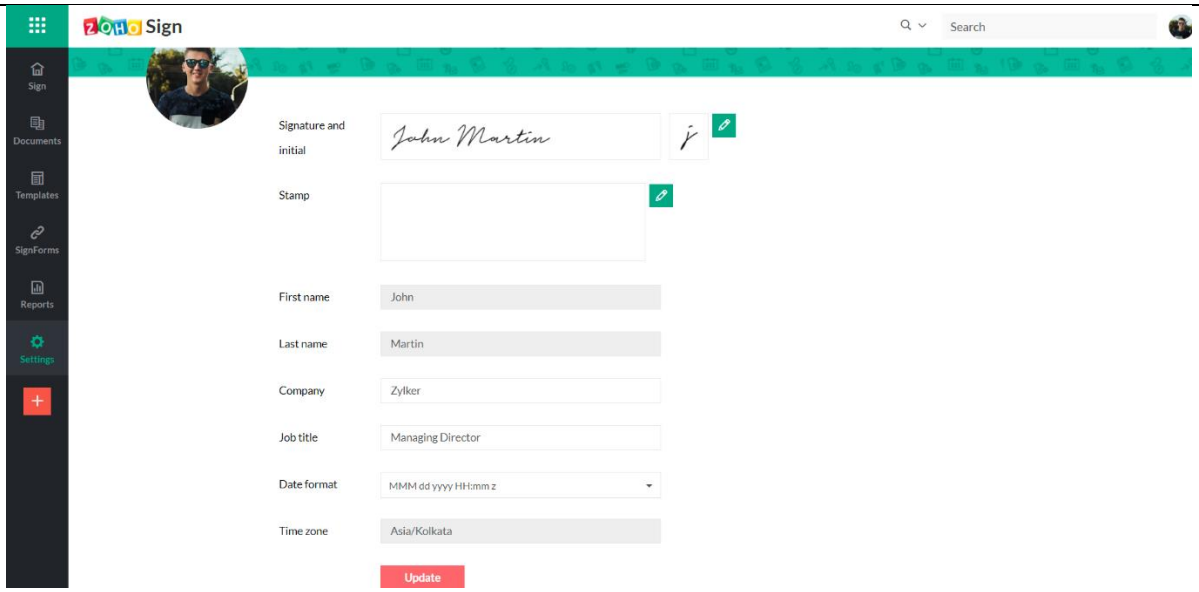


Fig. 1.8. Add signature and initial fields

Step 3. Choose your preferred method for creating your e-signature and proceed accordingly.

Step 4. To type your signature, click on *"Type"* at the top. Choose a font style from the default set, enter your signature and initials, then click *"OK"* as shown in Figure 1.9.

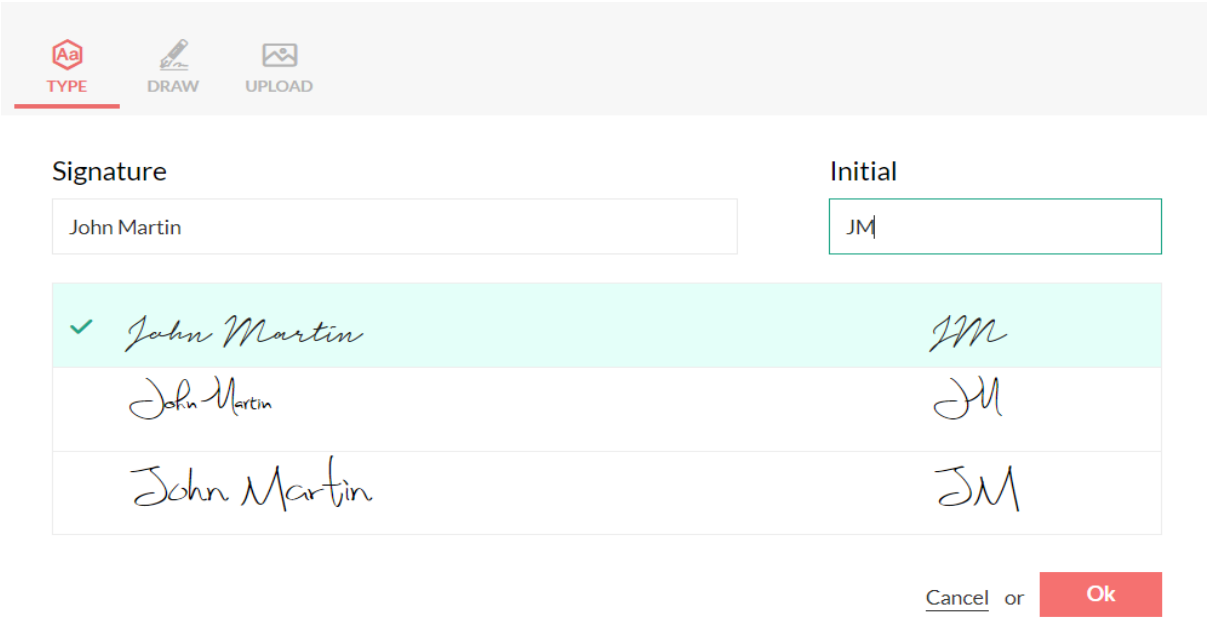


Fig. 1.9: Type of signature

Step 5. To draw your signature, select *"Draw"* at the top of your screen, sketch your signature, and then click *"OK"*, as shown in Figure 1.10.

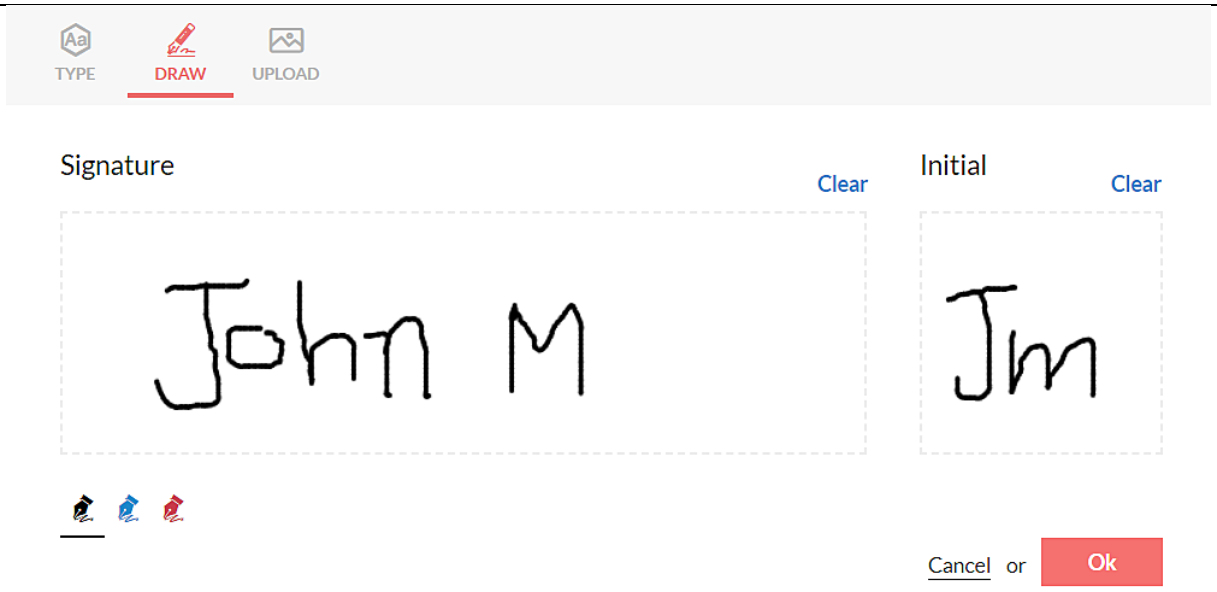


Fig. 1.10: Draw signature

Step 6. To upload a document containing your signature, click on *"Upload"* at the top, upload the document with your signature, and then click *"OK"* as illustrated in Figure 1.11.

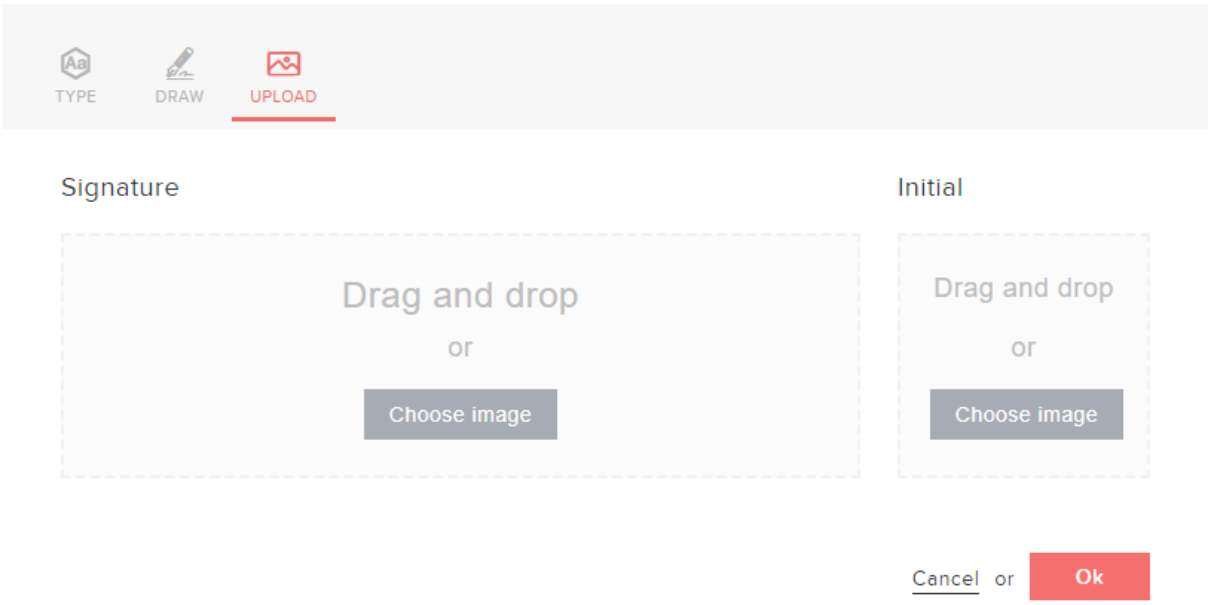


Fig. 1.11: Upload signature

1.6 Organization details

As an administrator, you have the flexibility to modify your organization details at any given moment. Additionally, you can delete your Zoho Sign account directly from this page.

To change the organization details:

- Navigate to the Settings tab located in the left pane and select **"Organization Settings".**

1. Fill in the organization details within the form fields provided below and then click on "**Save"** as shown in Figure 1.12.

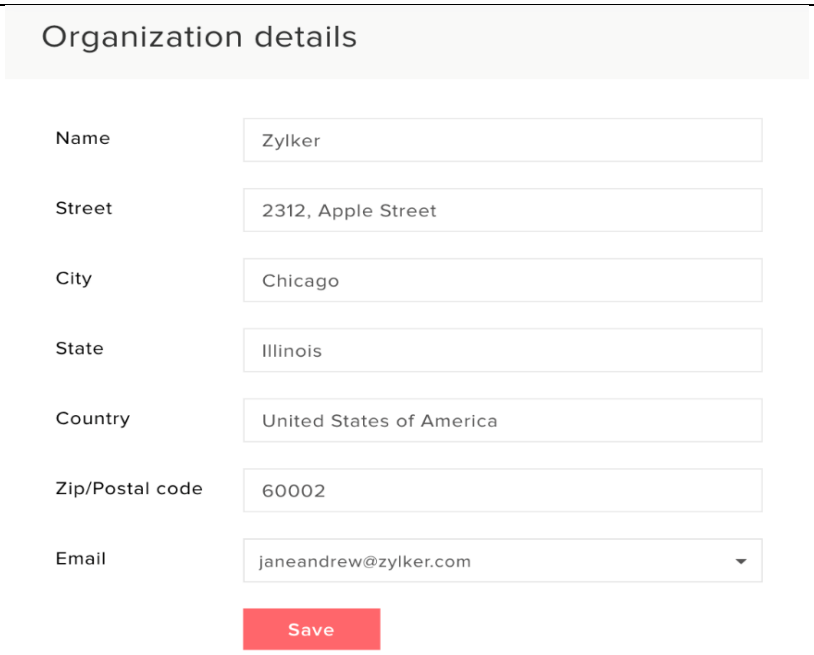


Fig. 1.12: Adding organization details

Logo

In this section, you can link your organization's logo with your Zoho Sign account. This enables Zoho Sign to send requests and automated notification emails adorned with your company's logo, enhancing your brand's visibility and image among recipients.

To add/change your logo:

- Go to Settings on the top right corner of the page.

1. Select Profile under Organization.
2. Under the **Organization Logo**, select **Upload Your Organization Logo** to add a new logo as shown in Figure 1.13.

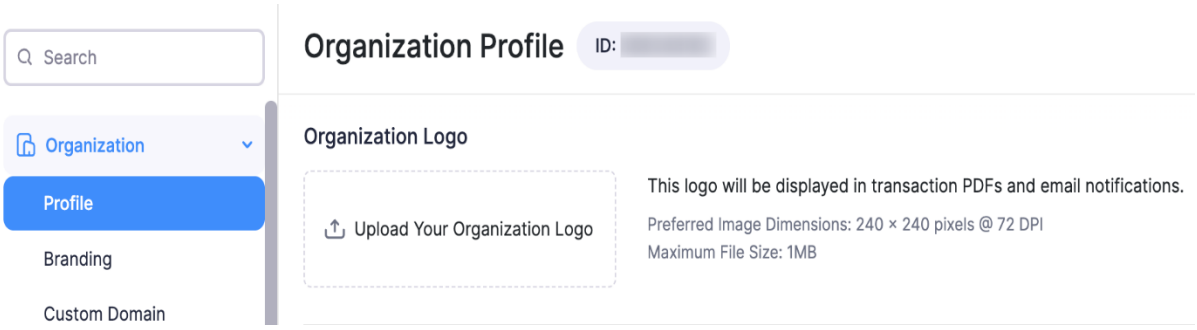


Fig. 1.13: Add logo

If you have an existing logo, click the **Delete** icon near the logo to remove it. After removing the existing logo, you can replace it with a new one as illustrated in Figure 1.14.

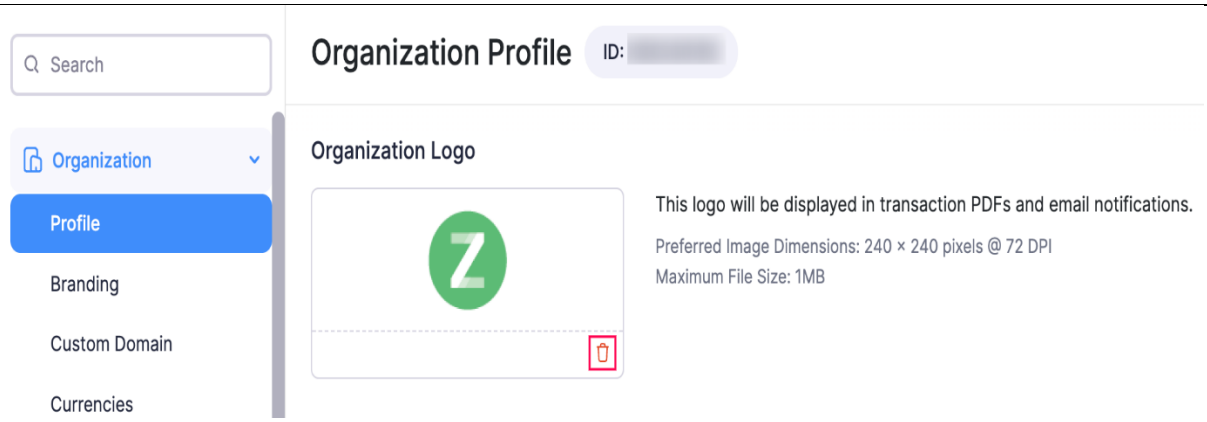


Fig. 1.14: Delete icon

To upload your company logo.

Step 1. Click the Upload option under Logo as illustrated in Figure 1.15.

Fig. 1.15: Upload logo

Step 2. Choose the logo image from your local drive and click "**Choose"**.

Step 3. Use the editor to resize, crop, rotate, or zoom your logo as needed, then click "Use" to upload the company logo as illustrated in Figure 1.16.

Fig. 1.16: Resize logo

Practical Activity 1.2. Demonstrate to add a Logo to Zoho account

Material Required: Laptop/Desktop, Internet Access

Step 1: First do sign-in to your Zoho account.

Step 2: Go to Settings on the top right corner of the page.

Step 3: Under the Organization Logo.

Step 4: Choose the logo image from your local drive and click **"Choose".**

Step 5: Use the editor to resize, crop, rotate, or zoom your logo as needed, then click **"Use"** to upload the company logo.

1.7 Account Settings

Within the account settings, users have the ability to adjust sending options and recipient experiences. They can also create, edit, and oversee document folders, document types, and trusted domains. Additionally, they can enable or disable blockchain stamping and email domain verification, set up automatic cloud backup, and activate Document Timestamp functionality.

1.7.1 Sending Options

Step 1. Select "**Settings"** from the left-hand pane and then opt for "**Account Settings"** as illustrated in Figure 1.16.

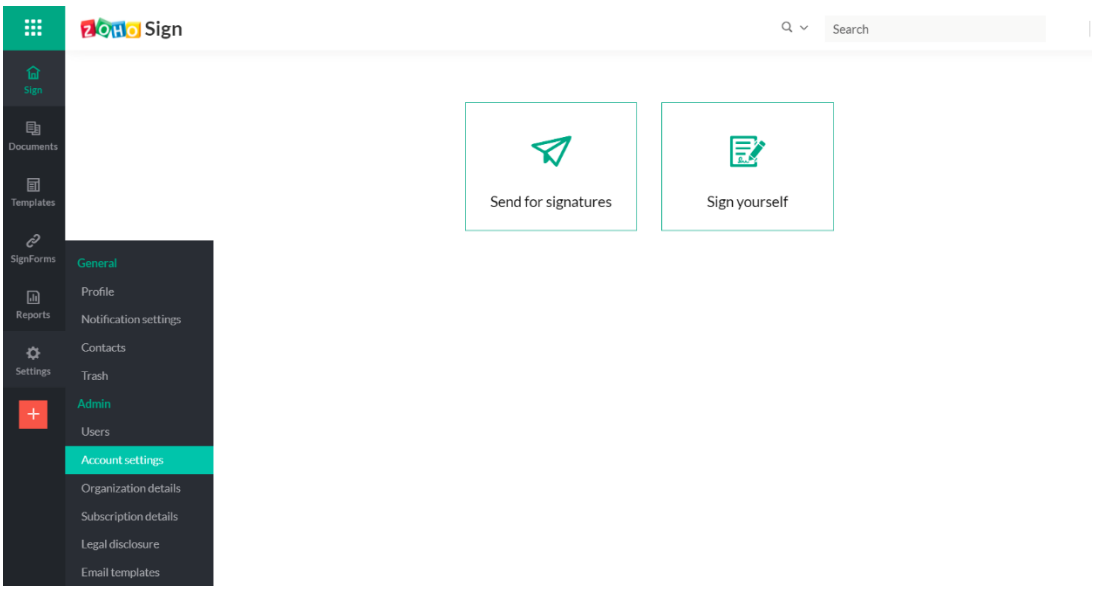


Fig. 1.16: Account settings

1.7.2 Request Defaults

Step 1. Activate the "Automatic Reminders" and "Send in Order" options by marking the respective checkboxes.

Step 2. Specify the frequency of automatic reminders by entering the desired number of days in the" Send **reminders every"** field as illustrated in Figure 1.17.

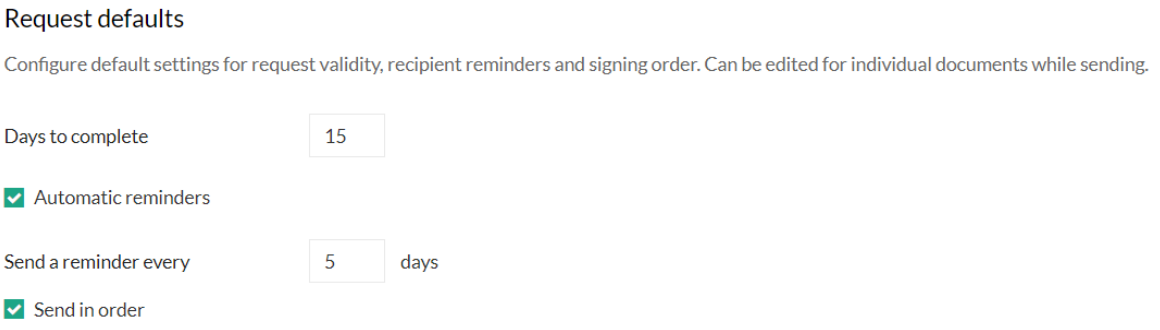


Fig. 1.17: Automatic remainders

Note: This option is used to configure the default settings. These settings can be edited for individual documents while sending.

1.7.3 Recipient Authentication

Configure recipient authentication settings in this section. Additionally, choose the mode of OTP delivery.

To set the delivery mode for authentication:

Step 1. Activate the "**Enforce Authentication"** checkbox.

Step 2. Select the preferred authentication code delivery mode as illustrated in Figure 1.18.

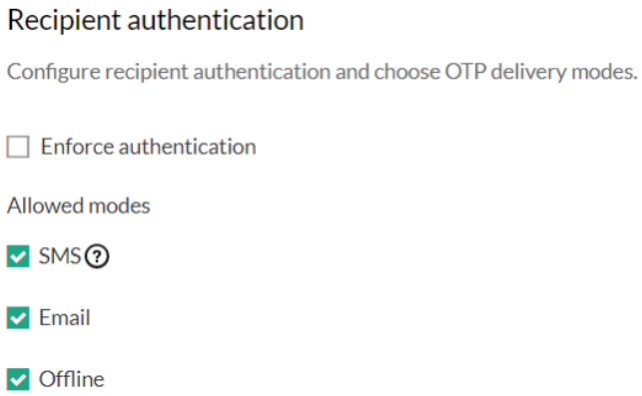


Fig. 1.18: Recipient authentication

Note: For SMS mode, Zoho Sign uses third-party service providers to send SMS to the recipients.

Email delivery

Select the specific email address from which the document will be sent out for signatures. You have the option to choose the organization's email address, the sender's email address, or the Zoho Sign notification email address, as illustrated in Figure 1.19.

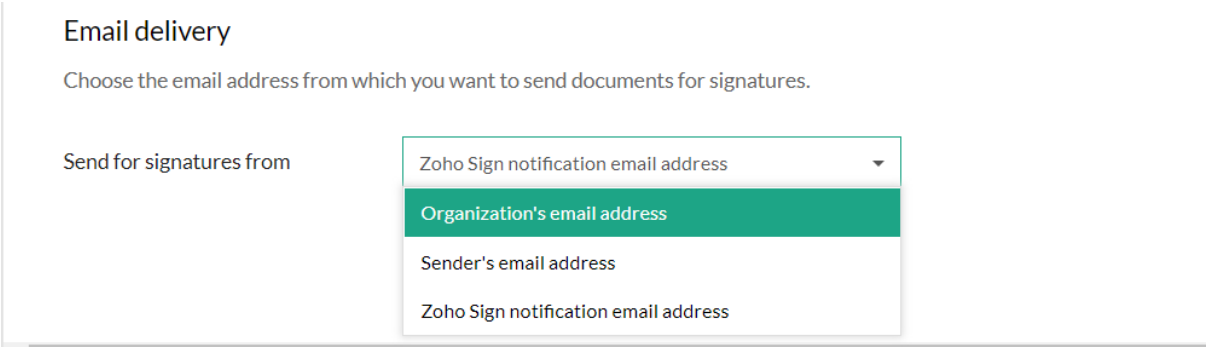


Fig. 1.19: Email delivery

To prevent Zoho Sign emails from being flagged as spam, it's crucial to verify your domain ownership.

To verify your email domain ownership:

1. Click on the" You **need to verify your domain ownership to ensure emails sent from Zoho Sign are never flagged as spam"** button.
2. Refer to our help documentation provided in this section to complete the email domain verification process. Once done, click "**Save"**

3. Note that only custom domains (e.g., zylker.com) can be verified. Domains like gmail.com and zoho.com cannot undergo verification.

Summary

1. **Zoho Desk –** Provides efficient customer support via multiple touchpoints, agent productivity tools, a Help Center, automation, reports, and secure data management.
2. **Zoho CRM –** Offers five editions, supports various languages, operates as a cloud-based system, and manages storage categorically.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Zoho Desk is primarily designed for efficient management of: (a) Sales Automation (b) Customer Support (c) Project Management (d) Financial Accounting
2. Which tool in Zoho Desk enhances customer service efficiency by providing tailored solutions? (a) Help Center (b) Automated Task Handling (c) Internal Repository (d) Community Forums
3. Zoho CRM provides how many distinct editions tailored to meet diverse business requirements? (a) 3 (b) 4 (c) 5 (d) 6
4. What is necessary for accessing Zoho CRM? (a) File Downloads (b) Continuous Internet Connectivity (c) System Installation (d) Local Memory Storage
5. Which section in Zoho CRM provides a breakdown of storage usage for images, attachments, and email templates? (a) File Storage (b) Data Storage (c) Recycle Bin (d) System Configurations
6. Which of the following functionalities of Zoho Desk involves automating ticket handling? (a) Connecting with customers via multiple touch points (b) Providing a Help Center (c) Automating essential and repeated tasks (d) Creating Standard and Customized Reports
7. Zoho CRM offers support for how many languages? (a) 20 (b) 25 (c) 28 (d) 30
8. Which web browser is NOT compatible with Zoho CRM? (a) Google Chrome 73 (b) Safari 13 (c) Mozilla Firefox 69 (d) Internet Explorer 11
9. Which editions does Zoho CRM offer? (a) Free, Basic, Premium (b) Basic, Professional, Ultimate (c) Free, Standard, Professional, Enterprise, Ultimate (d) Basic, Standard, Enterprise, Premium
10. What operating systems are compatible with Zoho CRM? (a) Windows, Linux, Mac OS X (b) Windows, Linux, iOS (c) Windows, Android, Mac OS X (d) Linux, iOS, Android

B. Fill in the Blanks

1. Zoho Desk offers diverse support channels like phone, email, social media, and web forms to gather customer inquiries and prioritize incoming tickets from various _____.
2. In Zoho CRM, storage space is categorized into two sections: _____ and _____.

3. Zoho Sign allows users to set up an electronic signature using three methods: _____, _____, and _____.
4. To access Zoho Sign as a new user, creating a Zoho account using an email or using _____, _____, or _____ account is necessary.
5. Recipient authentication settings in Zoho Sign help configure the mode of _____ delivery.
6. Zoho Desk allows gathering customer inquiries from various sources like _____, email, social media, or web forms.
7. Data storage in Zoho CRM encompasses the total space utilized by records within both _____ and custom modules.
8. Zoho Sign provides three methods to set up an e-signature: _____, Draw, Upload.
9. Zoho CRM is a _____ application.
10. Zoho CRM supports multiple operating systems including _____.

C. State whether the following statements are True or False

1. Zoho Desk primarily focuses on sales automation.
2. Zoho CRM supports 28 different languages.
3. Zoho Sign administrators cannot modify organization details.
4. Zoho CRM requires file downloads for local storage.
5. Zoho Sign offers recipient authentication settings but doesn't provide email delivery configuration options.
6. Zoho Desk requires file downloads and installations on the local computer to utilize the software.
7. Zoho CRM offers support for 25 languages.
8. Automatic Reminders and Send in Order are options available within Request Defaults in Zoho Sign.
9. Continuous internet connectivity is not necessary to access Zoho CRM.
10. Zoho Sign allows users to create, edit, and oversee document folders and document types.

D. Answer the following question in short

1. What are the core functionalities of Zoho Desk?
2. How does Zoho Desk facilitate customer inquiries from various sources?
3. Name two ways Zoho Desk enhances agent productivity.
4. Explain the purpose of the Help Center in Zoho Desk.
5. What tasks can be automated within Zoho Desk?
6. How does Zoho Desk enable assessment of help desk operations?
7. What are the editions offered by Zoho CRM?
8. What system configurations are compatible with Zoho CRM?
9. How is storage space categorized in Zoho CRM?
10. What are the key functionalities of setting up a Zoho Sign account?

Session 2: Managing Data

2.1. Manage Data

As an administrator, some crucial tasks include maintaining a clean database and implementing strategies to evaluate and enhance the quality of data in CRM. These efforts are vital for effective management and optimal utilization of the system.

Some of the day-to-day activities would include:

1. Import data from external sources to CRM
2. Export data from your CRM account
3. Deduplicate your database
4. Use the right keywords to filter your data
5. Use page-level and record-level navigation to spot data
6. Perform mass operations to save time and effort
7. Organize events in CRM calendar

2.1.1. Import

You can import records into your CRM account from external sources if you already possess the data. Utilize the" Import **My Organization Records"** option to import records assigned to you or those assigned to other users as illustrated in Figure 2.1.

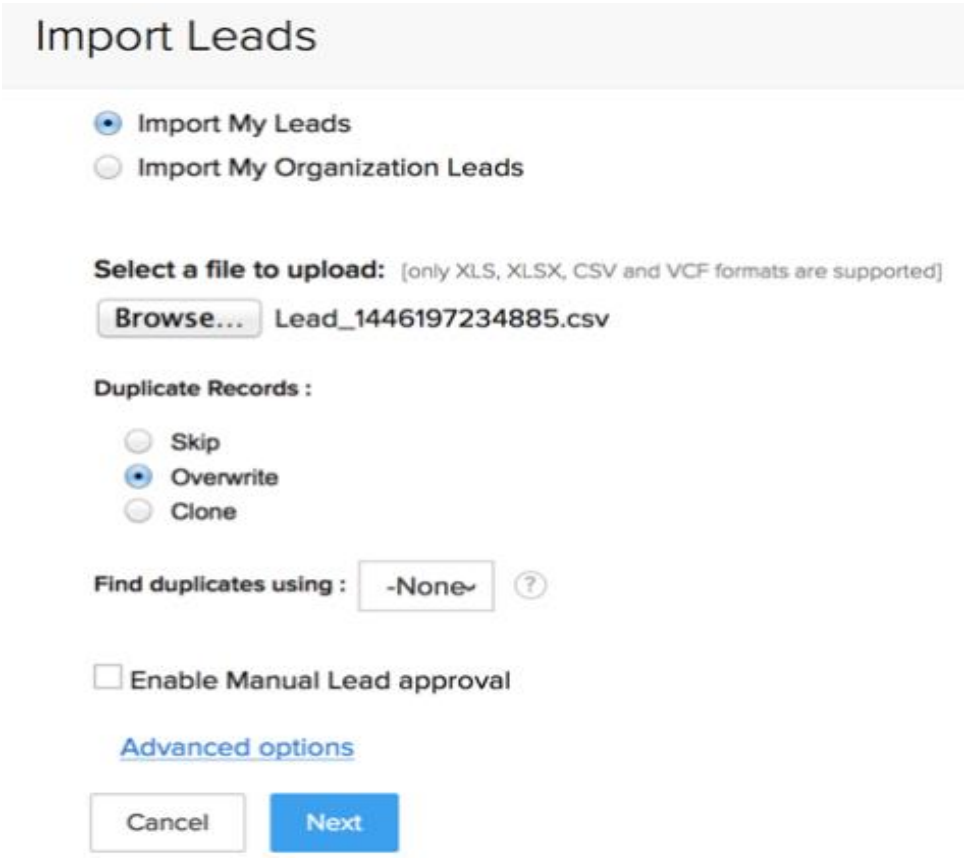


Fig. 2.1. Import

2.1.2. Export

You have the option to export data in CSV format from individual CRM modules within your CRM account. You can manually export records or request a data backup for convenience as illustrated in Figure 2.2.

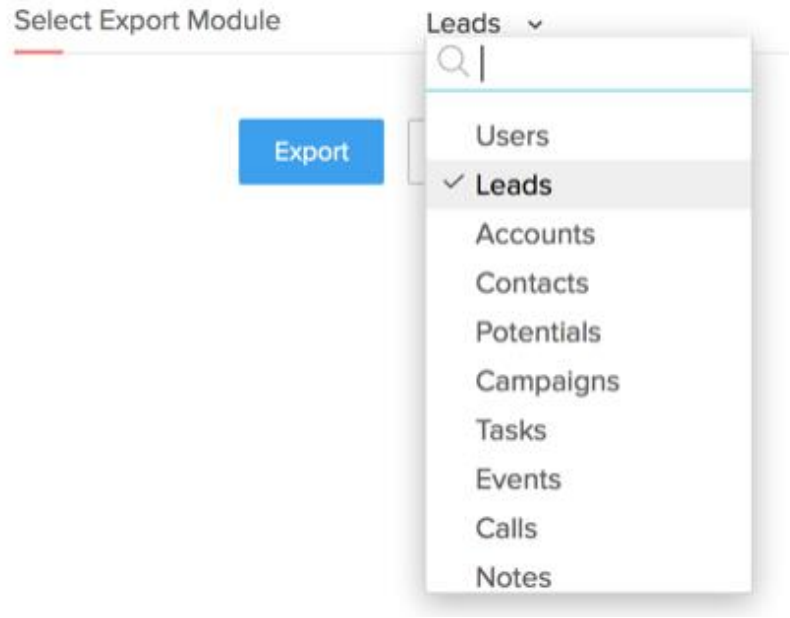


Fig. 2.2: Export

2.1.3. Navigate Records

Use page-level and record-level navigation to easily access the required information. Page-level navigation moves between specific pages, while record-level navigation helps move between individual records, allowing movement to the previous or next consecutive record(s) as illustrated in Figure 2.3.

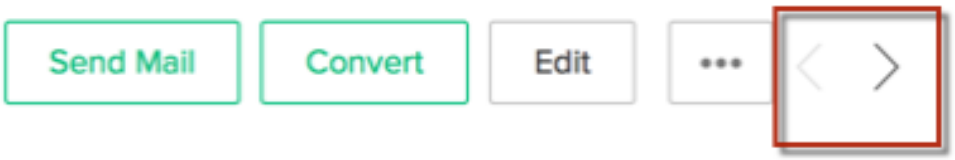


Fig. 2.3: Navigate Records

2.1.4. Advanced Filters

Use advanced filters to sort records according to sales criteria, encompassing activities, email status, and an array of other available parameters, as illustrated in Figure 2.3.

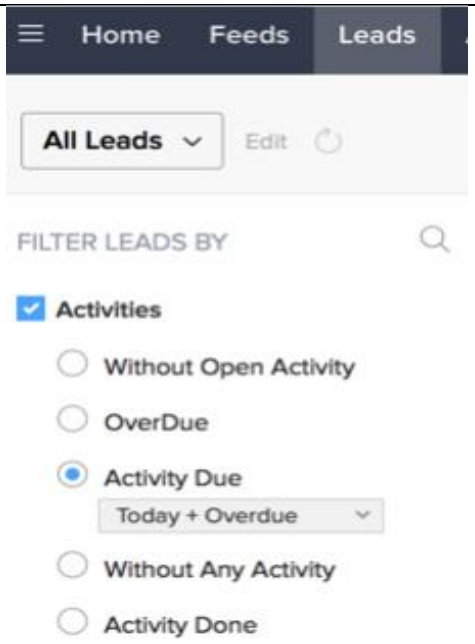


Fig. 2.3: Advanced filters

2.1.5. Bulk record actions

Efficiently manage records by executing bulk operations like mass updates, transfers, deletions, mass emailing, and more for swift and seamless management, as illustrated in Figure 2.4.

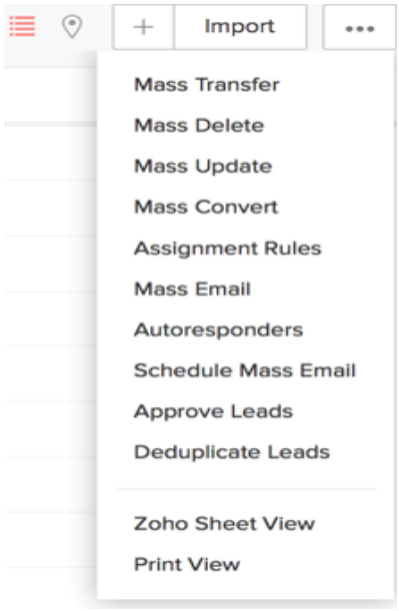


Fig. 2.4: Bulk record actions

2.1.6. Organize events using Zoho CRM Calendar

Use the Zoho CRM calendar for scheduling events and calls. Set up CalDAV on your iOS devices to integrate your official and personal events into one calendar. Additionally, sync your events with Google Calendar and Microsoft Outlook for streamlined coordination across platforms, as illustrated in Figure 2.5.

Fig. 2.5: Zoho CRM calendar

2.2. Manage Data Storage Space

In Zoho CRM, storage space is categorized into two sections: Data and File, providing a clearer breakdown. These categories are then divided into *Storage* and *Usage* details for better organization and representation of data.

2.2.1. Data storage

This encompasses the overall space taken up by records within both standard and custom modules, inclusive of attached notes. It also accounts for the space occupied by data stored in your recycle bin.

Data storage is determined by the collective size of the records stored within each module, including attached notes, and the data retained within the recycle bin.

(These values are approximations based on the average consumption of a user.)

Modules	***Size***
System defined modules (Leads, Contacts, Accounts, Deals, Campaigns, Products, Vendors, Quotes, Purchase Orders, Invoices, Sales Orders, Cases, Price Books, Visits, Tasks, Calls, and Events)	2 KB
Custom Modules	2 KB
Linking Modules	1 KB
Notes	1 KB
Emails (each records in the email related list)	1 KB
Recycle Bin	Size for each component will be same as above

2.2.2. Components in Data Storage

Data storage is further categorized into storage and usage details.

Under storage details, you can view:

1. The total space designated for the assigned subscription.
2. Used data storage.
3. Remaining storage space (this is periodically calculated to show the available space) as shown in Figure 2.6.

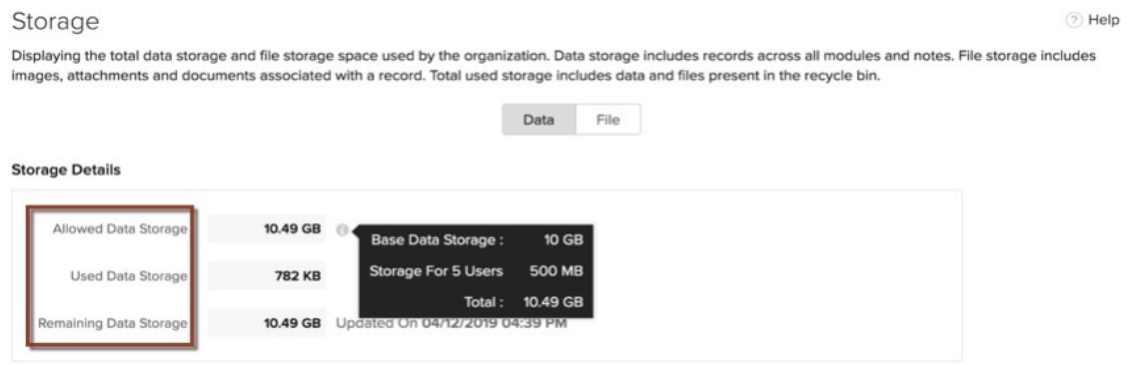


Fig. 2.6: Components in data storage

Within usage details, you can observe the total space occupied by the data in each module, encompassing all records and associated notes as illustrated in Figure 2.7.

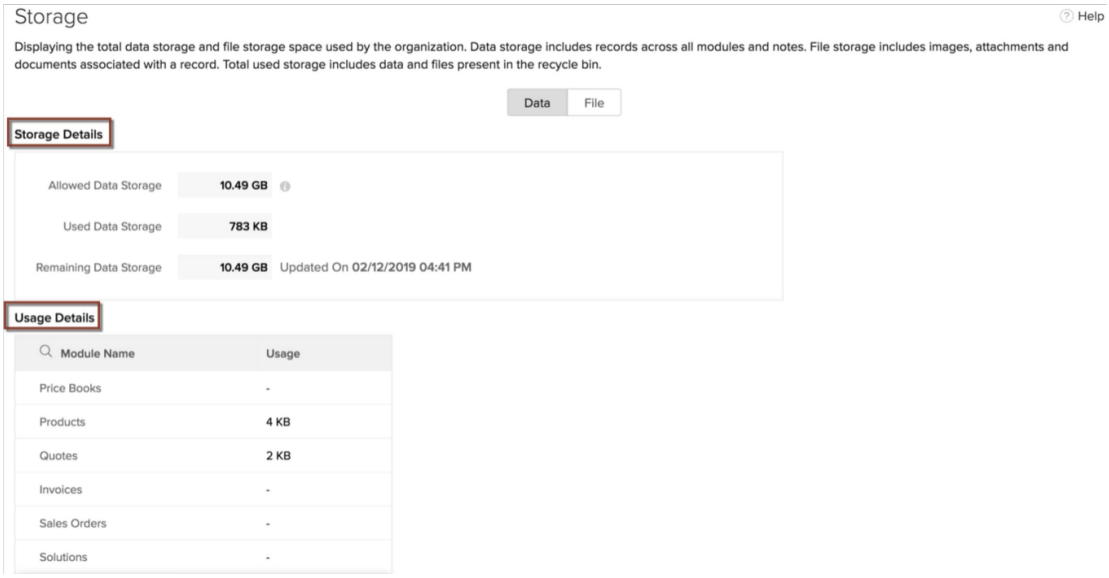


Fig. 2.7: Total space occupied by data

To view the data storage

1. Navigate to Setup -> Data Administration > Storage.
2. Within the Storage page, select the Data tab to access the comprehensive overview of total data storage space and individual user usage details.

2.3. Manage File Storage

File Storage

It includes the space taken up by images, attachments (both in records and emails), email templates, and documents linked to records. You can view a breakdown based on features such as mail-merge and documents. The utilized storage also accounts for the space occupied by data and files in the recycle bin.

Edition	*File Storage (For an organization)*	*Additional file storage (for an org)*
Free	1GB	-
Standard	1GB + 512 MB/ User license	5GB
Professional	1GB + 512 MB/ User license	5GB
Enterprise	1GB + 1 GB/ User license	5GB
Ultimate	5 GB + 1 GB/ User license	5GB

Additional file storage can be acquired (minimum 5 GB) at USD 4 per month for 5 GB. You can purchase up to 100 GB of extra storage via the Manage Subscription page in your CRM account.

1. The storage details section displays the total space used by files.
2. The usage details section shows the storage utilized by individuals within your team, as illustrated in Figure 2.8.

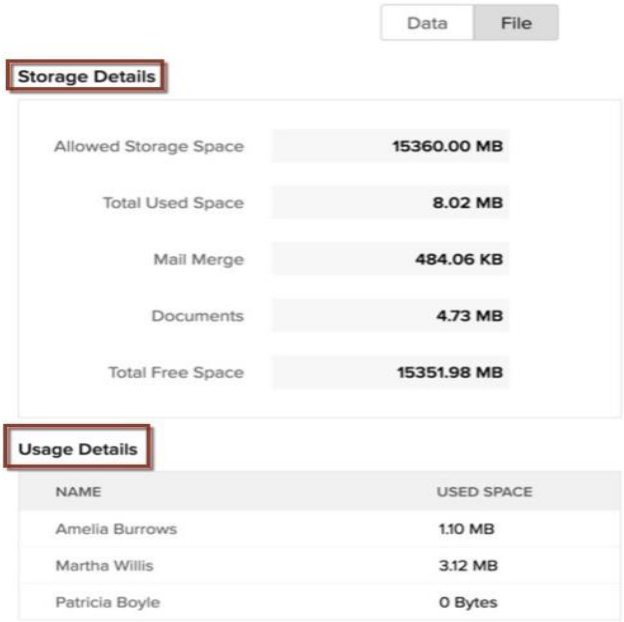


Fig. 2.8: Storage details and usage details

To view the file storage

a) Navigate to Setup -> Data Administration -> Storage.

b) On the Storage page, select the File tab to access the total file storage information and usage details.

Assignment 9.1.

List down the steps to view the file storage.

List down the space occupied by data and files in the recycle bin.

Summary

- Efficient CRM management involves importing and exporting data, deduplicating records, and using advanced filters for sorting.

- Navigation at page and record levels aids in data access, while bulk actions streamline operations and the CRM calendar organizes events.
- Data storage includes categorized space for records, notes, and emails, while file storage covers images, attachments, and templates.
- Various editions of Zoho CRM offer different file storage capacities, and the system segregates storage and usage details for user oversight.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Which of the following is NOT among the day-to-day activities recommended for effective data management in CRM? (a) Exporting data (b) Dealing with duplicate data (c) Uploading files without filtering (d) Organizing events in the CRM calendar
2. What is the purpose of the "Import My Organization Records" option in CRM? (a) Export data to external sources (b) Import records from external sources assigned to you or other users (c) Delete all records in the CRM (d) Schedule events in the CRM calendar
3. How can one export data in Zoho CRM? (a) Only request a backup (b) By manually exporting records or requesting a data backup (c) Importing from external sources (d) Use page-level and record-level navigation
4. What does record-level navigation in CRM facilitate? (a) Moves between specific pages (b) Sorts records according to parameters (c) Helps navigate between individual records (d) None of the above
5. Which feature in CRM allows for bulk operations like mass updates and deletions? (a) Advanced Filters (b) Page-level navigation (c) Bulk record actions (d) Organizing events in the CRM calendar
6. What does Zoho CRM offer for scheduling events and calls? (a) Dedicated mobile app (b) Integrated CRM calendar (c) External scheduling tool (d) Personal assistant service
7. How is storage space categorized in Zoho CRM? (a) Only in Data and File categories (b) Data and File, each further divided into Storage and Usage (c) Only as Data, without subdivisions (d) Unlimited storage space
8. What determines the size of data storage for different modules in Zoho CRM? (a) Fixed size for all modules (b) Size based on the average consumption of a user (c) Unlimited storage space (d) Size based on the number of modules
9. What does the "Storage" page under Data Administration in Zoho CRM provide? (a) Detailed breakdown of file storage usage (b) Data and file storage overview (c) User subscription details (d) None of the above
10. How can additional file storage be acquired in Zoho CRM? (a) By purchasing up to 5GB extra storage for free (b) Through manual uploads of additional files (c) By purchasing extra storage via the Manage Subscription page (d) It's not possible to get additional file storage

B. Fill in the Blanks

1. The advanced filters in CRM help in sorting records based on various _____.

2. _____ navigation helps in moving between specific pages.
3. The total space occupied by records within both standard and custom modules is categorized under_____.
4. File storage includes the space taken up by images, attachments, email templates, and documents linked to_____.
5. Zoho CRM offers the option to import records assigned to you or other users using the "_____" feature.
6. Storage space in Zoho CRM is divided into two sections: _____ details.
7. One can organize events and calls using the Zoho CRM _____ within CRM.
8. The storage details section displays the total _____ used by files.
9. Bulk operations like mass updates, transfers, and _____ help in seamless management.
10. The Zoho CRM calendar can be synced with _____ and _____ for enhanced coordination.

C. State whether the following statements are True or False

1. Record-level navigation enables movement between individual records in CRM.
2. File storage includes only images and attachments, excluding email templates.
3. Bulk record actions save minimal time and effort during record management.
4. Data storage in CRM is calculated differently for each user based on their activities.
5. Zoho CRM does not offer any options for data import from external sources.
6. The advanced filters in CRM can sort records based only on sales criteria.
7. The file storage in Zoho CRM varies for each organization based on their edition.
8. Storage and Usage details are not available separately within Zoho CRM.
9. The Zoho CRM calendar cannot integrate events from external calendars.
10. Navigation options in CRM are limited to page-level movement.

D. Short Question Answers

1. What are some day-to-day activities suggested for CRM administrators in managing data?
2. How can records be imported into a CRM account from external sources?
3. Explain the function of page-level and record-level navigation in CRM data management.
4. What are the key features of advanced filters in CRM data sorting?
5. Enumerate the bulk actions available for efficient record management.
6. How can events and calls be organized using the Zoho CRM calendar?
7. What are the categories covered under data storage in Zoho CRM?
8. Explain how data storage and usage details are presented within Zoho CRM.
9. How does file storage differ among various editions of Zoho CRM?
10. What steps can be taken to access file storage details within Zoho CRM?

Session 3. Importing and Exporting Data

3.1 Importing Data to Zoho CRM

Collecting data from various sources—such as purchasing record databases, acquiring information from trade shows and campaigns—is vital for businesses. Importing these records into Zoho CRM is a key step in lead creation. The import process should be straightforward, ensuring clean data without duplicates.

You have the choice of importing your data through either of the two options outlined below:

Importing data to individual modules in Zoho CRM:

You can import data into individual modules in Zoho CRM by importing individual files, one at a time, into a specific module.

Migrating data from other accounts to Zoho CRM:

The Data Migration wizard in Zoho CRM facilitates the transfer of data from other CRM systems. This tool allows you to upload the CSV file of the module to be migrated and configure the supported Date and Time format within the import file to prevent values from being overlooked during migration. Additionally, you can opt to receive email notifications from Zoho CRM upon completion of the import process. Once you've provided the required details, you'll proceed to map all mandatory fields in the CSV file with their corresponding fields in Zoho CRM.

3.1.1 Import Checklist

Prior to importing the data, it is essential to review the following checklist:

Permission: Ensure you possess the necessary access and privileges to import data. If you lack these permissions, the Import link will not be visible in your user interface.

File Format: Supported formats include Excel (XLS, XLSX), Comma Separated Value (CSV), and Business Card or vCard Format (VCF). Ensure that file attachments are separate from the data.

Note that XLS/XLSX files containing special controls like combo filters or embedded images may lead to unexpected errors during the import process.

Characters not allowed: The data intended for import should not include information enclosed within <script> and </script> tags.

Mandatory Fields: Every mandatory field must have a value assigned to it. Ensure no mandatory fields are left blank in the import file. For instance, when importing account information, each account record should include an Account Name.

Check box Data: Ensure that data intended for import from Boolean or checkbox fields contains values that can be accurately converted during the import procedure.

Imported data from Boolean and checkbox fields is converted as follows:

1. If the checkbox is selected: True or 1
2. If the checkbox is not selected: False or 0

Drop-down List: Ensure that all data values shown in the drop-down lists align with the corresponding fields in Zoho CRM. For example, if importing account information with industry type values, verify that all industry values in the source file are present

in the CRM's drop-down list. If values don't match, either adjust the source file values or have the administrator add the new values to the CRM.

If values are not included in the drop-down list, you can still import data. However, if you alter the field value post-import to a value not in the list, you won't be able to revert to the old value as it won't be available in the list.

Field Names: Ensure that the initial row of data in the source file includes column headings or field names rather than the actual data values. These heading field names aid in identifying the data when mapping new information to existing fields in Zoho CRM.

Export CRM Data: Exporting data from your CRM can serve various purposes based on your requirements. Common needs for exporting data include segmenting customers, collaborating by sharing data, fulfilling compliance-related requirements, generating reports, and archiving your data.

3.1.2 Options Available

There are three export-related options in Zoho CRM:

1. Export module data
2. Take a complete backup
3. Export reports

1. Export module data

You are allowed to export a maximum of 200,000 records from a single module at a time. These will be the oldest 200,000 records meeting your export criteria. The exported records, in CSV format, will be compressed into a zip file. The download link for the export will be accessible for 7 days.

Limits for number of exports per day will vary based your CRM's edition:

1. Free - 10
2. Starter - 50
3. Standard - 100
4. Professional - 250
5. Enterprise - 500
6. Ultimate – 1000

Note: If you need to download more than 200,000 records from an individual module, you can: Set criteria based on Created Time to create and download multiple exports

To export data

1. Click on Setup (located near the top-right corner).
2. Proceed to the Data Administration section and select Export.
3. Within the Export Data page, click on "Start an Export." As illustrated in Figure 3.1.

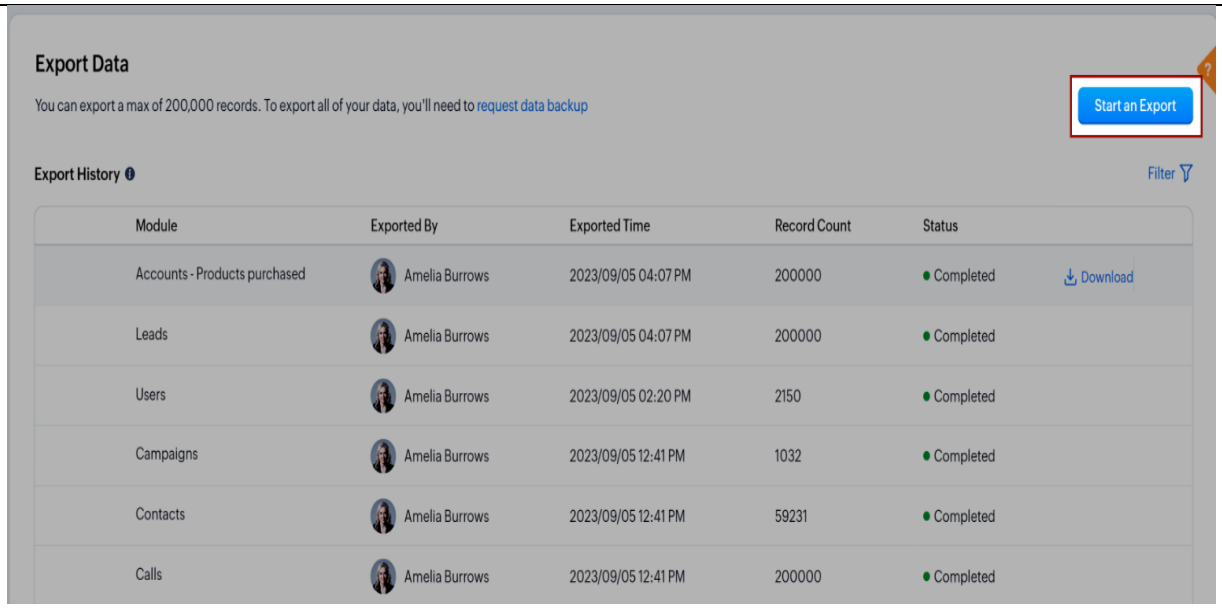


Fig. 3.1: Start an Export

4. In the opened Export Data page, follow these steps:

a. Choose a module, subform, or Notes from the Module drop-down list, as illustrated in Figure 3.2.

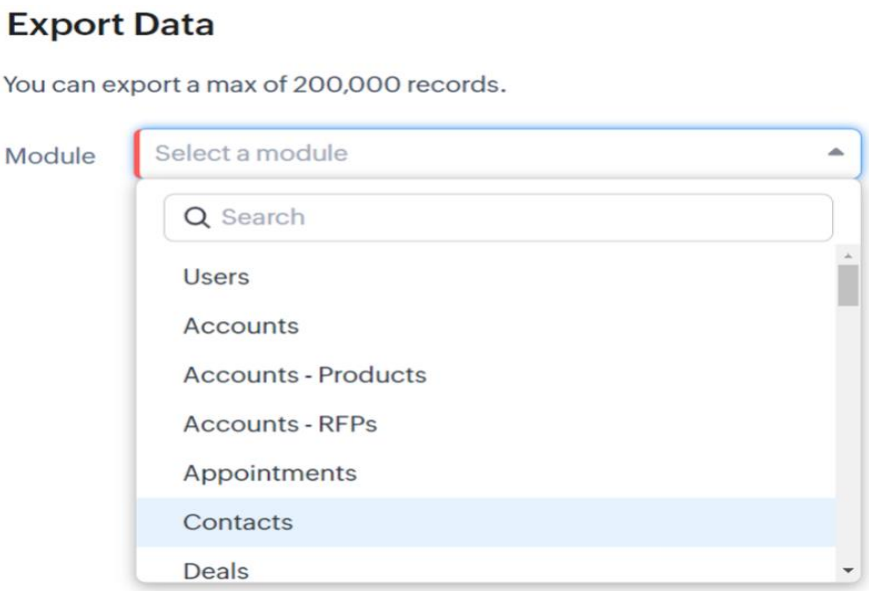


Fig. 3.2: Exporting data

b. Choose an option from the Custom View drop-down list. This might include a standard List View, a custom List View, or one based on specific criteria. As illustrated in Figure 3.3.

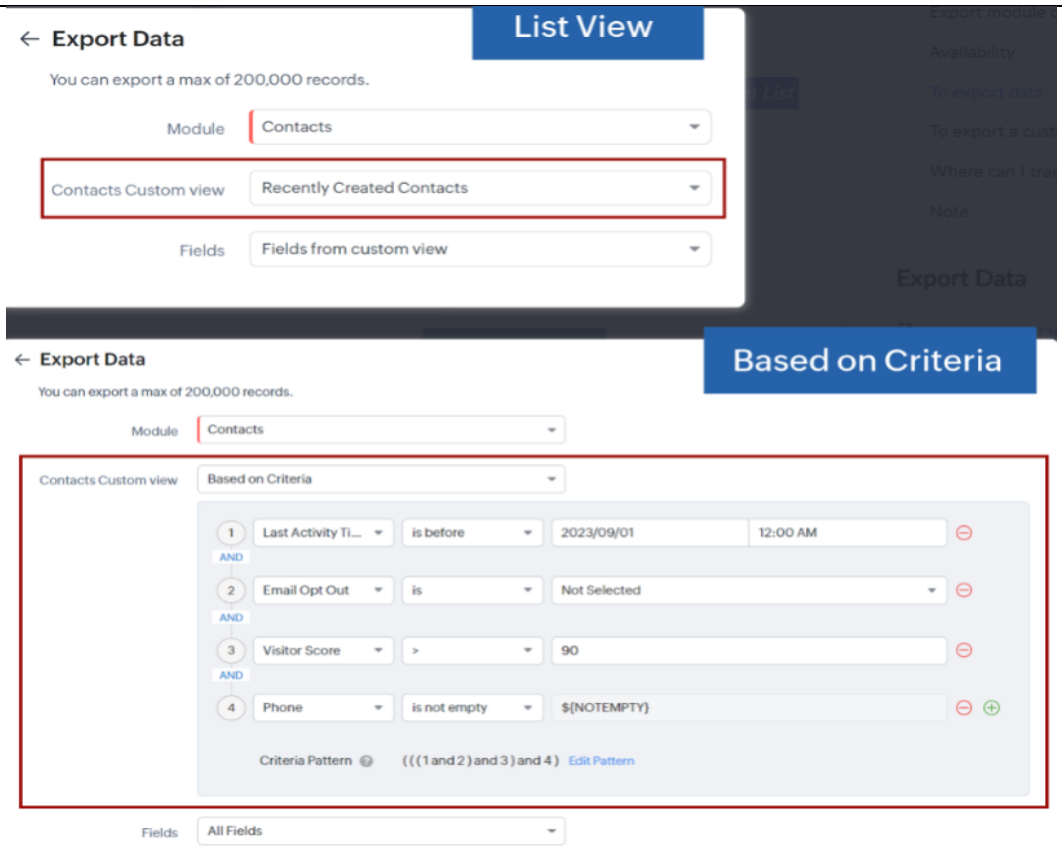


Fig. 3.3: Contacts Custom View drop-down list

If you have selected a subform from the Module drop-down list, you can establish criteria specifically for that subform as well, as illustrated in Figure 3.4.

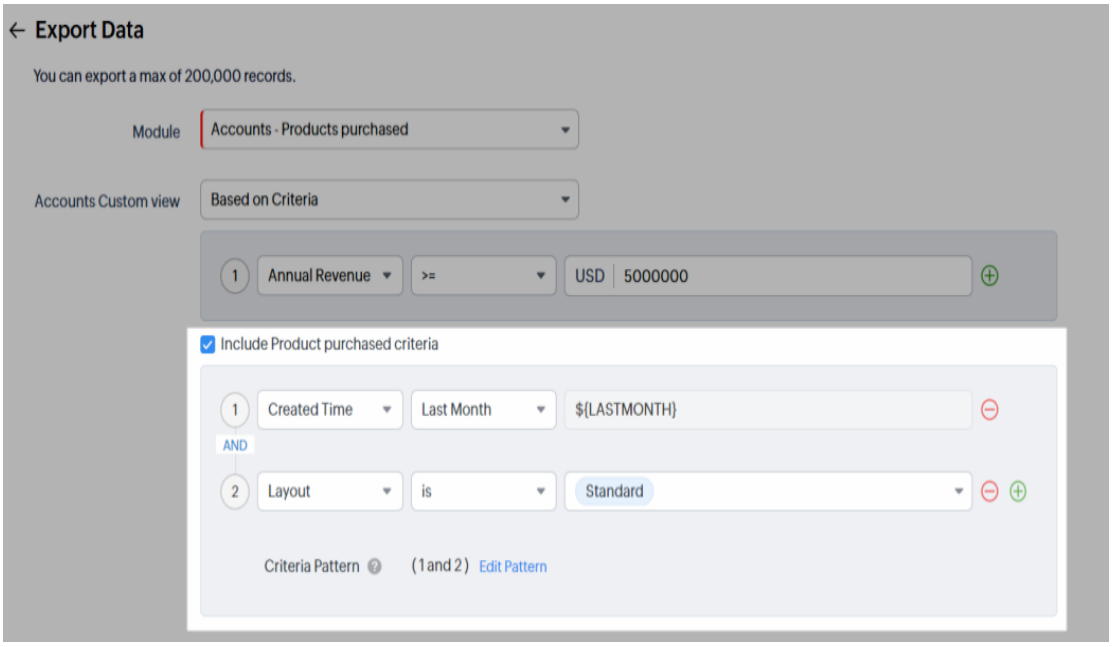


Fig. 3.4: Sub form from the Module drop-down list

c. Select an option from the Fields drop-down list. Your options are Fields from Custom View (only available if a list view is chosen in the Custom View drop-down list), All fields, and Choose fields.

If you've selected Choose fields, you can pick fields from the module and its lookup modules, as illustrated in Figure 3.5.

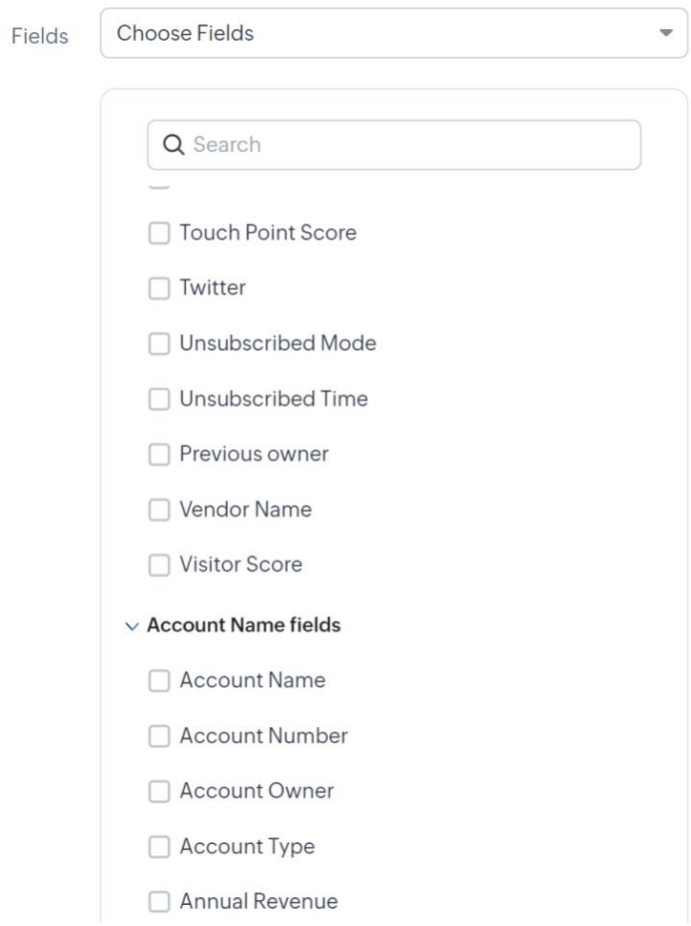


Fig. 3.5: Choose fields from the module

d. Click Export.

Your export will be added to the Export History table with the status 'In progress'. As illustrated in Figure 3.6.

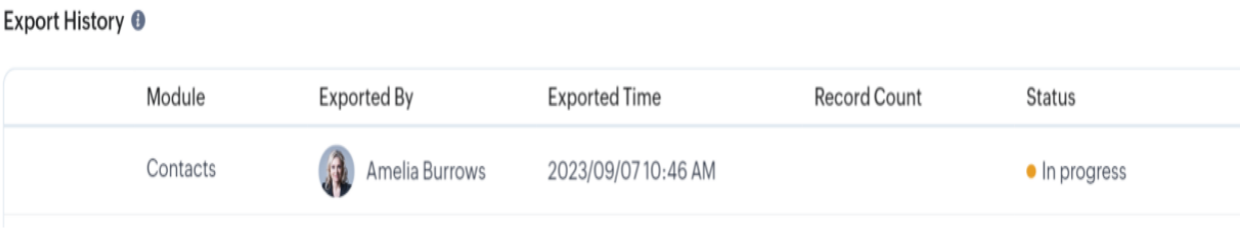


Fig. 3.6: Export history 'In progress'

Once the status changes to "Completed," hover over the entry and select the Download link to download the data to your local device, as illustrated in Figure 3.7.

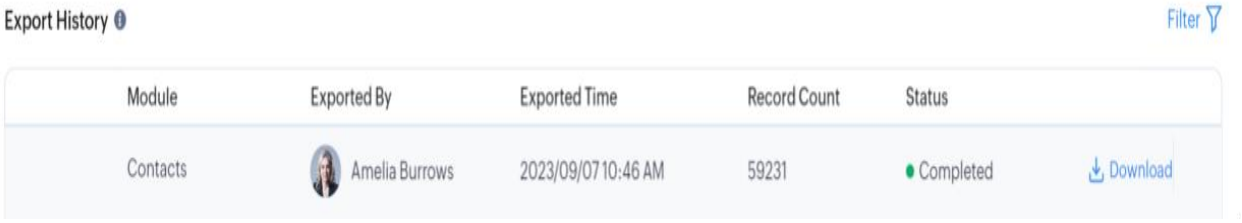


Fig. 3.7: Export history 'Completed'

To export a custom view

If you want to quickly export a custom view, you can initiate it from the Actions menu in a module page. To do this, you should:

1. Select a custom view in a module page.
2. Click the Actions button and select Export Contacts, as illustrated in Figure 3.8.

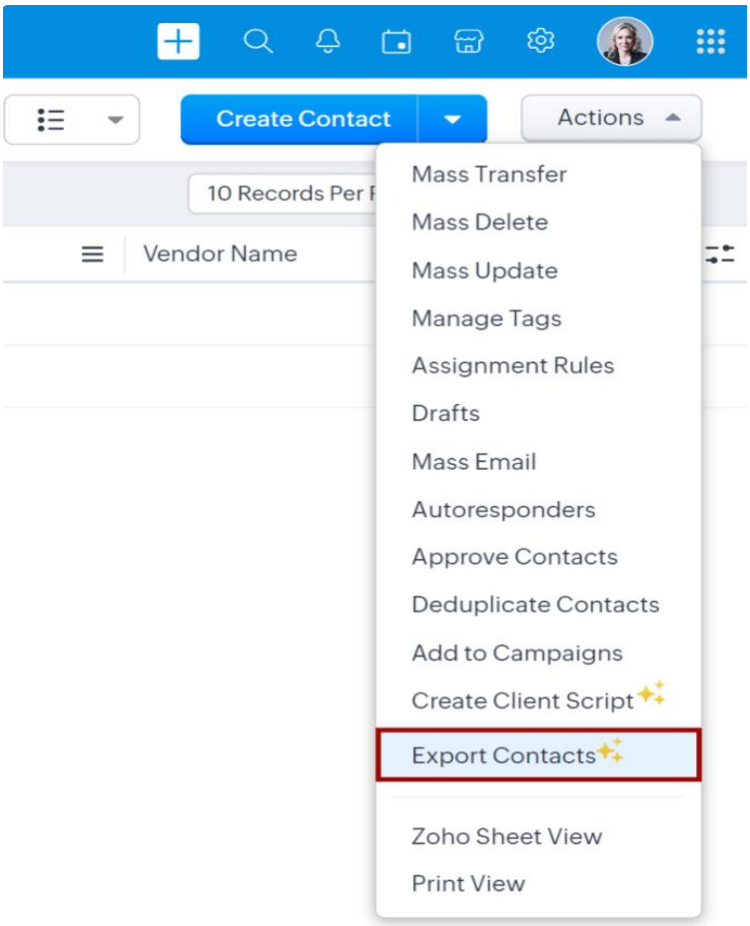


Fig. 3.8: Export contacts

3. In the Export Data page that appears, the Module, Custom View, and Fields dropdown lists will be auto-selected based on the custom view.
4. Click Export.

Assignment

List down the three export-related options in Zoho CRM.

List down the Limits for number of exports per day will vary based CRM's edition.

Summary

- Importing Data: Crucial for lead creation, allows import from individual modules or other CRM systems via the Data Migration wizard, with a checklist for proper formatting and field mapping.
- Exporting CRM Data: Offers three options—module data export, complete backup, and export reports—with varying daily export limits based on CRM editions, using specific steps for exporting chosen data criteria.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. What are the supported file formats for importing data into Zoho CRM? (a) Excel and PowerPoint (b) Excel, CSV, and vCard (c) PDF and DOCX (d) JSON and XML
2. How can you migrate data from other CRM systems to Zoho CRM? (a) Via manual data entry only (b) Using the Data Migration wizard (c) Through direct API integration (d) There's no provision for migrating data to Zoho CRM
3. Which field value conversion applies to checkbox fields during data import? (a) True or False (b) Yes or No (c) 1 or 0 (d) Checked or Unchecked
4. What is essential to ensure while importing data into Zoho CRM from drop-down lists? (a) Add any missing values post-import (b) Remove all drop-down values not present in CRM (c) Verify all values in the source file match CRM's drop-down list (d) Ignore drop-down list values; they're not crucial for importing
5. What is a critical requirement for the initial row in a source file when importing data? (a) It should include the actual data values (b) It must not contain any field names (c) It should have column headings or field names (d) It needs no specific structure; any data arrangement is acceptable
6. Which option allows exporting a complete backup of data in Zoho CRM? (a) Export module data (b) Take a complete backup (c) Export reports (d) There's no option for complete backup export
7. How many records can be exported from a single module at a time in Zoho CRM? (a) Unlimited (b) 100,000 records (c) 200,000 records (d) 500,000 records
8. Which export-related option in Zoho CRM allows exporting specific fields from a module? (a) Export module data (b) Take a complete backup (c) Export reports (d) Exporting specific fields isn't supported
9. What action triggers the start of an export process in Zoho CRM? (a) Clicking 'Export' directly (b) Clicking 'Start an Export' after selecting criteria (c) Hovering over 'Export History' and selecting 'Download' (d) There's no manual initiation; it's automatic
10. Which CRM edition allows 1000 exports per day? (a) Starter (b) Professional (c) Enterprise (d) Ultimate

B. Fill in the Blanks

1. The Data Migration wizard in Zoho CRM facilitates the transfer of data from _____.
2. The imported file for Zoho CRM shouldn't include information enclosed within _____ tags.
3. Every mandatory field during data import must have a _____ assigned to it.
4. Imported data from Boolean or checkbox fields converts 'selected' as _____.
5. Ensure that all data values in drop-down lists align with the corresponding fields in Zoho CRM to avoid _____.
6. The initial row of the source file for data import should contain _____.

7. Exporting a complete backup of data in Zoho CRM is an option available under _____.
8. Zoho CRM allows exporting a maximum of _____ records from a single module at a time.
9. The status 'In progress' indicates that the export process is _____.
10. _____ is the CRM edition allowing 500 exports per day.

C. State whether the following statements are True or False

1. The Import link will be visible regardless of user permissions.
2. CSV and PDF are the only supported formats for importing data into Zoho CRM.
3. Boolean or checkbox fields during import are converted as 'True' for selected checkboxes.
4. The Data Migration wizard in Zoho CRM doesn't support uploading CSV files.
5. Drop-down list values are not crucial when importing data into Zoho CRM.
6. The initial row of the source file for import should contain column headings or field names.
7. Exporting module data in Zoho CRM allows the export of a maximum of 500,000 records.
8. 'Export module data' in Zoho CRM doesn't allow choosing specific fields for export.
9. The 'Export History' in Zoho CRM doesn't display the export status.
10. The Ultimate edition of Zoho CRM allows 1000 exports per day.

D. Answer the following question in short

1. What are the two primary options for importing data into Zoho CRM?
2. Explain the purpose of the Data Migration wizard in Zoho CRM.
3. Why is it essential to review the import checklist before importing data?
4. What are the considerations for checkbox field data during import?
5. What is the significance of drop-down lists when importing data into Zoho CRM?
6. How does the Data Export feature in Zoho CRM differentiate between CRM editions?
7. What are the options available under the Export module data feature in Zoho CRM?
8. Describe the process to initiate an export of a custom view in Zoho CRM.
9. How does Zoho CRM restrict the number of daily exports based on CRM editions?
10. Explain the steps to download exported data from Zoho CRM to a local device.

Session 4. Creating Contacts

4.1 Creating Contacts

In Zoho CRM, you have multiple methods to create contacts:

Manual Entry: Enter contact details directly into the form. This could be data gathered from various sources like survey forms or your website.

Importing: Import contacts from external sources such as purchased databases or contacts from different business units using CSV or XLS files.

Web Form Capture: Create web forms on your website to allow visitors to submit their contact details or inquiries. These submissions are captured and stored directly in the Contacts module.

Lead Conversion: Convert leads into contacts upon lead conversion, which also generates accounts and deals if needed.

Outlook Contact Sync: Synchronize contacts from Microsoft Outlook with those in Zoho CRM for unified data management.

4.2 Create Contact Individually

You can create contacts individually in two ways:

Filling in Details: Input the necessary information into the contact creation form manually.

Cloning Contacts: Clone existing contacts with minor modifications, allowing for quick creation of similar contacts based on existing details.

To create contacts individually

1. In the Contacts module, click New Contact. As illustrated in Figure 8.1.

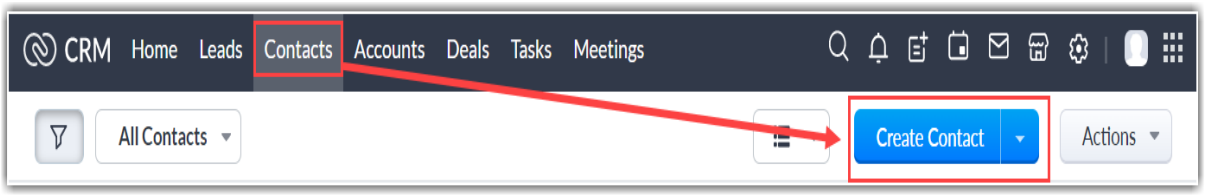


Fig. 4.1: Create contact

In the Create Contact page, enter the contact details.

Click Save.

To clone contacts

1. In the Contacts tab, click a particular contact that you want to be cloned.
2. In the Contact Details page, click Clone. As illustrated in Figure 4.2.

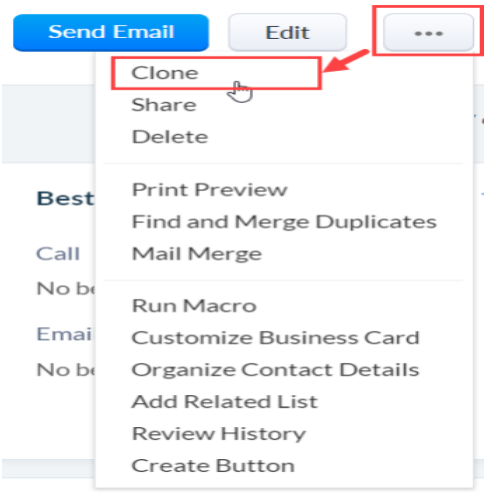


Fig. 4.2: Clone Contacts

3. In the Clone Contact page, modify the required details.
4. Click Save.

4.3 Work with the Contacts details page

After creating a contact, you can access and review all related information in one place on the contact's details page. This includes details such as associated deals and accounts, activities, notes, events, emails, and more, providing a comprehensive view of the contact's interactions and engagements within your CRM.

To view the contacts details page

- Click the Contacts module.
- Click the desired account from the Contacts list view.
- You will see the details page of the contact. As illustrated in Figure 4.3.

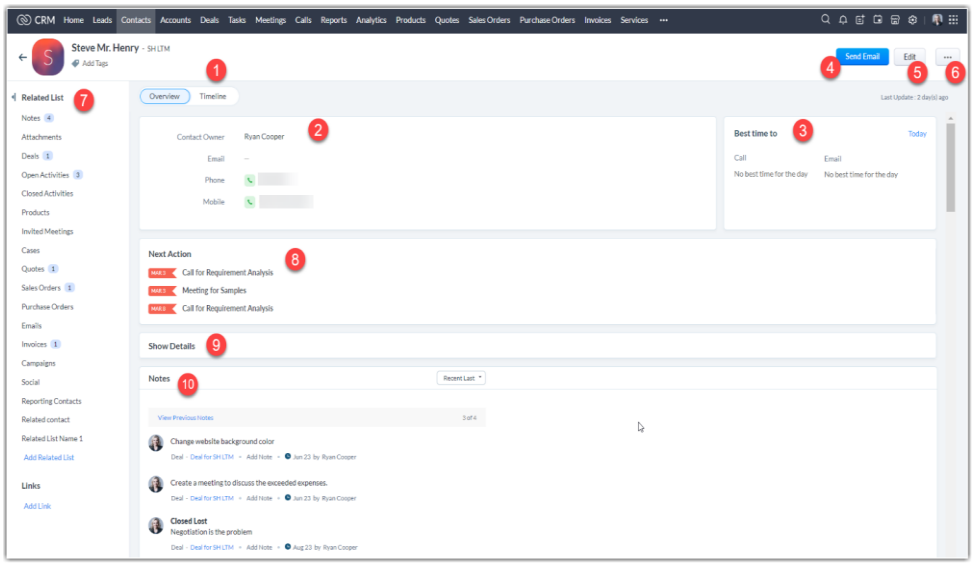


Fig. 4.3: details page of contact

1. Switch between the Overview and Timeline views of the contact's details page.

   a. Overview: Displays the details of the contact.

   b. Timeline: Displays a history of actions performed on the contact's details page (in the last six months), as illustrated in Figure 4.4.

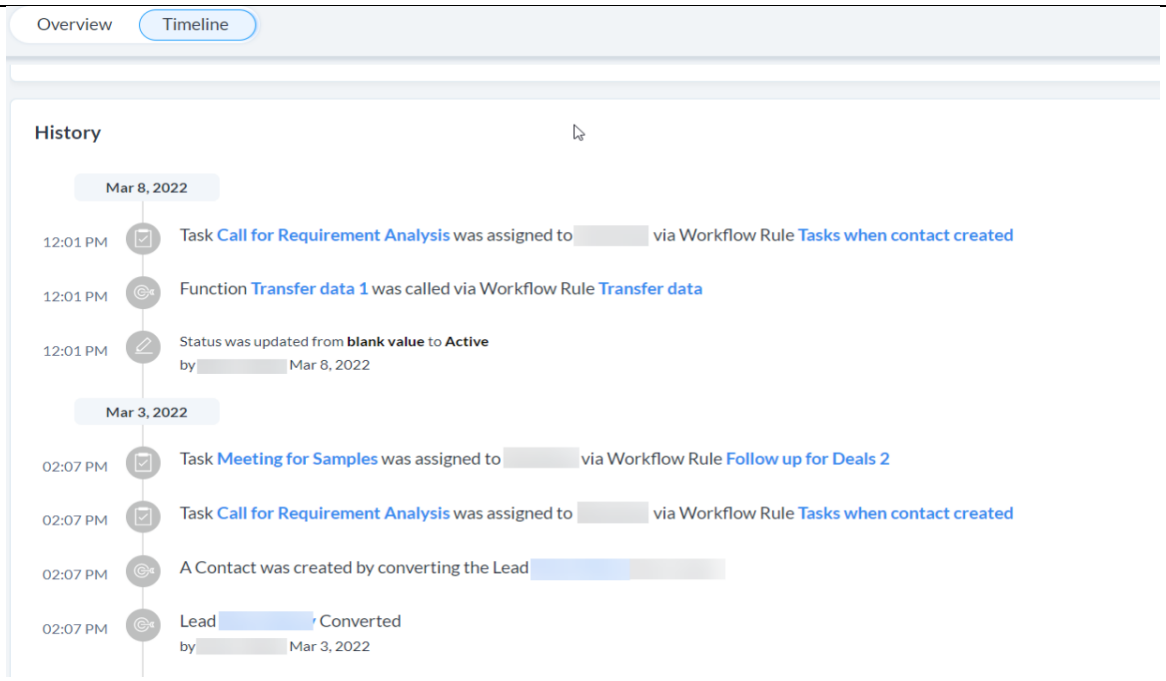


Fig. 4.4: Timeline

2. View the business card details of the contact.
3. View the best time to contact the customer.
4. Easily Send Mail to the contact or Edit the contact.
5. Click on the edit icon to edit the details on the contact page.
6. Click the More icon to execute further options such as clone, share, customize business card and so on.
7. Scroll down to navigate to all the related lists on the record's details page.
8. Learn priority details from the Quick-info section, such as Next Action and Deals associated to the contact instantly.
9. View detailed information about the client, this section can be minimized.
10. View Notes for the contact. This includes check-ins made on your mobile app as well as comments made on a project's task.

Assignment 4.1.

List down the steps to view the contacts details page.

List down the steps to clone contacts.

List down the ways to create contacts individually.

4.4 Associate Contact with other Records

You can compile a comprehensive 360-degree view of the contact, showcasing associated elements like deals, support tickets, ongoing and completed activities, attachments, and notes. This consolidated view offers a complete insight into the contact's engagements and interactions within your CRM.

In the Contact Details page, you can update the following:

- Member Accounts: To add other divisions or subsidiaries to the parent account.
- Open Activities: To add tasks and events

- Closed Activities: To display all the closed tasks and events
- Cases: To create cases for the contact
- Products: To add products for the contact
- Attachments: To attach documents and notes
- Notes: To attach notes to the contact.
- Deals: To add deals to the contact
- Sales Orders: To add sales orders to the contact
- Invoices: To add invoices to the contact
- Quotes: To add quotes
- Campaigns: To associate many campaigns to a single contact
- Social Interactions: To view the Twitter and Facebook interactions associated with the contact and send messages, like posts, re-tweet, etc.

4.5 Working with Contacts

Contacts represent individuals you engage with, whether for business opportunities or personal interactions. In Business-to-Consumer (B2C) scenarios, contacts are crucial for customer acquisition, while in Business-to-Business (B2B) settings, they form a part of the organizational information involved in your business engagements.

In Zoho CRM, the contacts module serves a dual function, enabling both customer acquisition and procurement of products from vendors. Contacts can be associated with accounts or vendors based on your business processes, facilitating seamless management of customer relations and vendor interactions within the system.

Contacts Home Page

Access the Contacts tab to navigate to the Contacts Home page and execute the following operations:

- Records are showcased in List Views. Tailor your own Custom Views to suit your specific needs. Additionally, predefined system list views such as "My Contacts," "New This Week," "New Last Week," "Unread Contacts," etc., are readily available for use, as illustrated in Figure 4.5.

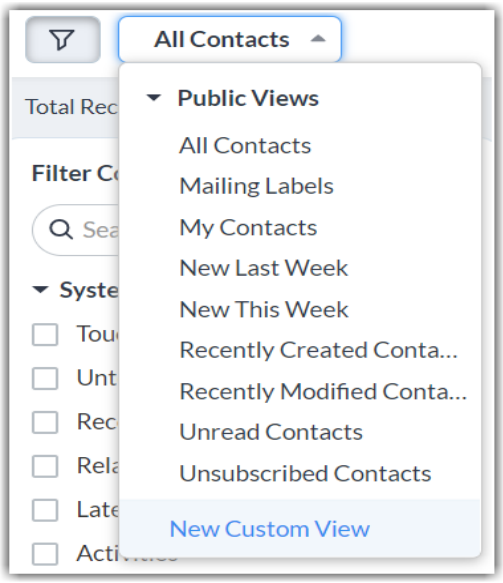


Fig. 4.5: Contacts home page

- Perform a mass deletion of records by marking the checkboxes next to the respective records and subsequently clicking on the Delete button, as illustrated in Figure 4.6.

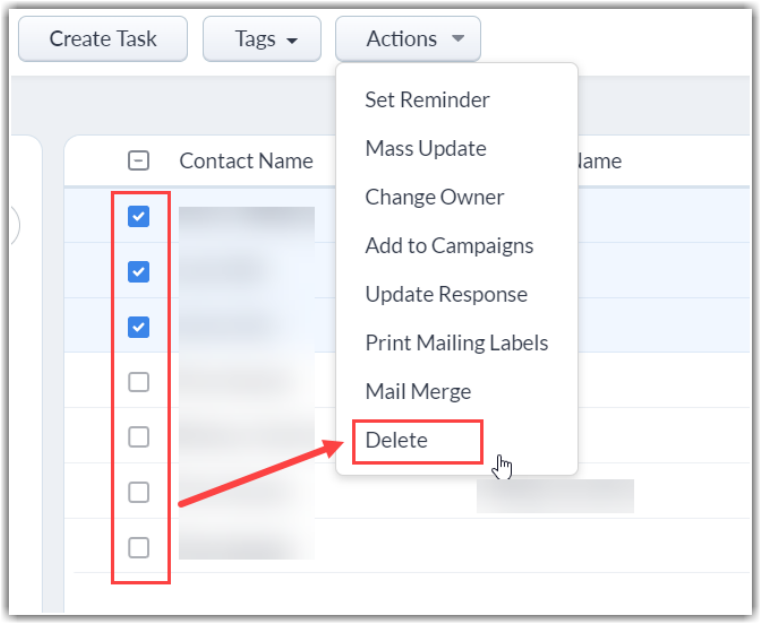


Fig. 4.6: Delete button

- To send a mass email to contacts, select the checkboxes adjacent to the records and proceed by clicking on the "Send Mail" button, as illustrated in Figure 4.7.

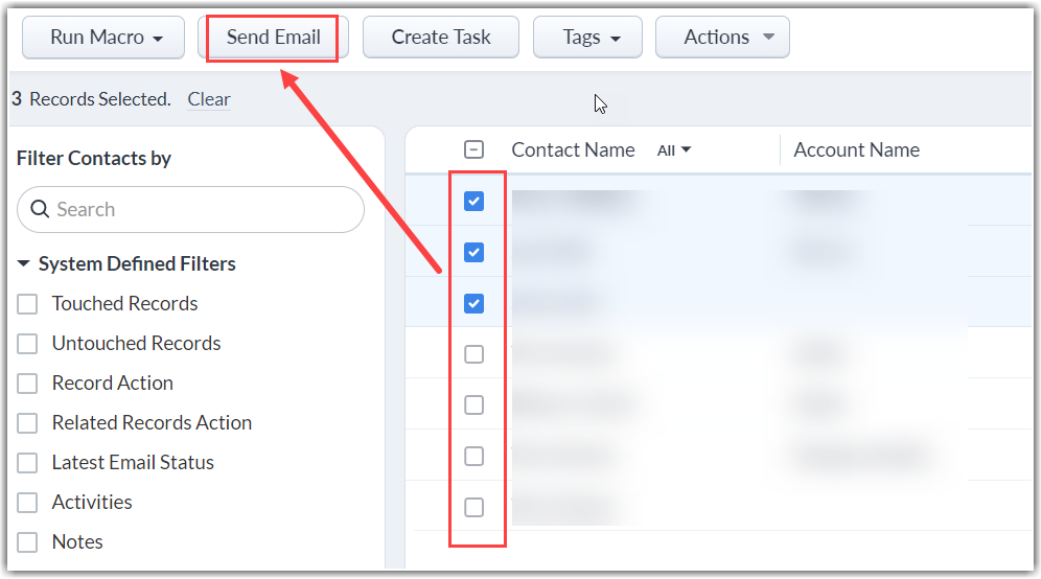


Fig. 4.7: Send mail

- Access the Action button within the detail page to execute various common operations for managing contacts, such as mass transfer, mass delete, exporting contacts, and more, as illustrated in Figure 4.8.

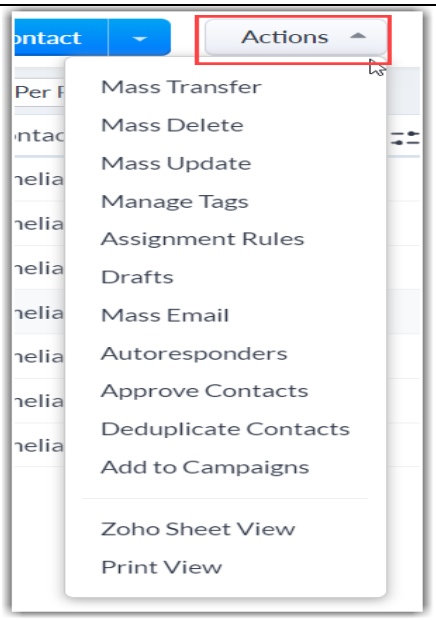


Fig. 4.8: Action button

- Explore records by alphabet, specific information, or set criteria for refined searches.
- Use advanced filters to sort contacts according to sales priorities.
- Print contacts along with essential details for documentation purposes, as illustrated in Figure 4.9.

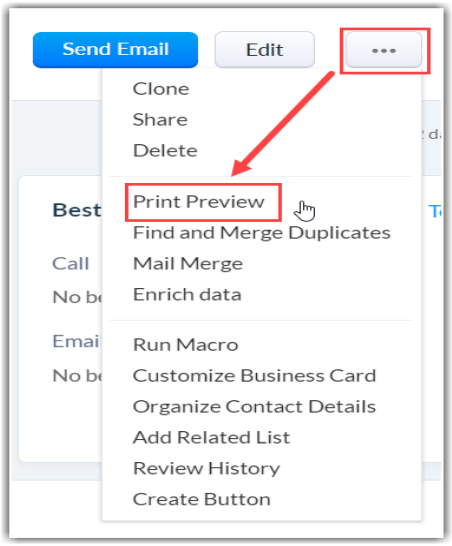


Fig. 4.9: Print preview

SUMMARY

- Contacts in Zoho CRM can be created manually, imported, or captured through web forms, providing varied options for data entry.
- Individual contact creation allows manual input or cloning of existing contacts, enabling swift creation based on existing details.
- The Contact Details page offers a comprehensive view, showcasing all associated information like deals, activities, and social interactions.

- Associations with other records like accounts, deals, or invoices consolidate a 360-degree view of a contact's engagements.
- Contacts serve dual functions in B2B and B2C scenarios, pivotal for customer acquisition and vendor interactions.
- Contacts Home Page provides functionalities for mass actions, filtering, and customization of views, streamlining contact management.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Which method in Zoho CRM allows the capture of visitor contact details directly from a website? (a) Manual Entry (b) Lead Conversion (c) Web Form Capture (d) Outlook Contact Sync
2. What does the process of cloning contacts in Zoho CRM allow you to do? (a) Merge contacts with similar details (b) Delete multiple contacts simultaneously (c) Create new contacts from existing ones with minor changes (d) Export contacts to external sources
3. In Zoho CRM, what is the purpose of the Contact Details page? (a) It displays overall CRM statistics (b) It showcases account-related details (c) It provides a comprehensive view of a contact's information (d) It offers sales analytics for contacts
4. Which feature in Zoho CRM enables synchronization of contacts from Microsoft Outlook? (a) Web Form Capture (b) Lead Conversion (c) Manual Entry (d) Outlook Contact Sync
5. What type of activities can be associated with contacts in Zoho CRM? (a) Tasks and Events (b) Accounts and Deals (c) Invoices and Quotes (d) Campaigns and Social Interactions
6. Where can you access predefined system list views such as "My Contacts" or "New This Week" in Zoho CRM? (a) Action button (b) Contact Details page (c) Contacts Home Page (d) Advanced filters
7. What function does the "Send Mail" button serve in Zoho CRM's Contacts Home Page? (a) Export contacts to CSV (b) Send mass emails to selected contacts (c) Delete multiple contacts (d) Create new contacts
8. How can you create contacts through Lead Conversion in Zoho CRM? (a) By manually entering contact details (b) By importing CSV files (c) By converting leads into contacts (d) By synchronizing contacts from Outlook
9. What does the "Timeline" view on the contact's details page in Zoho CRM display? (a) Contact's business card details (b) Comprehensive contact details (c) A history of actions performed on the contact (d) Associated accounts and deals
10. What is the purpose of the "Action" button on the Contacts Home Page in Zoho CRM? (a) Edit contact details (b) Execute common operations for managing contacts (c) View contact-specific tasks (d) Send notifications to contacts

B. Fill in the Blanks

1. _____ is the method where visitors can submit their contact details directly on a website.
2. Cloning contacts allows for the _____ creation of similar contacts based on existing details.
3. The Contact Details page in Zoho CRM provides a comprehensive view of a contact's _____ within your CRM.
4. ____ synchronization enables contacts from Microsoft Outlook to sync with Zoho CRM.
5. Lead Conversion in Zoho CRM involves converting _____ into contacts.
6. The "Send Mail" button in the Contacts Home Page allows users to send _____ to selected contacts.
7. The "Timeline" view on the contact's details page shows a history of actions in the last _____ months.
8. The "Action" button on the Contacts Home Page allows for mass _____ or transfer of records.
9. The "Advanced filters" in Zoho CRM help in sorting contacts according to _____ priorities.
10. Predefined system list views such as "My Contacts" or "New This Week" are available for use in the _____ section.

C. State whether the following statements are True or False

1. The Web Form Capture method in Zoho CRM is used for importing contacts from external databases.
2. The process of cloning contacts allows for the creation of entirely new contacts from scratch.
3. The Contact Details page in Zoho CRM displays only basic contact information.
4. Outlook Contact Sync allows synchronization of contacts from Google Gmail to Zoho CRM.
5. Contacts cannot be associated with any other records in Zoho CRM.
6. The "Timeline" view on the contact's details page displays actions performed in the last six months.
7. The "Action" button on the Contacts Home Page in Zoho CRM allows customization of contact details.
8. Lead Conversion involves converting potential sales leads into contacts, accounts, and deals if required.
9. The "Send Mail" button in Contacts Home Page allows for sending mass emails to selected contacts.
10. The "Advanced filters" in Zoho CRM are only used for searching contacts alphabetically.

D. Answers the following questions in short

1. What are the various methods available to create contacts in Zoho CRM?
2. How can contacts be created through the manual entry method?
3. What is the purpose of web form capture in Zoho CRM?
4. Explain the process of creating contacts through lead conversion.

5. What is the advantage of using the Outlook Contact Sync feature in Zoho CRM?
6. How many ways are there to create contacts individually, and what are they?
7. Describe the steps to create a contact individually in Zoho CRM.
8. How can you clone existing contacts in Zoho CRM?
9. What information is accessible on the contact's details page in Zoho CRM?
10. How can contacts be associated with other records in Zoho CRM for a comprehensive view of engagements?

Module 4 Occupational Health, Safety and Security

Module Overview

The work culture in IT industry is different from routine office work, where working hours are also not fixed. Continuously working in front of the computer creates health problems especially in your eyes. Adopting the safe work practice in the work place, the productivity can be increased.

This Unit deals with the concept of working environment in IT industry. It focuses on safe working practices at work place. It explains about health-related problem caused by the wrong practices and its solution. It also gives the knowledge about resources required in workplace for smooth working. Further it explains how to deal with computer component and problem related to electrical hazards. It also explains workplace safety guidelines, workplace hazard and its control. The medical emergency situations and its solution is illustrated.

Learning Outcomes

After completing this module, you will be able to:

- Understand the essential health, safety, and security measures necessary to maintain a safe work environment and protect employees.
- Learn to identify and implement quality measures in the workplace to enhance productivity, efficiency, and overall service standards.
- Develop skills to respond effectively to workplace accidents and emergencies, including prevention strategies and emergency response protocols.

Module Structure

Session 1: Health, Safety and Security at Work Place

Session 2: Workplace Quality Measures

Session 3: Accidents and Emergencies

Session 1: Health, Safety and Security at Work Place

One evening we were travelling on the busy road of Mumbai. We were looking at the big and tall buildings. My friend was telling me that all these buildings hold different IT companies. Suddenly we find that there was a lot of smoke coming out of the one building. People working in that building were running away from the building and shouting about the fire. Soon we find that the fire alarm was ringing and fire brigade vehicles along with water tanks were approaching the building. People were telling that there are lot of casualties and the overall damage to the building was worth of several lakhs. This event reminds us the importance of health and safety at the workplace.

Fig. 1.1 Illustration of fire catches in the office building

1.1 Introduction to health, safety and security at work place

Every workplace accident, illness or dispute is a cost to organization, as well as a cost to injured individuals and their families. It is our responsibility to create a safe workplace. This will improve the work environment and the productivity. Employees have to take responsibility for their own health and safety rather than relying solely on the *"safety officer"* or management.

Health

Health of an employee is the state of the physical, mental and social well being. Every organisation must provide health and safety working environment for their employees at the workplace. Health of an employee must be in a good condition so that the employees of the organisation will not suffer from any diseases. Cleanliness at the workplace is mandatory. The work places must be cleaned in the morning before the people start working. If it is neat and clean then the people will feel happy to work in that environment. A proper air conditioning is mandatory to provide clean and cool air at the workplace. A properly filtered water facility must be available for the employees of the company. A fresh food cafeteria must provide the good quality food for the employees. This will help to maintain the health of the employee. The organisation should maintain a clean wash-room facility in good condition to be used by the employees.

Safety

The work environment of the organisation must be safe. It must be free from hazards and risk. A hazard is the something that can cause harm to the people. A risk is a probability of causing harm to the people. A proper safety guideline must be prepared by the company and it should be strictly followed. At regular intervals of time, the safety procedures must be practised by the employees.

Security

Every employee working in an organisation must feel that they are secured in the company campus. Security is a kind of freedom from any potential harm. Security ensures the safety of the people working in the organisation. Every organisation must have separate security department. This department should be responsible for various security such as personal safety, computer system safety, electrical safety, transport safety and other equipment safety. The proper security procedures will reduce liabilities, insurance and compensation for an organisation. This will increase the business revenue and will reduce the operational charges of the company.

1.2 Policies and procedures for health, safety and security

The Department of Information Technology (DoIT) has prepared the policy to provide employees with a healthy and safe work environment.

Definition

A health, safety and security policy is a written statement by an employer stating the company's commitment for the protection of the health, safety and security of employees and to the public. It is an endorsed commitment by management to employees regarding their health, safety and security.

A health, safety and security program/policy contains the health, safety and security elements of an organization and objectives which make it possible for the company to achieve its goal in the protection of its workers at the workplace.

The government has a specific section mentioned in their company laws, which states the minimum requirements to be followed for health, safety and security programme. Each employer or company should follow these requirements. Apart from that the company should also have their own health, safety and security committee to determine the hazards present at the workplace. Once these hazards are identified then their control measures should be specified in the health, safety and security programme.

Reasons for Health, Safety and Security Programs or Policies in Workplace

There are several reasons that can be specified for safety policy as given below.

- It clearly indicates the company's commitment for their employee's health and safety;
- It shows the performance of the business and the safety performance are compatible with each other;
- It clearly state that the company is not only doing the business for profits but it is taking care of all its stake holders.
- The accountability of every one working for the company is outlined for the workplace health, safety and security;
- Company can comply national policy on Occupational Health and Safety (OH&S) of Government of India;
- Injuries and illness of the employees is prevented through such policy

A typical policy of an IT company may contain the following OH&S clauses.

- Provide adequate resources to ensure continual improvement in its OH&S performance.
- Comply with relevant OH&S legal and other requirements applicable to the organisation and drive for 'beyond compliance' leadership.
- Set appropriate OH&S objectives & targets and conduct periodic performance reviews against these targets.
- Adopt measures and processes that focus on the prevention of occupation related accidents, injuries, illnesses, and near-misses and strive to continuously improve such processes.
- Ensure OH&S awareness and build competency associated at all levels to handle individual OH&S responsibilities.

Breaches in Health, Safety and Security and Accident Report

In today's highly connected world, a reputation is its most valuable asset. A single health and safety breach brings down the reputation of an organisation. Health and safety breaches can lead to costly legal battles, fines, and compensation claims. The negative impact can lead to a loss of trust, brand loyalty, and market share. So it is important to take care of health, safety and security breaches.

Safety breaches in the designated premises are "Incidents" that need to be reported and duly responded to. Reporting a safety breach is done by providing an Incident Report. Some important points in the operations related to reporting and response related to safety breach must be included Incident Report are:

- The person/s involved (details of the offender/s)
- What exactly happened
- Number of casualties
- Where it happened (location of the incident)
- When did it happen (Exact time, when the incident took place)
- Why it happened (factors that caused the incident; the holes and gaps in the existing security system)
- Description, features, peculiar features and condition of the affected people, vehicles, properties, and goods

The common format of the Incident Report is given below:

INCIDENT REPORT

Day/ Night: _____ **Date :** _____ **Time:** _____

Report Writer Name: _____

Co No. _____ **Section :** _____

Telephone No. _____ **Extension :** _____

INCIDENT (Summary – Who, What, Where, When, Why, How etc.)

_____

_____

_____

ACTION TAKEN BY SECURITY

_____

_____

_____

RECOMMENDATIONS/ COMMENTS/ REFERENCES:

_____

_____

_____

Copy to Client: _____ **Date:** _____

Creating reports with comprehensive information is a must for every organization. The main idea behind this is to let the management body of the company know the hazards at the workplace. With the help of such reports, the company can examine, pinpoint the

risks, and carry on the essential improvements within the organization. Because of such reports, companies can recognize long-term risks and short-term risks and achieve remedial actions for those risks. In case of security-related issues or health-related issues, it is always a better choice to inform your supervisor or seniors.

A company can function in a systematic, smooth and successful way if it looks after the satisfaction of its employees. OH & S is one of the safety platforms where every corporation has to meet the safety guidelines.

Government Agencies for Safety at Workplace

As per Indian constitution there are the specific articles to ensure occupational safety and health for workers are: 42, 39 (e, f), and 24. Some government agencies that look into the safety and security of individuals at the workplace are follows:

- Labour Departments (for both UT and State)
- Ministry of Labour
- Government of India
- NSCI (National Safety Council of India)
- National APELL (Awareness and Preparedness for Emergencies at Local Level)

1.3 Workplace Safety Hazards

The most common definition of hazard is *'a danger or risk'* that is associated with something. Something can even be considered a hazard if it would be a trigger for causing another hazard to become present, which could hurt someone or something in the area. Workplace hazards pose potential harm to people at work, and that can cause damage to the work environment and everything else in it. Hazards could cause adverse health effects and losses of property and equipment for organizations.

There is a common way to classify hazards, and not all these are present in all workplaces. In some industries like manufacturing and pharmaceuticals, there are biological and chemical risks that pose risks to the workers. Physical dangers are present as well in many industries where there is exposure to electricity, radiation, extreme pressures, noises and magnetic fields. On the other hand, ergonomic hazards are present in facilities where there are repetitive movements and where workstations are set up haphazardly. But it can be generalized that in all these classifications, there are always safety hazards that come up along with the highlighted workplace dangers.

Physical hazards – It is the risks arising from the physical work environment – floors, facilities, walls, and ceilings. Physical hazards could also mean working with machinery and electricity-operated machines. Work processes or specific assignments could also qualify as areas where physical hazards are present. There is a vast list of physical hazards across all industries, but when we look at one specific sector, these dangers are also particular to the work setting.

Falling off heights, slipping and tripping – The reasons for falling are attributed to faulty scaffolding and ladders, as a result of contact with electricity, and slipping or crashing into anything that throws the worker off balance. On the other hand, trips and slips happen right on lower levels, particularly the floor, on ramps and any uneven surface in the workplace. Various injuries result from simply tripping over things at work, while many more accidents take place when employees slip on the floor, from motorized vehicles or from scaffolding or ladders.

To avoid falls and slips, all things must be arranged properly. Any spilt liquid, food or other items such as paints must be immediately cleaned to avoid any accidents. Make sure there is proper lighting and all damaged equipment, stairways and light fixtures are repaired immediately.

Fig. 1.2 Falling off heights, slipping and tripping

Electrical hazards – There are many reasons why workers get electrocuted or suffer from electric shock at work. For the most part, it's due to coming in direct contact with live wires, or having indirect contact through a conductor. While not all electrical accidents lead to death, there are many life-threatening, severe and often permanent injuries that could result from it. At work, the common causes of electrical accidents are exposed, worn-out wiring, overloading of electrical outlets, ungrounded or faulty equipment, and unsafe use of electrical equipment. Employees must be provided basic knowledge of using electrical equipment and common problems. Employees must also be provided instructions about electrical safety such as keeping water and food items away from electrical equipment. Electrical staff and engineers should carry out routine inspections of all wiring to make sure there are no damaged or broken wires.

Fire hazards – Each establishment must comply with housekeeping standards to ensure fire safety. Everyone does not follow such requirements, and this leads to accidents resulting in fire. Such events not only damage vital workplace equipment, stock and other items, and the building; it could also lead to injuries among its employees. To avoid fire, it is very important that safety precautions are in place. The whole organization must also have first response and emergency mitigation systems in place. Employees should be aware of all emergency exits, including fire escape routes, of the office building and also the locations of fire extinguishers and alarms.

Health hazards – Health refers to the physical well-being of the workers, and this includes the condition of their skin, eyes, ears and all other body parts. But it also includes the health situation of what we cannot see upfront – their respiratory and cardiovascular system, and the nervous system. Hazards are present in most workplaces that could impact any part of the human body. For example, a noisy machine or factory environment could damage the sense of hearing of the workers. In the same manner, exposure to bright lights and toxic fumes and vapour could damage the eyes and nose. There are also more serious and long-term health issues arising from hazardous workplaces, such as damage to the lungs because of the exposure to harmful chemicals.

Fig. 1.3 Health hazards

Potential Sources of Hazards in an Organization

Bright light sources behind the display screen can create contrast problems, making it difficult to clearly see your work. Apply the following possible solutions to avoid this.

- Use blinds or drapes on windows to eliminate bright light. Blinds and furniture placement should be adjusted to allow light into the room, but not directly into your field of view.
- Use indirect or shielded lighting where possible and avoid intense or uneven lighting in your field of vision. Ensure that lamps have glare shields or shades to direct light away from your line of sight.
- Reorient the workstation so bright lights from open windows are at right angles with the computer screen.
- High contrast between light and dark areas of the computer screen, horizontal work surface, and surrounding areas can cause eye fatigue and headaches. So, use well-distributed diffuse light.

Hazards using computers – Hazards while using computers include poor sitting postures or excessive duration of sitting in one position. These hazards may result in pain and strain. Making the same movement repetitively can also cause muscle fatigue. In addition, glare from the computer screen can be harmful to the eyes. Stretching at regular intervals or doing some simple yoga in your seat can mitigate such hazards.

Handling office equipment – Improper handling of office equipment can result in injuries. For example, sharp-edged equipment, if not handled properly, can cause cuts. Staff members should be trained to handle equipment properly. A relevant manual should be made available by the administration on handling equipment.

Handling objects – Lifting or moving heavy items without proper procedure or techniques can be a source of potential hazard. Always follow approved procedures and proper posture for lifting or moving objects.

Stress at work – In today's organisations, you may encounter various stress-causing hazards. Long working hours can be stressful and so can aggressive conflicts or arguments with colleagues. Always look for ways for conflict resolution with colleagues. Have some relaxing hobbies for stress against long working hours.

Working environment – Potential hazards may include poor ventilation, chairs and tables of inappropriate height, hard furniture, poor lighting, staff unaware of emergency procedures, or poor housekeeping. Hazards may also include physical or emotional intimidation, such as bullying or ganging up against someone. The staff should be made

aware of the organisation's policies to fight against all the given hazards related to a working environment.

Hazard Control

Hazards that have been identified and assessed as priorities are required to implement adequate control measures. Control measures should follow the hierarchy with a strong emphasis on eliminating hazards at the source, whenever possible.

- Take all feasible measures to eliminate the hazard, for example, by substituting or modifying the process.
- If elimination is impractical or remains incomplete, take all feasible measures to isolate the hazard, for example, instituting engineering controls such as insulating noise.
- If it is totally impossible to eliminate or isolate the hazard, its likelihood to cause injury should be minimized. Ensure that effective control measures are being applied, such as installing proper exhaust ventilation and providing personal protective clothing and equipment that is properly used and maintained.

Safety Guidelines Checklist

1. Store all cleaning chemicals in tightly closed containers in separate cupboards.
2. Throw rubbish daily.
3. Make sure all areas have proper lighting.
4. Do not wear loose clothing or jewellery when working with machines.
5. Never distract the attention of people who are working near a fire or with some machinery, tools or equipment.
6. Shut down all machines before leaving for the day.
7. Do not play with electrical controls or switches.
8. Do not operate machines or equipment until you have been properly trained and allowed to do so by your supervisor.
9. Repair torn wires or broken plugs before using any electrical equipment.
10. Do not use equipment if it smokes, sparks or looks unsafe.
11. Cover all food with a lid, plastic wrap or aluminium foil.
12. Do not smoke in 'No Smoking' areas.
13. Report any unsafe condition or acts to your supervisor.

Summary

- Safety breaches in the designated premises are "Incidents" that need to be reported and duly responded to.
- The full form of EHS is Environmental Health and Safety.
- The first rescuers will make the vic m sit reach under their armpits and grab their wrist.
- Informa on based on organizational meetings with the Area Health and Safety Committee.
- One must rationally and critically think and assess the severity of the emergency and determine what requires to be done on an immediate basis.
- First Aid is an emergency care or treatment given to an ill or injured person before regular medical aid can be acquired.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. Workplace safety is essential in organisation (a) to avoid the accident and injury (b) to increase the productivity (b) to improve the work environment (d) All of the above
2. Which of the following is not mandatory to keep the good health of an employee (a) cleanliness (b) food court (c) clean and fresh air (b) clean washroom
3. The security department is not responsible for (a) personal safety (b) computer system and equipment safety (c) electrical safety (d) personal belongings
4. The proper security procedures will increase (a) liabilities, (b) insurance (c) business revenue (d) operational charges of the company.
5. Which kind of hazards can occur in IT industry (a) biological (b) chemical (c) physical (d) ergonomic
6. Which of the following can cause hazards while using computers (a) poor sitting postures or excessive duration of sitting in one position (b) lifting heavy object (c) mishandling of tools and equipment (d) improper handling of office equipment
7. Which of the following statements is likely to result in an injury to the operator? (a) Selecting the right tool for the job (b) Wearing safety goggles or glasses (c) Using a tool with loose handles (d) Keeping cutting tools sharp
8. What are the potential cause of hazards at workplace (a) poor ventilation (b) poor lighting (c) poor housekeeping (d) all of above

B. Fill in the blanks

1. Health of an employee is the state of the physical, _____ and _____ well being.
2. The workplaces must be cleaned in _____ before the people start working.
3. A proper _____ provides clean and cool air at the workplace.
4. A fresh food cafeteria helps to maintain the _____ of the employee.
5. The work environment of the organisation must be_____ and free from _____ and _____.
6. The proper security procedures will increase the _____ and will reduce the _____ of the company.
7. Injuries and illness of the employees is prevented through national policy on ___.
8. Physical hazards occur due to _____.
9. Electrical hazards mostly caused due to coming in direct contact with _____, or indirect contact through a _____ .
10. Hazards while using computers occur due to _____ or excessive duration of sitting in _____.

C. State whether True or False

1. The employer and employees are responsible for workplace safety.
2. Any injury at work should be reported to the supervisor immediately.
3. No matter how big or small the injury; the injured person should receive medical attention.
4. While working with machines and equipment, employees must follow the safety guidelines set by the company.

5. Bright light sources behind the display screen can create contrast problems
6. Exposure to bright lights and toxic fumes and vapour could damage the mouth and ears.
7. The use of personal protective clothing and equipment can control the hazards at the workplace.
8. Do not throw rubbish daily.
9. Proper handling of office equipment can result in injuries.
10. Stress at the workplace can cause hazards in today's organisation.

D. Short Answer Questions

1. Briefly explain the concept of health, safety and security at the workplace.
2. State the most important reasons for health, safety and security programs in workplace
3. List out the various workplace safety hazards.
4. List out the potential sources of hazards in an organization.
5. List some of the IT workplace hazards.
6. What are the examples of potential hazards?
7. Describe information technology workplace hazards?
8. What are the workplace safety rules?
9. List out different safety guidelines?
10. Describe the type of emergency with an example?

Session 2: Workplace Quality Measures

In any organisation it is necessary to maintain a good air quality to improve the working capabilities of employees. Pollution free air is an essential requirement for any organisation. Also most of the IT companies make use of a centralised air conditioning system to keep the temperature of the working place at a pleasant level. Water pollution is another problem faced by many organisations. Most of the human activities make water polluted. The polluted water may cause the disease. So an organisation must ensure to prevent air pollution or water pollution.

Fig. 2.1 Air pollution and water pollution

2.1 Air and water quality monitoring process

Air and water pollution can be analysed by using several methods. There are three common forms of analysis – physical, chemical and biological. For such analysis samples can be collected in the surrounding region of the organisation. The water and air samples can be analysed by performing some physical, chemical and biological tests.

The temperature and content of the sample can be easily measured. For example, the various gases or percentage of various gases such as oxygen, nitrogen, carbon dioxide present in the air can be measured. The PH value of the water can be measured through chemical analysis. The effect of air and water on these plants and animals is studied. The microbial indicators are used to monitor the health of the ecosystem.

Guidelines for clean air and clean water.

A proper guideline may be followed by organisations to keep the surrounding air and water clean. Some of the points of such guidelines can be.

1. Air pollution is mostly caused by production of the dust, a mixture of solid particles and gases in the surrounding air. So avoid dust production, generation of solid particles and gases in the air.
2. Extensive use of automobile vehicles in the campus can lead to air pollution. So organisations must use a limited number of vehicles to avoid air pollution. Practice a no vehicle day every week.
3. Ozone produced in the air can pollute the air. Many times it is called smog. The generation of ozone gas must be kept at low level by the organisation.
4. Most of the human activities make the surrounding water polluted. The sewage or the wastewater can also cause water pollution. Take care that their waste is not mixed with the surrounding water.
5. Extensive use of fertilizers and pesticide must be avoided as it can make the ground water polluted.

2.2 Importance of cleanliness at workplace

It is always safe to keep your workplace clean to avoid hazardous work. The poor handling and storage practices result in damages. A clean work station makes your job easier and more pleasant. Common areas should be cleaned up by all personnel, when necessary.

- All areas must be kept neat and clean. Each employee is responsible for the cleanliness of their work area and all tools and equipment used.
- Spills and breakage are to be cleaned up immediately.
- Spaces around machines and equipment should be kept clear and clean at all times to permit free movement.
- Floors should be kept clean and clear to prevent slipping and collision.
- Lighting fixtures are to be checked regularly to permit clear vision. Faulty lights should be reported to administration, so that building maintenance/ facilities can be contacted to rectify the situation.

2.3 OFFICE ERGONOMICS

Ergonomics is the science concerned with designing and arranging things so that people can use them easily and safely. Applying ergonomics can reduce the potential for accidents, injury to improve performance and productivity. In an office setting, the repetition of a seemingly innocuous task over a period of time can cause an injury. The resulting injuries can be physically painful and rehabilitation can be difficult and time consuming. The following office ergonomics emphasize the identification of early warning signs.

Early Warning Signs	Potential Cause	Try This
Sore lower back	No lumbar support	Use backrest of chair, put small pillow or lumbar support on backrest of chair
Burning in the upper back	No upper back support from chair	Put document holder or prop up so you can see without leaning forward

Stiff neck	Working with head turned to side tilting head forward holding telephone between the ear and shoulder	Move or raise monitor to centre of desk check if headset is available
Sore shoulders	Reaching forward for long periods or reaching forward frequently	Move closer to the keyboard, Bring mouse down to level of keyboard or 1" higher
Arching wrists	Working with wrists extended too much repetition	Add a wrist rest to the front of keyboard and mouse pad rest thumbs on front edge of keyboard so wrists can't drop.
Dry eyes	Forget to blink	Rest eyes periodically and do simple eye exercises
Eye strain and sore eyes	Glares from overhead lights or windows eye glasses not correct need vision check	Re-orient your desk and computer so light is not directly behind or in front of you.

Computer Health & Safety Tips

With the increased use of computers, several health and safety issues related to vision, musculoskeletal issues, body aches and pains may occur. Many of these issues are preventable and if incurred are temporary. They can be resolved by adopting simple corrective action.

Musculoskeletal Problems

This problem includes different areas of your body such as neck, back, chests, arms, shoulders and feet. It occurs because of your wrong posture, uncomfortable chair for sitting that is not ergonomically correct while working on the computer.

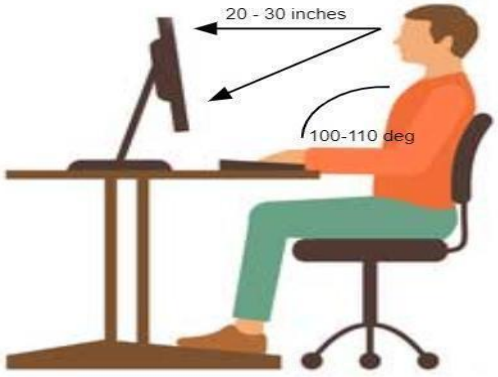


Fig 2.2 Ideal Neck and Monitor position

To avoid this problem,

- Position your computer such that the end of the monitor should be at your eye level.
- Keep the neck neutral with a monitor directly ahead to prevent turning your neck.
- Keep your monitor at least arm length distance, or 20 to 30 inches away from you.
- Maximize contact of your back against the backrest of the chair.
- Adjust height of armrests so that your elbows are at a 100-110 degrees open angle.

- Place the keyboard at a slight negative tilt if you are sitting upright.
- While typing, keep your hands slightly lower than elbows, with fingers pointing downwards at the floor.
- Minimize any twisting of your wrists from side to side or up and down.
- Use a keyboard palm rest as needed only when you are not typing. Do not rest your wrists when typing. It leads to wrist strain.
- Always take small breaks while working on the computer to stretch your muscles, keep your blood flowing, and to rest your eyes.

Occupational Overuse Syndrome

Occupational overuse syndrome, also known as repetitive strain injury (RSI), is a collective term for a range of conditions, characterized by discomfort or persistent pain in muscles, tendons and other soft tissues, with or without physical manifestations. It is usually caused or aggravated by work, and is associated with repetitive movement, sustained or constrained postures and/or forceful movements. Psycho-social factors, including stress in the working environment, may be important in the development of occupational overuse syndrome.

Repetitive use of muscle may feel pain in your neck, shoulder, wrist or fingers. One of the most common conditions related to repetitive use of muscles when using the computer is *carpal tunnel syndrome*. It causes pain, numbness, and tingling in the hand and arm as shown in Figure 2.3.

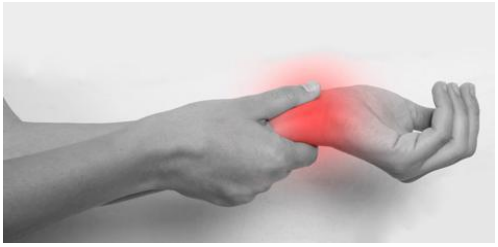


Fig 2.3 Symptoms of carpal tunnel syndrome

Ensure that you use appropriate posture when typing. For example, your fingers should be above the *'home position' (asdf and jkl; keys)* on the keyboard, when your elbows are by your sides. Users should avoid gripping the mouse too tightly. The keyboard and mouse should be kept at the same level. In addition, use of ergonomic keyboard and mouse help to reduce the risk of wrist related conditions.

Strain in Legs and Feet

Sitting to work for a long time may cause strain in the legs. Position your desk chair to sit comfortably with your feet flat on the floor and your lower legs vertical. Use a footrest for more support. Make sure that there's enough space to change position and stretch your legs out every now and then, too.

Eye Strain

Computer's bright light, glare and flickering images can cause eye strain and visual fatigue. When you constantly focus on the screen, you forget about blinking your eyes that can cause drying eyes. Computer Vision Syndrome is caused by poor lighting and glare on the computer screen. Both of these factors place strain on the user's eyes, causing blurry vision, burning and/or watering eyes, headaches and in some instances shoulder and neck pain. It is important to look after your eye health. Specifically, wear anti-glare glasses to work on the computer.

To reduce the risks of visual problems:

- Adjust the brightness of the computer screen to save your eyes from strain.
- Reposition the screen to avoid glare from lights or windows.
- Keep a proper vision distance from the computer screen and blink your eyes in an interval.
- Wear anti-glare glasses while working on the computer.
- Keep the screen clean and use a desk lamp to make it easier to see.
- Ensure the screen colours so that the characters look sharp and legible.
- Give eyes periodic breaks to eyes from the screen and perform frequent blinking.
- Look away from the screen into the distance for a few moments to relax your eyes.
- Focus on something 30 metres away for 30 seconds every 30 minutes.
- Keep your monitor between 18 to 24 inches away from your face.
- Lastly, position monitors to avoid glare from sunlight and keep them clean.

Headaches

Headache may occur due to muscle tension or pain in the neck. Strain on the eyes or vision problems can also cause headaches. Attend regular eye exams to work toward correcting any vision problems. Try your best to keep your neck straight in front of the computer and take breaks.

Obesity

Spending long hours on computers may lead to a lack of physical activity and exercise. In children prolonged use of computers or electronics in general, is a major contributing factor to obesity. You should take a break and try to squeeze in some exercise until you go back to work.

Stress Disorders

Technology impacts our behaviours and emotions. Prolonged use of computers may be accompanied by poor health and increased pressure on you in your workplace, which may lead to stress. The longer the stress is untreated, the greater the chances of contracting more serious health problems. Stress can lead to decreased attention span, lack of concentration, dizziness and becoming easily burned out. To tackle this problem, promote your own health and prevent future health conditions or by seeking treatment options for any stress that you may encounter. Try things from yoga, to natural remedies, to medications as prescribed by a medical provider to combat your stress.

Injuries from Laptop Use

The growing use of laptops causes more pain and strain. Laptops are designed for short periods of use. In the present day individuals choose to use laptops over desktops more frequently, due to convenience. In a laptop the screen and keyboard are very close together and there is really no right way to use a laptop because if you position the screen at the right height for your back and neck, it will cause you to have to lift your arms and shoulders too high to use it and vice versa. It will probably cause a problem. To overcome this problem, you may use a desktop that is set up ergonomically-correct, while working for long hours.

Sleeping Problems

Artificial lighting from computer screens can trick your brain and suppress its release of melatonin substance that assists your sleeping patterns. To tackle this, refrain from using a computer right before going to bed.

Health and safety requirements for Computer workplace

The minimum health and safety requirements for computers including Desktop computers, Laptops, Tablets, Smart phones, Television screens and Video monitors are as follows:

Display Screen (Monitor) – Use the modern LED monitors of legible size and with adequate spacing between the characters and lines. The image on the screen should be stable, with no flickering or other forms of instability. The screen must be free of reflective glare and reflections liable to cause discomfort to the user.

Keyboard – The keyboard should tilt and separate from the screen to find a comfortable working position and avoid fatigue in the arms or hands. The space in front of the keyboard must be sufficient to provide support for the hands and arms of the user. The keyboard should have a matt surface to avoid reflective glare. The symbols on the keys must be adequately contrasted and legible from the design working position.

Work Surface – The work desk should be sufficiently large, low-reflectance surface and allow a flexible arrangement of the screen, keyboard, documents and related equipment. The document holder shall be stable and adjustable so as to minimise the need for uncomfortable head and eye movements.

Work Chair – The work chair must be stable and allow the user to move easily and find a comfortable position. It should be adjustable in height. The user's feet must be placed flat on the floor or a footrest should be used.

Space Requirements – The workstation should be designed to provide sufficient space for the user to change position and vary movements. The user should have enough desk space for the equipment they use.

Lighting – There must be satisfactory lighting conditions with appropriate contrast between the screen and background environment. Possible disturbing glare and reflections on the screen or other equipment should be prevented.

Reflections and Glare – Workstations should be designed so that sources of light, such as windows and other openings, transparent or translucent walls, and brightly coloured fixtures or walls cause no direct glare and no distracting reflections on the screen. Windows shall be fitted with a suitable system of adjustable covering to attenuate the daylight that falls on the workstation.

Noise and Heat – Noise emitted by equipment should not distract the attention. Noise cancelling earphones may provide a solution if some noise is unavoidable. The equipment may not produce excess heat which could cause discomfort to users.

Cautions while working on the computer

It is important to work safely on the computer. The static electricity generated just by walking on the carpet can damage computer components. So use a surge protector when you plug in the system. A battery backup system is the best way to protect against a power outage, as it provides the system with constant voltage.

Remove rings, watches and necklaces while working on the computer. These ornaments are made of conductive metals which can damage computer components by striking them with static electricity.

Unplug all power sources and cables from the computer. It is shown in Figure 2.4. If you are working with a plugged in computer then it might damage your hardware. Modern processors will overheat within 7 sec if the heat sink is not attached.

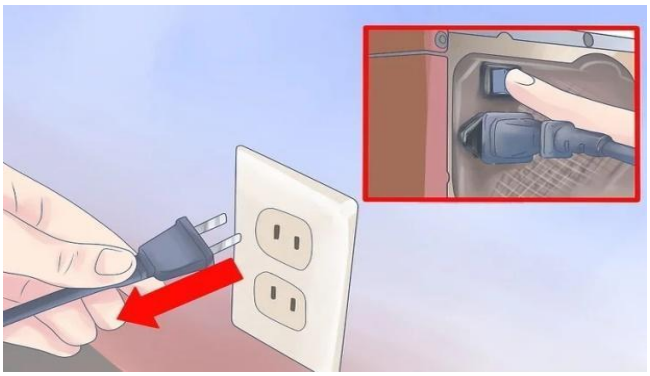


Fig 2.4 Unplug power source from computer

Watch out for cords and wires

Loose cords and wires can cause hazards and even electrical hazards as shown in Figure 2.5.

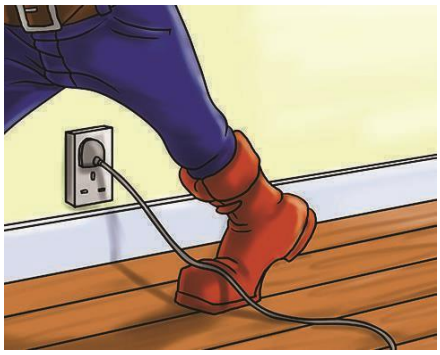


Fig. 2.5 Loose cord that can be hazardous

If a cord or wire will cross a pathway safety it should be marked with hazard tape as shown in Figure 2.6.

Fig. 2.6 Hazard tape

Avoid water at all times when working with electricity. As shown in Figure 2.7. Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the electrical conductivity of the body for the flow of electric current.

Fig 2.7 Avoid water while working with electricity

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. To provide healthy and safety working environment, every organisation must have (a) Cleanliness (b) Filtered water (c) Clean wash-room (d) All of the above
2. Air pollution is mostly caused by production of the _____ in the surrounding air (a) dust (b) mixture of solid particles (c) gases (d) All of above .
3. Repetitive use of muscle may feel pain in your (a) neck (b) shoulder (c) wrist or fingers (d) All of the above .
4. The security department organisation is not responsible for (a) other safety (b) computer system safety (c) electrical safety (d) transport safety
5. For an organisation, the proper security procedures will reduce (a) liabilities (b) insurance (c) business revenue (d) operational charges of the company
6. Do not wear _____ when working with machines. (a) jewellery (b) safety glasses, (c) masks (d) gloves
7. Sore lower back cause due to (a) reaching forward frequently (b) no lumbar support (c) no upper back support from chair (d) reaching forward for long periods
8. Sore lower back cause due to (a) reaching forward for long periods or reaching forward frequently (b) working with wrists extended too much repetition reaching forward frequently (c) no lumbar support (d) no upper back support from chair
9. What should you do with the problem of dry eyes (a) forget to blink (b) rest eyes periodically and do simple eye exercises (c) do exercise (d) blink the eyes.
10. If light is coming directly behind or in front of you then you may suffer from (a) Eye strain (b) sore eyes (c) dry eyes (d) eye strain and sore eyes

B. Fill in the Blanks

1. Air and water pollution can be analysed by using – physical, _____ and _____ analysis.
2. The PH value of the water can be measured through _____ analysis.
3. The _____ indicators are used to monitor the health of the ecosystem.
4. Ergonomics is the science concerned with _____ and arranging things.
5. Working with wrists extended too much repetition can cause _____
6. The repetition of a seemingly _____ task over a period of time can cause an injury.
7. If a cord or wire will cross a pathway safely it should be marked with _____.

8. Loose cords and wires can cause _____ .
9. Glare and _____ on the screen should be prevented.
10. The keyboard should have a matt surface to avoid _____ glare.

C. State whether True or False

1. The work environment of the organisation must be free from hazards and risk.
2. Practice a no vehicle day every week to avoid air pollution.
3. Applying ergonomics can improve performance and productivity.
4. Wear rings, watches and necklaces while working on the computer.
5. Never touch or try repairing any electrical equipment or circuits with wet hands.
6. Unplug all power sources and cables from the computer while working on the computer.
7. Occupational overuse syndrome, also known as repetitive strain injury.
8. The work chair must be stable and allow the user to move easily.
9. Artificial lighting from computer screens can cause sleeping problems.
10. The keyboard and mouse should not be kept at the same level.

D. Answer the following questions in short

1. What causes the water pollution?
2. What is occupational overuse syndrome?
3. What are musculoskeletal problems?
4. What cautions to be taken while working on the computer?
5. Why is there no right way to use a laptop?
6. What causes eye strain and how to avoid it?
7. What type of display screen is suitable to work on a computer?
8. What type of keyboard is suitable to work on a computer?

Session 3. Accidents and Emergencies

In an organisation, any small accident or unforeseen situation may turn into emergencies if not given due attention. The emergencies can be natural such as *floods, hurricanes, earthquakes* or man-made emergencies may include *fire, toxic gas releases, chemical spills, illness, explosions, and civil disturbances*. Such situations may disrupt or shut down your operations, or may cause physical or environmental damage. While no one expects such emergencies and disasters that can strike anyone, anytime, anywhere. The best way to protect yourself, workers, and organisation is to develop a well-thought-out emergency action plan to guide the employees in the event of an emergency. This chapter explains the general workplace hazards, its prevention, care and how to keep the workplace safe.

3.1 Accidents and emergencies

An accident is an unplanned, uncontrolled, or unforeseen event resulting in injury or harm to people and damages to goods. For example, a person falling down and getting injured or a glassware item that broke upon being knocked over. Emergency is a serious or crisis situation that needs immediate attention and action. For example, a customer having a heart attack or sudden outbreak of fire in your organization needs immediate attention.

Each organization has procedures and practices to handle and report accidents and to take care of emergencies. Although most of these procedures and practices are common across the industry, some procedures might be modified to fit a particular type of business within the industry. For example, procedures to handle accidents caused by slipping or falling will be similar across the industry. You need to be aware of the general procedures and practices as well as specific to your organization.

The following are some of the guidelines for identifying and reporting an accident or emergency:

Notice and correctly identify accidents and emergencies – You need to be aware of what constitutes an emergency and what constitutes an accident in an organization. The organization's policies and guidelines will be the best guide in this matter. You should be able to identify such incidents in your organization, and be aware of the procedures to tackle each form of accident and emergency.

Get help promptly and in the most suitable way – Follow the procedure for handling a particular type of accident and emergency. Promptly act as per the guidelines. Ensure that you provide the required help and support as laid down in the policies. Do not act outside the guidelines and policies laid down even if your actions are motivated by the best intention. Only properly trained and certified professionals may be authorized to take decisions beyond the organization's policies and guidelines, if the situation requires.

Follow company policies and procedures for preventing further injury while waiting for help to arrive – If someone is injured, do not act as per your impulse or gut feeling. Go as per the procedures laid down by your organization's policy for tackling injuries. You need to stay calm and follow the prescribed procedures.

Act within the limits of your responsibility and authority when accidents and emergencies arise – Provide help and support within your authorized limit. Provide medical help to the injured only if you are certified to provide the necessary aid. Otherwise, wait for the professionals to arrive and give necessary help.

Promptly follow instructions given by senior staff and the emergency services – Provide necessary services as described by the organization's policy. Also, follow the instructions of senior staff who are trained to handle particular situations. Work under their supervision when handling accidents and emergencies.

Types of Accidents

The following are some of commonly occurring accidents in organizations:

Trip and fall – Customers or employees can trip on carelessly left loose material and fall down, such as tripping on loose wires, goods left on aisles, elevated threshold. This type of accident may result in simple bruises to serious fractures.

Slip and fall – Slips are mainly due to wet floors, spilling of liquids or throwing of other slip-causing material on floors. Slip and fall is generally caused by negligence. It can also be due to broken or uneven walking surfaces, such as broken or loose floor tile. People should be properly cautioned against tripping and slipping. For example, a *"wet floor"* sign will warn people to walk carefully on freshly mopped floors. Similarly, *"watch your steps"* signs can prevent accidents on a staircase with a sharp bent or warn against a loose floor tile.

Injuries caused due to escalators or elevators (or lifts) – Although such injuries are uncommon, they mainly happen to children, ladies, and elderly. Injuries can be caused by falling on escalators and getting hurt. People may be injured in elevators by falling down due to sudden, jerking movement of elevators or by tripping on elevators' threshold. They may also get stuck in elevators resulting in panic and trauma. Escalators and elevators should be checked regularly for proper and safe functioning by the right person or department. If you notice any sign of malfunctioning of escalators or elevators, immediately inform the right people. If an organization's procedures are not being followed properly for checking and maintaining these, escalate to appropriate authorities in the organization.

Accidents due to falling of goods – Goods can fall on people from shelves or wall hangings and injure them. This typically happens if pieces of goods have been piled improperly or kept in an inappropriate manner. Always check that pieces of goods are placed properly and securely.

Accidents due to moving objects – Moving objects, such as trolleys, can also injure people in the organization. In addition, improperly kept props and lighting fixtures can result in accidents. For example, nails coming out dangerously from props can cause cuts. Loosely plugged in lighting fixtures can result in electric shocks.

3.2 Handling Accidents

Try to avoid accidents in your organization by finding out all potential hazards and eliminating them. In case of an injury to a colleague due to an accident, do the following.

- Attend to the injured person immediately depending on the level and seriousness of the injury, see that the injured person receives first aid or medical help at the earliest.
- Inform your supervisor about the accident giving details about the probable cause of the accident and a description of the injury.
- Assist your supervisor in investigating and finding out the actual cause of the accident. Help your supervisor to take appropriate actions to prevent occurrences of similar accidents in future.

3.3 Types of Emergencies

It is important to have policies and procedures to tackle the given categories of emergencies. You should be aware of at least the basic procedures to handle emergencies. Here are some general emergency handling procedures to follow:

First Aid – First-aid kits should be quickly accessible to the employees. It should contain all the important items for first aid required to deal with common problems such as cuts, burns, headaches and muscle cramps.

Electrical Safety – Employees must be provided instructions about electrical safety such as keeping water and food items away from electrical equipment. Electrical staff and engineers should carry out routine inspections of all wiring to make sure there are no damaged or broken wires.

Keep a list of numbers to call during an emergency, such as those of police, fire brigade, security, and ambulance.

Regularly check that all emergency handling equipment such as the fire extinguisher and fire alarm system are in working condition.

Ensure that emergency exits are not obstructed and keys to such exits are easily accessible. Never place any objects near the emergency doors or windows.

Emergency Procedure and Reporting Accident

Follow the organization's emergency procedures quickly, efficiently and calmly

Evaluating the Emergency

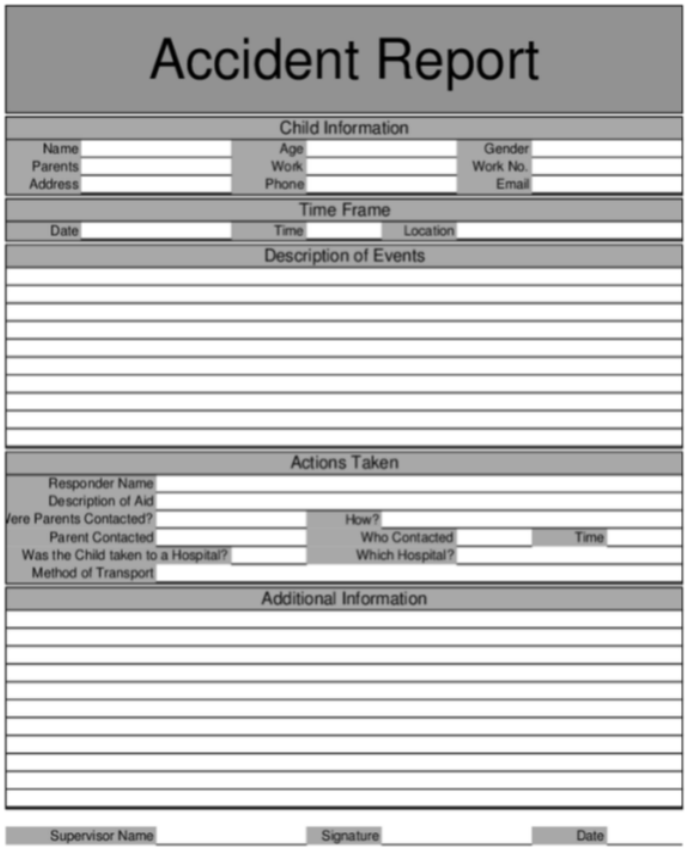
- One must rationally and critically think and assess the severity of the emergency and determine what requires to be done on an immediate basis.
- One must remain calm and composed during an emergency situation since stress during an emergency complicates things and may confuse a person.
- The emergency dispatcher aims at providing instant and appropriate help based on the nature and degree of emergency.
- One must look for additional help by calling up the emergency toll-free number, which would help the caller reach an official or 'dispatcher'.
- One must help the dispatcher by answering his/her questions and providing the dispatcher with the precise location and nature of the emergency.
- It is suggested that one should call from a GPS equipped phone so that the dispatcher is able to track the location, even if the caller is unable to speak.
- One must be aware of the nature of the emergency, i.e. whether it is a medical, mental health or behavioral emergency.
- One must evaluate the immediate threats, for example, in case a person is severely injured from a running machine, the machine must be turned off instantly to prevent others from getting hurt as well.

Handling the Emergency

- Extremely high casualties must be informed to the Occupational Health and Safety Committee (OHSC).
- One must move from the emergency spot and help others follow the same.
- Secondary Hazards must be removed or mitigated, at least. For example, a car accident comprises the risk of a violent explosion and fire outbreak resulting from spilled fuel.
- One must not feel guilty if nothing can be done to help the others.
- In case nothing can be done to lessen the severity of the situation, one must provide support to others by uplifting them mentally, inquiring about their medical history, noting events as they occur. This information may prove vital for the emergency response team.
- One must help the other victims and take suitable measures to assist the specially abled ones.
- One must refrain from moving a severely injured victim and provide only the basic first aid.
- Once the emergency team arrives, assist them with all required and relevant information.
- A First Aid kit must be used if required.

- One must try reviving a seemingly unconscious victim by rubbing the chest, pinching the earlobes, providing Cardiopulmonary Resuscitation (combination of chest compression and artificial respiration).

Sample form of Reporting Accidents



Accident Report

Child Information

Name		Age		Gender	
Parents		Work		Work No.	
Address		Phone		Email	

Time Frame

Date		Time		Location	

Description of Events

Actions Taken

Responder Name					
Description of Aid					
Were Parents Contacted?		How?			
Parent Contacted		Who Contacted		Time	
Was the Child taken to a Hospital?		Which Hospital?			
Method of Transport					

Additional Information

Supervisor Name		Signature		Date	

1. Work safely complying with health and safety legislation, regulations and guidelines

- Ensure that all emergency route maps are displayed in the accessible places on all floors of the building.
- Ensure that appropriate Fire Extinguishers are present on all the floors of the workplace.
- Learn and abide by company policy and procedures for dealing with security risks in the establishment.
- Ask your supervisor how you may retrieve PPE and its maintenance and storage.
- Stay aware that confined spaces must bear suitable signs, to restrict claustrophobic people from accessing them.

2. Ensure that health and safety instructions applicable to the workplace are being followed

- Lighting should be satisfactory in all areas and additional bulbs should be kept handy.
- While using cutting tools, the direction of cutting should always be away from your body.
- Arrange for frequent Safety Drills and Trainings to employees for safety awareness.

- Ensure that all manual cutting tools must be honed in advance because blunt tools may slip and lead to deep cuts.
- Have a clear idea of how much authority and accountability you have to deal with security risks, including your legal rights and duties.
- Learn and abide by company policies and procedures for maintaining security.

3. Check the worksite for any possible health and safety hazards

- Employ a Safety Supervisor in the workshop.
- Have your employer develop a daily checklist for all areas delegated to suitable employees.
- This Safety Supervisor will stay accountable for checking the worksite for potential health and safety hazards.

4. Follow manufacturer's instructions and job specifications relating to safe use of materials specifically chemicals and power equipment

- Ensure that all Chemical Solutions used on display shelves or for Housekeeping purposes must be used only after mentioning to the relevant MSDS (Material Safety Data Sheets) or Instruction Manuals.
- Loosely fitted clothes must be totally avoided because the loose ends may get caught in powered machinery and tools and may be lethal.
- Ensure that you read the Instruction Manual thoroughly before using powered tools and equipment.

5. Follow electrical safety measures while working with electrically powered tools & equipment

- Powered tools and equipment must be reviewed for any damage, before and after every use.
- Damaged switches must be reported to the supervisor and repaired with immediate effect.
- Plugs must be checked for missing or faulty prongs / pins.
- The power cord must be assessed carefully for any fraying, faults, cracks or loss of insulation.

6. Ensure safe handling and disposal of waste and debris

- All walkways should be free of clutter and debris, to avoid trips and falls.
- Any spill should be cleared off instantly and *'Wet Floor'* or *'Work in Progress'* signs should be used in suitable places.
- Store equipment, Tools and Chemicals should be stored correctly, abiding by all instructions provided in the Instruction Manual and *'Directions for Use'*.

7. Ensure electrical safety compliances and EMI/EMC hygiene requirements are met as per the guidelines

The risks associated with the use of electrical equipment are extended to both the user and the workplace. Few of such risks are mentioned below:

- Lethal Electrocution accidents.
- Non-fatal electric shocks leading to serious burn injuries.

- Non-fatal severe shocks leading to damages caused to the internal tissues and vital organs like the brain and the heart.
- Non-fatal yet painful static electric shocks.
- Falls from cranes, ladders, and scaffolding and resulting mechanical injuries due to electric shocks.
- Explosions and fire outbreaks caused by the sudden ignition of flammable materials.
- Health issues like nausea, muscle spasms, unconsciousness, and palpitations.

3.4 Evacuation

Environmental Health and Safety (EHS) studies and deploys the practical aspects of environmental protection and safety at work. Simply, it is what organizations and workshops must do to ensure that their actions do not cause harm to anyone. The EHS commands that there must be specific escape routes or safety evacuation points. This includes thorough plans or blueprint of the building which is understandable to anyone. Each floor of the workshop or building must have the Safety Evacuation Map as shown in Figure 3.1

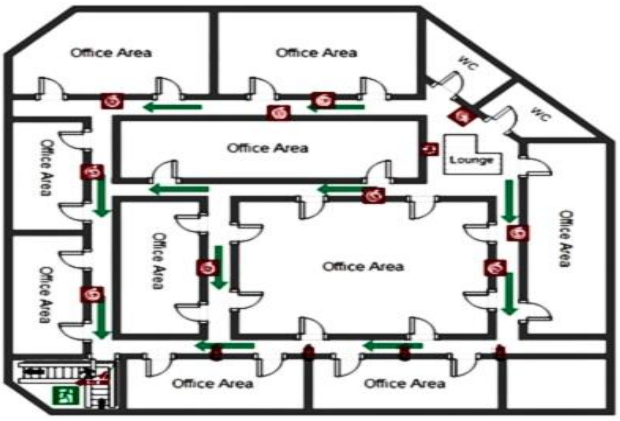


Fig. 3.1: Emergency Evacuation Plan

These are mainly applicable for cases of Fire outbreaks or natural calamities like Earthquake and Flood. It is critical for employees to know who is the coordinator or authority to make decisions during emergencies. The coordinator should be responsible for handling the evacuation process.

The sequence of an Evacuation situation is given below:

1. Detection
2. Decision
3. Alarm
4. Reaction
5. The movement to an area of refuge or an Assembly sta on
6. Transportation

3.4.1 General Evacuation Procedures

Each organization has its own evacuation procedures as listed in its policies. You should be aware of these procedures and follow them properly during an emergency evacuation. In addition to organization's policies, here are some general evacuation steps useful in such situations,

- Leave the premises immediately and start moving towards the nearest emergency exit.
- Guide your customers to the emergency exits.
- If possible, assist the person with disability to move towards the emergency exit.
- You may carry your hand-held belongings, as you move towards the emergency exit. Do not come back to pick up your belongings unless the area is declared safe.
- Do not use the escalators or elevators (lifts) to avoid overcrowding and getting trapped, in case there is a power failure. Use the stairs instead.
- Go to the emergency assembly area. Check if any of your colleagues are missing and immediately inform the person concerned.

Safety Signs

Fig. 3.2 (a) Safety signs

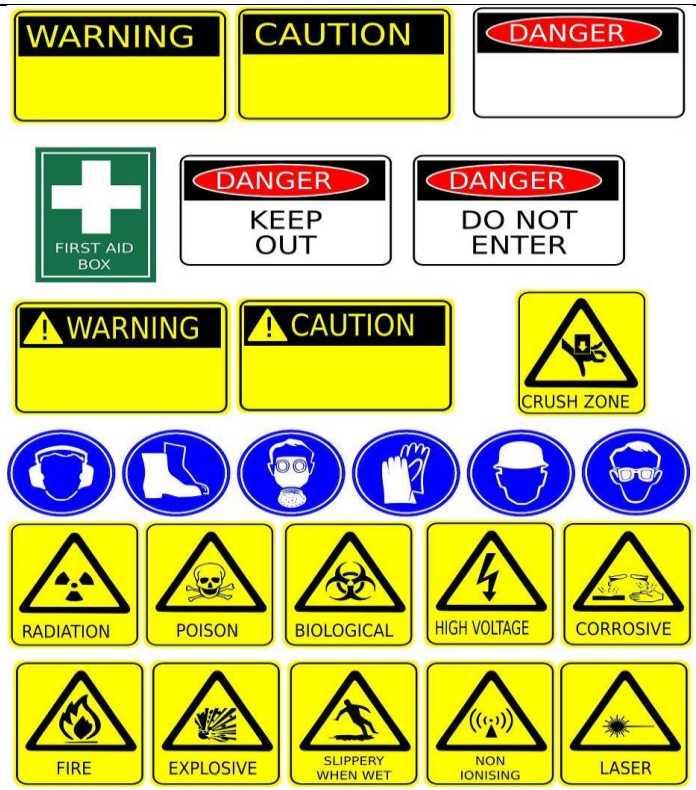


Fig. 3.2 (b) Safety signs

Fire Hazards in the Workplace

The first step to fire safety is assessing the existence of fire hazards in the workplace. In most facilities, there are three main types of hazards to evaluate – electrical hazards, combustible materials, and flammable materials.

Electrical issues, such as damaged extension cords, blocked electrical panels and heaters, and overloaded circuits often lead to fires. Fires are also commonly caused by electrical events such as arc flash. Maintenance of power cords and other electrical equipment should be conducted on a regular basis.

Workplace fires are also commonly caused by improper storage of flammable material or combustible dust. Both are dangerous and should be properly handled and stored. Dust explosions can be another cause of fire hazard.

Fire Safety

There are basically three methods with the help of which people can be rescued from a building engulfed in fire. To ensure on-site reception, here are two of the important steps that must be taken into consideration. These come under the best safe carrying and lifting practices.

1. Conventional Technique

This is a good method if there is an open area nearby. The first rescuers will make the victim sit, reach under their armpits and grab their wrist. The other rescuer will cross the ankle (victim) and pull up that person's legs on his shoulder. Finally, on the count of 3, both will lift the person up and move out.

2. Bomb Threat

During the Bomb Threat, don't panic and try to keep calm. Open the emergency exit gate so as to propagate the evacuation process. (Figure 3.3) Think ahead and consider places where a bomb can be planted.

Don’t assemble in the common assembly area because terrorists want to kill as many people as possible. The common assembly area is the place where the evacuees assemble and therefore the possibility of killing a maximum number of people is in the common assembly area. Always assemble at a place which is not premeditated.

Inform the local police immediately. Evacuate immediately after receiving a bomb threat and don’t wait until something is found after investigation. Document everything and submit the documentation to the concerned authority. If anything suspicious comes into sight, barricade it with red ribbon maintaining a diameter of 100 meters. Ensure that no one comes within the boundary. Bring sandbags and put them around the barricade to minimize the effect of the blast. Don’t try to touch any suspicious object and wait for the police to arrive at the spot to diffuse it.

Fig 3.3 Proper Evacuation Procedures During Bomb Threat

For Fire Outbreak

The emergency and evacuation procedures are given below:

- A clear passageway must be present to all escape routes.
- Signage like escape routes should be clearly marked.
- Don’t use the Elevator during a fire.
- All people at the workplace must be given brief instructions about the positions of the escape routes.
- Enough exits and routes must be there for all people to escape.
- Emergency lighting (Infrared lights for night and blurred vision) must be present.
- Emergency doors, that open easily, must be present.
- Brief instructions must also be given regarding the availability and use of fire extinguishers.
- The workplace must have a safe meeting point or assembly area for the staff.

Correctly demonstrate rescue techniques applied during fire hazard:

1. Responding to Fire

- The Fire Alarm System must be initiated and an alert must be raised.
- The appropriate class of Fire Extinguisher must be chosen.
- A safe evacuation path must be identified before dealing with the fire.

- Immediate evacuation must be initiated if the extinguisher is exhausted and the fire still exists.
- Call the workplace security or the local emergency services.
- Summon the fire-fighting services at the earliest.
- Look out for the nearest emergency exit routes and call out for people, who you can take along with you.
- Always use a staircase and not the elevator.
- While opening a door, first touch the door with the back side of your palm.
- The P.A.S.S technique must be adopted for extinguishing the fire.
- Always move downstairs and avoid returning to the burning premises, till the fire-fighters arrive.
- As you move out of the building, gather people, whoever you come across.
- Stay as far as possible from smoke, because smoke may comprise toxic gases.
- Cover your mouth and nose with a damp cloth to protect yourself. If possible, help your colleagues (those who are with you) to repeat the same.
- Keep doors open, after you open them.
- Start moving out of the building and ask your colleagues to do so.
- Do not rush.

2. Initiate Evacuation

- Stop your work and move out safely and without spreading panic.
- Carry only the most important items like cell phones.
- Await instructions from the Safety Committee.
- Leave the workplace from the nearest door bearing an “Exit” sign.
- Report to the designated Assembly Area.
- Incorporate first aid treatment to anyone in need.

Fire Prevention

- All employees must know where the fire extinguishers are located, and how to properly use them.
- Fire extinguishers and First Aid Stations should be clearly marked with signs.
- Never block access to Exits, fire extinguishers, electric switches and panels.
- Do not block or stack material against doors, which would prevent them from operating properly in the event of a fire.
- Do not use flammable material near electrical panels, switches, lift trucks or any electrical equipment.
- Make sure all equipment is properly grounded where needed.
- Fire extinguishers must be inspected regularly.
- Report to your supervisor any defect in electrical, fire prevention or material handling equipment.

- No flammable materials are to be placed around an exit doorway.

Identification of Materials and Ignition Sources

Materials are classified by risk, and are sorted according to these fire classifications:

Class A Materials – materials such as wood, cloth, and paper, which won't ignite on their own but will continue to burn once exposed to a heat source.

Class B Materials – all liquid, grease, and gas materials that burn when exposed to ignition sources.

Class C Materials – electrical materials and equipment. These materials cause fires very quickly and present a serious risk of arc flash.

Class D Materials – any materials that are volatile and able to quickly ignite, such as magnesium, potassium, and sodium.

Examples of ignition sources include:

Open flames such as gas ovens, lighters in smoking areas, and welding torches.

Sparks from wood or metal saws and other types of equipment.

Heat sources such as combustion engines, space heaters, ovens, and machines that produce heat during operation.

Chemical ignition from chemicals that combust under normal working temperatures.

Select the suitable type of fire extinguisher					
	Water CO_2	**Dry chemical powder**	**Carbon dioxide**	**Mechanical foam**	**ABC dry powder**
Class A	Suitable	Not suitable	Not suitable	Suitable	Suitable
Class B	Not suitable	Suitable	Suitable	Suitable	Suitable
Class C	Not suitable	Suitable	Suitable	Not suitable	Suitable
Class D	Not suitable	Suitable	Not suitable	Not suitable	Suitable

Fire Extinguisher

A fire extinguisher is a protection device used to extinguish fires. It is a cylindrical pressure vessel containing an agent which can be discharged to extinguish a fire. The Figure 3.4 shows the different parts of the fire extinguisher.

Fig 3.3 Fire extinguisher with its parts labeled

The method of using a fire extinguisher is to follow the method: P.A.S.S.

To use an extinguisher in a proper way, follow the PASS method. PASS is the acronym for:

Pin (P) – The first step is to pull the handle's pin

Aim (A) - The next step is to aim the extinguisher's nozzle. The direction should be toward the fire's base. This is because the sprayed foam at the top will diminish or extinguish only the fire at the top. This will not serve the purpose for which the extinguisher is used and the burned down flame may spring up to life if it gets enough oxygen or any combustible material.

Squeeze (S) – Then in an extremely controlled manner, squeeze the trigger to release the agent.

Sweep (S) –Sweep the extinguisher's nozzle from left to right. Continue with this process until you put out the fire as you need to act fast as most extinguishers' discharge time is nearly 10-20 seconds. The following activity will demonstrate the operation of a fire extinguisher.

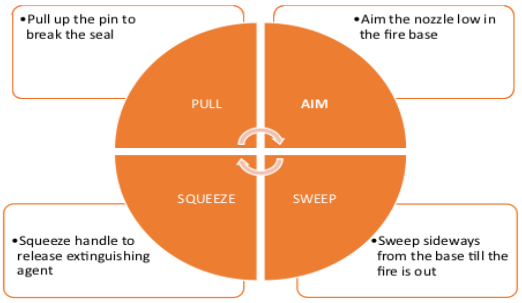


Fig 10.3.1 P.A.S.S Technique for Fire Fighting

Activity

Practical Activity – Demonstrate the operation of a fire extinguisher.

Procedure

Step 1. Identify the safety pin of the fire extinguisher, present in its handle.

Step 2. Break the seal and pull the safety pin from the handle.

Step 3. Use the fire extinguisher by squeezing the lever.

Step 4. Sweep it from side to side. It is shown in Figure 3.5.

Fig 3.5 Steps to open the seal and safety pin

For Natural Calamities / Disasters:

2. Flood and Storms

The emergency and evacuation procedures are:

- Move to the high grounds and help others move before the flood strikes
- Stay alert, avoid panicking and monitor the surroundings with eyes and ears open
- Accumulate disaster supplies like:
  - Canned, dry, ready-to-eat and packaged food, which do not require refrigeration or cooking
  - Liquid cash
  - Drinking water in clean containers
  - First Aid Kit
  - Adequate batteries
  - Flashlights
  - Essential clothing
- Instruct people around you not to drive.
- Shut off the Mains Supply (electricity) at the circuit breakers.
- Do not walk or swim through the flooded water.
- Stay alert for evacuation calls and help people identify alternate routes of getting there.

3. Earthquake

The emergency and evacuation procedures are given below:

- Inform others in the area by raising an alarm if they have not heard it while you are evacuating yourself.
- Quickly shutdown any hazardous operations or processes.
- Exit the room.
- Take jackets or other relevant clothing material needed for protection from the weather.
- If possible, close windows and doors as you leave, but avoid locking the doors and emergency exit routes.
- Exit the building and walk to the nearest safe exit route.
- Do not run.
- Do not use elevators.

4. For Accidents

The emergency and evacuation procedures are:

- Summon emergency medical help by ringing the Safety Committee officials or the toll-free number.
- One must inform the immediate supervisor about an injury or illness.

- Check and examine the site, to gather as much information as possible, so that the same can be provided to the emergency team, once it arrives.
- One must extend help and assistance to others.
- If possible, workers may treat themselves to first aid or ask colleagues to do so.

5. The general steps involved in carrying out an evacuation are

- Stop your work and move out without spreading panic.
- Gather and carry only the most important items like cell phones.
- Report to the designated Assembly Area.
- Leave the workplace through the nearest door bearing an "Exit" sign.
- Await instructions from the Safety Committee.
- Incorporate first aid treatment to anyone in need.

6. Evacuation and emergency procedures for the specially abled

With Impaired Hearing, Turn lights on/off to gain the person's a en on, or specify directions with gestures, or write a note with evacuation directions. The Visually Impaired, Announce the type of emergency, Offer your arm for help.

People with Prosthetic Limbs, Crutches, Canes, Walkers, Evacuate these individuals along a route specially designated as injured persons. Accompany and assist the evacuation site if possible. Notify emergency crew of their location. Use a sturdy chair, or a wheeled one, to move the person to an enclosed stairwell.

Activity 2

Practical Activity 3.2. Prepare an Awareness Poster

Material Required: Pen/Pencil, colors, Sheet/Paper

Procedure

Prepare an emergency and evacuation procedures of the following:

- Earthquake.
- Flood and storms
- Fire

3.5 DEALING WITH EMERGENCIES

1. Emergencies at Workplace

An Emergency can be defined as a serious, unexpected, and dangerous situation requiring immediate action. Every organisation has an evacuation procedure. Every organisation also has an assembly point, within the organization compound or outside it, where all employees are expected to gather in case of an emergency evacuation. The team leader guides the team and takes them to a safe place. It is very important to assemble at the safe area immediately during an emergency evacuation.

If a team member does not reach the safe area on time, the team leader is responsible for his or her team member's safety.

- An unforeseen situation is one that:
- threatens the employees, customers or the public;

- disrupts or shuts down the operations;
- Causes physical or environmental damage.

Emergencies that require evacuation include:

- Fire;
- Explosion;
- Floods;
- Earthquake;
- Hurricane;
- Tornado;
- Toxic material release;
- Civil disturbance;
- Workplace violence.

2. Equipped for Emergency

Every company has:

- An evacuation policy. All the TIs are responsible for informing their employees about it.
- When the U is informing you about these details, pay attention. Negligence at this time could cost lives.
- A designated assembly point for emergencies. Ensure you know where it is.
- A 'buddy system' for individuals with special needs or disabilities. This system ensures that the differently abled are assisted and guided out of the premises or the impacted area properly. If you are a buddy to someone, ensure that your buddy is safely at the assembly point with you.
- Floor plans with evacuation routes in work areas. Ensure that you understand these so you can use it in time of need.
- Assembly areas. These are the areas where you are required to assemble after evacuation.
- Periodic evacuation drills. Ensure that you pay attention during these drills. You need to save your life and you can be helpful in saving someone else's life too.

Respond to Emergency Situation

Responding to an Emergency situation while working at the site involves the given steps:

1. Undertake first aid activities in case of any accident, if required and asked to do so.

First Aid is an emergency care or treatment given to an ill or injured person before regular medical aid can be acquired.

Before administering First Aid to a victim, one must check the category and degree of emergency and then apply the techniques accordingly.

***2.* Report hazards that you are not competent enough to deal with to the relevant person in line with the organizational procedures and alarm others who may get affected.**

As an important part of the emergency management procedure, any workplace must designate a Safety Committee, which comprises liable and senior people from all departments and teams. This committee would act as the legislative body, the authority and the first point of contact for reporting any hazard, potential risks / threats and emergency situations in the workplace. This committee would also be liable to conduct training sessions, safety audits, and drills, to help all employees prepare themselves for emergency and unprecedented situations. The list of the committee members, their designations and job titles, as well as contact numbers, must be listed and circulated among the employees as well as displayed at popular parts of the workplace, in the form of an Emergency

Furthermore, this list must be mandatorily included in every First Aid kit in the workplace premises, so that a person treating a victim with first aid techniques may call for additional help and report the accident.

Practice no Loss for Company Due to Safety Negligence

Safety negligence at the workplace or even at home can prove to be lethal to the individual. So to ensure that there no chances of safety carelessness, companies should follow these aspects:

- The companies should ensure that the wiring in the workplace is insulated.
- No malfunctioned machinery should be kept with the new or spare ones.
- No sharp objects or equipment are kept on the walkway.
- First aid kits should be kept either at the reception or in a separate medical supply area.
- There are no open or damaged sockets.

Practice regular safety drills for being prepared in the event of a fire or natural calamity

- The first step in this process is to raise the alarm as all companies and workshops do have push-glass fire alarm systems. Breaking the glass and pushing the alarm button should be the first step to let the people know that the building is on fire.
- On hearing the emergency evacuation alarm, the foremost thing that a person must do is cease and wind up all activities and look for an exit path.
- The next should be to find out the place where the fire started.
- It should be followed by tackling the fire with an appropriate fire extinguisher.
- Meanwhile, a person from that workshop or building should call for emergency help services like ambulance and fire brigade officers.
- People should take the stairs to get out of the office building instead of using the lift.
- Every company should keep folding wheelchairs so that company employees or even visitors can transport individuals with severe mobility impairments or health.
- It is important that all individuals emptying the building should be calm and composed.

Participate in Emergency Procedures

Raising Alarm – Fire Alarms may either have a "Break Glass" or a "Pull / Push" mechanism. In case of the break glass system, the glass sheet must be forcefully hit with a clenched fist. One must continue repeating the process until the glass breaks. In case of the "Pull / Push" systems, one must break the glass first and then either pull down or push up the lever to raise the alarm.

Correct Assembly Point – Proper instructions must be given to the workers about the site of and the directions to the correct assembly point in the workplace. Information about this must be given during mock evacuation drills and training sessions as well.

Safe and efficient evacuation – Suitable evacuation procedures must be adopted for the common public and for specially abled persons. Specially-abled persons must be helped to evacuate the place by giving them access to Wheelchairs and other aids.

Roll call – Once everybody has evacuated the building / workshop and arrived at the Assembly Point, Roll call or Head Count must be done to ensure that nobody is left behind in the affected area. This must be done mandatorily to ensure that everybody on the premises is safe.

Correct return to work – Evacuation must be conducted in a very streamlined, organized, and noiseless manner. Likewise, everybody, who had evacuated the workplace, must return to their respective locations/positions/seats, following normal or emergency routes, depending on whether the situation has been re-established to normal or not. Once everybody is back in place, another Roll call is taken.

Electrical Emergencies

Electrical accidents cause countless injuries. Electrocution is injury or death caused due to electric shock. It is shown in Figure 3.6. Injury could be minimised and many lives can be saved if proper rescue techniques and treatment are used. Electrical accidents may occur at any time or place. Timely response and treatment of victims is a major concern. When an electrical accident occurs, due to the effect of muscle cramping, a victim is often incapable of moving or releasing the electrical conductor. There should always be an emergency response plan for scheduled electrical maintenance or work.

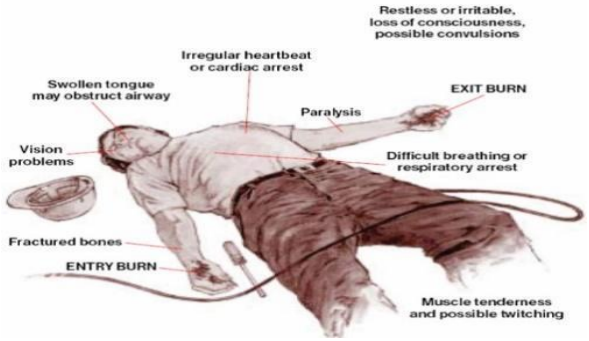


Fig. 3.6 An unconscious state because of an electrical shock

Electrical Rescue Techniques

Step 1. Approaching the accident

- The first step is to approach the accident spot cautiously. It is shown in Figure 3.7
- Call for help from a colleague, who is trained in treating electrocution victims.
- Inspect the accident scene to ensure if the source of electrocution is still active.

- Inspect if the victim is still in contact with the source of shock.
- Call 108 as soon as possible.

Fig. 3.7:

Fig 3.7 Approach the Victim and Inspect the Accident from a Safe Distance

Step 2. Examining the scene

- Visually examine victims to determine if they are in contact with energised conductors. It is shown in Figure 3.8
- Metal surfaces, objects near the victim itself may be energised.
- Do not touch the victim or conductive surfaces while they are energised.
- Touch the victim only if all power sources have been deactivated.
- Switch off the electrical circuits if possible.
- Detach the main power supply of the area.
- Dodge any electrical conductors in the surroundings.

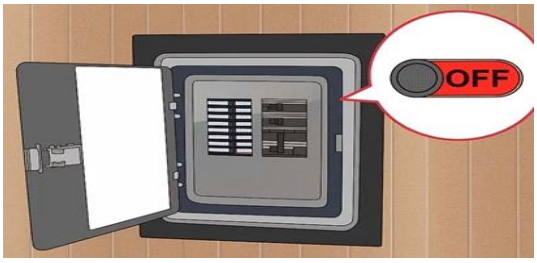


Fig 3.8 Disconnect the Source of Power

Hazards and solutions

- Be alert for hazards, such as heated surfaces and fire etc.
- In case it is impossible to deactivate the power supply, the victim must be removed from the location of the live power source.
- Wear appropriate insulating gloves and shoes to protect yourself from electric shocks. (Figure 3.9)
- Ensure that your hands and feet are dry.
- Use non-conductive material to remove a victim from the conductor.

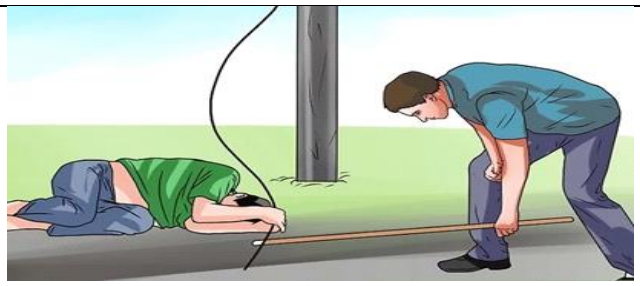


Fig 3.9 Use Insulators to Approach the Victim of Electrocution

- The victim must not be removed in case of neck or spine injury. (Figure 3.10)
- The area must not be crowded so as to allow sufficient breathing air.
- The victim's pulses and breathing rate must be checked.
- CPR may be provided if required.

Fig 3.10 Perform CPR if Required

Medical emergency

A medical emergency is an accidental injury or a medical crisis that is severe. It includes the situations where:

- The person is not breathing;
- Stroke or heart attack;
- Severe bleeding;
- Shock;
- Poisoning;
- Burns.

A medical emergency requires your immediate attention. Sometimes, even before you call emergency services for help. It is crucial to know the Emergency Medical Service (EMS) number for your safety and the safety of others.

Call EMS if:

A seizure happens to someone who is not known to have epilepsy or seizure disorder. It could be a sign of serious illness.

- A seizure lasts for more than five minutes.
- The person is slow to recover, has a second seizure or has difficulty breathing afterwards.
- Has another medical condition.
- The lady is pregnant.

- There are any signs of injury or illnesses.

Do not:

- Give the person anything to eat or drink.
- Restrain the person.
- Put anything between the person's teeth during the seizure.
- Splash or pour any liquid on the person's face.
- Move the person to another place (unless it is the only way to protect the person from injury).

1. Bleeding

Procedure to assist someone who is bleeding:

- Wherever necessary, apply additional pressure to help reduce bleeding.
- Apply direct pressure to the wound with a direct pressure bandage.
- Elevate the wound to slow the bleeding

2. Shock

Shock is made worse by fear and pain.

Procedure to assist someone who is in shock:

- Keep the person lying down, if possible.
- Elevate the person's leg unless you suspect a back injury or broken bones.
- Cover the person to maintain body temperature.
- Provide the person with plenty of fresh air and space.
- If the person begins to vomit, place him/her on his/her left side.
- Loosen restrictive clothing.
- If the person's condition seems to worsen, call EMS.

3. Fainting

Fainting is a brief loss of consciousness that is caused by a temporary reduction of blood flow to the brain. A person suffers from shock when the circulatory system fails and insufficient amount of oxygen reaches the tissues. If it is not treated quickly, vital organs can fail that ultimately cause death.

Procedure to assist someone who has fainted:

- Position the person by lying on their back and elevate legs.
- Check the person's airway to ensure it is clear.
- Check for signs of breathing, coughing or movement.
- Loosen clothing (neck ties, collars, belts etc.)
- If consciousness is not regained within one minute, call the EMS.

4. Muscle Cramps

Procedure to assist the person suffering from muscle cramps:

- Slowly stretch the affected muscle to counteract the cramp.
- Massage the cramped muscle firmly but slowly.

- Apply moist heat to the area.
- Get medical help if the cramp persists.

5. Strains and Sprains (R.I.C.E)

The steps to follow when assisting someone suffering from strain or sprain:

- Rest- Avoid movements and activities that cause pain.
- Ice- Ice helps reduce pain and swelling.
- Compression- Light pressure can be applied from using an elastic wrap or bandage. It helps reduce swelling.
- Elevation- Raising the affected limb reduces pain and swelling.

6. Fractures

A fracture is a break or crack in the continuity of the bone.

Symptoms:

- Pain at or near fractured site;
- Tenderness at or near the affected area;
- Swelling over the fracture site;
- Deformity e.g. irregularity of bone, angulation or rotation of limb, depression of bone etc.;
- Temporary loss of movement;
- Signs and symptoms of shock.

7. Dislocation

A dislocation is the displacement of one or more bones at a joint. It usually occurs in the shoulders, elbow, thumb, fingers and the lower jaw.

Symptoms:

- Pain at the site of injury;
- Limited movement at the joint;
- Deformity;
- Swelling;

8. Dislocation and Fractures

Steps to take when assisting someone suffering from a fracture or dislocation:

I – Immobilize the area. Stop any movement by supporting the injured area. Use pillows, jackets, blankets etc.

A – Activate Emergency Medical Services (EMS). Call your office medical helpline.

C – Care for the person if he or she seems in shock.

T – Treat any additional secondary injuries.

9. Early Warning Signs of an Asthma Attack

The early signs of an asthma attack:

- Coughing with no cold;
- Wheezing (however light) especially upon exhaling;

- Fast/irregular breathing;
- Anxiousness;
- Cyanosis (bluish skin colour);
- Nostrils flaring with each breath.

Procedure to assist someone suffering from an asthma attack:

Keep the person in a comfortable upright position leaning slightly forward. This is known as the 'tripod' position. Generally, the person will dictate what position is most tolerable to them. Usually, sitting up makes it easier to breathe. Check with the person first about the most comfortable position for him or her.

a) Try to calm and reassure the person.
b) Administer warm fluids if possible.
c) Ask the person about any asthma medication he or she may be using. Usually, the person will have an inhaler nearby.
d) If the person does not respond to his or her medication, cannot speak or cannot breathe, seek medical attention immediately.

10. Animal Bites

Procedure to assist someone who has been bitten by an animal:

1. Wash the bite area with mild soap and warm water for five minutes to remove saliva and any other foreign matter.
2. Use direct pressure or pressure point bleeding control to stop any bleeding.
3. If the wound is swollen, apply ice wrapped in a towel for 10 minutes.
4. Cover the wound with a clean dressing or bandage.
5. Seek medical assistance if the person showcases any severe symptom.

11. Nose Bleeds

Precautions to take while assisting someone with a nose bleed:

- It often occurs when a person has been breathing dry air.
- Seek professional help if they occur often.
- Do not tilt the person's head back. This could cause them to choke as the blood runs down their throat.

12. Object in the Eye

Procedure to assist someone who has a foreign object in their eye:

- Do not rub the eye.
- Wash your hands, clean the person's eye using water.

SUMMARY

1. EHS (Environmental Health and Safety) encompasses measures for workplace safety and environmental protection.
2. Safety Evacuation Maps are vital for clear pathways during emergencies like fire outbreaks or natural disasters.
3. Evacuation sequences involve Detection, Decision, Alarm, Reaction, and movement to safe areas.

4. Avoiding elevators during emergencies, using the "P.A.S.S." technique for fire extinguishing, and prioritizing higher ground during floods are crucial safety measures.
5. Proper response to bomb threats involves open emergency exits, avoiding predetermined assembly points, and promptly informing authorities.
6. After workplace accidents, prompt reporting to supervisors and providing aid without compromising personal safety is essential.
7. Assistance for visually impaired individuals during evacuation involves clear verbal instructions or physical guidance.
8. Keeping escape routes clear and avoiding elevators contribute to efficient and safe evacuations during emergencies.

CHECK YOUR PROGRESS

A. Multiple Choice Questions

1. What are the steps necessary for operating a fire extinguisher? (a) Identify the safety pin of the fire extinguisher which is generally present in its handle (b) Break the seal and pull the safety pin from the handle (c) Use the fire extinguisher by squeezing the lever (d) All of the above
2. Which of the following is an examples of ignition sources of open flames (a) gas ovens (b) lighters in smoking areas (c) welding torches (d) All of the above
3. In fire classification, all liquid, grease, and gas materials comes under (a) Class A materials (b) Class B materials (c) Class C materials (d) Class A materials
4. In fire classification, materials magnesium, potassium, and sodium comes under (a) Class A materials (b) Class B materials (c) Class C materials (d) Class D materials
5. In fire classification, materials wood, cloth, and paper comes under (a) Class A materials (b) Class B materials (c) Class C materials (d) Class D materials
6. In fire classification, electrical material and equipment comes under (a) Class A materials (b) Class B materials (c) Class C materials (d) Class D materials
7. When do we use a fire extinguisher? (a) In case of flood (b) In case of electric shock (c) In case of fire (d) In case of burn injury
8. What is the primary fire emergency telephone number? (a) 011 (b) 101 (c) 108 (d) 111
9. Which of the following contains everything you need to know about evacuating your facility safely (a) Evacuation Diagram (b) Emergency Action Plan (c) Employee Directory (d) Both a and b
10. The best course of action to take during a medical emergency is to (a) Begin first aid immediately (b) Activate the emergency plan for reporting injuries (c) Notify the person's family about the situation (d) Both a and b

B. Fill in the blanks

1. Emergency is a serious or crisis situation that needs_____attention and _____.

2. A _____ sign will warn people to walk carefully on freshly mopped floors.
3. _____ signs can prevent accidents on a staircase with a sharp bent or warn against a loose floor tile.
4. The _____ should be responsible to handle the evacuation process.
5. Workplace fires are commonly caused by improper storage of _____ material or _____ dust.
6. There should always be an _____ plan for scheduled electrical maintenance or work.
7. If the victim is breathing and has a heartbeat, give _____ for injuries and treat for shock.
8. Fire extinguisher is a _____ containing an agent which can be discharged to extinguish fire.

C. State True or False

1. The organization's policies and guidelines are the best guide to handle emergencies.
2. If someone is injured, act as per your impulse or gut feeling.
3. Keep water and food items away from electrical equipment.
4. Always switch off the electrical circuits.
5. Always wear protective equipment, such as gloves and shoes.
6. A fire extinguisher is a protection device used to extinguish fires.
7. Flammable materials can be placed around a door exit.
8. You can determine possible evacuation routes from floor plan diagrams posted in your facility.

C. Short Answer Questions

1. What is a workplace emergency?
2. How do you protect yourself, your employees, and your business?
3. What is an emergency action plan?
4. What should your emergency action plan include?
5. How do you develop an evacuation policy and procedures?
6. How do you establish evacuation routes and exits?
7. What are the various types of fire extinguisher and their extinguishing material?
8. What are the steps for operating a fire extinguisher in case of a fire emergency.
9. Compare the different types of fire extinguishers.
10. List the different classes of fire.
11. List out electrical rescue techniques?
12. What is the first aid for electrical emergencies?

Vocabulary Words

Mock Drill/Fire Drill – Practice how to respond/react in case of an emergency, such as a fire

Fire Extinguisher – A small container usually filled with special chemicals for putting out a fire.

Exit – The way to go out of a building or room

First Aid Kit – A container, which has medicines and ointments

Fire Escape Route – The way out in case of a fire

Emergency – A sudden, urgent and unexpected event

Spilt Liquid – Soft drink/water/coffee/tea etc. that has fallen on the floor

Routine inspections – Regular checking

Damaged equipment – Torn wires or broken plugs

Stairways – Staircase/ stairs to go to the next floor

Light fixtures – Bulbs, tube lights etc.

Injury – Getting hurt/bleeding

Kitchen equipment – Vessels used in the kitchen, such as wok, knives, cutting board etc.

Cleaning Supplies – Liquid soap, dish washing liquid etc.

Answer

Module 1. Fundamentals of RDBMS

Chapter 1. RDBMS Concepts

A. Multiple choice questions

1. (c) 2. (c) 3. (a) 4. (b) 5. (b) 6. (b) 7. (c) 8. (a) 9. (a) 10. (b) 11. (b) 12. (d)

B. Fill in the blanks

1. Relation, Tuple 2. DBMS 3. tables 4. show database 5. structure 6. foreign key 7. Composite Key 8. Primary Key 9. Primary Key 10. null, duplicate

C. State whether True or False

1. (T) 2. (T) 3. (T) 4. (T) 5. (T) 6. (F) 7. (F) 8. (T) 9. (F) 10. (F)

Session 2. Structured Query Language (SQL)

A. Multiple choice questions

1. (b) 2. (c) 3. (d) 4. (c) 5. (c) 6. (d) 7. (d) 8. (d) 9. (c) 10. (b) 11. (c) 12. (c) 13. (b) 14. (b) 15. (c) 16. (c)

B. Fill in the blanks

1. Five 2. Desc 3. Delete 4. alter 5. truncate 6. Drop 7. virtual 8. one 9. DCL 10. TCL 11. ORDER BY DESC 12. DISTINCT

C. State whether True or False

1. (F) 2. (T) 3. (T) 4. (F) 5. (F) 6. (T) 7. (T) 8. (F) 9. (T) 10. (F)

Session 3. Functions In SQL

A. Multiple choice questions

1. (d) 2. (c) 3. (a) 4. (d) 5. (a) 6. (b) 7. (d) 8. (d) 9. (c) 10. (a)

B. Fill in the blanks

1. value 2. (c) set of records 3. numeric 4. numeric 5. ascending 6. first occurrence 7. (d) 8. leading 9. leading, trailing 10. Intersect

C. State True or False

1. (F) 2. (F) 3. (T) 4. (T) 5. (F) 6. (F) 7. (T) 8. (T) 9. (T) 10. (T)

Module 2. Customer Query Management

Session 1. Customer Queries

A. Multiple Choice Questions

1. (b) 2. (c) 3. (c) 4. (c) 5. (b) 6. (b) 7. (a) 8. (b) 9. (b) 10. (d)

B. Fill in the Blanks

1. Impression 2. Professional 3. Readiness 4. Verbal and Non-verbal 5. Tone 6. Impression 7. Verbal and Non-verbal 8. Emotions

C. State whether the following statements are True or False

1. (T) 2. (F) 3. (F) 4. (F) 5. (F) 6. (F) 7. (T) 8. (F) 9. (F) 10. (F)

Session 2. Query Management

A. Multiple Choice Questions

1. (b) 2. (b) 3. (b) 4. (b) 5. (c) 6. (b) 7. (c) 8. (c) 9. (b) 10. (d)

B. Fill in the Blanks

1. E-mail/chat 2. Contracts 3. Expectations 4. Outlook 5. Contracts 6. Expectations 7. Emails/communications 8. Measure 9. Loyalty 10. Streamline

C. State whether the following statements are True or False

1. (F) 2. (F) 3. (F) 4. (F) 5. (F) 6. (F) 7. (T) 8. (T) 9. (F) 10. (F)

Chapter 3. Documentation of Customer Queries

A. Multiple Choice Questions

1. (d) 2. (a) 3. (c) 4. (b) 5. (b) 6. (d) 7. (d) 8. (c) 9. (a) 10. (b)

B. Fill in the Blanks

1. Organization 2. Documents 3. Employees 4. Information 5. Multiple systems 6. Factual 7. Service Department 8. Reporter 9. Priority 10. service request

C. State whether the following statements are True or False

1. (F) 2. (F) 3. (T) 4. (T) 5. (F) 6. (F) 7. (F) 8. (T) 9. (F) 10. (T)

Chapter 4. Manage Query Resolution

A. Multiple Choice Questions

1. (b) 2. (c) 3. (c) 4. (b) 5. (a) 6. (c) 7. (c) 8. (b) 9. (d) 10. (c)

B. Fill in the Blanks

1. Really Simple Syndication (RSS) 2. Mute the CSR's microphone 3. Pressure 4. Rule-based 5. Capturing and sharing 6. Respect and caution 7. Experiences 8. Hold music 9. "Not ready" 10. Expectations

C. State whether the following statements are True or False

1. (F) 2. (T) 3. (T) 4. (F) 5. (F) 6. (F) 7. (F) 8. (T) 9. (F) 10. (F)

Module 3. Working with Zoho CRM Application

Session 1. Zoho Desk

A. Multiple Choice Questions

1. (b) 2. (c) 3. (c) 4. (b) 5. (a) 6. (c) 7. (c) 8. (d) 9. (c) 10. (a)

B. Fill in the Blanks

1. Touch Points 2. Data, File 3. Type, Draw, Upload 4. Google, LinkedIn, Office 365 5. OTP 6. Phone 7. Standard 8. Type 9. cloud-based 10. Windows, Linux, and Mac OS

C. State whether the following statements are True or False

1. (F) 2. (T) 3. (F) 4. (F) 5. (F) 6. (F) 7. (F) 8. (T) 9. (F) 10. (T)

Session 2. Managing Data

A. Multiple Choice Questions

1. (c) 2. (b) 3. (b) 4. (c) 5. (c) 6. (b) 7. (b) 8. (b) 9. (b) 10. (c)

B. Fill in the Blanks

1. Parameters 2. Page-level 3. Data storage 4. Records 5. Import My Organization Records 6. Storage and Usage 7. Calendar 8. Space 9. Deletions 10. Google Calendar, Microsoft Outlook

C. State whether the following statements are True or False

1. (T) 2. (F) 3. (F) 4. (F) 5. (F) 6. (F) 7. (T) 8. (F) 9. (F) 10. (F)

Session 3. Importing and Exporting Data

A. Multiple Choice Questions

1. (b) 2. (b) 3. (c) 4. (c) 5. (c) 6. (b) 7. (c) 8. (a) 9. (b) 10. (d)

B. Fill in the Blanks

1. Other CRM systems 2. <script> and </script> 3. Value 4. True or 1 5. Data mismatch 6. Column headings or field names 7. Take a complete backup 8. 200,000 9. in progress 10. Ultimate

C. State whether the following statements are True or False

1. (F) 2. (F) 3. (T) 4. (F) 5. (F) 6. (T) 7. (T) 8. (T) 9. (F) 10. (T)

Session 4. Creating Contacts

A. Multiple Choice Questions

1. (c) 2. (c) 3. (c) 4. (d) 5. (a) 6. (c) 7. (b) 8. (c) 9. (c) 10. (b)

B. Fill in the Blanks

1. Web Form Capture 2. Quick 3. Interactions and Engagements 4. Outlook Contact Sync 5. Leads 6. Mass Emails 7. Six 8. Deletion or Transfer 9. Sales 10. Contacts Home Page

C. State whether the following statements are True or False

1. (F) 2. (F) 3. (F) 4. (F) 5. (F) 6. (T) 7. (T) 8. (T) 9. (T) 10. (F)

Module 4. Occupational Health, Safety and Security

Session 1. Health, Safety and Security at Workplace

A. Multiple Choice Questions

1. (d) 2. (b) 3. (d) 4. (c) 5. (d) 6. (a) 7. (c) 8. (d)

B. Fill in the blanks

1. (mental, social) 2. (morning) 3. (air conditioning) 4. (health) 5. (safe, hazards, risk) 6. (business revenue, operational charges) 7. (Occupational Health and Safety) 8. (physical work environment) 9. (live wires, conductor) 10. (poor sitting posture, one position).

C. State whether True or False

1. (T) 2. (T) 3. (T) 4. (T) 5. (T) 6. (F) 7. (T) 8. (T) 9. (F) 10. (T)

Session 2. Workplace Quality Measures

A. Multiple Choice Questions

1. (d) 2. (d) 3. (d) 4. (a) 5. (c) 6. (a) 7. (b) 8. (a) 9. (b) 10. (d)

B. Fill in the blanks

1. (chemical, biological) 2. (chemical) 3. (microbial) 4. (designing) 5. (arching wrists) 6. (innocuous) 7. (hazard tape) 8. (electrical hazards) 9. (reflections) 10. (reflective)

C. State whether True or False

1. (T) 2. (T) 3. (T) 4. (F) 5. (T) 6. (F) 7. (T) 8. (T) 9. (T) 10. (F)

Session 3. Prevent Accidents and Emergencies

A. Multiple Choice Questions

1. (d) 2. (d) 3. (b) 4. (d) 5. (a) 6. (c) 7. (c) 8. (b) 9. (d) 10. (d)

B. Fill in the blanks

1. (immediate, action) 2. (wet floor) 3. (watch your steps) 4. (coordinator) 5. (flammable, combustible) 6. (emergency response) 7. (first aid) 8. (cylindrical pressure vessel)

C. State whether True or False

1. (T) 2. (F) 3. (T) 4. (F) 5. (F) 6. (T) 7. (F) 8. (T)