CHAPTER 16

More on SQL- Grouping Records and Table Joins

Brief Summary of the Chapter:

- grouping records
- table-joining using Group by clause of select statement of SQL
- Define a Transaction
- Describe reason why all the tasks in a transaction should be executed fully
- or not at all.
- Perform basic transactions.
- Commit a transaction.
- Add Save Points to a transaction.
- Roll back a Transaction
- Roll back a Transaction to a Savepoint.

Key Points :

Aggregate or Group functions: MySQL provides Aggregate or Group functions which work on a number of values of a column/expression and return a single value as the result. Some of the most frequently used. Aggregate functions in MySQL are : MIN(), MAX(), AVG(), SUM(), COUNT().
Data Types in aggregate functions: MIN(), MAX(), and COUNT() work on any type of values - Numeric, Date, or String. AVG(), and SUM() work on only Numeric values (INT and DECIMAL).
NULLs in aggregate functions: Aggregate functions totally ignore NULL values present in a column.
GROUP BY: GROUP BY clause is used in a SELECT statement in conjunction with aggregate functions to group the result based on distinct values in a column.
HAVING: HAVING clause is used in conjuction with GROUP BY clause in a SELECT statement to put condition on groups.
WHERE Vs HAVING: WHERE is used to put a condition on individual row of a table whereas HAVING is used to put condition on individual group formed by GROUP BY clause in a SELECT statement.
• Cartesian Product (or Cross Join): Cartesian product of two tables is a table obtained by pairing each row of one table with each row of the other. A cartesian product of two tables contains all the columns of both the tables.
• Equi-Join: An equi join of two tables is obtained by putting an equality condition on the Cartesian product of two tables. This equality condition is put on the common column of the tables. This common column is, generally, primary key of one table and foreign key of the other.
• Foreign Key: It is a column of a table which is the primary key of another table in the same database. It is used to enforce referential integrity of the data.
• Referential Integrity: The property of a relational database which ensures that no entry in a foreign key column of a table can be made unless it matches a primary key value in the corresponding column of the related table.
• Union: Union is an operation of combining the output of two SELECT statements.

• Constraints: These are the rules which are applied on the columns of tables to ensure data integrity and consistency.
• ALTER TABLE: ALTER TABLE command can be used to Add, Remove, and Modify columns of a table. It can also be used to Add and Remove constraints.

Solved Questions(MULTIPLE CHOICE QUESTIONS)

EXERCISES

1. Which of the following will give the same answer irrespective of the NULL values in the specified column:

   a. MIN() b. MAX()

   c. SUM() d. None of the above

2. An aggregate function:

   a. Takes a column name as its arguments

   b. May take an expression as its argument

   c. Both (a) and (b)

   d. None of (a) and (b)

3. HAVING is used in conjunction with

   a. WHERE b. GROUP BY clause

   c. Aggregate functions d. None of the above

4. In the FROM clause of a SELECT statement

   a. Multiple Column Names are specified.

   b. Multiple table names are specified.

   c. Multiple Column Names may be specified.

   d. Multiple table names may be specified.

5. JOIN in RDBMS refers to

   a. Combination of multiple columns b. Combination of multiple rows

   c. Combination of multiple tables d. Combination of multiple databases

6. Equi-join is formed by equating

   a. Foreign key with Primary key b. Each row with all other rows

   c. Primary key with Primary key d. Two tables

7. Referential integrity

   a. Must be maintained

   b. Cannot be maintained

   c. Is automatically maintained by databases

d. Should not be maintained

8. A Primary key column

a. Can have NULL values
b. Can have duplicate values
c. Both (a) and (b)
d. Neither (a) nor (b)

9. Primary Key of a table can be

a. Defined at the time of table creation only.
b. Defined after table creation only.
c. Can be changed after table creation
d. Cannot be changed after table creation

10. Two SELECT commands in a UNION

a. Should select same number of columns.
b. Should have different number of columns
c. Both (a) and (b)
d. Neither (a) nor (b)

Answers 1-c,2-c,3-b,4-a,5-c,6-a,7-a,8-d,9-a,10-c

Very Short Question Answer

1. Why is it not allowed to give String and Date type arguments for SUM() and AVG() functions? Can we give these type of arguments for other functions?

Answer : String and dates are not real numbers that we calculate so sum or avg functions are not valid for them.

2. What is default, Autocommit mode in MySQL ?

Answer : By default, Autocommit mode is on in MySQL.

3. Can where be added a savepoint in a transaction ?

Answer : We can add a savepoint anywhere in a transaction.

4. How are NULL values treated by aggregate functions?

Answer : : None of the aggregate functions takes NULL into consideration. NULL is simply ignored by all the aggregate functions.

5. There is a column C1 in a table T1. The following two statements: SELECT COUNT(*) FROM T1; and SELECT COUNT(C1) from T1; are giving different outputs. What may be the possible reason?

Answer : There may be a null value.

6. What is the purpose of GROUP BY clause?

Answer : GROUP BY: GROUP BY clause is used in a SELECT statement in conjunction with aggregate functions to group the result based on distinct values in a column.

7. What is the difference between HAVING and WHERE clauses? Explain with the help of an example.

Answer : WHERE Vs HAVING: WHERE is used to put a condition on individual row of a table whereas HAVING is used to put condition on individual group formed by GROUP BY clause in a SELECT statement.

8. What is a Foreign key? What is its importance?

Answer : Foreign Key: It is a column of a table which is the primary key of another table in the same database. It is used to enforce referential integrity of the data.

9. What are constraints? Are constraints useful or are they hindrances to effective management of databases?

Answer : These are the rules which are applied on the columns of tables to ensure data integrity and consistency. These play very important role for tables so are not hindrances.

10. In a database there is a table Cabinet. The data entry operator is not able to put NULL in a column of Cabinet? What may be the possible reason(s)?

Ansewr : Not NULL or Primary key constraints used.

11. In a database there is a table Cabinet. The data entry operator is not able to put duplicate values in a column of Cabinet? What may be the possible reason(s)?

12. Ansewr : Primary key constraint used.

13. Do Primary Key column(s) of a table accept NULL values?
Answer :No.

14. There is a table T1 with combination of columns C1, C2, and C3 as its primary key? Is it possible to enter:

    a. NULL values in any of these columns?

    b. Duplicate values in any of these columns?

    Answer : No.

15. What are the differences between DELETE and DROP commands of SQL?
Answer : Delete is used for row removing while drop is used for removing complete table.

16. **What are Aggregate Functions ?**
Answer : A multiple row function works on multiple values. These functions are called aggregate functions or group functions.

Q. for what Data Types aggregate functions : MIN(), MAX(), and COUNT() work?

Answer : on any type of values - Numeric, Date, or String. AVG(), and SUM() work on only Numeric values (INT and DECIMAL).

Q. What is HAVING clause ?

Answer : HAVING clause is used in conjunction with GROUP BY clause in a SELECT statement to put condition on groups.

Q. What is Referential Integrity ?

Answer : The property of a relational database which ensures that no entry in a foreign key column of a table can be made unless it matches a primary key value in the corresponding column of the related table.

Q. What is Union used for ?

Answer : Union is an operation of combining the output of two SELECT statements.

Q. What is ALTER TABLE ?

Answer : ALTER TABLE command can be used to Add, Remove, and Modify columns of a table. It can also be used to Add and Remove constraints.

Q. What is DROP TABLE ?

Answer : DROP TABLE command is used to delete tables.

Q. What function is used whenever a condition involves an aggregate function ?

Answer : whenever a condition involves an aggregate function, then we use HAVING clause in conjunction with GROUP BY clause.

Q. What is Difference between GROUP BY' and Having functions ?

Answer : WHERE function is used for individual records and HAVING for groups . GROUP BY function is used for getting results based on some groups of data while a condition on groups is applied by HAVING clause.

Short Q.A.

Q. Why are aggregate functions called so? Name some aggregate functions.

Answer : A multiple row function works on multiple values. These functions are called aggregate functions or group functions. Some of the most frequently used. Aggregate functions in MySQL are : MIN(), MAX(), AVG(), SUM(), COUNT().

Q. What is ALTER TABLE command ?Write all the commands that can be applied using alter table.

Answer : a new column can be added to a table using ALTER TABLE command. ALTER TABLE can be used:

- to add a constraint
- to remove a constraint
- to remove a column from a table
- to modify a table column

Q. What is the Cartesian product of two table? Is it same as an Equi-join?

Answer : Cartesian Product (or Cross Join): Cartesian product of two tables is a table obtained by pairing each row of one table with each row of the other. A cartesian product of two tables contains all the columns of both the tables.

Equi-Join: An equi join of two tables is obtained by putting an equality condition on the Cartesian product of two tables. This equality condition is put on the common column of the tables. This common column is, generally, primary key of one table and foreign key of the other.

LONG QUESTION-ANSWER

Q. Does Union display any duplicate rows ?

Answer :Union does not display any duplicate rows unless ALL is specified with it.

R. Name the Aggregate Functions.

Answer : These functions are:

S. No.	Name of the Function	Purpose
1	MAX()	Returns the MAXIMUM of the values under the specified column/expression.
2	MIN()	Returns the MINIMUM of the values under the specified column/expression.
3	AVG()	Returns the AVERAGE of the values under the specified column/expression.
4	SUM()	Returns the SUM of the values under the specified column/expression.
5	COUNT()	Returns the COUNT of the number of values under the specified column/expression.

S. What is Max Function ? Give few Examples.

MAX() function is used to find the highest value of any column or any expression based on a column. MAX() takes one argument which can be any column name or a valid expression. involving a column name. e.g.,

To find the highest cost of any type of shoe in the factory.

```
SELECT MAX(cost) FROM shoes;
| MAX(cost) |
+-----------+
|         843.00 |
+-----------+
```

To find the highest cost of any shoe of type 'School'.

```
SELECT MAX(cost) FROM shoes WHERE type ='School';


+-----------+
| MAX(cost) |
+-----------+
|         320.75 |
+-----------+
```

To find the highest selling price of any type of shoe.

SELECT MAX(cost+cost*margin/ 100) FROM shoes;

```
+--------------------------+
| MAX(cost+cost*margin/100) |
+--------------------------+
|                828.517500000 |
+--------------------------+
```

To find the highest selling price of any type of shoe rounded to 2 decimal places.

SELECT ROUND(MAX(cost+cost*mar gin/100),2) AS "Max. SP" FROM shoes;

```
+---------+
| Max. SP |
+---------+
|      733.36 |
+---------+
```

To find the highest selling price of any type of shoe rounded to 2 decimal places.

SELECT ROUND(MAX(cost+cost*mar gin/100),2) AS "Max. SP" FROM shoes;

+---------+
| Max. SP |
+---------+
| 733.36 |
+---------+

Q. What is min() Function ? Give Some Examples.

MIN() :

MIN() function is used to find the lowest value of any column or an expression based on a column. MIN() takes one argument which can be any column name or a valid expression involving a column name. e.g.,

To find the lowest cost of any type of shoe in the factory.

SELECT MIN(cost) FROM shoes;

```
+-----------+
| MIN(cost) |
+-----------+
|          843.00 |
+-----------+
```

To find the lowest cost of any shoe of type 'School'.

SELECT MIN(cost) FROM shoes WHERE type ='School';

```
+-----------+
| MIN(cost) |
+-----------+
|          320.75 |
+-----------+
```

To find the lowest selling price of any type of shoe rounded to 2 decimal places.

SELECT ROUND(MIN(cost+cost*mar gin/100),2)

```
    AS "Min. SP" FROM shoes;
+---------+
| Min. SP |
+---------+
|  135.15 |
+---------+
```

Q . What is AVG() Function ? Give Some Examples.

Answer : AVG() function is used to find the average value of any column or an expression based on a column. AVG() takes one argument which can be any column name or a valid expression involving a column name. Here we have a limitation: the argument of AVG() function can be of numeric (int/decimal) type only. Averages of String and Date type data are not defined. E.g.,

To find the average margin from shoes table.

```
SELECT AVG(margin) FROM shoes;
+-------------+
| AVG(margin) |
+-------------+
|    2.600000 |
+-------------+
```

To find the average cost from the shoes table.

```
SELECT AVG(cost) FROM shoes;
+------------+
| AVG(cost) |
+------------+
| 491.750000 |
+------------+
```

To find the average quantity in stock
for the shoes of type Sports.

```
SELECT AVG(qty) FROM shoes WHERE type ='Sports';
+----------+
| AVG(qty) |
+----------+
| 580.0000 |
+----------+
```

Q. What is Sum() Function ? Give Some Examples.

SUM() function is used to find the total value of any column or an expression based on a column. SUM() also takes one argument which can be any column name or a valid expression involving a column name. Like AVG(), the argument of SUM() function can be of numeric (int/decimal) type only. Sums of String and Date type data are not defined. e.g.,

To find the total quantity present in the stock

```
SELECT SUM(Qty) FROM Shoes;
+----------+
| SUM(Qty) |
+----------+
|    10020 |
```

```
+----------+
```

To find the total order quantity

```
SELECT SUM(order_qty) FROM orders;
+---------------+
| SUM(order_qty) |
+---------------+
|                2475 |
+---------------+
```

To find the the total value (Quanitity x Cost) of Shoes of type 'Office' present in the inventory

```
SELECT SUM(cost*qty) FROM shoes WHERE type = 'Office';
+---------------+
| SUM(cost*qty) |
+---------------+
|             772000.00 |
+---------------+
```

Q. What is COUNT() Function ? Give Some Examples.

COUNT() function is used to count the number of values in a column. COUNT() takes one argument which can be any column name, an expression based on a column, or an asterisk (*). When the argument is a column name or an expression based on a column, COUNT() returns the number of non-NULL values in that column. If the argument is a *, then COUNT() counts the total number of rows satisfying the condition, if any, in the table. e.g.,

To count the total number of records in the table Shoes.

```
SELECT COUNT(*) FROM shoes;
+----------+
| COUNT(*) |
+----------+
|               13 |
+----------+
```

To count the different types of shoes that the factory produces

```
SELECT COUNT(distinct type) FROM shoes;
+----------------------+
| COUNT(distinct type) |
+----------------------+
|                                3 |
+----------------------+
```

To count the records for which the margin is greater than 2.00

```
SELECT COUNT(margin) FROM shoes WHERE margin > 2;
+---------------+
| COUNT(margin) |
+---------------+
|                          5 |
+---------------+
```

To count the number of customers in 'A' category

SELECT COUNT(*) FROM customers WHERE category ='A';

```
+----------+
| COUNT(*) |
+----------+
|        2 |
+----------+
```

To count the number of orders of quantity more than 300

SELECT COUNT(*) FROM orders WHERE order_qty >300;

```
+----------+
| COUNT(*) |
+----------+
|        2 |
+----------+
```

Q. Does aggregate Functions consider Null values.Does NULLs play any role in actual calculations ?

Answer : None of the aggregate functions takes NULL into consideration. NULL is simply ignored by all the aggregate functions. For example, the statement:

SELECT COUNT(*) FROM shoes;

Produces the following output:

```
+----------+
| COUNT(*) |
+----------+
|       13 |
+----------+
```

Indicating that there are 13 records in the Shoes table. Whereas the query:

SELECT COUNT(margin) FROM shoes;

produces the output:

```
+---------------+
| COUNT(margin) |
+---------------+
|            10 |
+---------------+
```

This output indicates that there are 10 values in the margin column of Shoes table. This means there are 3 (13-10) NULLs in the margin column.

This feature of aggregate functions ensures that NULLs don't play any role in actual calculations.

the following statement:

SELECT AVG(margin) FROM shoes;

Q. What is AVG() Function ? Give Some Examples. Does NULLs play any role in Average calculations ?

This Function is used to get the Average Value.

produces the output:

```
+-------------+
| AVG(margin) |
+-------------+
|    2.600000 |
+-------------+
```

The average margin has been calculated by adding all the 10 non NULL values from the margin column and dividing the sum by 10 and not by 13.

Q. What is 'GROUP BY' ? Give Examples.

Answer : GROUP BY function is used for getting results based on some groups of data.

For example,

- The management of the shoe factory may want to know what is the total quantity of shoes of various types. i.e., what is the total quantity of shoes of type School, Office, and Sports each.
- The management may also want to know what is the maximum, minimum, and average margin of each type of shoes.
- It may also be required to find the total number of customers in each category.

There are many such requirements. SQL provides GROUP BY clause to handle all such requirements. For the above three situations, the statements with GROUP BY clause are given below:

In the first situation we want MySQL to divide all the records of shoes table into different groups based on their type (GROUP BY type) and for each group it should display the type and the corresponding total quantity (SELECT type, SUM(qty)). So the complete statement to do this is:

SELECT type, SUM(qty) FROM shoes GROUP BY type;

G1 and the corresponding output is:

```
+--------+----------+
| type   | SUM(qty) |
+--------+----------+
| Office |     1100 |
| School |     7180 |
| Sports |     1740 |
+--------+----------+
```

Similarly, for the second situation the statement is:

SELECT type, MIN(margin), MAX(margin), AVG(margin)
FROM shoes GROUP BY type; G2 and the corresponding output is:

```
+--------+-------------+-------------+-------------+
| type   | MIN(margin) | MAX(margin) | AVG(margin) |
+--------+-------------+-------------+-------------+
| Office |        3.00 |        3.00 |    3.000000 |
| School |        2.00 |        2.00 |    2.000000 |
| Sports |        3.50 |        3.50 |    3.500000 |
+--------+-------------+-------------+-------------+
```

In the third situation we want MySQL to divide all the records of Customers table into different groups based on the their Category (GROUP BY Category) and for each group it should display the Category and the corresponding number of records (SELECT Category, COUNT(*)). So the complete statement to do this is:

SELECT category, COUNT(*) FROM customers GROUP BY category;

G3

```
+----------+----------+
| category | COUNT(*) |
+----------+----------+
| A        |        2 |
| B        |        2 |
| C        |        1 |
```

```
+----------+----------+
```

Let us have some more examples. Consider the following statement:

```
SELECT cust_code, SUM(order_qty)
FROM orders GROUP BY cust_code;
```

This statement produces the following output. Try to explain this this output.

```
+-----------+---------------+
| cust_code | SUM(order_qty) |
+-----------+---------------+
| C001      |          1025 |
| C002      |           750 |
| C003      |           150 |
| C004      |           200 |
| C005      |           350 |
+-----------+---------------+
```

Do the same for the following statement also:

```
SELECT shoe_code, SUM(order_qty) FROM orders GROUP BY shoe_code;
```

```
+-----------+---------------+

| shoe_code | SUM(order_qty) |
+-----------+---------------+
| 1001      |           200 |
| 1002      |           200 |
| 1011      |           550 |
| 1012      |           250 |
| 1101      |           300 |
| 1102      |           350 |
| 1103      |           225 |
| 1201      |           200 |
| 1203      |           200 |
+-----------+---------------+
```

If you carefully observe these examples, you will find that GROUP BY is always used in conjunction with some aggregate function(s). A SELECT command with GROUP BY clause has a column name and one or more aggregate functions which are applied on that column and grouping is also done on this column only.

Q. What is Role of HAVING in SQL.Give Examples. How it is related with Group by ?

Sometimes we do not want to see the whole output produced by a statement with GROUP BY clause. We want to see the output only for those groups which satisfy some condition. It means we want to put some condition on individual groups (and not on individual records). A condition on groups is applied by HAVING clause. As an example reconsider the

statement G1 discussed above. The statement produced three records in the output - one for each group. Suppose, we are interested in viewing only those groups' output for which the total quantity is more than 1500 (SUM(Qty) > 1500). As this condition is applicable to groups and not to individual rows, we use HAVING clause as shown below:

```
SELECT type, SUM(qty)  FROM shoes GROUP BY type  HAVING SUM(qty) > 1500;
```

```
+--------+----------+
| type          | SUM(qty) |
+--------+----------+
```

```
| School |          7180 |
| Sports |          1740 |
+--------+----------+
```

Now suppose for G2 we want the report only for those types for which the average margin is more than 2. For this, following is the statement and the corresponding output:

```
SELECT type, SUM(qty) FROM shoes GROUP BY type HAVING AVG(margin) >2;
+--------+----------+
| type   | SUM(qty) |
+--------+----------+
| Office |     1100 |
| Sports |     1740 |
+--------+----------+
```

In these statements if we try to put the condition using WHERE instead of HAVING, we shall get an error. Another way of remembering this is that whenever a condition involves an aggregate function, then we use HAVING clause in conjunction with GROUP BY clause.

Q. What Functions are used for conditions on individual records as well as on groups. Give Examples.

Answer : Situations may also arise when we want to put the conditions on individual records as well as on groups. In such situations we use both WHERE (for individual records) and HAVING (for groups) clauses. This can be explained with the help of the following examples:

- The management of the shoe factory may want to know what is the total quantity of shoes, of sizes other than 6, of various types. i.e., what is the total quantity of shoes (of sizes other than 6) of type School, Office, and Sports each.

  Moreover, the report is required only for those groups for which the total quantity is more than 1500.

- The management may also want to know what is the maximum, minimum, and average margin of each type of shoes. But in this reports shoes of sizes 6 and 7 only should be included. Report is required only for those groups for which the minimum margin is more than 2.

The statements and their outputs corresponding to above requirements are given below:

```
SELECT type, SUM(qty) FROM shoes
    WHERE size <> 6                    Checks individual row
    GROUP BY type HAVING sum (qty) > 1500;        Checks individual group
```

```
+--------+----------+
| type   | SUM(qty) |
+--------+----------+
| School |     3780 |
+--------+----------+
```

```
SELECT type, MIN(margin), MAX(margin), AVG(margin) FROM shoes WHERE size in
(6,7)
GROUP BY type having MIN(margin) > 2;
```

```
+--------+-------------+-------------+-------------+
| type   | MIN(margin) | MAX(margin) | AVG(margin) |
+--------+-------------+-------------+-------------+
| Office |        3.00 |        3.00 |    3.000000 |
| Sports |        3.50 |        3.50 |    3.500000 |
+--------+-------------+-------------+-------------+
```

Q. **How Will you Display Data from Multiple Tables ?**

Answer : To understand this consider the following situations:

- The management of the shoe factory wants a report of orders which lists three columns: Order_No, corresponding customer name, and phone number. - (MT-1)

  In this case order number will be taken from Orders table and corresponding customer name from Customers table.

- The management wants a four-column report containing order_no, order_qty, name of the corresponding shoe and its cost. - (MT-2)

  In this case order number and order quantity will be taken from Orders table and corresponding shoe name and cost from Shoes table.

- The management wants the names of customers who have placed any order of quantity more than 300. - (MT-3)

  In this case Order quantity will be checked in Orders table and for each record with quantity more than 300, corresponding Customer name will be taken from Customers table.

- The management wants a report in which with each Order_No management needs name of the corresponding customer and also the total cost (Order quantity x Cost of the shoe) of the order are shown. - (MT-4)

  In this case order number will be taken from Orders table and corresponding customer name from Customers table. For the cost of each order the quantity will be taken from Orders table and the Cost from Shoes table.

In all these cases, the data is to be retrieved from multiple tables. SQL allows us to write statements which retrieve data from multiple tables.

To understand how this is done, consider the following tables of a database.

Product

Code	Name
P001	Toothpaste
P002	Shampoo
P003	Conditioner

Supplier

Sup_Code	Name	Address
S001	DC & Company	Uttam Nagar
S002	SURY Traders	Model Town

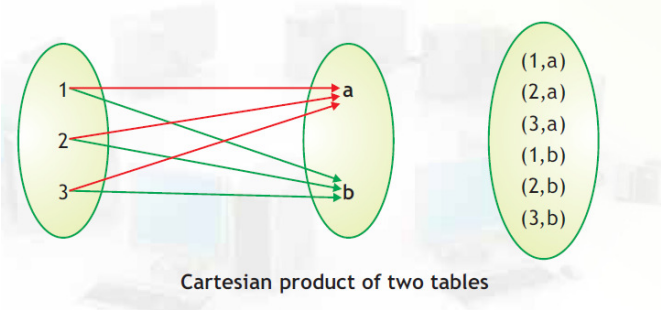
Order_table

Order_No	P_Code	Sup_Code
1	P001	S002
2	P002	S002

These tables are taken just to explain the current concept.

Q. What do you understand by Cartesian Product or Cross Join of tables .Give Example.

Cartesian product (also called Cross Join) of two tables is a table obtained by pairing up each row of one table with each row of the other table. This way if two tables contain 3 rows and 2 rows respectively, then their Cartesian product will contain 6 (=3x2) rows. This can be illustrated as follows:

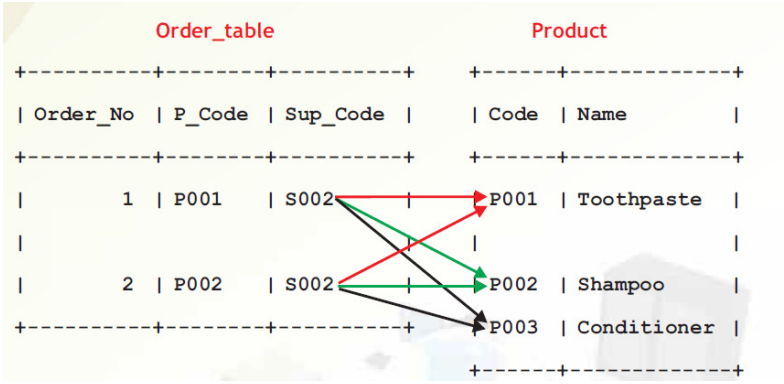


Cartesian product of two tables

Notice that the arrows indicate the 'ordered pairing'. The number of columns in the Cartesian product is the sum of the number of columns in both the tables. In SQL, Cartesian product of two rows is obtained by giving the names of both tables in FROM clause. An example of Cartesian product is shown below:

SELECT * FROM order_table, product;

To give the output of this query, MySQL will pair the rows of the mentioned tables as follows:



And the following output will be produced:

Order_No	P_Code	Sup_Code	Code	Name
1	P001	S002	P001	Toothpaste
2	P002	S002	P001	Toothpaste
1	P001	S002	P002	Shampoo
2	P002	S002	P002	Shampoo
1	P001	S002	P003	Conditioner
2	P002	S002	P003	Conditioner

-(CP-1)

Here we observe that the Cartesian product contains all the columns from both tables. Each row of the first table (Order_table) is paired with each row of the second table (Product).B

If we change the sequence of table names in the FROM clause, the result will remain the same but the sequence of rows and columns will change. This can be observed in the following statement and the corresponding output.

SELECT * FROM product, order_table;

Code	Name	Order_No	P_Code	Sup_Code
P001	Toothpaste	1	P001	S002
P001	Toothpaste	2	P002	S002
P002	Shampoo	1	P001	S002
P002	Shampoo	2	P002	S002
P003	Conditioner	1	P001	S002
P003	Conditioner	2	P002	S002

-(CP-2)

Q. Show the Cartesian product of three tables(more than two tables.

Ans : We can have Cartesian product of more than two tables also. Following is the Cartesian Product of three tables:

SELECT * FROM order_table, supplier, product; -(CP-3)

+----------+--------+----------+----------+-------------+-------------+------+-------------+

Order_No	P_Code	Sup_Code	Sup_Code	Name	Address	Code	Name
1	P001	S002	S001	DC & Company	Uttam Nagar	P001	Toothpaste
2	P002	S002	S001	DC & Company	Uttam Nagar	P001	Toothpaste
1	P001	S002	S002	SURY Traders	Model Town	P001	Toothpaste
2	P002	S002	S002	SURY Traders	Model Town	P001	Toothpaste
1	P001	S002	S001	DC & Company	Uttam Nagar	P002	Shampoo
2	P002	S002	S001	DC & Company	Uttam Nagar	P002	Shampoo
1	P001	S002	S002	SURY Traders	Model Town	P002	Shampoo
2	P002	S002	S002	SURY Traders	Model Town	P002	Shampoo
1	P001	S002	S001	DC & Company	Uttam Nagar	P003	Conditioner
2	P002	S002	S001	DC & Company	Uttam Nagar	P003	Conditioner
1	P001	S002	S002	SURY Traders	Model Town	P003	Conditioner
2	P002	S002	S002	SURY Traders	Model Town	P003	Conditioner

The complete Cartesian product of two or more tables is, generally, not used directly. But, sometimes it is required. Suppose the company with the above database wants to send information of each of its products to each of its suppliers. For follow-up, the management wants a complete list in which each Supplier's detail is paired with each Product's detail. For this, the computer department can produce a list which is the Cartesian product of Product and Supplier tables, as follows:

```
SELECT *, '' AS  Remarks  FROM  Product, Supplier;
```

to get the following report:

Code	Name	Sup_Code	Name	Address	Remarks
P001	Toothpaste	S001	DC & Company	Uttam Nagar	
P001	Toothpaste	S002	SURY Traders	Model Town	
P002	Shampoo	S001	DC & Company	Uttam Nagar	
P002	Shampoo	S002	SURY Traders	Model Town	
P003	Conditioner	S001	DC & Company	Uttam Nagar	
P003	Conditioner	S002	SURY Traders	Model Town	

Q. What is Equi- Join of tables .Show by examples.

The complete Cartesian product of two or more tables is, generally, not used directly. Sometimes the complete Cartesian product of two tables may give some confusing information also. For example, the first Cartesian product (CP-1) indicates that each order (Order Numbers 1 and 2) is placed for each Product (Code 'P001', 'P002', 'P003'). But this is incorrect!

Similar is the case with CP-2 and CP-3 also.

But we can extract meaningful information from the Cartesian product by placing some conditions in the statement. For example, to find out the product details corresponding to each Order details, we can enter the following statement:

```
SELECT * FROM order_table, product WHERE p_code = code;

+----------+--------+----------+------+------------+
| Order_No | P_Code | Sup_Code | Code| Name|
+----------+--------+----------+------+------------+
|        1 | P001   | S002     | P001 | Toothpaste |
|        2 | P002   | S002     | P002 | Shampoo    |
+----------+--------+----------+------+------------+
```

Two table names are specified in the FROM clause of this statement, therefore MySQL creates a Cartesian product of the tables. From this Cartesian product MySQL selects only those records for which P_Code (Product code specified in the Order_table table) matches Code (Product code in the Product table). These selected records are then displayed.

It always happens that whenever we have to get the data from more than one tables, there is some common column based on which the meaningful data is extracted from the tables. We specify table names in the FROM clause of SELECT command. We also give the condition specifying the matching of common column. (When we say common column, it does not mean that the column names have to be the same. It means that the columns should represent the same data with the same data types.) Corresponding to this statement, internally the Cartesian product of the tables is made. Then based on the specified condition the meaningful data is extracted from this Cartesian product and displayed.

Let us take another example of producing a report which displays the supplier name and address corresponding to each order.

```
SELECT Order_No, Order_table.Sup_Code, Name, Address FROM

    order_table, supplier

    WHERE order_table.sup_code = supplier.sup_code;

    +----------+----------+--------------+------------+
    | Order_No | Sup_Code | Name         | Address    |
    +----------+----------+--------------+------------+
    |        1 | S002     | SURY Traders | Model Town |
    |        2 | S002     | SURY Traders | Model Town |
    +----------+----------+--------------+------------+
```

In this statement the tables referred are Order_table and Supplier. In these tables sup_code is the common column. This column exists with same name in both the tables. Therefore whenever we mention it, we have to specify the table from which we want to extract this column. This is known as qualifying the column name. If we don't qualify the common column name, the statement would result into an error due to the ambiguous the column names.

Following is another example of equi-join. This time with three tables.

```
Select Order_no, Product.name as Product, Supplier.Name as Supplier From order_table, Product,

    Supplier

WHERE order_table.Sup_Code = Supplier.Sup_Code and P_Code = Code;
```

The output produced by this statement is:

Order_no	Product	Supplier
1	Toothpaste	SURY Traders
2	Shampoo	SURY Traders

Let us now get back to our original Shoe database and see how Ms. Akhtar uses the concept of joins to extract data from multiple tables.

For the situation MT-1, she writes the query:

```
SELECT order_no , name, phone FROM orders, customers WHERE orders.cust_code =
    customers.cust_code;
```

and get the following required output:

order_no	name	phone
1	Novelty Shoes	4543556, 97878989
2	Novelty Shoes	4543556, 97878989
5	Novelty Shoes	4543556, 97878989
9	Novelty Shoes	4543556, 97878989
4	Aaram Footwear	NULL
6	Aaram Footwear	NULL
10	Aaram Footwear	NULL
3	Foot Comfort	51917142, 76877888
7	Pooja Shoes	61345432, 98178989
8	Dev Shoes	NULL

Following are the queries and corresponding outputs for the situations MT-2, MT-3, and MT-4 respectively:

```
SELECT order_no , Order_Qty, name, cost
    FROM orders, shoes WHERE Shoe_Code = code;
```

order_no	Order_Qty	name	cost
1	200	School Canvas	132.50
2	200	School Canvas	135.50
3	150	School Leather	232.50
4	250	School Leather	270.00
5	400	School Leather	232.50
6	300	Galaxy	640.00
7	200	Tracker	700.00
8	350	Galaxy	712.00
9	225	Galaxy	720.00
10	200	Tracker	800.50

```
SELECT name, address FROM orders, customers WHERE
orders.cust_code = customers.cust_code and order_qty > 300;
```

```
+---------------+-----------------------+
| name          | address               |
+---------------+-----------------------+
| Novelty Shoes | Raja Nagar, Bhopal    |
| Dev Shoes     | Mohan Nagar, Ghaziabad|
+---------------+-----------------------+
```

```
SELECT order_no, Order_Qty, customers.name,cost*order_qty as 'Order Cost' FROM orders, shoes,
Customers WHERE Shoe_Code = code and Orders.Cust_Code = Customers.Cust_Code order by
order_no;
```

```
+----------+-----------+---------------+------------+
| order_no | Order_Qty | name          | Order Cost |
+----------+-----------+---------------+------------+
|        1 |       200 | Novelty Shoes |   26500.00 |
|        2 |       200 | Novelty Shoes |   27100.00 |
|        3 |       150 | Foot Comfort  |   34875.00 |
|        4 |       250 | Aaram Footwear|   67500.00 |
|        5 |       400 | Novelty Shoes |   93000.00 |
|        6 |       300 | Aaram Footwear|  192000.00 |
|        7 |       200 | Pooja Shoes   |  140000.00 |
|        8 |       350 | Dev Shoes     |  249200.00 |
|        9 |       225 | Novelty Shoes |  162000.00 |
|       10 |       200 | Aaram Footwear|  160100.00 |
+----------+-----------+---------------+------------+
```

Here is another statement extracting data from multiple tables. Try to find out what will be its output and then try this statement on computer and check whether you thought of the correct output.

```
SELECT order_no , Order_Qty, name, cost FROM orders, shoes WHERE Shoe_Code = code
    and order_qty > 200;
```

Q. Explain the Foreign Key .

As we have just seen, in a join the data is retrieved from the Cartesian product of two tables by giving a condition of equality of two corresponding columns - one from each table. Generally, this column is the Primary Key of one table. In the other table this column is the Foreign key. Such a join which is obtained by putting a condition of equality on cross join is called an 'equi-join'. As an example, once again consider the Product, Supplier, and Order tables referenced earlier. For quick reference these tables are shown once again:

Product

```
+------+-------------+
| Code | Name        |
+------+-------------+
```

P001	Toothpaste
P002	Shampoo
P003	Conditioner

Supplier

Sup_Code	Name	Address
S001	DC & Company	Uttam Nagar
S002	SURY Traders	Model Town

Order_table

Order_No	P_Code	Sup_Code
1	P001	S002
2	P002	S002

In these tables there is a common column between Product and Order_table tables (Code and P_Code respectively) which is used to get the Equi-Join of these two tables. Code is the Primary Key of Product table and in Order_table table it is not so (we can place more than one orders for the same product). In the order_table, P_Code is a Foreign Key. Similarly, Sup_Code is the primary key in Supplier table whereas it is a Foreign Key is Order_table table. A foreign key in a table is used to ensure referential integrity and to get Equi-Join of two tables.

Q. What do you understand by Referential Integrity ?

Answer : Suppose while entering data in Order_table we enter a P_Code that does not exist in the Product table. It means we have placed an order for an item that does not exist! We should and can always avoid such human errors. Such errors are avoided by explicitly making P_Code a foreign key of Order_table table which always references the Product table to make sure that a non-existing product code is not entered in the Order_table table. Similarly, we can also make Sup_Code a Foreign key in Order_table table which always references Customer table to check validity of Cust_code. This property of a relational database which ensures that no entry in a foreign key column of a table can be made unless it matches a primary key value in the corresponding related table is called Referential Integrity.

Q. Describe Union operation by giving examples.

Union is an operation of combining the output of two SELECT statements. Union of two SELECT statements can be performed only if their outputs contain same number of columns and data types of corresponding columns are also the same. The syntax of UNION in its simplest form is:

SELECT <select_list> FROM

<tablename> [WHERE

<condition>]

```
UNION [ALL]
SELECT <select_list> FROM
    <tablename> [WHERE
    <condition> ];
```

Union does not display any duplicate rows unless ALL is specified with it.

Example:

Suppose a company deals in two different categories of items. Each category contains a number of items and for each category there are different customers. In the database there are two customer tables: Customer_Cat_1 and Customer_Cat_2. If it is required to produce a combined list of all the customers, then it can be done as follows:

```
SELECT Cust_Code from Customer_Cat_1
UNION
SELECT Cust_Code from Customer_Cat_2;
```

If a customer exists with same customer code in both the tables, its code will be displayed only once - because Union does display duplicate rows. If we explicitly want the duplicate rows, then we can enter the statement:

```
SELECT Cust_Code from Customer_Cat_1
UNION ALL
SELECT Cust_Code from Customer_Cat_2;
```

Q. What are Constraints for a table ? List all the constraints with their purpose. How these are applied?

Many times it is not possible to keep a manual check on the data that is going into the tables using INSERT or UPDATE commands. The data entered may be invalid. MySQL provides some rules, called Constraints, which help us, to some extent, ensure validity of the data. These constraints are:

S.No.	Constraint	Purpose
2.	PRIMARY KEY	Sets a column or a group of columns as the Primary Key of a table. Therefore, NULLs and Duplicate values in this column are not accepted.
3.	NOT NULL	Makes sure that NULLs are not accepted in the specified column.
4.	FOREIGN KEY	Data will be accepted in this column, if same data value exists in a column in another related table. This other related table name and column name are specified while creating the foreign key constraint.

5.	UNIQUE	Makes sure that duplicate values in the specified column are not accepted.
6.	ENUM	Defines a set of values as the column domain. So any value in this column will be from the specified values only.
7.	SET	Defines a set of values as the column domain. Any value in this column will be a seubset of the specied set only.

We shall discuss only the PRIMARY KEY and NOT NULL constraints in this book. Other constraints are beyond the scope of this book.

Q . What is PRIMARY KEY ? Give Examples.

Answer : Primary key of a table is a column or a group of columns that uniquely identifies a row of the table. Therefore no two rows of a table can have the same primary key value. Now suppose that the table Shoes is created with the following statement:

```
CREATE TABLE Shoes
    (Code CHAR(4), Name VARCHAR(20), type VARCHAR(10), size INT(2),
    cost DECIMAL(6,2), margin DECIMAL(4,2), Qty INT(4));
```

We know that in this table Code is the Primary key. But, MySQL does not know that. Therefore it is possible to enter duplicate values in this column or to enter NULLs in this column. Both these situations are unacceptable.

To make sure that such data is not accepted by MySQL, we can set Code as the primary key of Shoes table. It can be done by using the PRIMARY KEY clause at the time of table creation as follows:

```
CREATE TABLE Shoes
    (Code CHAR(4) PRIMARY KEY, Name VARCHAR(20),type VARCHAR(10), size
    INT(2), cost DECIMAL(6,2), margin DECIMAL(4,2), Qty INT(4));
```

or as follows:

```
CREATE TABLE Shoes
    (Code CHAR(4), Name VARCHAR(20), type VARCHAR(10), size INT(2),
    cost DECIMAL(6,2), margin DECIMAL(4,2), Qty INT(4), PRIMARY
    KEY (Code));
```

To create a table Bills with the combination of columns Order_No and Cust_Code as the primary key, we enter the statement:

```
CREATE TABLE bills
    (Order_Num INT(4) PRIMARY KEY, cust_code
    VARCHAR(4) PRIMARY KEY, bill_Date DATE,
    Bill_Amt DECIMAL(8,2));
```

Contrary to our expectation, we get an error (Multiple primary key defined) with this statement. The reason is that MySQL interprets this statement as if we are trying to create two primary keys of the table - Order_Num, and Cust_code. But a table can have at most one primary key. To set this combination of columns a primary key we have to enter the statement as follows:

```
CREATE TABLE bills
    (Order_Num INT(4), cust_code VARCHAR(4), bill_Date
    date, Bill_Amt DECIMAL(8,2), PRIMARY
    KEY(Order_Num, cust_code));
```

Q. How 'Dese' is used for showing structure of the table ?

Answer : We may check the table structure with the command: DESC bills;

The table structure is as shown below:

```
+-----------+-------------+------+-----+---------+-------+
| Field     | Type        | Null | Key | Default | Extra |
+-----------+-------------+------+-----+---------+-------+
| Order_Num | INT(4)      | NO   | PRI | 0       |       |
| cust_code | VARCHAR(4)  | NO   | PRI |         |       |
| bill_Date | date        | YES  |     | NULL    |       |
| Bill_Amt  | DECIMAL(8,2)| YES  |     | NULL    |       |
+-----------+-------------+------+-----+---------+-------+
```

These columns constitute the primary key of the table. NULLs cannot be accepted in these columns.

Q. How will you a create table in which NULL values should not be accepted ?

Answer : Many times there are some columns of a table in which NULL values should not be accepted. We always want some known valid data values in these columns. For example, we cannot have an order for which the customer code is not known. It means whenever we enter a row in the orders table, corresponding customer code cannot be NULL. Similarly while entering records in the Shoes table, we have to mention the Shoe size, it cannot be set NULL. There may be any number of such situations. While creating a table we can specify in which columns NULLs should not be accepted as follows:

```
CREATE TABLE Shoes
    (Code CHAR(4) PRIMARY KEY, Name VARCHAR(20), type
    VARCHAR(10), size INT(2) NOT NULL,
    cost DECIMAL(6,2), margin DECIMAL(4,2), Qty INT(4)); CREATE TABLE bills
    (Order_Num INT(4), cust_code VARCHAR(4), bill_Date DATE,
    Bill_Amt DECIMAL(8,2) NOT NULL, PRIMARY KEY
    (Order_Num, cust_code));
```

Now if we try to enter a NULL in the specified column, MySQL will reject the entry and give an error.

Q. How can we view the Columns Associated with Constraints ?

After creating a table, we can view its structure using DESC command. The table structure also includes the constraints, if any. Therefore, when we use DESC command, we are shown the table structure as well as constraints, if any. A constraint is shown beside the column name on which it is applicable. E.g., the statement:

DESC Shoes;

displays the table structure as follows:

```
+--------+-------------+------+-----+---------+-------+
| Field  | Type        | Null | Key | Default | Extra |
+--------+-------------+------+-----+---------+-------+
| Code   | CHAR(4)     | NO   | PRI | NULL    |       |
| Name   | VARCHAR(20) | YES  |     |         |       |
| type   | VARCHAR(10) | YES  |     | NULL    |       |
| size   | INT(2)      | NO   |     | 0       |       |
| cost   | DECIMAL(6,2)| YES  |     | NULL    |       |
| margin | DECIMAL(4,2)| YES  |     | NULL    |       |
| Qty    | INT(4)      | YES  |     | NULL    |       |
+--------+-------------+------+-----+---------+-------+
```

Q. Show Add, Modify, and Remove constraints for altering a table.

If we create a table without specifying any primary key, we can still specify its primary key by ALTER TABLE command. Suppose we have created the Shoes table without specifying any Primary key, then later we can enter the statement as follows:

```
ALTER TABLE Shoe      ADD  PRIMARY KEY(code);
```

This will set Code as the primary key of the table. But if the Code column already contains some duplicate values, then this statement will give an error.

In MySQL, it is also possible to change the primary key column(s) of a table. Suppose, in the Shoes table, istread of Code, we want to set the combination of 'Name' and 'Size' as the primary key. For this first we have to DROP the already existing primary key (i.e., Code) and then add the new primary key (i.e., Name and Size). The corresponding statements are as follows:

```
ALTER TABLE Shoes DROP PRIMARY KEY;
```

After this statement, there is no primary key of Shoe table. Now we can add the new primary key as follows:

```
ALTER TABLE Shoe ADD PRIMARY KEY (Name, Size);
```

Now if we see the table structure by DESC Shoes; statement, it will be shown as follows:

```
+--------+--------------+------+-----+---------+-------+
| Field  | Type         | Null | Key | Default | Extra |
+--------+--------------+------+-----+---------+-------+
| Code   | CHAR(4)      | NO   |     | NULL    |       |
| Name   | VARCHAR(20)  | NO   | PRI |         |       |
| type   | VARCHAR(10)  | YES  |     | NULL    |       |
| size   | INT(2)       | NO   | PRI | 0       |       |
| cost   | DECIMAL(6,2) | YES  |     | NULL    |       |
| margin | DECIMAL(4,2) | YES  |     | NULL    |       |
| Qty    | INT(4)       | YES  |     | NULL    |       |
+--------+--------------+------+-----+---------+-------+
```

In MySQL, it is not possible to add or drop NOT NULL constraint explicitly after the table creation. But it can be done using MODIFY clause of ALTER TABLE command. As an example, suppose we don't want to accept NULL values in bill_date column of bills table, we can issue the statement:

ALTER TABLE bills MODIFY bill_date DATE NOT NULL;

Later on if we wish to change this status again, we can do so by entering the command:

ALTER TABLE bills MODIFY bill_date DATE NULL;

Remove and Modify columns :

ALTER TABLE can be used to remove a column from a table. This is done using DROP clause in ALTER TABLE command. The syntax is as follws:

ALTER TABLE <tablename> DROP <columnname>

[, DROP <columnname> [, DROP <columnname> [, . . .]]];

Following are some self-explanatory examples of SQL statemenets to remove columns from tables:

ALTER TABLE Shoes DROP Qty;

ALTER TABLE Orders DROP Cust_Code;

ALTER TABLE Student DROP Class, DROP RNo, DROP Section;

Although any column of a table can be removed, MySQL puts the restriction that a primary key column can be removed only if the remaining, primary key columns, if any, do not contain any duplicate entry. This can be understood more clearly with the help of following example:

The Name and Size columns of the Shoe table constitute its primary key. Now if we drop the Name column from the table, Size will be the remaining Primary Key column of the table. Therefore, duplicate entries in the Size column should not be allowed. To ensure this, before removing Name column from the table, MySQL checks that there are no duplicate entries present in the Size column of the table. If there are any, then the statement trying to remove Name column from the table will result in an error and the Name column will not be removed. If there are no duplicate enteries in the Size column, then Name column will be removed. Similar will be the case with the Name column, if we try to remove Size column. But there won't be any problem if we try to remove both the primary key columns simultaneously with one ALTER TABLE statement as follows:

ALTER TABLE Shoes DROP name, DROP size;

ALTER TABLE can also be used to change the data type of a table column. For this the syntax is as follows:

ALTER TABLE <tablename> MODIFY <col_name> <new datatype> [,MODIFY

<col_name> <new datatype>

[,MODIFY <col_name> <new data type> [, . . .]]];

e.g., the statement:

ALTER TABLE shoes modify code CHAR(5), modify type VARCHAR(20);

changes the data type of column Code to CHAR(5) and that of type to VARCHAR(20).

When we give a statement to chage the data type of a column, MySQL executes that statement correctly only if the change in data type does not lead to any data loss. E.g., if we try to change the data type of order_date column of orders table from date to int, we'll get an error. This is because the data already stored in this column cannot be converted into int type. Similarly, if a column of VARCHAR(10) type conatins some data value which is 10 characters long, then the data type of this column cannot be converted to VARCHAR(n), where n is an integer less than 10.

Q. What is DROPPING a TABLE ?

Sometimes there is a requirement to remove a table from the database. In such cases we don't want merely to delete the data from the table, but we want to delete the table itself. DROP TABLE command is used for this purpose. The syntax of DROP TABLE command is as follows:

DROP TABLE <tablename>;

e.g. to remove the table Orders from the database we enter the statement:

DROP TABLE Orders;

And after this statement orders table is no longer available in the database. It has been removed.Aggregate or Group functions: MySQL provides Aggregate or Group functions which work on a number of values of a column/expression and return a single value as the result.

CHAPTER 17

More RDBMS(Relational Database Management System)

Summary

Till now we have studied about various SQL statements manipulating data stored in a MySQL database. We executed SQL statements without concern about inconsistencies arising due to group of statements not being executed in entirety. In this lesson, we will study the basic concepts of Transaction processing and how MySQL ensures consistency of data when a group of statements is executed.

Key Pionts

- Work done during a transaction is a series of operations.

- If one of the operations of a transaction is not executed successfully, then the
- entire transaction should be cancelled. If all the operations are executed
- successfully, the transaction should be saved to a database.
- START TRANSACTION statement is used to start a transaction.
- The process of cancelling a transaction is called Rolling back.
- ROLLBACK statement is used to terminate a transaction and roll back the
- database to its original state before the transaction.
- COMMIT statement is used to save changes to the database.
- When AutoCommit is ON, each SQL statement is a transaction.The changes resulting from each statement are automatically committed.

Q. What do you mean by DBMS and Transaction Management ?

Suppose Raunak's account number is 3246 and his aunt's account number is 5135. In order to process the cheque presented by Raunak, the following two SQL commands need to be executed on the database maintained by the bank:

UPDATE Savings SET balance = balance – 2000 WHERE account_no = 5135; For Aunt's account

UPDATE Savings SET balance = balance + 2000 WHERE account_no = 3246; For Raunak's account

The above two Updates should both take place. If the first Update takes place and there is a system failure, the first updation should be undone. Either both the updations should be done and if it is not possible for both the updations to be done, then no updation should be done.

Q. What is a Transaction?

A Transaction is a unit of work that must be done in logical order and successfully as a group or not done at all. Unit of work means that a Transaction consists of different tasks - but together they are considered as one unit. Each transaction has a beginning and an end. If anything goes wrong in between the execution of transaction, the entire transaction (No matter to what extent has been done) should be cancelled. If it is successful, then the entire transaction should be saved to the database.

A transaction is a unit of work that must be done in logical order and successfully as a group or not done at all.

In Raunak's case, both the updation statements constitute a transaction. Both are together treated as a single unit.

Q. how transactions are managed ?

Answer : let us study the following 3 statements of SQL:

- START TRANSACTION statement
- COMMIT statement
- ROLLBACK statement
-

START TRANSACTION Statement :

START TRANSACTION statement commits the current transaction and starts a new transaction. It tells MySQL that the transaction is beginning and the statements that follow should be treated as a unit, until the transaction ends. It is written like this:

START
TRANSACTION;

The START TRANSACTION statement has no clauses.

COMMIT Statement :

The COMMIT statement is used to save all changes made to the database during the transaction to the database.Commit statement is issued at a time when the transaction is complete- all the changes have been successful and the changes should be saved to the database. COMMIT ends the current transaction.

COMMIT statement is used like this:

COMMIT;
Or
COMMIT WORK;

Here WORK is a keyword and is optional.

In the following example, the table named savings has 2 rows. A transaction is started and balance in Siddharth's account (with account number 1004) is increased by Rs. 2000.00 and the balance in Akriti's account (with account number 1006) is decreased by Rs. 2000.00. COMMIT statement makes the changes made by the transaction permanent.

Example 1:

```
mysql> select * from savings;
+------------+-----------------+----------+
| account_no | name            | balance |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 87000.00 |
|       1006 | Akriti Malik     | 87000.00 |
+------------+-----------------+----------+
mysql> START TRANSACTION;
mysql> UPDATE Savings
    -> SET balance = balance + 2000
    -> WHERE account_no = 1004; mysql>
UPDATE Savings
    -> SET balance = balance - 2000
```

-> WHERE account_no = 1006; mysql>

SELECT * FROM Savings;

```
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal| 89000.00 |
|       1006 | Akriti Malik    | 85000.00 |
+------------+-----------------+----------+
```

2 rows in set (0.00 sec)
mysql> COMMIT;

ROLLBACK Statement :

When a transaction is being executed, some type of error checking is usually performed to check whether it is executing successfully or not. If not, the entire transaction is undone using the ROLLBACK statement. The ROLLBACK statement cancels the entire transaction i.e. It rolls the transaction to the beginning. It aborts any changes made during the transaction and the state of database is returned to what it was before the transaction began to execute and does not save any of the changes made to the database during the transaction.

ROLLBACK statement is used like this:

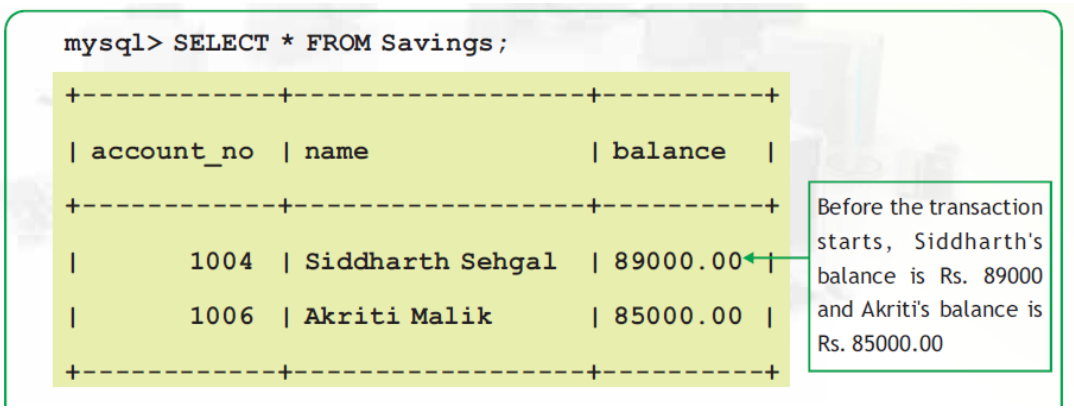
ROLLBACK;

Or

ROLLBACK WORK;

Here WORK is a keyword and is optional.

If in Example 1 shown above ROLLBACK was used instead of COMMIT, the updation of incrementing Siddharth's account by ` 2000.00 and decrementing Akriti's account by 2000 wouldn't have taken place. Let us now initiate a transaction, increase Akriti's account by ` 3000.00, then Rollback the transaction and see what happens to the updation done on Akriti's account.



mysql> START TRANSACTION;

mysql> UPDATE Savings

```
    -> SET balance = balance + 3000
    -> WHERE account_no = 1006;
mysql> ROLLBACK;
mysql> SELECT * FROM Savings;
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 89000.00 |
|       1006 | Akriti Malik     | 85000.00 |
+------------+-----------------+----------+
```

Akriti's balance is increased by Rs. 3000.00

Because of the Rollback, Akriti's balance is not updated and is displayed as it was before the transaction started.

- After the ROLLBACK command is issued to the database, the database itself starts a new transaction; though no explicit command of starting a transaction like START TRANSACTION is issued.

Example 2:
Let us try out some more SQL statements on Savings table to understand transactions well.

mysql> SELECT * FROM savings;

```
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 84000.00 |
|       1006 | Akriti Malik     | 92000.00 |
|       1008 | Chavi Mehra      | 67000.00 |
|       1009 | Raunak Singh     | 56000.00 |
+------------+-----------------+----------+
```

```
mysql> INSERT INTO Savings VALUES
    (1010,'Lakshmi Swamy',34000);
mysql> START TRANSACTION;
mysql> UPDATE Savings SET balance =
balance +2000 WHERE account_no = 1010;
mysql> ROLLBACK;
mysql> SELECT * FROM Savings;
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 84000.00 |
|       1006 | Akriti Malik     | 92000.00 |
|       1008 | Chavi Mehra      | 67000.00 |
|       1009 | Raunak Singh     | 56000.00 |
|       1010 | Lakshmi Swamy    | 34000.00 |
+------------+-----------------+----------+
5 rows in set (0.00 sec)
```

Start transaction statement starts a transaction and commits the previous INSERT INTO statement.

Rollback cancels the effect of Update statement.

SELECT statement displays Lakshmi Swamy's row with balance of 34000.00

Q. What are SavePoints. What is benefit for inserting save points in a transaction ? Give Examples.

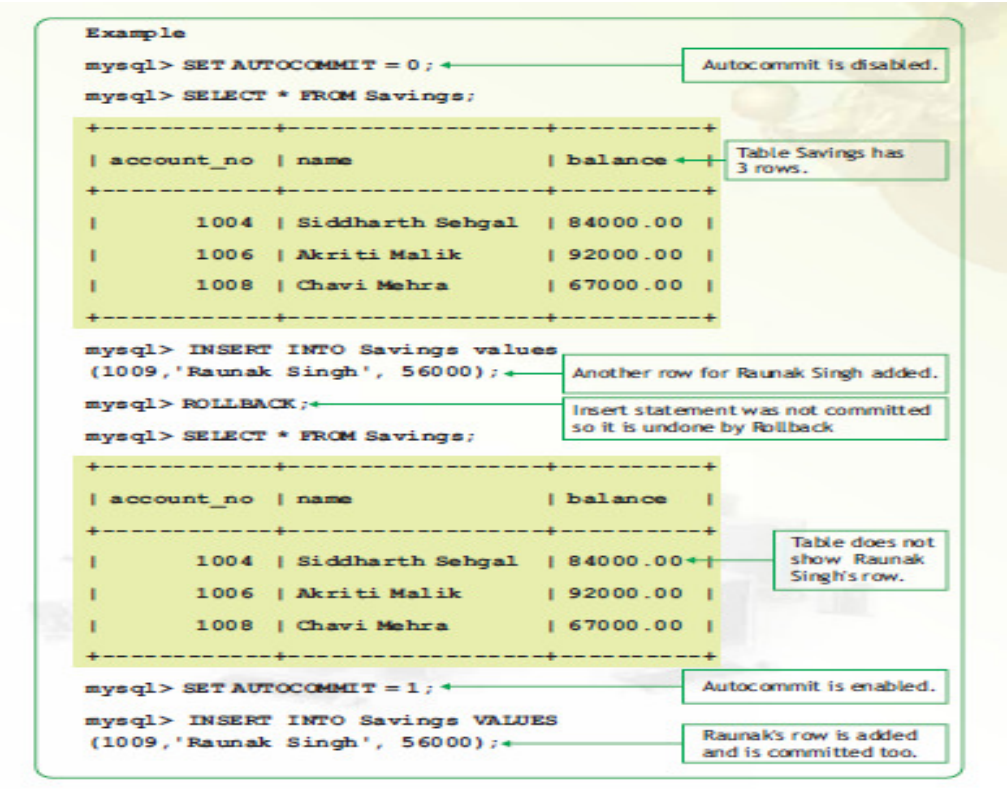
The SAVEPOINT statement defines a marker in a transaction. These markers are useful in rolling back a transaction till the marker.

We can add a savepoint anywhere in a transaction. When you roll back to that savepoint, any changes made to the database after the savepoint are discarded, and any changes made prior to the savepoint are saved. It is like semicomitting a transaction.

To define a savepoint, we enter the SAVEPOINT statement like this:
SAVEPOINT <savepoint-name>;
Example : SAVEPOINT Mark1;
In the above statement a marker (savepoint) with the name Mark1 is defined. It becomes a bookmark in the transaction. Now we can write the following statement:

Q. How we can rollback any transaction upto a save point ?
Ans : to rollback the transaction till the bookmark named Mark1.
ROLLBACK TO SAVEPOINT Mark1;

Q. What is Autocommit ?How can it be set ?
Answer : By default, Autocommit mode is on in MySQL. It means that MySQL does a COMMIT after every SQL statement that does not return an error. If it returns an error then either Rollback or Commit happens depending on the type of error. If we do not want individual statements of SQL to be automatically committed, we should set the autocommit mode to off.When Autocommit is off then we have to issue COMMIT statement explicitly to save changes made to the database. The following statement sets the autocommit mode to off. It also starts a new transaction
SET AUTOCOMMIT=0;
The following statement sets the autocommit mode to ON. It also commits and terminates the current transaction.
SET AUTOCOMMIT=1;
If autocommit is set to ON. we can still perform a multiple-statement transaction by starting it with an explicit START TRANSACTION statement and ending it with COMMIT or ROLLBACK.
Let us look at the following example to understand it:



```
mysql> ROLLBACK;
mysql> SELECT * FROM Savings;
+------------+-----------------+----------+
| account_no | name            | balance  |
+------------+-----------------+----------+
|       1004 | Siddharth Sehgal | 84000.00 |
|       1006 | Akriti Malik     | 92000.00 |
|       1008 | Chavi Mehra      | 67000.00 |
|       1009 | Raunak Singh     | 56000.00 |
+------------+-----------------+----------+
```

Rollback cannot undo insertion of Raunak's row.

If the autocommit mode has been set to off in a session and you end that session, the autocommit mode is automatically set to on when you start a new session.

Let us try out some more SQL statements :

Example

```
mysql> SET AUTOCOMMIT = 1;
Query OK, 0 rows affected (0.00 sec)

mysql> START TRANSACTION;
Query OK, 0 rows affected (0.00 sec)

mysql> DELETE FROM Savings WHERE account_no = 1006;
Query OK, 1 row affected (0.00 sec)

mysql> ROLLBACK WORK;
Query OK, 0 rows affected (0.03 sec)
```

Autocommit is enabled

Start transaction sets autocommit off.

Row with account_no 1006 deleted but is not committed.

Deletion of Row with account_no 1006 is cancelled.

mysql> ROLLBACK WORK;
Query OK, 0 rows affected (0.03 sec)
Row with account_no 1006 deleted but is not committed. Deletion of Row with account_no 1006 is cancelled.An implicit COMMIT takes place, even if AUTOCOMMIT is set OFF, on the database when the user issues a Data Definition language command like CREATE TABLE, ALTER TABLE etc

CHAPTER 18
IT- Applications

Brief Summary

- Three major groups of IT applications covered in this chapter are: egovernance, e-business, and e-learning.
- e-Governance involves applications which are used by government agencies/organizations to provide better governance.

- e-Business applications use technology to effectively access and deliver business related services and perform various kinds of business transactions.
- e-Learning applications use technology to effectively deliver and monitor learning and teaching processes. They help the trainer to organize and manage his/her lesson plans, present them to students/learners, evaluate and take the feedback to enhance & fine-tune this process in future.
- An IT application has two major parts: Front-end (The user interface) and back-end (The database).
- The front-end of an IT application is usually a group of one or more forms through which the user enters the input values and is shown the corresponding output. A good front-end ensures the acceptance of the application in the first go.
- The back-end of an IT application is the database in which all the data is stored. This database resides in the server. All the data which is requested by the front-end is supplied by back-end. A good back-end ensures sustainability, efficiency and easy modification of the application.
- Development of an IT application involves creation of front-end, back-end, and connecting these two. It also involves testing the application and then implementing it.
- Use of ICT has its social and economic impacts. Society is impacted as due to ICT people change their way of conducting the transactions and thus save their
- time, money, and energy. Economy is impacted as ICT leads to fast completion of data transfer and data processing jobs. ICT also brings transparency in the administration.

Key Points

- Differentiate between front-end and back-end of an application.
- Identify various components of the front-end of an application.
- Design and develop simple IT applications.
- List the impacts of ICT(Information & Communication Technology) on society

##########

Solved Questions(MULTIPLE CHOICE QUESTIONS)

1. A web site to provide online information and services to the citizens is an example of

   a. e-Business b. e-Mail

   c. e-Governance d. e-Learning

2. The web-site of an electricity supply company which allows its customers to pay bills online is an example of

   a. e-Business b. e-Mail

   c. e-Governance d. e-Learning

3. The web-site of a school which allows the students to go through various lessons in their subjects is an example of

   a. e-Business b. e-Mail

   c. e-Governance d. e-Learning

4. Web address of national portal of India is:

a. India.gov.in b. GOI.gov.in

c. ncert.nic.in d. None of the above

5. A form through which users interact with an IT application is a part of

a. database b. front-end

c. back-end d. Javascript

6. A good front-end is

a. consistent b. user-friendly

c. neither of the above d. both a and b.

7. Mr. X is an infomaniac. It means he

a. Uses information carefully
b. Uses computers to get information.
c. Responds to almost all his SMSs, eMails etc.
d. Tries to get correct information

8. Javascript is a

a. database b. front end

c. back-end d. scripting language

Answers : 1.-c, 2-a,3-d,4-a,5-b,6-d,7-c,8-d

VERY SHORT QUESTIONS-ANSWERS

1. Give some examples of input values, where Radio Button and Check Boxes should be used for efficiency in the application.
Answer : for selection criteria applying, Providing optional choices.

2. What are the important guidelines we should keep in mind while developing an efficient application?
Answer : It should be user friendly, reliable and should be maintained database with consistency and integrity with GUI.

3. Is it a good practice to take in the inputs using TextFields only? Justify your answer.

Answer : TextField is used to get small textual information like Name, RollNo, email address, quantity, etc. Disabled/Uneditable TextFields are also used to display such information so it is a good practice to take in the inputs using TextFields. But we may also use Dialog to take input.

Short Question-Answers

Q. Write Short Notes on : e-Governance, e-Business, e-Learning.

Answer : e-Governance involves applications which are used by government agencies/organizations to provide better governance.

e-Business applications use technology to effectively access and deliver business related services and perform various kinds of business transactions.

e-Learning applications use technology to effectively deliver and monitor learning and teaching processes. They help the trainer to organize and manage his/her lesson plans, present them to students/learners, evaluate and take the feedback to enhance & fine-tune this process in future.

Q. What are Front-end (The user interface) and back-end (The database) ?

Answer : An IT application has two major parts: Front-end (The user interface) and back-end (The database) .The front-end of an IT application is usually a group of one or more forms through which the user enters the input values and is shown the corresponding output. A good front-end ensures the acceptance of the application in the first go. The back-end of an IT application is the database in which all the data is stored. This database resides in the server. All the data which is requested by the front-end is supplied by back-end. A good back-end ensures sustainability, efficiency and easy modification of the application.

Q.What are the terms involved in Development of an IT application ?

Development of an IT application involves creation of front-end, back-end, and connecting these two. It also involves testing the application and then implementing it.

Q. What social and economic impacts are found of ICT. ?

Answer : Society is impacted as due to ICT people change their way of conducting the transactions and thus save their time, money, and energy. Economy is impacted as ICT leads to fast completion of data transfer and data processing jobs. ICT also brings transparency in the administration.

Q. What do you mean by Infomania ?

Answer :Infomania is the condition of reduced concentration caused by continually responding to electronic communications such as e-mail, SMSs, MMSs etc. ICT is making more and more people infomaniac. This is making some people waste their productive time in the office, neglect their families and duties. Some people are also in a habit of frequently checking their e-mails even when they are on vacation with their families. We have to be careful in the use of ICT so that we use it constructively and not get obsessed with it and become infomaniacs.

Q. What OS and fonts are used for Indic Language Support ?

Answer : Mac OS 10.5 supports Devanagari, Gujarati, Gurmukhi and Tamil. Linux based desktops support Bengali, Devnagari, Gujarati, Kannada, Malayalam, Oriya, Tamil, Telugu and Gurmukhi,

Q. Write the steps for enabling Indic Language Support in Windows.

Answer :Windows 7 and Windows Vista include all the necessary files to support Indic languages Complex(Indic) text support is automatically enabled. Therefore you just need to enable the keyboard for the language that you want to use by following the steps in the Enable a keyboard layout section.For Windows XP, some additional setup may be required to support Indic languages. Therefore you first follow the steps given under Enabling International Language Support in Windows and then proceed with the steps given under the Enable a keyboard layout section.

Q. Write the steps for turning on the language bar .

If you do not see the language bar in the task bar (at the bottom of the desktop) or floating on the desktop please do the following:

Step 1: Click Start, click Control Panel, and then double-click Regional and Language Options.

Step 2: On the Languages tab, under Text services and input languages, click Details as shown in Figure 8.

Step 3: Under Preferences, click Language Bar.

Step 4: Select the Show the Language bar on the desktop check box.

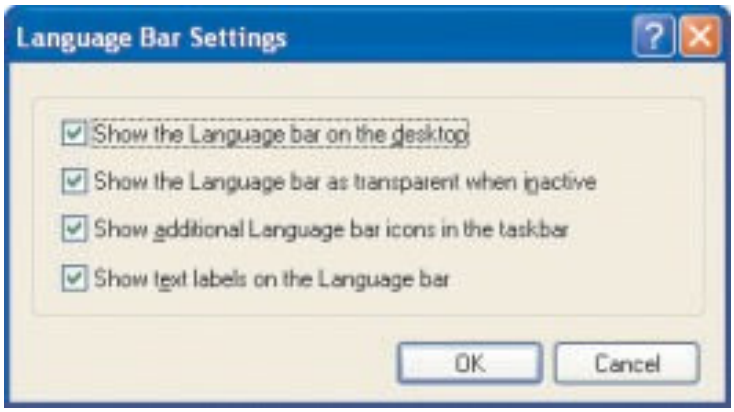


Figure 3 Language Bar Settings in Windows XP

Note: You can switch between different languages by clicking on the language bar and changing the language or by pressing the left ALT+SHIFT keys.

Q. How Fonts in Windows are Installed ?

Step 1: Go to Windows Fonts folder e.g. C:\Windows\Fonts. (The path may differ on some computers.)

Step 2: Copy-paste the font file into this folder. Windows will now install the font file.

Step 3: Once installed the font will be available in your text-based applications.

Q. How can be established Front-End and Database Connectivity ?

A database application consists of Front-End and Database (Back-end). These two entities cannot work in isolation. Whatever data is entered by the user has to go to the database and whatever relevant data is extracted from the database is to be shown to the user through the Front-End. Therefore, the Front-End and the Database of an IT application must be connected. This connectivity is achieved as learnt in Chapter 6 (Database Connectivity). If the application is web based then the connectivity is achieved using some scripting language (like vbScript or JavaScript).

Q. Are there Websites in Indian languages ? Write about them ?

Answer :Yes,these days multiple Government and private organizations are providing their websites in Hindi and other regional languages also. The aim is to provide their services even to the common people in remote areas. Small towns where computers and internet have reached, information on the net should also be available in regional languages so that people not knowing English can also have access to the information. Language should not be a hinderance but a support to learning. Understaning the importance of regional languages, many websites have also provided translation services so that the same page can be viewed in any language of user's choice.

Long Question-Answers

Q. What is IT Application ?Give details on it.

1) In information technology, an application is the use of a technology, system, or product.2) The term application is a shorter form of application program. An application program is a program designed to perform a specific function directly for the user or, in some cases, for another application program. Examples of applications include word processors, database programs, Web browsers, development tools, drawing, paint, image editing programs, and communication programs. Applications use the services of the computer's operating system and other supporting applications. The formal requests and means of communicating with other programs that an application program uses is called the application program interface (API).

We have already seen that IT applications are essential requirement of every individual and organization to simplify their day-to-day work, efficiently manage and execute projects. These applications save

time and efforts both. Now, it is the time to get into the real world of IT applications by first exploring the existing applications and then developing new applications to solve real life problems.

we have already learnt about broad categories of IT application as e-Gaming, e-Business, e-Governance, e-Learning etc. e-Business involves applications dealing with buying and selling of products and services. e-Governance involves applications which are used by government agencies/organizations to provide better governance. e- Learning involves applications which are developed to help learning of any concept/skill. Similar applications are also possible in other sectors of economy and social service.

You must have used or seen others using many such applications several times. Whenever you perform an activity online, like register for a new email account, apply for a Visa while going abroad, reserve a seat on a flight/train, buy a book online - you are actually using IT applications only. So, you can see how these applications save us time and efforts in getting various jobs done. These applications have become an integral part of our modern society.

Q. What do mean by Front-End Interface ?

Front-end and back-end are terms used to characterize program interfaces and services relative to the initial user of these interfaces and services. (The "user" may be a human being or a program.) A "front-end" application is one that application users interact with directly. A "back-end" application or program serves indirectly in support of the front-end services, usually by being closer to the required resource or having the capability to communicate with the required resource. The back-end application may interact directly with the front-end or, perhaps more typically, is a program called from an intermediate program that mediates front-end and back-end activities.

For example, the Telephony Application Program Interface (TAPI) is sometimes referred to as a front-end interface for telephone services. A program's TAPI requests are mapped by Microsoft's TAPI Dynamic Link Library programs (an intermediate set of programs) to a "back-end" program or driver that makes the more detailed series of requests to the telephone hardware in the computer.

As another example, a front-end application might interface directly with users and forward requests to a remotely-located back-end program in another computer to get requested data or perform a requested service. Relative to the client/server computing model, a front-end is likely to be a client and a back-end to be a server.

All IT applications process some data entered by the user. For example, when an examinee has to see his result on the net, he has to enter his roll number. When a person has to deposit his house tax online, he has to enter information about his house and his credit/debit card using which the house tax has to be deposited. To place an order online for some purchase, the buyer has to enter some information about himself and the item to be purchased. Similarly for any IT application the user has to enter some data which may be just a number or a lot of data like buyer's details. Every IT application provides some sort of form using which users enter the data. This form is called the Front End Interface (or just Front-End or Interface or user-interface) of the application.

Q. What Components are used for creating Front-end of any software ?Give details about those components.

Answer :To create a front-end various components, like those studied in Java GUI application development, are used. Some of the most commonly used components are discussed below.

TextField: TextField is used to get small textual information like Name, RollNo, email address, quantity, etc. Disabled/Uneditable TextFields are also used to display such information.

TextArea: TextArea is used to get long textual information which may span multiple lines of text. E.g. to get Address, Complaint, Suggestion etc. Disabled/ Uneditable TextAreas are also used to display such information.

Radio Button: Radio buttons are used to get an option out of several mutually exclusive (out of which only one can be selected) options. Examples of such options are Gender (Male or Female or Other), Type of Credit Card (Master or Visa or Other), Type of internet connection (DialUp or Braodband), etc.

CheckBox: Check boxes are used to get one or more options out of several given options which are not mutually exclusive. These are the cases where multiple options are given to the user and the user can select zero or more out of the given options. Examples of such options are Hobbies (a user may have zero or more hobbies), Magazines to subscribe for (a user may subscribe to zero or more of the given magazines) etc.

List: A list is used to get one or more options out of several given options which may or may not be mutually exclusive. This may seem to be the case where CheckBoxes are to be used, but the difference is in the number of options available. If the number of options is small, then CheckBoxes can be used. In case of large number of options, using CheckBoxes may take up a lot of space on the form and it may also be inconvenient for the user to select the desired options. In such cases Lists are preferred over checkboxes. Examples of such cases are: To select cities out of a given list of cities, to select magazines out of a given list of magazines, etc.

ComboBox: A ComboBox is used to get an option out of several given options which are mutually exclusive. This may seem to be the case where RadioButtons are to be used, but the difference is in the number of options available. If the number of options is small, then RadioButtons can be used. In case of large number of options, using RadioButtons may take up a lot of space on the form and it may also be inconvenient for the user to select the desired option. In such cases ComboBoxes are preferred over radio buttons. Examples of such cases are: To select a city out of a given list of cities, to select a train out of a given list of trains, etc.

When the options are mutually exclusive, then a List can also be used instead of a ComboBox. It all depends on the space available on the form (a ComboBox consumes less space as compared to a List) and the look of the form (which the form designer has to decide).

PasswordField: A PasswordField is used to get some secret textual information like Password, CVV number of a credit card etc.

Front-end interface is the face of any application. In most of the cases, the front-end decides whether the application will be easily accepted or not. If the front-end is convenient and unambiguous for the user, then the user will like to use it and hence the application will be given positive reviews. If the front-end interface is inconvenient for the user, then the user will not like to use the application. Therefore, front-end of an

application must be user-friendly. Following are a few tips to make the front-end more and more user friendly:

1. Consistency: Consistency in looks and operations plays a major role in front-end design. If in one window the buttons are placed at the bottom, then in all the other windows also they should be placed at the bottom. If double-clicking an item pops- up a short-cut menu, then double-clicking any other item should pop-up the relevant short-cut menu. Labels, color-scheme etc. should also be consistent through-out the application. Consistency enables users to make an idea of how the application works, and this idea leads to fast acceptance of the application.

2. Make it convenient for the user:

a) Place the most important items at the top-left position of the form. When a user looks at a window, top-left is the first position where user attention goes. So an item placed at top-left position has least chances of getting skipped.

b) Don't use such bright colors which put pressure on users' eyes. The colors which look very fantastic are not necessarily convenient for the user when it comes to entering data or viewing reports.

3. Help the user enter correct data in the first go: Ask for minimum textual data to be entered by the user. If you have to ask for class and section, provide a list to choose the class, provide radio buttons to choose the section. This way user has the options only to enter the valid data. If you ask the user to enter the class and section in a text box, then the user has all the options to enter the data and hence more chances of entering invalid data.

4. Listen to all: Before creating the user interface, you should speak to the potential users and get their ideas to decide the design of user interface. You should put a limit there only. You must get the ideas but you are not bound to use these ideas. Use your skill and commonsense to decide which of these should be incorporated and which one should not be. The aim is to create a consistent, convenient, and logically correct user interface.
5. Smooth shifting from one window to the next (or the previous): Make the sequence of moving from one window to another exactly same as the flow of work the application is made to do.

Q. What is Back-End Database ? Give detailed information about it.

A back-end database is a database that is accessed by users indirectly through an external application rather than by application programming stored within the database itself or by low level manipulation of the data (e.g. through SQL commands).A back-end database stores data but does not include end-user application elements such as stored queries, forms, macros or reports.

Front-End is just one part of an IT application. Any IT application usually stores a lot of data in the form of a database which is not visible to the user. This database is used by the application to give suitable responses to the user. This database is called Back-End Database (or just Back-End or Database). For Example, the database of train reservation system stores all the data about trains and passengers, the database of an online shopping system stores the data of all the items available in the store, and so on. If the front-end interface makes the user like or dislike the application in the first go, then the back-end decides whether the user will keep liking the application or not. A good back- end improves the speed of the application. A good back-end also ensures easy modification of the application whenever required.

Q. What are features of a good back-end database ?

Answer : Following are the features of a good back-end database:

- It should use multiple tables for storing data to avoid data redundancy.
- Tables in the database should be created using constraints wherever applicable.
- Keys (Primary and Foreign) of tables must be defined.

To make the application efficient and effective, you should also follow the guidelines given below:

1. It should meet all the requirements of the problem, for which the application was created.
2. It should have user-friendly interface to make the user comfortable while using.
3. Code should have sufficient number of comments to help the programmer/yourself to modify/update the code in future.
4. Keep the navigation of input in a standard order as much as possible. Most significant information should be entered first.
5. There should not be any ambiguity in data and information and it should avoid inputting duplicate information anywhere in any form.

Q. Give some Examples of IT Applications.Give some examples.

There are numerous IT applications. We consider herein IT applications for e-Governance, e-Business, and e-Learning. Web addresses of a few of these are given below:

e-Governance: To reach the citizens in an effective and transparent manner ICT enabled counters have been setup by government where several services like Birth/Death certificate registration, Railway enquiry and ticket booking, submission of RTI application etc. are provided. These centres are accessible to anyone and people can use these to get guidance, information, and services without paying any money to touts or middle men.

india.gov.in (The National Portal of India) -This portal not only gives the information about Government of India, but also allows the users to apply online for various services provided by the government.

1. goidirectory.nic.in (Government of India Web Directory) - Through this portal one can access various government web sites. These sites include sites of various states and union territories, and sites of central government departments etc. All these sites are examples of e-Governance applications of IT. Some of these sites are:
   a) mcchandigarh.gov.in:
      Portal of Municipal Corporation of Chandigarh
   b) Jammukashnir.nic.in:
      Portal of Municipal Government of Jammu and Kashmir

   Bhoomi (meaning land) is the project of on-line delivery and management of land records in Karnataka. It provides transparency in land records management with better citizen services and takes discretion away from civil servants at operating levels.

   The Revenue Department in Karnataka, with the technical assistance from National Informatics Centre (NIC), Bangalore, has built and operationalised the BHOOMI system throughout the state. The BHOOMI has computerized 20 million records of land ownership of 6.7 million farmers in the state.

   National Informatics Centre (NIC) is a premiere Science & Technology institution of the Government of India, established in 1976, for providing e- Government / e- Governance Solutions adopting best practices, integrated services and global solutions in Government Sector.

Hindi version of Government of India portal is http://bharat.gov.in/.

Q. What do you understand by e-Business ? Give Examples.

To reach the customers and business associates in an effective and fast manner business houses (now a days many small shops like snacks corners and paan shops also) provide their services on the net. These ICT enabled counters are used to get orders and feedbacks from the customers and also for inter-business transactions. This helps the businesses to widen their customer base. nafed-india.com/ebusiness.asp (e-business site of NAFED) -Through this URL NAFD (National Agricultural Cooperative Marketing Federation of India Ltd.) offers its e-business services to various corporates and customers.

1. Amazon.com (e-Business site of Amazon.com) - Amazon is the world's largest online store. Through this URL Amazon does its online business

e-Learning :

e-Learning has multiple goals. It is much more than having a net connection and/or CDs through which people learn. E-Learning is about giving freedom to people to learn whatever they want to learn and whenever they want to learn. This is irrespective of (except in exceptional cases) age, caste, gender, economical background, or qualification of the learner. The only requirement is the will to learn. E-learning is available on almost all the topics imaginable.

1. w3schools.com (Website Developers e-Learning site) - At w3schools.com you will learn how to make a website. It offers free tutorials in all web development technologies.
2. www.gcflearnfree.org - It is an educational part of the GCF mission. GCF creates and provides quality, innovative online learning opportunities to anyone who wants to improve the technology, literacy, and math skills necessary for them to be successful in both work and life.

GCF believes that there's freedom in the ability to learn what you want, when you want, regardless of your circumstances.

3. educationportal.mp.gov.in/public/multimedia.aspx -This government of Madhya Pradesh portal provides multimedia tutorials on various topics of different subjects like maths, science, social sciences etc.
4. ncert.nic.in/html/learning_basket.htm - This NCERT portal provides interactive modules for students to learn various topics.

Q. Give some guidelines for Multilingual websites.

NIC has developed guidelines for Indian Government websites. These guidelines are accessible at http://www.pon.nic.in/homeinfo/govt-website-guidelines.pdf. Article 5.7 of this document lays guidelines for Multilingual versions of Government websites. The main points of this article are:

a) Ideally all the pages on the website should be translated in Hindi and other regional languages. In case it becomes difficult to do so, corresponding Departments should identify the content which is widely accessed by the public and put up such content in regional languages.

b) It MUST be ensured that the documents/pages in multiple languages are updated simultaneously so that there are no inconsistencies, at any point, between the various language versions.

c) In case it is practically difficult to update the versions in all the languages simultaneously due to delays on account of translation etc., the obsolete information should be removed from the site till the latest information is uploaded. In any case, a time stamp indicating the date of uploading the information and its validity should be put along with all the time sensitive documents.

Q. How IT applications are created ? Write notes on Development of IT applications.

For developing such application, one needs to follow the following steps:

Step 1: Identify the problem for which the application is to be developed and discuss about its feasibility. If the applications is technically and economically feasible (possible and profitable to carry out), then steps are taken for its development, otherwise the project is scrapped.

Step 2: Identify and decide, which database tables and table structures will be required in the application. Make sure that the data types and sizes of the columns in the tables are carefully planned and used. Create database and tables as per the requirement of the application.

Step 3: Identify and decide, which all inputs are required to be taken from the user in the Front-End of the application. Find out, where you can minimize the typing efforts of user by introducing known options using RadioButton/CheckBox/ List/ComboBox etc. Develop the front-end of the application as per the requirement and ease of use.

Step 4: Establish the data connectivity between the Front-End interface and Back-End Database.

Step 5: Test the full application (Front-End and Back-End) with multiple sample sets of data. It is always better if the sample data are collected from potential users of the application randomly. Now, the application is ready for implementation.

Q. Give examples to understand the process of IT application development.

Example 1 - e-Business : To expand its business, XYZ Mall plans to go online. Anyone who shops at the Mall will be given a membership number and Password which can be used for online shopping. With this membership number and password, customers can place their orders online. The mall will maintain the customers' data and orders' data. A person is put on duty to keep constantly checking the Orders data. Whenever an order is received, its processing has to start at the earliest possible.The Orders' data will be analyzed periodically (monthly, quarterly, annually - whatever is suitable) to further improve business and customer satisfaction.

Example 2 - e-Governance : The state administration wants to make vehicles' data (RegNo, RegDate, Owner, OwnerShipNumber, Address, HP) easily available to citizens. Each registration authority in-charge will regularly update the data. Citizens will be given read only access to this data.

Example 3 - e-Learning :

An organization of dedicated teachers, 'Meticulous Teachers Consortium', decides to invite computer aided teaching modules from individuals and organizations so that these can be put on the internet for students' use free of cost. No money will be charged from users and no money will be paid to the developers. Once the modules start pouring in, a front-end is created for the students where the students can select any of the available modules to learn any topic.

Q. What is ICT ? Write Impact of ICT on society.

Answer : ICT stands for Information and Communication Technology. Like everything else that is used by common man, ICT (Information and Communication Technology) also has impacted the society. ICT has impacted the society in a much wider way than any other technology. Most of these impacts are positive, though there are some negative impacts also.

Social and Economic benefits of ICT:

- Social networking sites help people remain in touch with their nears and dears even when they are staying on opposite sides of the globe.
- Social networking sites help like-minded people come together and work for some cause.
- e-Governance sites help people save their productive time by performing various government related jobs like getting some forms, depositing bills online.
- ICT helps economy grow at a faster rate as it provides transparency in the processes and helps the government to keep check on defaulters.
- Due to e-Banking and use of plastic money more money is put in circulation leading to faster growth of GDP.
- e-Learning sites make quality study material available even to the students staying at remote places.

Q. Write the steps for enabling International Language Support in Windows .

Step 1: Click Start and then go to Control Panel.

Step 2: Click on Date, Time, Language, and Regional Options and choose Add Other Languages from the task list.

Step 3: In the Regional and Language Options dialog box Highlight the Languages tab.

Step 4: In the Regional and Language Options dialog box, under Supplemental Language Support, select the Install files for complex script and right-to-left languages check box. Click OK or Apply.

Step 5: You will be prompted to insert the Windows CD-ROM or point to a network location where the files are located. After the files are installed, you must restart your computer.

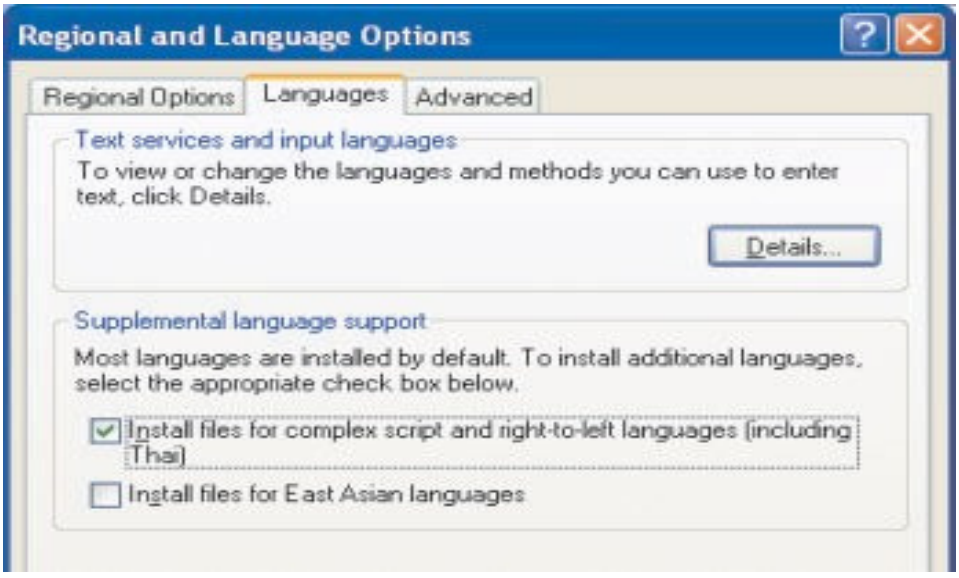


Figure 1 Languages tab in Regional and languages option in Windows XP

Q. Write steps for enabling a Keyboard Layout in Windows.

Step 1: Under "Text services and input languages," click on the "Details..." button.
Step 2: Under Installed Services, click "Add..."
Step 3: In the Text Services and Input Languages dialog box, on the Settings tab, click Add.
Step 4: In the Add Input Language dialog box, click the Input language list and select your preferred language and dialect. If you want to change the standard keyboard layout, click the Keyboard layout/IME list and select a new keyboard layout. Then, click OK.
Step 5: In the Text Services and Input Languages dialog box, on the Settings tab, click the Default input language list, and select the language you will use most often. The language you select as the default will display when you first start your computer. If you have finished adding languages, click OK.
Step 6: Click the Regional Options tab. Click the Standards and formats list, and then select your region.
Step 7: Click the Location list, and then select your location.
Step 8: Once done, click OK to exit. On the Text Services and Input Languages page, click OK again to close Regional Options. You should now see a language indicator in the System Tray (located at bottom right hand corner of the desktop by default)

CLOUD COMPUTING(Future trends)

Q. What is cloud computing ?

Answer : This means that cloud computing is a type of Internet-based computing, and it consists of every situation where the use of IT resources by an entity, including a person or an organization.

Q. What are the properties of cloud computing ?

Answer :Properties of cloud computing are :

Access to the resources is:
- Controlled by the entity, and restricted by them to their authorised users.
- Delivered via the Internet to all of these users.

- The resources are:
  - Hosted by a service provider on behalf of the entity.
  - Dedicated to their exclusive use.
- Data processed by the resources is:
  - Private to the entity and its associates.
  - Entered or collected by them, or automatically produced for them.