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13

Table Creation and Data Manipulation Commands

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13.1 INTRODUCTION

Uptil now, you have learnt quite a lot about working in MySQL. So far, you have learnt about writing simple SQL statements and using MySQL functions in queries. This chapter is going to introduce many new and useful commands of SQL. In this chapter we shall be discussing some more commands that let you create tables, add data in tables, modify/change data in tables, delete tuples from tables etc. Let us begin with table creation command– CREATE TABLE.

13.2 DATABASES IN MYSQL

Before you start creating tables, you need a database, which is the container of tables. The database acts as a central point of administration for the tables in the database. The actual data is stored in the tables, which provide a structured organization for the data and maintain the integrity of that data. To create tables, either you can create a new database or use an existing database. MySQL provides an empty database by the name **test**, which you can use to store your tables in. But it is recommended that you create new database before you create a group of some tables pertaining to a specific application. In the coming lines, you are going to learn how you can create databases in MySQL.

The first step in setting up a MySQL database is to create the actual database object, which serves as a container for the tables in that database.

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13.2.1 Creating Databases

Creating databases is an easier task relatively. In simplest form the *Create Database* command takes the following syntax.

SYNTAX `CREATE DATABASE [IF NOT EXISTS] <database name> ;`

The IF NOT EXISTS clause, if used, will first test whether a database by the mentioned name already exists or not. If it does, then create database command is simply ignored, otherwise a database with the mentioned name is created.

Following are some example database creation commands :

```
CREATE DATABASE myDB ;
```

Creates database having name as MyDB

```
CREATE DATABASE IF NOT EXISTS myDB ;
```

Creates a database having name as MyDB, if there is no database by the name MyDB already existing

13.2.2 Opening Databases

Creating database is not enough. Before you create tables in it, you need to open the database. To open a database, you simply need to write the statement as per following syntax.

SYNTAX `USE <databasename> ;`

For example, to open **myDB** database that was created just before, you need to write :

```
USE myDB ;
```

The only thing you need to ensure before opening a database is that it must already exist *i.e.*, it must be already created. To check the names of existing databases, you may write following command :

```
SHOW DATABASES ;
```

13.2.3 Removing Databases

Sometimes, you need to remove a database when you don't need it anymore. But before making this decision, do make sure that you don't need data stored in different tables of the database. This is because, when you drop a database, all its tables also get removed along with the database.

To remove a database, you need to issue a command with following syntax.

SYNTAX `DROP DATABASE<database name> ;`

That is, to drop a database namely **myDB**, you 'll be writing :

```
DROP DATABASE myDB ;
```

Now that you know about how to create and use databases, you can move on to creating tables and adding data to them.

13.3 CREATING TABLES

Tables are defined with the CREATE TABLE command. When a table is created, its columns are named, data types and sizes are supplied for each column. Each table must have at least one column.

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The syntax of CREATE TABLE command is :

SYNTAX

```
CREATE TABLE <table-name>
        (<column name> <data type> [ (<size>)],
        <columnname> <data type> [ ( <size> ) ... ]) ;
```

To create an *employee* table whose schema is as follows :

```
employee (ecode, ename, sex, grade, gross)
```

the *SQL* command will be

```
CREATE TABLE employee
    (   ecode    integer,
        ename    char(20),
        sex      char(1),
        grade    char(2),
        gross    decimal ) ;
```

NOTE

Before issuing a CREATE TABLE command, make assure that its parent database has been opened using USE <database name> command.

When you create a table, you can place constraints on the values that can be entered into its fields. If this is specified, *SQL* will reject any values (entered / changed through INSERT/UPDATE command) that violate the criteria you define. Let us learn about constraints in details.

13.3.1 Data Integrity Through Constraints

A *constraint*, in general, refers to a condition or a check that is applied to a column (field) or set of columns in a table. The *constraints* applied to maintain data integrity are also known as ***integrity constraints***.

CONSTRAINT

A **Constraint** is a condition or check applicable on a field or set of fields.

Once an integrity constraint is enabled, all data in the table must confirm to the rule that it specifies. Any subsequent SQL statement, that tries to enter or modify data in the table, is successfully carried out if and only if the data being entered or modified satisfies the integrity constraints.

The two basic types of constraints are ***Column constraints*** and ***Table constraints***. The difference between the two is that *column constraints* apply only to individual columns, whereas *table constraints* apply to groups of one or more columns. The following is the syntax for the CREATE TABLE command, expanded to include constraints :

SYNTAX

```
CREATE TABLE <table name>
(   <column name><data type> [ ( <size> ) ] <column constraint>,
    <column name><data type> [ ( <size> ) ] <column constraint> ...
    <table constraint> (<column name>,[, <column name> ... ] ) ...) ;
```

The fields given in parenthesis after the table constraint(s) are the fields to which they apply. The column constraints apply to the columns whose definitions they follow.

For example, if you write the keywords NOT NULL immediately after the data type (and size) of a column, this means the column can never have empty values (*i.e.*, NULL[1] values). Otherwise *SQL* will assume that NULLs are permitted.

1. **NULL is a special keyword in *SQL* that depicts an empty value. A column having NULL is not empty but stores an empty value. Two NULLs cannot be added ; subtracted or compared.**

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Consider the following *SQL* command.

```
CREATE TABLE employee
    (   ecode    integer      NOT NULL,
        ename    char (20)    NOT NULL,
        sex      char (1)     NOT NULL,
        grade    char (2),
        gross    decimal  ) ;
```

The above command creates a table called *employee* in which *ecode* column (integer type) can never be empty as its definition is followed by keywords NOT NULL. Similarly, the columns *ename* (*char (20)*) and *sex* (*char (1)*) can never have NULL values. Any attempt to put NULL values in these columns will be rejected.

13.3.1A Different Constraints

These constraints ensure database integrity, thus are sometimes called *database integrity constraints*. A few of them are :

- *Unique* constraint
- *Primary key* constraint
- *Default* constraint
- *Check* constraint
- *Foreign key* constraint

MySQL also supports some other constraints such as **ENUM** and **SET** constraints that are used to define columns that can contain only a given set of values. We are not going to talk about these constraints here as their coverage is beyond the scope of this book.

1. Unique Constraint

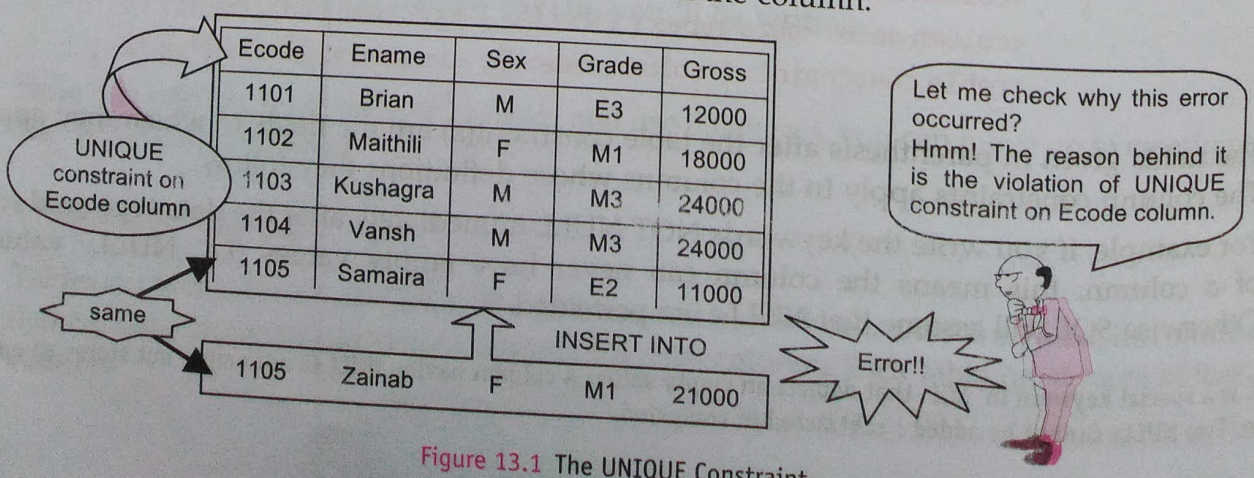
This constraint ensures that no two rows have the same value in the specified column(s). For example, UNIQUE constraint applied on *ecode* of *employee* table ensures that no rows have the same *ecode* value, as shown below.

```
CREATE TABLE employee
(   ecode    integer      NOT NULL UNIQUE,
    ename    char (20)    NOT NULL,
    sex      char (1)     NOT NULL,
    grade    char (2),
    gross    decimal ) ;
```

NOTE

Please note that a column that is specified as a primary key must also be unique. At the same time, a column that's unique may or may not be a primary key. In addition, multiple UNIQUE constraints can be defined on a table.

After the application of this constraint, all subsequent SQL statements are executed ensuring that the condition posed by this constraint is met. In other words, the values being entered or modified must ensure that the column *ecode's* value is not already existing in the table. Figure 13.1 illustrates this very concept. This constraint when applied to columns ensures that there cannot exist more than one NULL value in the column.



Ecode	Ename	Sex	Grade	Gross
1101	Brian	M	E3	12000
1102	Maithili	F	M1	18000
1103	Kushagra	M	M3	24000
1104	Vansh	M	M3	24000
1105	Samaira	F	E2	11000

1105	Zainab	F	M1	21000

Figure 13.1 The UNIQUE Constraint.

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2. Primary Key Constraint

This constraint declares a column as the primary key of the table. This constraint is similar to unique constraint except that only one column (or one group of columns) can be applied in this constraint. The primary keys cannot allow NULL values, thus, this constraint must be applied to columns declared as NOT NULL. Consider the following *SQL* statement :

```
CREATE TABLE employee
(    ecode     integer      NOT NULL PRIMARY KEY,
     ename     char (20)    NOT NULL,
     sex       char (1)     NOT NULL,
     grade     char (2),
     gross     decimal ) ;
```

NOTE

There are differences between UNIQUE and PRIMARY KEY constraints. Though both ensure unique values for each row in a column, but UNIQUE allows NULL values whereas PRIMARY KEY does not. Also, there can exist multiple columns with UNIQUE constraints in a table, but there can exist only one column or one combination with PRIMARY KEY constraint.

3. Default Constraint

A default value can be specified for a column using the DEFAULT clause. When a user does not enter a value for the column (having default value), automatically the defined default value is inserted in the field. Consider the following *SQL* statement.

```
CREATE TABLE employee
(    ecode     integer      NOT NULL PRIMARY KEY,
     ename     char (20)    NOT NULL,
     sex       char (1)     NOT NULL,
     grade     char (2)     DEFAULT 'E1',
     gross     decimal) ;
```

According to above command, if no value is provided for *grade*, the default value of 'E1', will be entered. The datatype of the default value has to be compatible with the datatype of the column to which it is assigned. Insertion of NULL (as default value) is possible only if the column definition permits. (NOT NULL columns cannot have NULL as default). *A column can have only one default value.*

4. Check Constraint

This constraint limits values that can be inserted into a column of a table. For instance, consider the following *SQL* statement :

```
CREATE TABLE employee
(    ecode     integer      NOT NULL PRIMARY KEY,
     ename     char (20)    NOT NULL,
     sex       char (1)     NOT NULL,
     grade     char (2)     DEFAULT 'E1',
     gross     decimal      CHECK (gross > 2000) ) ;
```

This statement ensures that the value inserted for *gross* must be greater than 2000.

When a check constraint involves more than one column from the same table, it is specified after all the columns have been defined. For instance,

```
CREATE TABLE items
(    icode     char (5) NOT NULL PRIMARY KEY,
     descp     char (20)    NOT NULL,
     rol       integer,
     qoh       integer,
     CHECK     (ROL < QOH ) ) ;
```

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This statement compares two columns *ROL* and *QOH*, thus, these two columns must be defined before this CHECK constraint. Check constraint can consist of :

- A list of constant expressions specified using IN. For example,

```
descp char (20) CHECK
(descp IN ('NUT', 'BOLT', 'SCREW', 'WRENCH', 'NAIL') )
```

- Range of constant expressions specified using BETWEEN. The upper and lower boundary values are included in the range. For example :

```
price decimal CHECK (price BETWEEN 253.00 and 770.00)
```

- A pattern specified using LIKE. For example, if we give a date in *Char* format, then we may check :

```
ordate char (10) NOT NULL CHECK (ordate LIKE '- -/- -/- - - -')
```

- Multiple conditions using OR, AND etc. For example,

```
CHECK    (    (discount = 0.15 AND city = 'HISSAR') OR
              (discount = 0.13 AND city = 'JAIPUR') OR
              (discount = 0.17 AND city = 'MOHALI')    )
```

For example, in the following CREATE TABLE statement,

```
CREATE TABLE Customer
(SID integer CHECK (SID > 0),
Last_Name varchar (30),
First_Name varchar(30) );
```

Column ***SID*** has a constraint — *its value must only include integers greater than 0*. So, attempting to execute the following statement,

```
INSERT INTO Customer VALUES ('-3','Gonzalves','Linda');
```

should result in an error because the values for SID must be greater than 0. But you will find that your query is executed without checking the condition specified through CHECK constraint. *The reason being* MySQL ignores CHECK constraint internally.

NOTE

Please note that MySQL does not enforce the CHECK constraint although MySQL syntax allows the definition of CHECK constraint. As per MySQL documentation, 'Check constraint gets parsed but IGNORED'.

5. Foreign Key Constraint

In an RDBMS, tables reference one another through common fields and to ensure validity of references, referential integrity is enforced. Referential integrity is a system of rules that a DBMS uses to ensure that relationships between records in related tables are valid, and that users don't accidentally delete or change related data. Referential integrity is ensured through FOREIGN KEY constraint. This is implemented as explained in the following paragraph.

Whenever two tables are related by a common column (or set of columns), then the related column(s) in the **parent table** (or **primary table**) should be either declared a PRIMARY KEY or UNIQUE key and the related column(s) in the **child table** (or **related table**) should have FOREIGN KEY constraint. For instance, if we have following two tables :

```
Items (Itemno, Description, Price, QOH)
Orders (Orderno, Orderdate, Itemno, Qty)
```

Underlined columns indicate primary key

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Both the tables are related through common column **Itemno**. The column **Itemno** is *primary key* in *parent table* **Items** and it should be declared *foreign key* in *child table* **Orders** to enforce referential integrity *i.e.*, both the tables should be created as follows :

```
CREATE TABLE Items
(    Itemno char(5) NOT NULL PRIMARY KEY,
        ⋮
);
CREATE TABLE Orders        ← child table.
(    Orderno Number (6, 0) NOT NULL PRIMARY KEY,
     ⋮
     Itemno char(5) REFERENCES Items (Itemno),   ← primary key of parent table.
     ⋮
);
```

foreign key — *parent table's name*

Notice that the related column ***Itemno*** in child table **Orders** has been declared *foreign key* through REFERENCES clause. To enforce a foreign key constraint at column level, the syntax to be followed is :

SYNTAX

```
columnname datatype (size) REFERENCES tablename
[(columnname)] [ON DELETE CASCADE] [ON UPDATE CASCADE]
```
[2]

Here the first *columnname* is the name of related column in *child table* and the *columnname* appearing after REFERENCES clause is the name of related column in the *parent table*. The *tablename* after REFERENCES clause is the name of *parent table* or *primary table* to which the column in current table is related.

- If you skip the related *columnname* in parent table, then, by default MySQL will reference the primary key of *parent table*.
- If you write ON DELETE CASCADE also, while defining foreign key constraint then in case a row or a tuple is deleted in *parent table*, all its related tuples or rows in the *child table* will automatically be deleted.
- If you write ON UPDATE CASCADE also, while defining foreign key constraint then in case a row or a tuple is updated in *parent table*, all its related tuples or rows in the *child table* will automatically be updated.

The foreign key constraint can also be applied through FOREIGN KEY table constraint, as shown below :

```
CREATE TABLE Orders ( OrderID SMALLINT NOT NULL PRIMARY KEY,
                      ModelID SMALLINT NOT NULL,
                      ModelDescrip VARCHAR(40),
                      SupplierID SMALLINT NOT NULL,
                      FOREIGN KEY (ModelID) REFERENCES Models (ModelID)
                      ON DELETE CASCADE ON UPDATE CASCADE,
                      FOREIGN KEY (SupplierID) REFERENCES Suppliers (SupplierID)
                      ON DELETE CASCADE ON UPDATE CASCADE      );
```

ModelID and SupplierID are being defined as foreign keys

2. You can also use RESTRICT | SET NULL | NO ACTION in place of CASCADE. **RESTRICT** will reject the operation ; NO ACTION will not allow deletion or updation of a primary key as long as there is a foreign key dependent on it ; SET NULL will set NULL in the foreign key column.

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Role of FOREIGN KEY/REFERENCES constraint

- It results into the rejection of INSERT (statement used to insert new data) or UPDATE (statement used to modify existing data) if a corresponding value does not currently exist in the *primary table*. (*See* Fig. 13.2)
- If ON DELETE CASCADE option has been set then upon deleting a tuple in the *parent table*, all its related records in the *child table* get deleted. In the absence of this clause, it rejects the deletion operation if corresponding records in the *child table* exist.
- The foreign key column in the *child table* must reference a PRIMARY KEY or UNIQUE column in the *parent table*.
- Both the related columns (in parent table and in child table) should have the same data type.
- May reference to the same table in which it is being defined *i.e.*, it may reference the same table name as in the CREATE TABLE command.

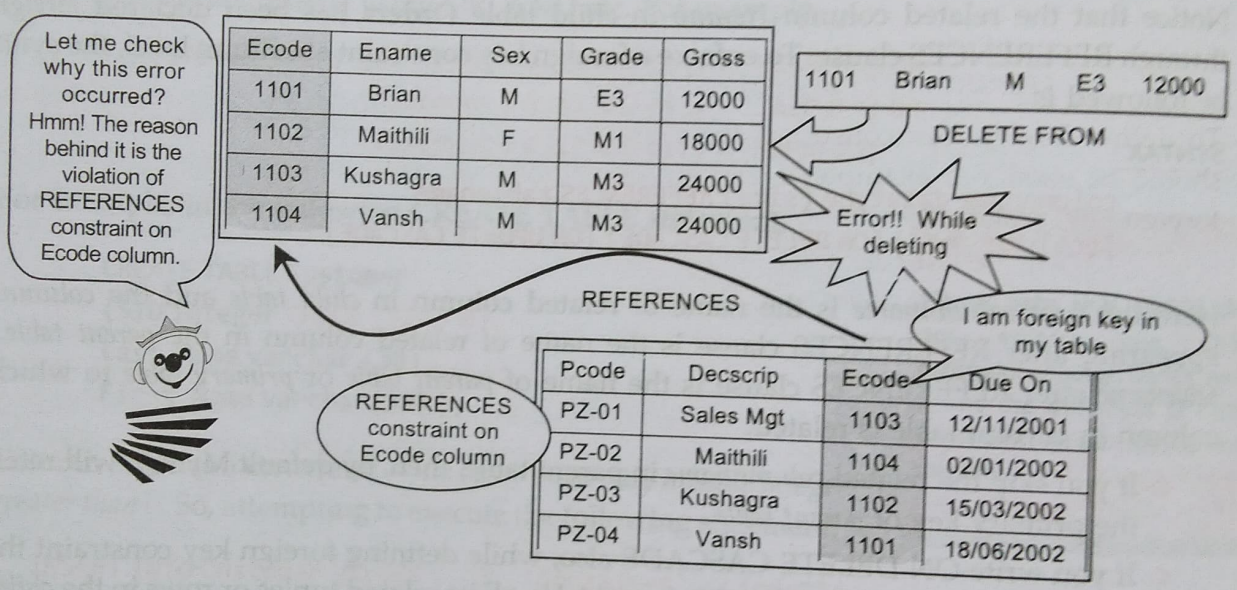

Figure 13.2 FOREIGN KEY/REFERENCE Constraint.

Important Foreign Key and Storage Engine

MySQL is capable of creating databases in many different storage engines that offer different features. The default storage engine is ISAM but ironically it does not support foreign keys. So, if you find that your foreign key constraint are being ignored or not implemented, you need to change the storage engine of your database tables to InnoDB storage engine.

To do so you simply need to write following command for your connecting tables :

```
ALTER TABLE <tablename> ENGINE = innodb ;
```

e.g.,

```
ALTER TABLE table1 ENGINE = innodb ;
```

Once done, you can create and implement foreign keys for your tables.

13.3.1B Applying Table Constraints

When a constraint is to be applied on a group of columns of the table, it is called ***table constraint***. The table constraints appear in the end of table definition. For instance, if you want combination of *icode* and *descp* of table *items* to be unique, you may write it as follows :

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```
CREATE TABLE items
(   icode    char (5)      NOT NULL,
    descp    char (20)     NOT NULL,
    ROL      integer,
    QOH      integer,
    CHECK    (ROL < QOH),
    UNIQUE   (icode, descp) ) ;
```

these are a table constraints

The above statement ensures that the combination of *icode* and *desc* in each row must be unique. Similarly, if you want to define primary key that contains more than one column, you can use PRIMARY KEY table constraint. For instance, if you want to declare a primary key for the table *members* as the combination of columns *firstname* and *lastname*, it can be done as follows :

```
CREATE TABLE members
(   firstname      char (15)  NOT NULL,
    lastname       char (15)  NOT NULL,
    city           char (20),
    PRIMARY KEY (firstname, lastname) ) ;
```

this is a table constraint

To define foreign key constraint for a group of columns, FOREIGN KEY table constraints should be used. For example, if a group of columns say ***orderno*** and ***items***, is to be declared foreign key, it should be done as follows :

```
CREATE TABLE Orders
(   Orderno Number(6, 0) NOT NULL,
        ⋮
    Itemno char(5),
        ⋮
    FOREIGN KEY (Orderno, Itemno) REFERENCES OrdMaster (OrderNO, ItemNO)
        ⋮
);
```

13.3.1C Assigning Names to Constraints

By default, MySQL assigns a unique name to each constraint defined by you. MySQL names constraints as :

```
SYS_Cn
```

where *n* is an integer that makes the constraint name unique. For instance, SYS_C003217, SYS_C001592 etc. are constraint names generated by MySQL. However, you, yourself, can name a constraint created by you. This can be done as per following syntax :

SYNTAX

```
CONSTRAINT <name-of-constraint> <definition-of-constraint>
```

For example, consider the following two CREATE TABLE statements :

```
CREATE TABLE Items
(   Itemno char(5) CONSTRAINT p_Itemkey PRIMARY KEY,
        ⋮
);
CREATE TABLE Orders
(   Orderno ,
        ⋮ ,
    CONSTRAINT Group_fkey_Orders FOREIGN KEY (Orderno, Itemno)
    REFERENCES OrdMaster (Order#, Item#)   ) ;
```

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EXAMPLE 13.1 *Create table* **Employee** *with the following structure :*

Name of Column	ID	First_Name	Last_Name	User_ID	Salary
Type	Number(4)	Varchar(30)	Varchar(30)	Varchar(10)	Number(9,2)

Ensure the following specification in created table :

- *ID should be declared as Primary Key*
- *User_ID should be unique*
- *Salary must be greater than 5000.*
- *First_Name & Last_Name must not remain blank.*

Solution.

```
CREATE TABLE Employee
(    ID Number(4) NOT NULL PRIMARY KEY,
     First_Name Varchar(30) NOT NULL,
     Last_Name Varchar(30) NOT NULL,
     User_ID Varchar(10) UNIQUE,
     Salary Number (9,2) CHECK (Salary > 5000)    ) ;
```

MySQL responds as : `Query OK, 0 rows affected`

EXAMPLE 13.2 *Create another table* **Job** *with following structure :*

Name of column	*Type*
Job_id	Number(4)
Job_des	Varchar(30)
Alloc_on	Date
Due_on	Date
Emp_id	Number(4)

Ensure the following specifications in the table :

- *Job_id* is the primary key
- *Job_des, Alloc_on, Due_on* cannot be left blank.
- *Emp_id* is foreign key here that is related to *ID* column of earlier created table *Employee*.

Solution.

```
CREATE TABLE Job
(    Job_id Number(4) NOT NULL PRIMARY KEY,
     Job_Des Varchar(30) NOT NULL,
     Alloc_on Date NOT NULL,
     Due_on Date NOT NULL,
     Emp_id Number(4) REFERENCES Employee (ID) ) ;
```

MySQL responds as : `Query OK, 0 rows affected`

NOTE

If you want to view the CREATE TABLE statement of an existing table, you may write : **SHOW CREATE TABLE <tablename> ;**.

13.3.1D Viewing a Table Structure

Once you have created a table, you may want to view its structure. Anytime, if you want to view an already created/existing table's structure, you may use DESC[RIBE] command of MySQL * Plus.

The syntax of this command is as follows :

SYNTEAX `DESC[RIBE] <tablename> ;`

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For example, if you write

```
DESC Pet ;
```

or

```
DESCRIBE Pet ;
```

MySQL will show you the complete structure of table named PET as shown below :

```
+----------+--------------+---------+---------+---------+---------+
| Field    | Type         | Null    | Key     | Default | Extra   |
+----------+--------------+---------+---------+---------+---------+
| name     | varchar(20)  | YES     |         | NULL    |         |
| owner    | varchar(20)  | YES     |         | NULL    |         |
| species  | varchar(20)  | YES     |         | NULL    |         |
| sex      | char(1)      | YES     |         | NULL    |         |
| birth    | date         | YES     |         | NULL    |         |
| death    | date         | YES     |         | NULL    |         |
+----------+--------------+---------+---------+---------+---------+
6 rows in set (0.08 sec)
```

Once you have created tables in your database, you can check the tables' names in the database. To check what all tables are there in database, simply write :

```
SHOW TABLES ;
```

it will show you the names of all the tables in the database.

13.3.1E Creating Table from Existing Table

You can define a table and put data into it without going through the usual data definition process. This can be done by using SELECT statement with CREATE TABLE.

The new table stores the result produced by the SELECT statement. The name of the new table must be unique. Following query illustrates this :

```
CREATE TABLE orditem AS
(   SELECT icode, descp
    FROM items
    WHERE QOH < ROL
);
```

NOTE

Alternatively, you may also write : **SHOW COLUMNS FROM <tablename> ;** to view column details of a table.

This will create a new table called *orditem* that stores two columns : *itemcode* and *description* for the items that have their *QOH* less than *ROL* in the relation ***items***.

The newly created table **Orditem** will look as it is shown below :

Table : *Orditem*

Icode	Descp
I06	Cream Roll

The table *Orditem* has derived its contents from table **items**.

If you do not specify the WHERE clause, *icode* & *descp* from all rows of the *items* relation will be copied into *Orditem table*.

The CREATE TABLE <table> AS SELECT... is useful for creating test tables, new tables as copies of existing tables, and for making smaller tables out of large tables.

Please check the practical component-book – Progress in Computer Science with Python and fill it there in PriS 13.1, 13.2 under Chapter 13 after practically doing it on the computer.

>>>❖<<<

13.4 CHANGING DATA WITH DML COMMANDS

As you know that DML (Data Manipulation Language) division of SQL, is dedicated to manipulating data in one way or another. This section is going to talk about various DML commands that are used for changing data in tables. Of these commands, INSERT INTO command is used for entering data into tables.

13.4.1 Inserting Data into Table

Values are placed in and removed from attributes of a relation with three DML commands : INSERT, DELETE and UPDATE. These are all referred to in *SQL* as *update* commands in a generic sense. In our text, lowercase "update" will indicate these commands generically and the uppercase for the keyword UPDATE.

13.4.1A INSERT INTO Command

The rows (tuples) are added to relations using INSERT command of *SQL*. In its simplest form, INSERT takes the following syntax :

SYNTAX

```
INSERT INTO <tablename> [ <column list> ]
VALUES ( <value>, <value> ... ) ;
```

For example, to enter a row into *employee* table (defined earlier), you could use the following statement :

```
INSERT INTO employee
VALUES (1001, 'Ravi', 'M', 'E4', 4670.00) ;
```

See the order of values matches the order of columns in the CREATE TABLE command of *employee*. The same can be done with an alternate command as shown below :

```
INSERT INTO employee (ecode, ename, sex, grade, gross)
VALUES (1001, 'Ravi', 'M', 'E4', 4670.00) ;
```

The INSERT statement adds a new row to *employee* giving a value for every column in the row. Note that the data values are in the same order as the column names in the table. Data can be added only to some columns in a row by specifying the columns and their data.

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For instance, if you want to insert only *ecode*, *ename* and *sex* columns, you use the command :

```
INSERT INTO employee (ecode, ename, sex)
VALUES (2014, 'Manju', 'F') ;
```

The columns that are not listed in the INSERT command will have their default value, if it is defined for them, otherwise, NULL value.

If any other column (that does not have a **default value** and is defined NOT NULL) is skipped or omitted, an error message is generated and the row is not added.

NOTE

In an INSERT statement, only those columns can be omitted that have either default value defined or they allow NULL values.

EXAMPLE 13.3 *Add the following data in the above Table (Employee) as instructed.*

ID	First_Name	Last_Name	User_ID	Salary
1	Dim	Joseph	Jdim	5000
2	Jagannath	Mishra	jnmishra	4000
3	Siddharth	Mishra	smishra	8000
4	Shankar	Giri	sgiri	7000
5	Gautam	Buddha	bgautam	2000

(*i*) *Populate table with first record mentioning the column list in the insert clause.*

(*ii*) *Populate table with next two records without mentioning the column list in the insert clause.*

(*iii*) *Populate table with 4th record and enter only ID and First_Name.*

(*iv*) *Populate table with 5th recorded and enter ID, User_ID, and Last_Name only.*

Solution. (*i*)

```
INSERT INTO Employee (ID, First_name, Last_name, User_ID, Salary)
Values (1, 'Dim', 'Joseph', 'Jdim', 5000) ;
```

(*ii*)

```
INSERT INTO Employee
Values (2, 'Jagannath', 'Mishra', 'jnmishra', 4000) ;
INSERT INTO Employee
Values (3, 'Siddarth', 'Mishra', 'smishra', 8000) ;
```

(*iii*)

```
INSERT INTO Employee (ID, First_name)
Values (4, 'Shankar') ;
```

(*iv*)

```
INSERT INTO Employee (ID, User_ID, Last_Name)
Values (5, 'bgautam', 'Buddha') ;
```

As you know that following command is used to insert a new row with values for all columns of the table :

```
INSERT INTO <tablename>
VALUES (<value1>, <value2>.....) ;
```

And the following INSERT INTO command allows you to insert a new row with values of select columns :

```
INSERT INTO <tablename> (<columnname1>, <columnname2>.....)
VALUES (<value1>, <value2>.....) ;
```

Let us now learn how you can insert nulls, date-values and data from other table(s).

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13.4.1B Inserting NULL values

To insert value NULL in a specific column, you can type NULL without quotes and NULL will be inserted in that column. Consider the following statement :

```
INSERT INTO EMPL (Empno, Ename, Job, Mgr, Hiredate, Sal, Comm, Deptno)
VALUES (8100, 'YASH', 'ANALYST', NULL, '10-MAY-03', 6000, NULL, 20) ;
```

See, for **Mgr** and **Comm** columns, NULL values have been inserted.

13.4.1C Inserting Dates

Dates are by default entered in 'YYYY-MM-DD' format *i.e.*, first four digits depicting *year*, followed by a hyphen, followed by 2 digits *month*, followed by a hyphen and a two digit day. All this is enclosed in single quotes. In the above two INSERT INTO statements given in previous section, the dates (HIREDATE) have been given in the same format.

13.4.1D Inserting Data from Another Table

INSERT command can also be used to take or derive values from one table and place them in another by using it with a query. To do this, simply replace the VALUES clause with an appropriate query as shown in the following example :

```
INSERT INTO branch1
SELECT * FROM branch2
WHERE gross > 7000.00 ;
```

This query will generate data to be inserted into table

It will extract all those rows from *branch2* that have *gross* more than 7000.00 and insert this produced result into the table *branch1*. To insert using a query, the following conditions must be true :

(*i*) Both the tables must be already created.

(*ii*) The columns of the tables being inserted into, must match the columns output by the subquery.

EXAMPLE 13.4 *Insert into empl table, the employee numbers, names, and salaries of all those employees of* **Temp** *table that have completed 2 years. The structure of* **Temp** *table is as follows :*

Enum	NOT NULL Number(4)
Ename	Varchar(10)
Sal	Number(7,2)
Months	Number(3)

Solution.

```
mysql> INSERT INTO Empl(Empno, Ename, Sal)
       SELECT Enum, Ename, Sal
       FROM Temp
       WHERE Months >= 24 ;
```

NOTE

Issue a command **COMMIT** ; to make the changes to a table permanent.

13.4.2 Modifying Data with UPDATE Command

Sometimes you need to change some or all of the values in an existing row. This can be done using the UPDATE command of *SQL*. The UPDATE command specifies the rows to be changed

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using the WHERE clause, and the new data using the SET keyword. The new data can be a specified constant, an expression or data from other tables. For example, to change the reorder level *ROL* of all items to 250, you would write

```
UPDATE items
SET ROL = 250 ;
```

If you want to change *ROL* to 400 only for those items that have *ROL* as 300, you use the command

```
UPDATE items
SET ROL = 400
WHERE ROL = 300 ;
```

Updating Multiple Columns

To update multiple columns, multiple column assignments can be specified with SET clause, separated by commas. All of the said assignments will still be made to the table, a single row at a time. To update the *ROL* and *QOH* for items having icode less than 'I040', we shall write

```
UPDATE items
SET ROL = 400, QOH = 700
WHERE icode < 'I040' ;
```

Using Expressions in Update

Scalar expressions can also be used in the SET clause of the UPDATE command. Suppose, if you want to increase the gross pay of all the employees by Rs. 900, you could use the following expression :

```
UPDATE employee
SET gross = gross + 900 ;
```

To double the gross pay of employees of grade 'E3' and 'E4', you use the command :

```
UPDATE employee
SET gross = gross * 2
WHERE (grade = 'E3' OR grade = 'E4') ;
```

Updating to NULL Values

The NULL values can also be entered just as other values. For example, a new grade is to be introduced and all the employees with grade 'E4' have to be promoted to it. But for the time being this grade is not known, thus NULL values are to be inserted for grades 'E4'. This can be done as follows :

```
mysql> UPDATE employees
       SET grade = NULL
       WHERE grade = 'E4' ;
```

NOTE

Don't forget to issue **COMMIT** ; after making changes to your table.

13.4.3 Deleting Data with DELETE Command

While working with tables, we may reach at a situation where we no longer need some rows of data. In such a case, we would like to remove such rows. This can be done by using DELETE command.

The DELETE command removes rows from a table. This removes the entire rows, not individual field values, so no field argument is needed or accepted. The DELETE statement takes the following general form :

```
DELETE FROM <tablename>
[WHERE <predicate> ] ;
```

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To remove all the contents of *items* table, you use the command :

```
DELETE FROM items ;
```

The table would now be empty and could be destroyed with a DROP TABLE command (covered later in the section 13.5.2).

Even some specific rows from a table can also be deleted. To determine which rows are deleted, you use a condition, just as you do for queries. For instance, to remove the tuples from *employee* table that have *gross* less than 2200.00, the following command is used :

```
DELETE FROM employee
WHERE gross < 2200.00 ;
```

13.5 MORE DDL COMMANDS

As you know, the DDL division of SQL is responsible for defining, redefining, modifying, dropping various database objects. Uptil now, you have learnt to use different database objects. This section is going to discuss some more DDL commands that prove very useful while redefining or dropping database object.

You have already worked with one DDL command – the CREATE TABLE command in the beginning of the chapter. That is, you already know how to create tables along with constraints' definition. This section is going to discuss DDL commands for altering tables, adding comments, enabling/disabling constraints, truncating tables, renaming objects, dropping tables, views and synonyms etc. Let us begin with ALTER TABLE command that is used to alter a table's definition.

13.5.1 ALTER TABLE Command

When we define a system, we specify what data we need to store, the size and data type of that data. What can we do when the requirements change ? We can alter the tables to accommodate the changed requirements.

The ALTER TABLE command is used to change definitions of existing tables. Usually, it can add columns to a table. Sometimes it can delete columns (depending on privileges) or change their sizes. In general, in MySQL SQL, ALTER TABLE command is used :

- to add a column
- to add an integrity constraint
- to redefine a column (datatype, size, default value).

13.5.1A Adding Columns

Typically, the syntax to add a column to a table is as follows :

SYNTAX

```
ALTER TABLE <table name> ADD <column name> <data type><size> [<constraint name>] ;
```

The new column will be added with NULL values for all rows currently in the table. It is generally possible to add several new columns, separated by commas, in a single command. It may be possible to drop or alter columns. Most often, altering columns will simply be a matter of increasing their size. For instance, to add a new column *tel_number* of type *integer* in table *Empl* you may give :

```
ALTER TABLE Empl
ADD (tel_number integer) ;
```

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EXAMPLE 13.5 *In table EMPL (Chapter 12, Table 12.5), add a column named THRIFTPLAN of datatype NUMBER with a maximum of seven digits and two decimal places and a column named LOANCODE of datatype CHAR with a size of one and an integrity constraint that checks that load code should be one of these characters : 'E', 'C', 'H', 'P'.*

Solution.

```
mysql> ALTER TABLE empl
       ADD ( thriftplan NUMBER(7,2),
       loancode CHAR(1) CHECK (loancode IN('E', 'C', 'H', 'P'))) ;
```

While adding columns, you can define these types of integrity constraints (NOT NULL, UNIQUE, PRIMARY KEY, referential integrity (REFERENCES), DEFAULT and CHECK constraints) on existing columns using the ADD clause and in table constraint syntax.

EXAMPLE 13.6 *In table EMPL (Chapter 12, Table 12.5), add a column named SPECIAL PAY of datatype NUMBER with maximum of seven digits with 2 digits after decimal and with a DEFAULT value of 2400.*

Solution.

```
mysql> ALTER TABLE empl
       ADD(specialpay NUMBER(7,2) DEFAULT 2400) ;
```

If you use the ADD clause to add a new column to the table, then the initial value of each row for the new column is NULL. You can add a column with a NOT NULL constraint only to a table that contains no rows.

13.5.1B Modifying Column Definitions

You can use the MODIFY clause to change any of the following parts of a column definition :

- datatype
- default value
- Order of column
- size
- NOT NULL column constraint

The MODIFY clause need only specify the column name and the modified part of the definition, rather than the entire column definition.

NOTE

You can add a column with a NOT NULL constraint only to a table that contains no rows.

Datatypes and Sizes

You can change a CHAR column to VARCHAR and a VARCHAR to CHAR only if the column contains nulls in all rows or if you do not attempt to change the column size. You can change any column's datatype or decrease any column's size if all rows for the column contain nulls. However, you can always increase the size of a CHAR or VARCHAR column or the precision of a numeric column.

NOTE

You can change any column's datatype or decrease any column's size if all rows for the column contain nulls.

Default Values

A change to a column's default value only affects rows subsequently inserted into the table. Such a change does not change default values previously inserted.

Integrity Constraints

The only type of integrity constraint that you can add to an existing column using the MODIFY clause with the column constraint syntax is a NOT NULL constraint. However, you can define other types of integrity constraints (UNIQUE, PRIMARY KEY, referential integrity, and CHECK constraints) on existing columns using the ADD clause and the table constraint syntax.

You can define a NOT NULL constraint on an existing column only if the column contains no nulls.

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Order of Column

With MODIFY clause you can also reorder the columns within a table. For this you need to use *FIRST* or *AFTER <colname>* clause to specify the position of the column. To modify existing columns of table, ALTER TABLE command can be used according to following syntax :

```
ALTER TABLE <tablename>
MODIFY (columname newdatatype (newsize) ) [FIRST|AFTER column] ;
```

To modify column *Job* of table *Empl* (Chapter 12) to have new width of 30 characters, you may give :

```
ALTER TABLE Empl
MODIFY (Job char(30) ) ;
```

Similarly, if you want to reorder an existing column say **ProjID** to be the first column in the table **Assignment**, you may write :

```
ALTER TABLE Assignment
MODIFY ProjID INT FIRST ;
```

EXAMPLE 13.7 *In table EMPL, increase the size of the THRIFTPLAN column to nine digits :*

Solution.

```
mysql> ALTER TABLE empl
       MODIFY(thriftplan NUMBER(9,2)) ;
```

EXAMPLE 13.8 *In table ACCOUNTS, modify the BAL column so that it has a default value of 0.*

Solution.

```
mysql> ALTER TABLE accounts
       MODIFY(bal DEFAULT 0) ;
```

EXAMPLE 13.9 *Add a PRIMARY KEY data constraint on the column supplier_no belonging to the table supplier_master.*

Solution.

```
ALTER TABLE supplier_master
ADD PRIMARY KEY(supplier_no) ;
```

NOTE

Please note that MySQL will reject FOREIGN KEY constraint if its database engine is not INNODB. So your query involving a FOREIGN KEY constraint may be rejected also.

Changing a Column Name

Sometimes you may need to change the name of one of your columns. For this you can use CHANGE clause of ALTER TABLE command as per following syntax :

```
ALTER TABLE
CHANGE [COLUMN] old_col_name new_col_name column_definition ;
```

For instance, to change the existing column namely First_Name of table Student, to FirstName you may write:

```
ALTER TABLE Customers
CHANGE First_Name FirstName VARCHAR(20);
```

See, complete column description is given along with the new name.

13.5.1C Removing Table Components

If you plan to remove a component of a table, then you may use the DROP clause of ALTER TABLE. The keywords mostly used with DROP clause of ALTER TABLE command are :

PRIMARY KEY	Drops the table's primary key constraint.
COLUMN <columnname>	Removes mentioned column from the table
FOREIGN KEY <constraintname>	Removes the mentioned foreign key constraint from the table.

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Now consider the following examples :

```
ALTER TABLE Empl
DROP PRIMARY KEY, DROP FOREIGN KEY fk_1, DROP COLUMN deptno ;
```

In the above given ALTER TABLE statement, the primary key, the FOREIGN KEY constraint namely fk_1, and the column namely **deptno** are all removed form the **Empl** table.

EXAMPLE 13.10 *Drop the primary key of the DEPT table.*

Solution.

```
mysql> ALTER TABLE dept
       DROP PRIMARY KEY CASCADE ;
```

The CASCADE option drops any foreign keys that reference the primary key.

EXAMPLE 13.11 *Drop the DNAME column of the DEPT table.*

Solution.

```
mysql> ALTER TABLE dept
       DROP COLUMN dname ;
```

13.5.2 The DROP TABLE Command

The DROP TABLE command of *SQL* lets you drop a table from the database. The syntax for using a DROP TABLE command is :

```
DROP TABLE [IF EXISTS] <tablename>
```

That is, to drop a table *items*, you need to write :

```
DROP TABLE items ;
```

Once this command is given, the table name is no longer recognized and no more commands can be given on that object.

The IF EXISTS clause of DROP TABLE first checks whether the given table exists in the database or not. If it does, then it drops the mentioned table from the database. For instance, consider the following query :

```
DROP TABLE IF EXISTS players ;
```

The above query will first check for existence of *players* table in current database. If it exists, then it (table *players*) will be dropped from the database.

Check Point 13.1

1. Which command is used for creating tables ?
2. What is a constraint ? Name some constraints that you can apply to enhance database integrity.
3. What is the role of UNIQUE constraint ? How is PRIMARY KEY constraint different from UNIQUE constraint ?
4. What is primary key ? What is PRIMARY KEY constraint ?
5. What is NOT NULL constraint ? What is DEFAULT constraint ?
6. When a column's value is skipped in an INSERT command, which value is inserted in the database ?
7. Can a column defined with NOT NULL constraint, be skipped in an INSERT command ?
8. How would you view the structure of table Dept ?
9. Table Empl has same structure as that of table EMPL Write a query statement to insert data from table NewEmpl into EMPL where salary and comm is more than Rs. 4000.
10. What is the error in following statement ?

    ```
    UPDATE EMPL ;
    ```

11. Identify the error :

    ```
    DELETE ALL FROM TABLE EMPL ;
    ```

12. Differentiate between DDL and DML.

DDL COMMANDS — Progress In Python 13.3

This 'Progress in Python' session is aimed at laying string foundation of decision constructs.

>>>❖<<<

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LET US REVISE

- *CREATE TABLE command is used to create tables in database.*
- *INSERT INTO command is used to insert data in the table.*
- *Nulls are inserted in the table by typing NULL without quotes.*
- *To insert data from other tables, subquery can be used inside INSERT INTO command.*
- *Existing data in tables can be changed with UPDATE command.*
- *To update a table with values coming from another table, UPDATE command can use subqueries.*
- *Tuples in a table can be deleted using DELETE command.*
- *ALTER TABLE command is used to alter the definition of already created tables.*
- *With ALTER TABLE, new columns can be added, existing columns can be redefined.*
- *DROP TABLE command drops a table from a database.*

Objective Type Questions

OTQs

Multiple Choice Questions

1. Consider the following SQL statement. What type of statement is this ?

```
CREATE TABLE employee (name VARCHAR, id INTEGER)
```

(*a*) DML (*b*) DDL
(*c*) DCL (*d*) Integrity constraint

2. The data types *CHAR(n)* and *VARCHAR(n)* are used to create _____, and _____ length types of string/text fields in a database.

(*a*) Fixed, equal (*b*) Equal, variable
(*c*) Fixed, variable (*d*) Variable, equal

3. A table ***Table1*** has two text fields defined as below :

```
:
Name1 varchar(20),
Name2 char(20),
:
```

If ***Name1*** stores value as 'Ana' and ***Name2*** stores value as 'Anuj', then ***Name1*** will consume _____ characters' space and ***Name2*** will consume _____ characters' space.

(*a*) 3, 20 (*b*) 20, 4
(*c*) 20, 20 (*d*) 3, 4

4. Consider the following SQL statement. What type of statement is this ?

```
INSERT INTO instructor VALUES (10211, 'Shreya', 'Biology', 66000);
```

(*a*) Procedure (*b*) DML
(*c*) DCL (*d*) DDL

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5. In the given query which keyword has to be inserted ?

```
INSERT INTO employee _______ (1002,Kausar,2000);
```

(a) Table (b) Values (c) Relation (d) Field

6. Which of the following is/are the DDL statements ?

(a) Create (b) Drop (c) Alter (d) All of these

7. In SQL, which command(s) is(are) used to change a table's structure/ characteristics ?

(a) ALTER TABLE (b) MODIFY TABLE
(c) CHANGE TABLE (d) All of these

8. _____ defines rules regarding the values allowed in columns and is the standard mechanism for enforcing database integrity.

(a) Column (b) Constraint (c) Index (d) Trigger

9. Which command defines its columns, integrity constraint in create table :

(a) Create table command (b) Drop table command
(c) Alter table command (d) All of these

10. Which command is used for removing a table and all its data from the database :

(a) Create table command (b) Drop table command
(c) Alter table command (d) All of these

11. Which of the following is not a DDL command ?

(a) UPDATE (b) TRUNCATE (c) ALTER (d) None of these

12. Which of the following is not a legal constraint for a CREATE TABLE command ?

(a) Primary key (b) Foreign key (c) Unique (d) Distinct

Fill in the Blanks

1. A database can be opened with _____ <database> command.
2. To list the names of existing database, you can use _____ command.
3. A _____ is a condition or check applicable on a field or a set of fields.
4. The _____ constraint creates a foreign key.
5. Issue _____ command to make changes to a table permanent.
6. To increase the size of a column in an existing table, use command _____ _____ .
7. To remove table data as well table structure, use command _____ _____ .
8. To define a column as a primary key, _____ _____ constraint is used in CREATE TABLE.

True/False Questions

1. Constraints can be defined with CREATE TABLE command.
2. Constraints can only be defined with CREATE TABLE command.
3. Unique and Primary key constraints are the same.
4. DELETE from <table> command is same as DROP TABLE command.
5. Conditional updates in table data are possible through UPDATE command.

NOTE : Answers for OTQs are given at the end of the book.

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Solved Problems

Consider the table created in example 13.1. Perform the following on the same Employee table.

1. *For record with ID = 4 update record with Last_Name, User_ID and Salary.*

   Solution.
```
Update Employee
SET Last_Name = 'Sahukar',
USER_ID = 'skar',
Salary = 9000
WHERE ID = 4 ;
```

2. *Make the changes permanent.*

   Solution.
```
COMMIT ;
```

3. *Modify the Last_Name, of the employee 3, to Gautam.*

   Solution.
```
UPDATE Employee
SET Last_Name = 'Gautam'
WHERE id = 3 ;
```

4. *Modify the Salary and increase it by 1000, for all who get salary less than 5000.*

   Solution.
```
UPDATE Employee
SET Salary = salary + 1000
WHERE salary < 5000 ;
```

5. *Delete the employee record having First_Name as Siddharth.*

   Solution.
```
DELETE FROM Employee
WHERE First_Name = 'Siddharth' ;
```

6. *Remove the entire contents of the table.*

   Solution.
```
DELETE FROM Employee ;
```

7. *Drop table Employee2.*

   Solution.
```
DROP TABLE Employee2 ;
```

8. *Add one column Email of data type VARCHAR and size 30 to the table Customer.*

   Solution.
```
ALTER TABLE Customer
ADD (Email Varchar(30)) ;
```

9. *Change the data type of column pincode to VARCHAR(10) in the table Customer.*

   Solution.
```
ALTER TABLE Customer
MODIFY(Pincode VARCHAR(10)) ;
```

10. *Add a PRIMARY KEY constraint to the table Employee2 using the EmpID column.*

    Solution.
```
ALTER TABLE Employee2
ADD CONSTRAINT p_key PRIMARY KEY(EmpID) ;
```

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11. *Add a FOREIGN KEY reference on the Employee2 table that will ensure that employee records with non-existent departments are to be prohibited.*

Solution.
```
ALTER TABLE Employee2
ADD CONSTRAINT frn_key(DeptID) REFERENCES Department ON DELETE CASCADE ;
```

12. *Add a NOT NULL constraint to the table Employee2 on column EmpName.*

Solution.
```
ALTER TABLE Employee2
ADD CONSTRAINT EN_NOTNULL
(EmpName NOT NULL) ;
```

13. *An examination agent designs the following database tables to store the information on candidates who register for examination.*

Table : CAND

Field Name	Type	Width	Description
CNUM	Character	8	Unique candidate number of the candidate where the first three characters are the unique school code of the candidate's school
CNAME	Character	30	Name of the candidate
DOB	Date		Date of birth of the candidate

Table : REGISTER

Field Name	Type	Width	Description
CNUM	Character	8	Candidate number of the candidate who sits the examination of the subject
SCODE	Character	2	Unique subject code

Table : SUBJECT

Field Name	Type	Width	Description
SCODE	Character	2	Unique subject code
SNAME	Character	30	Name of the subject

(a) (i) *Write an SQL command to create CAND.*

(ii) *Which of the following can be a candidate key of CAND ? Explain briefly.*

(A) *CNUM* (B) *CNAME + DOB*

(b) *Identify the primary key(s) and foreign key(s) of REGISTER.*

(c) (i) *Write an SQL command to increase the width of CNUM in CAND to 12.*

(ii) *The subject code and subject name of a new subject are 09 and LAW respectively. Write a SQL command to insert this record into SUBJECT.*

Solution.

(a) (i)
```
CREATE TABLE CAND
(   CNUM   CHAR(8)    PRIMARY KEY,
    CNAME  CHAR(30)   NOT NULL,
    DOB    Date       NOT NULL
);
```

(ii) Candidate key of table CAND can be CNUM as it provides unique value for each row.

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(*b*) **Primary key :** SCODE ; **Foreign key :** CNUM (*parent table* : CAND)

(*c*) (*i*)
```
ALTER TABLE CAND
MODIFY (CNUM CHAR(30)) ;
```

(*ii*)
```
INSERT INTO SUBJECT
VALUES(09, "LAW")
```

14. *A database is created with the following SQL commands to store the subject scores of a class of students in an examination. REG_NO and SUBJ_CODE represent the registration number of a student and the code of a subject respectively.*

```
CREATE TABLE EXAM(
    REG_NO CHAR(6),
    SUBJ_CODE CHAR(3),
    SCORE NUMERIC(5, 1) )

CREATE TABLE STUDENT (
    REG_NO CHAR(6),
    STUD_NAME CHAR(20) )

CREATE TABLE SUBJECT (
    SUBJ_CODE CHAR(3),
    SUBJ_NAME CHAR(15) )
```

(*a*) *Modify the first SQL command to ensure that no records in EXAM contain empty values in REG_NO and SUBJ_CODE.*

(*b*) *Identify the primary key(s) and foreign key(s) in the database.*

(*c*) *Because of a notification in the examination paper of the subject code ENG, all students will be awarded two additional scores. Write an SQL command to increase the value of SCORE by 2 in each relevant record.*

(*d*) *Describe the purpose of the following SQL command.*

```
DELETE FROM STUDENT WHERE LEN(TRIM(STUD_NAME)) = 0
```

Solution.

(*a*)
```
CREATE TABLE EXAM (
REG_NO CHAR(6),          NOT NULL,
SUBJ_CODE CHAR(3),       NOT NULL,
SCORE NUMERIC(5, 1))
```

(*b*) Table **Exam :** **Primary key :** Reg_No **Foreign key :** Subj_Code (parent table : subject)

Table **Student :** **Primary key :** Reg_No

Table **Subject :** **Primary key :** Subj_Code

(*c*)
```
UPDATE EXAM
SET SCORE = SCORE + 2
WHERE SUBJ_CODE = 'ENG' ;
```

(*d*) This command will delete all those records from STUDENT table where STUD_NAME is either empty or contains just spaces.

15. *Using SQL statements in MySQL, create the tables identified below in the following order.*
Database name : Univ. Create database if needed. (Underlined columns depict primary keys.)

Campus	(CampusID, CampusName, Street, City, State, pin, Phone, CampusDiscount)
Position	(PositionID, Position, YearlyMembershipFee)
Members	(MemberID, LastName, FirstName, CampusAddress, CampusPhone, CampusID, PositionID, ContractDuration)
Foreign Keys	CampusID --> Campus(CampusID) PositionID --> Position(PositionID)

Table Structure Notes :

- Use the proper naming convention for your constraints :
  Example : *Constraint TableName_FieldName_ConstraintID (Campus_CampusID_PK)*
- *Set up the Primary Keys for each table with Constraints listed.*
- *Add Your Foreign Keys for each table with your Constraints listed.*
- *Make the data types for all the Primary Keys and their corresponding Foreign Keys as VARCHAR(5).*

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- *Make the data types for the **YearlyMembershipFee** DECIMAL, 7 digits maximum with 2 digits to the right of the decimal place.*
- *Make the data type for **ContractDuration** INTEGER with 3 digits maximum for calculation purposes.*
- *Make the data type for **CampusDiscount** DECIMAL, 2 digits maximum with 2 digits to the right of the decimal place.*

Solution.

Database Creation

```
CREATE DATABASE IF NOT EXISTS UNIV ;
USE UNIV ;
```

Creating Table Campus

```
CREATE TABLE Campus (
    CampusID          VARCHAR(5),
    CampusName        VARCHAR(100),
    Street            VARCHAR(100),
    City              VARCHAR(100),
    State             VARCHAR(100),
    Pin               VARCHAR(6),
    Phone             VARCHAR(100),
    CampusDiscount  DECIMAL (2,2)  ) ;

    ALTER TABLE Campus ADD CONSTRAINT
    Campus_CampusID_PK PRIMARY KEY (CampusID) ;
```

Creating Table Position

```
CREATE TABLE Position (
PositionID        VARCHAR(5),
Position          VARCHAR(100),
YearlyMembershipFee  DECIMAL (7,2)  ) ;
ALTER TABLE Position ADD CONSTRAINT
Position_PositionID_PK PRIMARY KEY (PositionID) ;
```

Creating Table Members

```
CREATE TABLE Members (
MemberID            VARCHAR(5),
LastName            VARCHAR(100),
FirstName           VARCHAR(100),
CampusAddress       VARCHAR(100),
CampusPhone         VARCHAR(100),
CampusID            VARCHAR(5),
PositionID          VARCHAR(5),
ContractDuration  INTEGER      ) ;
ALTER TABLE Members    ADD CONSTRAINT
Members_MemberID_PK  PRIMARY KEY (MemberID) ;
ALTER TABLE Members    ADD CONSTRAINT
    Members_CampusID_FK FOREIGN KEY (CampusID) REFERENCES Campus ;
ALTER TABLE Members  ADD CONSTRAINT
Members_PositionID_FK FOREIGN KEY (PositionID)  REFERENCES Position ;
```

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16. *What is the following command doing ?*

```
ALTER TABLE Persons
ADD CONSTRAINT chk_Person CHECK (P_ID>0 AND City = 'Shimla') ;
```

Solution. The given command is adding a CHECK constraint namely **chk_person** in table **Persons**, that will ensure that **P_ID** should always be greater than 0 (zero) and city should always be **Shimla**.

17. *Given a statement as follows.*

```
CREATE TABLE Orders
(   O_Id int NOT NULL,
    OrderNo int NOT NULL,
    P_Id int,
    PRIMARY KEY (O_Id),
    FOREIGN KEY (P_Id) REFERENCES Persons(P_Id)  ) ;
```

Identify the number and types of constraints in the table Orders.

Solution. There are *four* constraints defined in **Orders** table as per above statement:

- Two *NOT NULL* constraints for columns **O_Id** and **P_Id**
- One *PRIMARY KEY* constraint for column **O_Id**.
- One *FOREIGN KEY* constraint for column **P_Id**.

18. *Write an SQL statement to create a PRIMARY KEY constraint on the "P_Id" column of table Persons, when the table is already created.*

Solution.

```
ALTER TABLE Persons
ADD PRIMARY KEY (P_Id)
```

19. *What is the following query doing ?*

```
ALTER TABLE Persons
DROP PRIMARY KEY ;
```

Solution. The given statement drops the PRIMARY KEY constraint in table **Persons**.

20. *On your MySQL server instance, there is a database Mydb that contains three tables namely class, marks, sports. To delete all the tables and database, following set of commands is issued, but it generates errors. What could be the problem ?*

```
DROP DATABASE mydb ;
DROP TABLE class ;
DROP TABLE marks ;
DROP TABLE sports ;
```

Solution. The first statement drops the database. When a database is dropped, all its components such as tables etc., also get dropped. Thus, with the first statement the tables also get dropped along with the database and no more exist. So the next three DROP TABLE statements are redundant and are not required.

GLOSSARY

DDL Data Description Language Subset of SQL commands that are used to describe various entities of database.

DML Data Manipulation Language Subset of SQL commands that are used to manipulate data in tables.

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Assignments

Type A : Short Answer Questions/Conceptual Questions

1. What are different divisions of SQL and commands ? Give examples of commands in each division.
2. What is foreign key ? How do you define a foreign key in your table ?
3. How is FOREIGN KEY commands different from PRIMARY KEY command ?
4. How is FOREIGN KEY commands related to the PRIMARY KEY ?
5. How do you enforce business rules on a database ?
6. What are table constraints ? What are column constraints ? How are these *two* different ?
7. What is default value ? How do you define it ? What is the default value of column for which no default value is define ?
8. Differentiate between :

   (*i*) DROP TABLE, DROP DATABASE (*ii*) DROP TABLE, DROP clause of ALTER TABLE.

Type B : Application Based Questions

1. Insert all those records of table Accounts into table *Pending* where amt_outstanding is more than 10000.
2. Increase salary of employee recrods by 10% (*table employee*).
3. Give commision of Rs. 500 to all employees who joined in year 1982 (*table Empl*).
4. Allocate the department situated in BOSTON to employee with employee number 7500 (*tables EMPL, Dept*)
5. Given the following tables :

```
Orders (OrdNo, Ord_date, ProdNo#, Qty)
Product (ProdNo, Descp, Price)
Payment (OrdNo, Pment)
```

   Write a query to delete all those records from table Orders whose complete payment has been made.

6. Enlist the names of all tables created by you.
7. Write Query statements for following transaction : ***(Consider tables of question 12)***

   (*i*) Increase price of all products by 10%.

   (*ii*) List the details of all orders whose payment is pending as per increased price.

   (*iii*) Decrease prices by 10% for all those products for which orders were placed 10 months before.
8. Modify table Empl, add another column called Grade of VARCHAR type, size 1 into it.
9. In the added column Grade, assign grades as follows :

   if sal is in range 700 – 1500, Grade is 1 ; if sal is in range 1500 – 2200, Grade is 2

   if sal is in range 2200 – 3000, Grade is 3 ; if sal is in range 3000 – Grade is 4
10. Add a constraint (NN-Grade) in table Empl that declares column Grade not null.
11. Insert a record of your choice in table Empl. Make sure not to enter Grade.
12. Modify the definition of column Grade. Increase its size to 2.
13. Drop the table Empl.
14. Create the table Department table based on the following table instance chart.

Column Name	ID	Name
Data Type	NUMBER	VARCHAR
Length	8	25

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15. Populate the table Department with data from table dept. Including only required columns.
16. Create the table Employee based on the following table instance chart.

Column Name	ID	First_Name	Last_Name	Dept_ID
Data Type	NUMBER	VARCHAR	VARCHAR	NUMBER
Length	8	25	25	8

17. Drop table Employee and Department.
18. Create table Customer as per following Table Instance Chart.

Column Name	Cust_ID	Cust_Name	Cust_Address1	Cust_Address2	Pincode	Cust_Phone
Datatype	NUMBER	VARCHAR	VARCHAR	VARCHAR	NUMBER	VARCHAR
Length	7	30	20	30	6	10

19. Add one column Email of data type VARCHAR and size 30 to the table Customer.
20. Add one more column CustomerIncomeGroup of datatype VARCHAR(10).
21. Insert few records with relevant information, in the table.
22. Drop the column CustomerIncomeGroup from table Customer.
23. Create table Department as per following Table Instance Chart.

Column Name	DeptID	DeptName
Key Type	Primary	
Nulls/Unique		NOT NULL
Datatype	NUMBER	VARCHAR
Length	2	20

24. Create table Employee as per following Table Instance Chart.

Column Name	EmpID	EmpName	EmpAddress	EmpPhone	EmpSal	DeptID
Key Type	Primary					Foreign
Nulls/Unique		NOT NULL				
Fk Table						Department
Fk Column						Dept_ID
Datatype	NUMBER	VARCHAR	VARCHAR	VARCHAR	NUMBER	VARCHAR
Length	6	20	30	10	9,2	2

25. View structures of all tables created by you.