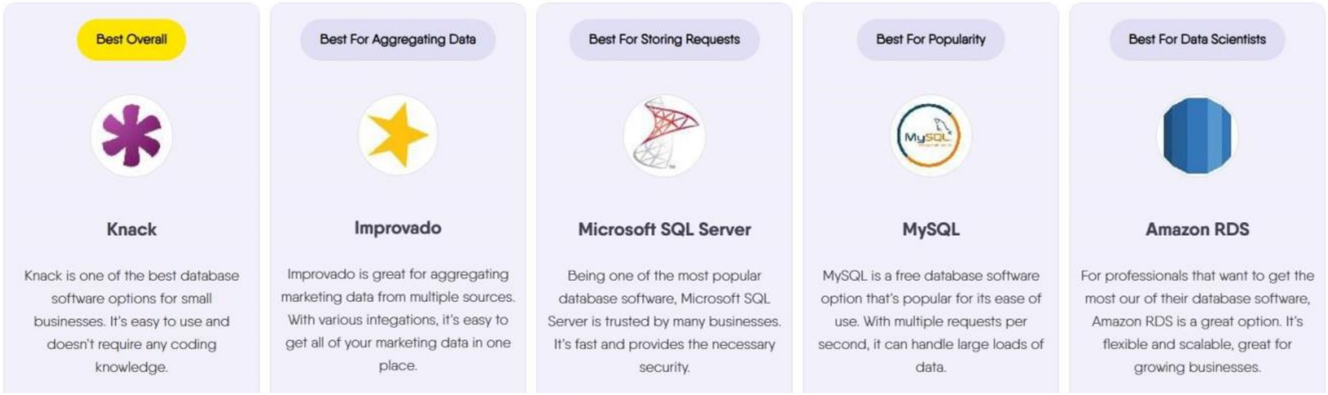
Faculty of Applied Sciences - Rajarata University of Sri Lanka

ICT1407 – Database Management Systems

Practical Sheet 01

Database Software and Systems of 2023



Best Overall

Knack

Knack is one of the best database software options for small businesses. It's easy to use and doesn't require any coding knowledge.

Best For Aggregating Data

Improvado

Improvado is great for aggregating marketing data from multiple sources. With various integations, it's easy to get all of your marketing data in one place.

Best For Storing Requests

Microsoft SQL Server

Being one of the most popular database software, Microsoft SQL Server is trusted by many businesses. It's fast and provides the necessary security.

Best For Popularity

MySQL

MySQL is a free database software option that's popular for its ease of use. With multiple requests per second, it can handle large loads of data.

Best For Data Scientists

Amazon RDS

For professionals that want to get the most our of their database software, Amazon RDS is a great option. It's flexible and scalable, great for growing businesses.

What is MySQL

MySQL is an open-source Relational Database Management System (RDBMS) that enables users to store, manage, and retrieve structured data efficiently. It is widely used for various applications, from small-scale projects to large-scale websites and enterprise-level solutions.

Advantages of MySQL

Free and Open Source

Large Community for Support

High Performance, Scalability, Flexibility

Platform Independency

Disadvantages of MySQL

Stability issues

Poor Performance in High Loads

MySQL Installation on Windows

Download MySQL

The simplest and recommended method is to download MySQL Installer for Windows from https://dev.mysql.com/downloads/installer/ and execute it.

Starting Work with MySQL

1. Open Command Prompt
2. Enter a copy of the link to your MySQL Bin Directory in the Command Prompt

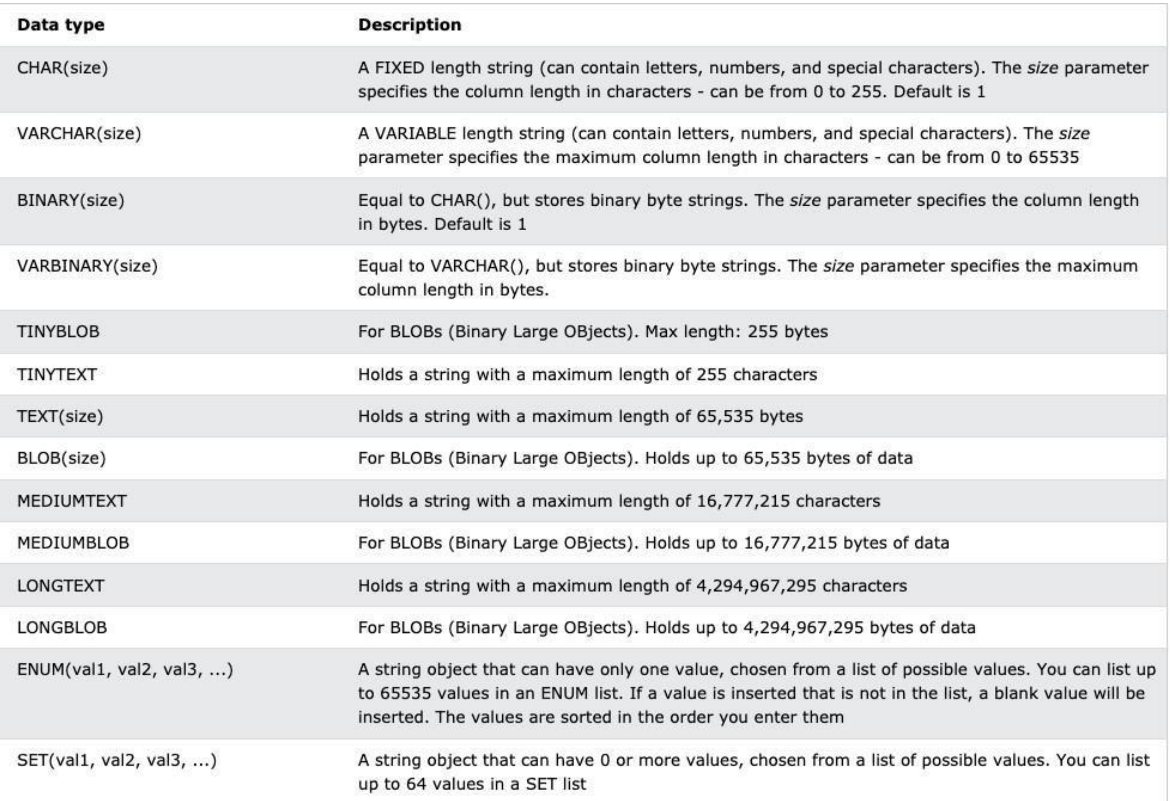
   cd <path to your MySQL Bin Directory>
3. Log in to MySQL by typing (consider your username as root)

   mysql -u root -p
4. Give your password
5. You will see **mysql>** in your command prompt. This means that you have successfully logged into MySQL.

MySQL Data Types

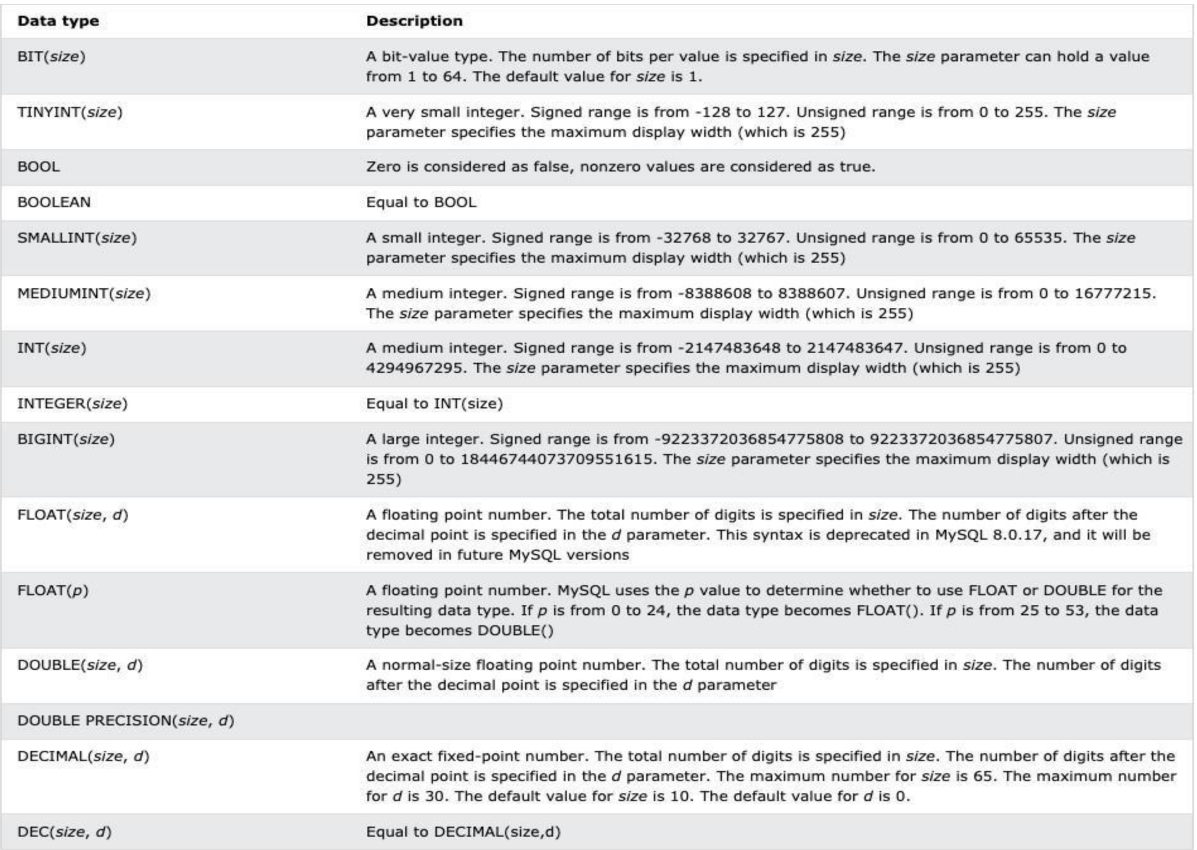
- MySQL Data Types help you to properly define fields in a table, for overall optimization of your database.
- MySQL uses many different data types broken into three categories. They are as follows.

A) String Data Types



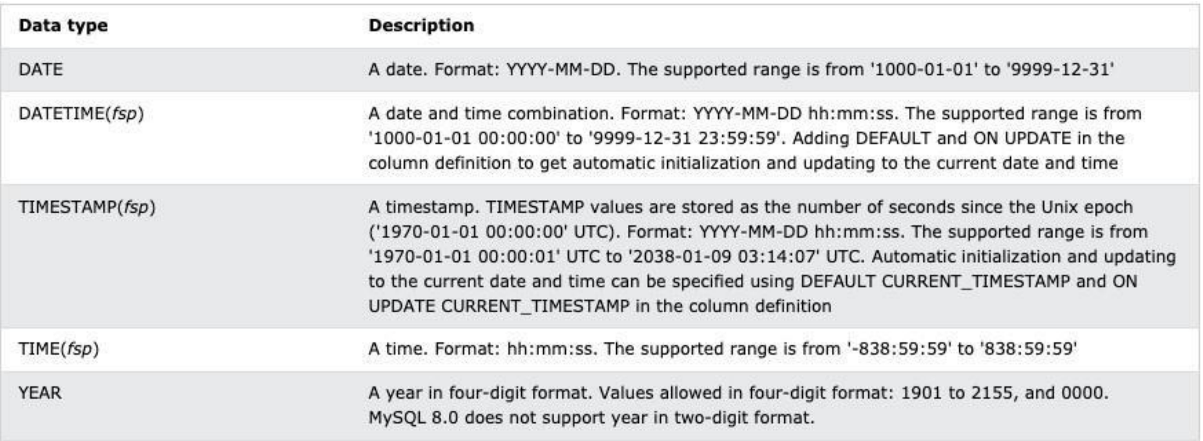
Data type	Description
CHAR(size)	A FIXED length string (can contain letters, numbers, and special characters). The *size* parameter specifies the column length in characters - can be from 0 to 255. Default is 1
VARCHAR(size)	A VARIABLE length string (can contain letters, numbers, and special characters). The *size* parameter specifies the maximum column length in characters - can be from 0 to 65535
BINARY(size)	Equal to CHAR(), but stores binary byte strings. The *size* parameter specifies the column length in bytes. Default is 1
VARBINARY(size)	Equal to VARCHAR(), but stores binary byte strings. The *size* parameter specifies the maximum column length in bytes.
TINYBLOB	For BLOBs (Binary Large OBjects). Max length: 255 bytes
TINYTEXT	Holds a string with a maximum length of 255 characters
TEXT(size)	Holds a string with a maximum length of 65,535 bytes
BLOB(size)	For BLOBs (Binary Large OBjects). Holds up to 65,535 bytes of data
MEDIUMTEXT	Holds a string with a maximum length of 16,777,215 characters
MEDIUMBLOB	For BLOBs (Binary Large OBjects). Holds up to 16,777,215 bytes of data
LONGTEXT	Holds a string with a maximum length of 4,294,967,295 characters
LONGBLOB	For BLOBs (Binary Large OBjects). Holds up to 4,294,967,295 bytes of data
ENUM(val1, val2, val3, ...)	A string object that can have only one value, chosen from a list of possible values. You can list up to 65535 values in an ENUM list. If a value is inserted that is not in the list, a blank value will be inserted. The values are sorted in the order you enter them
SET(val1, val2, val3, ...)	A string object that can have 0 or more values, chosen from a list of possible values. You can list up to 64 values in a SET list

B) Numeric Data Types



Data type	Description
BIT(*size*)	A bit-value type. The number of bits per value is specified in *size*. The *size* parameter can hold a value from 1 to 64. The default value for *size* is 1.
TINYINT(*size*)	A very small integer. Signed range is from -128 to 127. Unsigned range is from 0 to 255. The *size* parameter specifies the maximum display width (which is 255)
BOOL	Zero is considered as false, nonzero values are considered as true.
BOOLEAN	Equal to BOOL
SMALLINT(*size*)	A small integer. Signed range is from -32768 to 32767. Unsigned range is from 0 to 65535. The *size* parameter specifies the maximum display width (which is 255)
MEDIUMINT(*size*)	A medium integer. Signed range is from -8388608 to 8388607. Unsigned range is from 0 to 16777215. The *size* parameter specifies the maximum display width (which is 255)
INT(*size*)	A medium integer. Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295. The *size* parameter specifies the maximum display width (which is 255)
INTEGER(*size*)	Equal to INT(size)
BIGINT(*size*)	A large integer. Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615. The *size* parameter specifies the maximum display width (which is 255)
FLOAT(*size*, *d*)	A floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. This syntax is deprecated in MySQL 8.0.17, and it will be removed in future MySQL versions
FLOAT(*p*)	A floating point number. MySQL uses the *p* value to determine whether to use FLOAT or DOUBLE for the resulting data type. If *p* is from 0 to 24, the data type becomes FLOAT(). If *p* is from 25 to 53, the data type becomes DOUBLE()
DOUBLE(*size*, *d*)	A normal-size floating point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter
DOUBLE PRECISION(*size*, *d*)	
DECIMAL(*size*, *d*)	An exact fixed-point number. The total number of digits is specified in *size*. The number of digits after the decimal point is specified in the *d* parameter. The maximum number for *size* is 65. The maximum number for *d* is 30. The default value for *size* is 10. The default value for *d* is 0.
DEC(*size*, *d*)	Equal to DECIMAL(size,d)

C) Date and Time



Data type	Description
DATE	A date. Format: YYYY-MM-DD. The supported range is from '1000-01-01' to '9999-12-31'
DATETIME(*fsp*)	A date and time combination. Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1000-01-01 00:00:00' to '9999-12-31 23:59:59'. Adding DEFAULT and ON UPDATE in the column definition to get automatic initialization and updating to the current date and time
TIMESTAMP(*fsp*)	A timestamp. TIMESTAMP values are stored as the number of seconds since the Unix epoch ('1970-01-01 00:00:00' UTC). Format: YYYY-MM-DD hh:mm:ss. The supported range is from '1970-01-01 00:00:01' UTC to '2038-01-09 03:14:07' UTC. Automatic initialization and updating to the current date and time can be specified using DEFAULT CURRENT_TIMESTAMP and ON UPDATE CURRENT_TIMESTAMP in the column definition
TIME(*fsp*)	A time. Format: hh:mm:ss. The supported range is from '-838:59:59' to '838:59:59'
YEAR	A year in four-digit format. Values allowed in four-digit format: 1901 to 2155, and 0000. MySQL 8.0 does not support year in two-digit format.

1. Create Database

Here is a generic SQL syntax to create a MySQL Database. The name of the database we are creating is EMPLOYEE.

CREATE DATABASE COMPANY;

2. Use the Created Database

The USE statement tells MySQL to use the named database as the default (current) database for subsequent statements.

```
USE COMPANY;
```

3. Create Tables

To begin with, the table creation command requires the following details.

- Name of the table
- Name of the fields
- Definitions for each field

Now, we will create the following table in the EMPLOYEE database.

```
CREATE TABLE EMPLOYEE(
Fname VARCHAR(15),
Minit CHAR,
Lname VARCHAR(15),
Ssn CHAR(9),
Bdate DATE,
Address VARCHAR(15),
Sex CHAR,
Salary DECIMAL(10,2),
Super_ssn CHAR(9),
Dno INT);
```

4. Get a Description of the Tables

- We use the DESCRIBE command to show the structure of our table, such as column names, constraints etc.

- The DESC command is a short form of the DESCRIBE command.

```
DESCRIBE employee;

DESC employee;
```

5. Modify the Tables

MySQL allows you to modify tables. The following commands will help you with them.

Add new columns

```
ALTER TABLE EMPLOYEE

ADD tel_no VARCHAR (255);
```

Drop columns

```
ALTER TABLE EMPLOYEE

DROP COLUMN tel_no;
```

Modify Columns

```
ALTER TABLE EMPLOYEE

MODIFY COLUMN Address VARCHAR(30);
```

6. Insert Data to the Table

There are two methods to insert data to the table.

Method 1

```
INSERT INTO EMPLOYEE

(Fname, Minit, Lname, Ssn, Bdate, Address, Sex,Salary, Super_ssn, Dno)

VALUES

('John','B','Smith','12345789','1965-01-09','731 Fondren, Houston, TX','M',30000,'33344555',5);
```

Method 2 - Insert Multiple Records

```
INSERT INTO EMPLOYEE(

Fname, Minit, Lname, Ssn, Bdate, Address, Sex,Salary, Super_ssn, Dno)
```

VALUES

('Franklin','T','Wong','33344555','1955-12-08','638 Voss, TX','M',40000,'88866555',5),

('Alicia','J','Zelaya','999887777','1968-01-19','3321 Castle, Houston, TX','F',25000,'987654321',4);

7. Update Tables

There are several ways in which you can update a table.

Update a single record **UPDATE**

EMPLOYEE

SET Fname = 'Nimal'

WHERE Ssn ='33344555';

Update Multiple Records

UPDATE EMPLOYEE

SET salary = 50000.00

WHERE Dno=5;

Update Multiple Columns

UPDATE EMPLOYEE

SET salary = 45000.00, Dno='2'

WHERE Super_ssn='88866555';

Be careful when updating records. If you omit the WHERE clause, ALL records will be updated!

8. Delete

You can delete data in tables in the following methods.

Delete Specific Records

DELETE FROM EMPLOYEE WHERE Fname = 'Alicia';

Delete All Records

DELETE FROM EMPLOYEE;

Drop a Database

```
DROP DATABASE COMPANY;
```