Index in DB:
==========

--index is a DB object which is used to improve the performance of DB by minimizing the number of disk access required when a query is processed.

--indexes are created on the DB table columns.

--whenever we try to retrieve the data by using index col then DB server retrieve the data from DB very fastly.

--generally indexes are created by DBA at the time of DB schema desgin.

--In DB indexes are created in 2 ways:

1.automatically

2.manually

--whenever we are defining PK or unquie constraint on a perticular col, then DB server automatically create an index on those columns.

we can also create index explicitly by using following syntax:

>create index index_name on tables_name(col1,col2,...)

Book :1000 pages ------> index(keyword<-->pagenumber)(4 pages)

suppose we have salary like:

1.5000
2.1200
3.7800
4.1000
5.9500

1000000

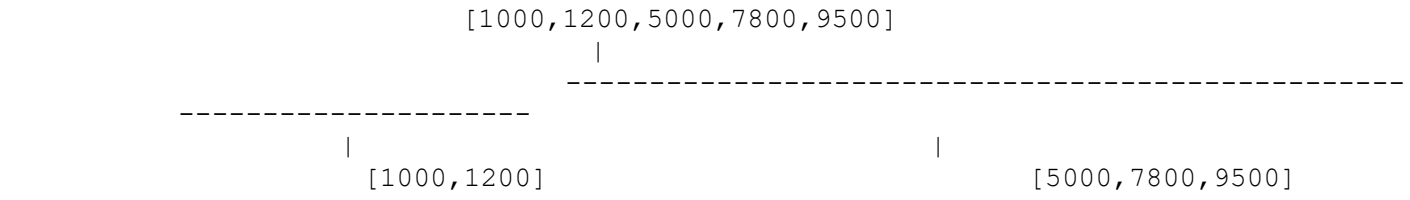
salary = 3000

--index maintains ordered data, bydefault it asc order

--if we create an index on salary column then our salary data will be in sorted order asc:

4.1000
2.1200
1.5000
3.7800
5.9500

--internally index uses B tree datastructure to store the indexed column value.



here 4,2,1,3,5 is the address of record(ROWID) and
1000,1200,5000,7800,9500 is the real data

the ROWID contains 3 parts:

1.file number (table name)
2.data block number
3.record number

--if we try to search the details of the emp based on salary column (indexed col) then before query executes on the real table, it verifies on the index.

Note: whenever "where clause " contains != or IS NULL or IS NOT NULL operator then DB does not searches for index for those columns even though index is created/applied on those column.

--So if we frquently verify a perticular col value then it is better to create an index on that column.

droping index:

```
> drop index idx_salary;
```

Autoincrement in mysql:
==========

--this is for auto generate the id field.

--mysql support auto_increment where as Oracle DB used sequence to generate the id field col automatically.

```
create table student
(
roll int primary key auto_increment,
name varchar(12) not null,
marks int
);
```

--to modify an existing table:

```
alter table emp modify eid int auto_increment;
```

Limit:

> select * from emp LIMIT 4;

getting record from 3 - 6th row

>select * from emp LIMIT 4 OFFSET 2;

after 4th record get the 2 record:

>select * from emp LIMIT 4,2;

relationship among tables:
==========

At table level we have 3 types of relationships:

1.One to One (Person <---->DL, Person <----> AadharCard)

2.One to Many (Father ---Child, Dept ---Emp, School--Student)

3.Many to Many (Student<-->Course , Books-- Authors, Movies---Actors)

OTO:
=====

Person("pid", pname, address, mobile, email);

DL ("dlid", issueDate, expirationDate, RTO, pid-- FK refer Person(pid));

here we need to make FK column also as unique

```
create table Person
(
pid int primary key,
pname varchar(12) not null,
address varchar(12),
mobile varchar(10),
email varchar(15)
);
```

```
create table DL
(
dlid int primary key,
issueDate date,
expDate date,
rto varchar(12),
pid int unique, foreign key (pid) references Person(pid)
);
```

OTM:

======

Dept("did" dname, location)

Emp("eid","ename", address, salary, deptid--FK refer Dept(did));

MTM:
=====

Student("roll", sname, address, mobile)

Course("cid",cname, fee, duration)

Note: whenever we have MTM relationship we need to take the support of 3rd linking table

Student_course(roll, cid)

```
create table student
(
roll int primary key,
sname varchar(12),
address varchar(12),
mobile varchar(12)
);

create table course
(
cid int primary key,
cname varchar(12),
fee int,
duration varchar(12)
);


create table student_course
(
roll int,
cid int, foreign key (roll) references student(roll), foreign key (cid)
references course(cid)
);
```

```
mysql> select * from student_course;
+------+------+
| roll | cid  |
+------+------+
|    1 | 1000 |
|    1 | 1001 |
|    1 | 1003 |
|    2 | 1002 |
|    4 | 1000 |
|    4 | 1003 |
|    3 | 1001 |
|    3 | 1003 |
+------+------+
8 rows in set (0.00 sec)
```

```
mysql> select * from course;
+------+-----------+------+----------+
| cid  | cname     | fee  | duration |
+------+-----------+------+----------+
| 1000 | Java      | 8500 | 45-days  |
| 1001 | Spring    | 9500 | 35-days  |
| 1002 | SQL       | 5500 | 25-days  |
| 1003 | Hibernate | 8500 | 35-days  |
+------+-----------+------+----------+
4 rows in set (0.00 sec)

mysql> select * from student;
+------+--------+---------+-----------+
| roll | sname  | address | mobile    |
+------+--------+---------+-----------+
|    1 | ram    | delhi   | 78544545  |
|    2 | ravi   | delhi   | 68544788  |
|    3 | venkat | chennai | 98544788  |
|    4 | rajiv  | hyd     | 995454545 |
+------+--------+---------+-----------+
4 rows in set (0.00 sec)
```

Q/ getting the Student details who enrolled in java:

```
> select s.roll, s.sname, s.address,s.mobile, c.cname, c.fee, c.duration
from student s INNER JOIN course c INNER JOIN student_course sc ON s.roll
= sc.roll AND c.cid = sc.cid AND c.cname = 'java';
```

Q/ getting the Course details in which venkat has enrolled.

```
>select  c.cname, c.fee, c.duration, s.sname from student s INNER JOIN
course c INNER JOIN student_course sc ON s.roll = sc.roll AND c.cid =
sc.cid AND s.sname = 'venkat';
```

Schema Desgining:

E R diagram (Entity relationship diagram)

DB schema : Schema is a DB structural view.

--it is a logical representation or description of entire db.

--tables uses physical memory where schema uses logical structure to store data.

JDBC: Java Database connectivity

Java mostly used to develop the Business application.

--every business organizations provide their business services to the customer, and to computerize those business services offered by a business organization , whatever computer application we develop, is known
as business application.

Business orgnizations are also of 2 types :

1.small scale business orgnization
2.Large scale business organization (Enterprise)

Main objective/goal of any business organization is : profit.

common and general things required in a business application :

1. maintaining business data permanently in a secure and easily retriaval manner.

2.processing the business data according to the business rule.

3. presenting the data to end-user in user understandable format.

Note: In realtime, the business data will be stored in RDBMS s/w

ex:

Mysql
Oracle
Postgres
DB2
Sql-Server

Why Java DB communication is required:
==========

--Our Java application is very efficient in Processing the data and presenting the data,
but it is very poor in storing the data in a secure and easily retrieval manner.

--with the java using Serialization and desirialization process we can store/save business
data(holded in the objects).

--RDBMS s/w are very much excellent in storing/maintaining the data, but they are very poor in presenting the data and processing the data.

--to develop the robust and powerfull business application,we need to integrate the power
of both hetregenious technology.

--Java application can perform any task through the method calls, objects, these
method calls and objects are not understandable by RDBMS s/w directly.

--similarly, DB s/w performs any operations by using SQL, but these sql commands is not understandable by the JVM.

---inspite of heteregenious env, we can communicate Java app with the DB s/w using JDBC.

Note: JDBC enables any kind of Java application to communicate with any kind of DB s/w in a standard manner.

Russian translator
Japanese
Java<-------------- Jdbc driver s/w ----------------------------->DB s/w

JDBC:

--it is an open specification from sun-microsystem(Oracle), (a documentation
which contains rules and guidelines to develop a perticular s/w (JDBC driver s/w))

--DB vendor or any 3rd party vendor will implements this specification and develop the
jdbc driver s/w.

mysql : oracle
db2 : IBM
sql_server : microsoft

Ratandb: Ratan : JDBC driver according to the JDBC specification ----------> Java application.

--for each DB s/w, we have diff Jdbc driver s/w. but all driver s/w devloped based on jdbc specification only.

--these driver s/w comes in the form of jar file.

mysql : mysql-connector.jar
oracle : ojdbc6.jar
postgres: postgres-version.jar

--this jdbc specification provides a jdbc api, to the programmer/developer to perform the DB operation from the Java application.

--this jdbc api comes in the form of 2 packages:

1.java.sql
2.javax.sql

--this jdbc api comes along with JDK installation. along with Java core library.

--to make our java application to communicate with DB s/w we need to downlaod the jdbc driver s/w jar file and we need to set that jar file to the classpath of our application.

--in the context of Java DB communication, our Java application will act as a client
because it needs the services of the DB s/w. so our Java application is also called
as JDBC client.

responsibility of the JDBC client (Java application):
==========

1. requesting the connection from the DB.

2.submitting the appropriate sql statement to the DB server in the form of String
object.

3. processing the result comming from the DB s/w.

4. dealing with exceptions if any. (most of jdbc exceptions are the checked exception)

5.managing the transaction whenever it is required.

6.closing the connection once done with DB operation.

Jdbc driver :-

--it is a translation s/w written in Java according to the JDBC specification.

responsibility of JDBC driver s/w:
---

1. establish the connection bt java application and DB s/w.

2.recieving the jdbc method calls from the java application, and translate them
into the DB understandable format and forward them to the DB s/w.

3.translate the DB s/w given result to the Java format (some objects) and returns
to the JDBC client (to the Java application)

Step to connect the Java application with the DB s/w:
==========

step1: download the jdbc driver related jar file and set that jar file in the classpath
of our project/application.

step 2: load the jdbc driver (loading the jdbc driver related main class into the memory.)

step 3: prepare the connection URL.'

step 4: establish the connection

step 5: after performing the CRUD (insert, select, update, delete)operation close the connection.

Note: with the Java application even though we can perform DDL operation , but we should always perform DML, DRL ,TCL type of operations.

Javaapp:

A.java
B.Java
C.java
Demo.java

---after compiling we need to compess all the .class files inside a jar file.

app1.jar

Myapp1: here we need to set the app1.jar the classpath of Myapp1 application

```
class X {

A a1= new A();

}
```

adding the jar file to the project class path:
---

rightclick on the project ---->build path ----> configure build path -----> select libraries tab----> add external archieve -----> select the downloaded jar file ---->apply and close.

Connection URL:

```
String url= "jdbc:mysql://localhost:3306/ratandb";
```

example app:

Demo.java:

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;

public class Demo {

	public static void main(String[] args) {

		try {
			Class.forName("com.mysql.cj.jdbc.Driver");
		} catch (ClassNotFoundException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
		}


		String url= "jdbc:mysql://localhost:3306/ratandb";

		try {
			Connection conn= DriverManager.getConnection(url,
"root", "root");

			if(conn  != null)
				System.out.println("connected...");


		} catch (SQLException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
		}

	}

}
```

JDBC
JDBC specification and implementation
JDBC driver s/w

when Class.forName(-) method is executed following 3 things happens in the backgroud.

1. Driver related main class will be loaded into the memory

2.Driver related main class object will be created.

3.that object will be registerd with the DriverManager class.

```
            try {
                  Driver d= new Driver();

                  DriverManager.registerDriver(d);


            } catch (SQLException e1) {
                  // TODO Auto-generated catch block
                  e1.printStackTrace();
            }
```

--the above code is written inside the static block of each Driver related main class.

static block and non-static block:
-==========================

```
package com.masai;

public class A {

      public A() {
            System.out.println("inside the constrcutor of A");
      }

      void funA() {

            System.out.println("inside funA of A");
      }

      {
            System.out.println("inside non-static block");
      }

      static{
            System.out.println("inside static block");
      }

      public static void main(String[] args) {

            System.out.println("inside main method of A");
```

```
            A a1=new A();

            a1.funA();

      }

}
```

output:

```
inside static block
inside main method of A
inside non-static block
inside the constrcutor of A
inside funA of A
```

Note: before starting the execution from the main jvm will call all the static blocks one by one if they are defined.

--inside a static block we can write any kind of executable statement. for example we can create object of a class, we can call any method,etc..

--non-static block will be executed before executing the constructor of our class. so if we have some overloaded constructors are there and some statements are required in all the constrcutors then it is recomended to keep those statements inside the non-static block.

****Note: whenever we load any class into the memory then that class context will be created and its all static members will be loaded into the context area and then its all static blocks will be executed.

--to load any class into the memory we can make use of forName(-) method of Class class.

--this Class class belongs to java.lang package.

example

A.java:

```
package com.masai;

public class A {


            void funA() {
                  System.out.println("inside funA of A");
            }


            static {

                  System.out.println("inside static block");
```

```
                A a1=new A();


                a1.funA();

            }
}
```

Demo.java:

```
package com.masai;

public class Demo {

      public static void main(String[] args) {


            try {
                  Class.forName("com.masai.A");
            } catch (ClassNotFoundException e) {
                  e.printStackTrace();
            }
      }

}
```

Note: from Java 1.6 loading the Driver related main class is optional , becoz once we add the driver related jar file inside the classpath of our application, then automatically Driver related main class will be loaded into the memory.

But it is recomended to keep the Class.forName() method inside our application.

inserting a student record inside the db using Java application:
==========

--once we get the Connection obj, then we can execute any type of sql statements from our java application to the DB server.

for that we require a "java.sql.Statement(I)" object.

we get the Statement obj by using :

```
Statement st= conn.createStatement();
```

--with the Statement obj we can pass/supply any type of SQL statement to the DB server from our java application for that we need to use following methods:

1. public int executeUpdate(String dml)throws SQLException /// insert, update, delete
--this method return the number of row affected due to the DML statement.

2.public ResultSet executeQuery(String drl) throws SQLException //select statement
--it will return the result from the DB in the form of ResultSet object.

3.public boolean execute(String anysql)throws SQLException // any type of sql(including DDL also)

Demo.java:
=========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;
import java.sql.Statement;

import com.mysql.cj.jdbc.Driver;

public class Demo {

	public static void main(String[] args) {

		try {
			Class.forName("com.mysql.cj.jdbc.Driver");
		} catch (ClassNotFoundException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
		}


		String url= "jdbc:mysql://localhost:3306/ratandb";

		try {
			Connection conn= DriverManager.getConnection(url, "root", "root");

			Statement st= conn.createStatement();

			int x= st.executeUpdate("insert into student values(10,'Ram','delhi',780)");


			if(x >0) {
				System.out.println("record inserted sucessfully");
			}
			else
				System.out.println("not inserted...");


		} catch (SQLException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
```

```
            }

      }

}
```

closing the connection solution 1:
==========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;
import java.sql.Statement;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {

            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";

            Connection conn=null;

            try {
                  conn = DriverManager.getConnection(url, "root", "root");

                  Statement st= conn.createStatement();

                  int x= st.executeUpdate("insert into student
values(20,'Ramesh','delhi',680)");


                  if(x >0) {
                        System.out.println("record inserted sucessfully");
                  }
                  else
                        System.out.println("not inserted...");




            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }
            finally {
```

```
                try {
                      conn.close();
                } catch (SQLException e) {
                      // TODO Auto-generated catch block
                      e.printStackTrace();
                }


          }
     }

}
```

closing the connection solution 2: using try with resource:
==========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;
import java.sql.Statement;

import com.mysql.cj.jdbc.Driver;

public class Demo {

     public static void main(String[] args) {

          try {
                Class.forName("com.mysql.cj.jdbc.Driver");
          } catch (ClassNotFoundException e) {
                // TODO Auto-generated catch block
                e.printStackTrace();
          }


          String url= "jdbc:mysql://localhost:3306/ratandb";


          try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {


                Statement st= conn.createStatement();

                int x= st.executeUpdate("insert into student
values(20,'Ramesh','delhi',680)");


                if(x >0) {
                      System.out.println("record inserted sucessfully");
                }
                else
                      System.out.println("not inserted...");
```

```
            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }

      }

}
```

inserting the student record by taking input from the user:

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {


            Scanner sc = new Scanner(System.in);

            System.out.println("Enter roll");
            int roll= sc.nextInt();

            System.out.println("Enter Name");
            String name= sc.next();

            System.out.println("Enter Address");
            String adr= sc.next();

            System.out.println("Enter Marks");
            int marks= sc.nextInt();




            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";
```

```
            try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {


                  Statement st= conn.createStatement();

                  int x= st.executeUpdate("insert into student
values("+roll+",'"+name+"','"+adr+"',"+marks+")");


                  if(x >0) {
                        System.out.println("record inserted sucessfully");
                  }
                  else
                        System.out.println("not inserted...");




            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }



      }

}
```

Note: if we use the Statment(I) obj to perform any DB operation then this Statement object has the following limitations:

1.complexities to concatenate dynamic variables.

2. whenever we pass any query to the DB using Statement obj, DB engine will perform following task every time to execute that query.

a.query compilation
b.query plan generation
c.query optimization.

--for the same query doing this operation every time , it will degrede the performance.

--to tell the DB engine to perform above 3 task only at first time with the value or without the value, and put that query in the cache, next time onwards just add the dynamic values and execute the query
--for that we need to use "java.sql.PreparedStatement(I)" obj instead of Statement obj.

```
Statement(I)
        |
PreparedStatement(I)
```

Note: Statement is relativly faster than PreparedStatment.

--to get the PreparedStatment obj we need to call

prepareStatement(String sqlquery) method on the Connection obj, with the value or without the value.

--in case of without value we need to use placeholders (?)

ex:

```
PreparedStatement ps= conn.prepareStatement("insert into student
values(?,?,?,?)");
```

--In case of placeholders, before executing the query we need to bind the appropriate values to the corresponding placeholders by calling variaous types of setXXX() methods on the PreparedStatement object.

ex:

```
ps.setInt(1,roll);
ps.setString(2,name);
ps.setString(3,adr);
ps.setInt(4,marks);
```

--after binding the appropriate placeholders we need to execute the query using one of the following methods of PreparedStatement obj.

```
public int executeUpdate()throws SQLException;

public ResultSet executeQuery()throws SQLException;

public boolean execute()throws SQLException;
```

Demo.java:

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {


            Scanner sc = new Scanner(System.in);
```

```
            System.out.println("Enter roll");
            int roll= sc.nextInt();

            System.out.println("Enter Name");
            String name= sc.next();

            System.out.println("Enter Address");
            String adr= sc.next();

            System.out.println("Enter Marks");
            int marks= sc.nextInt();




            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";


            try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {

                  PreparedStatement ps= conn.prepareStatement("insert into
student values(?,?,?,?)");

                  ps.setInt(1, roll);
                  ps.setString(2, name);
                  ps.setString(3, adr);
                  ps.setInt(4, marks);


                  int x= ps.executeUpdate();


                  if(x >0) {
                        System.out.println("record inserted sucessfully");
                  }
                  else
                        System.out.println("not inserted...");


            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }



      }

}
```

updating a record: giving grace marks to those students whose marks is greater than 700.
==========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

	public static void main(String[] args) {


		Scanner sc = new Scanner(System.in);

		System.out.println("Enter the Grace marks");
		int gMarks= sc.nextInt();




		try {
			Class.forName("com.mysql.cj.jdbc.Driver");
		} catch (ClassNotFoundException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
		}


		String url= "jdbc:mysql://localhost:3306/ratandb";


		try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {

	PreparedStatement ps= conn.prepareStatement("update student set
marks=marks+? where marks > 700");

	ps.setInt(1, gMarks);


	int x= ps.executeUpdate();


				if(x >0) {
					System.out.println(x+" record updated
sucessfully");
				}
				else
					System.out.println("not updated...");
```

```
            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }



      }

}
```

sql :

DDL (Data Defination language) (create, alter, drop, rename) // table schema

DML (Data manipulation language) (insert, update, delete) // on table data   // executeUpdate()

DRL (Data retrival language) (select)   // executeQuery()

TCL(Transaction control language) (commit, rollback, savepoint)

example Deleting a record:
==========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {


            Scanner sc = new Scanner(System.in);

            System.out.println("Enter the roll to delete the student");
            int roll= sc.nextInt();




            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
```

```
                e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";


            try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {

      PreparedStatement ps= conn.prepareStatement("delete from student
where roll =?");

      ps.setInt(1, roll);


      int x= ps.executeUpdate();


                  if(x >0) {
                        System.out.println(x+" record deleted
sucessfully");
                  }
                  else
                        System.out.println("Student does not exist...");




            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }



      }

}
```

Performing select DRL operation :
==========

```
      PreparedStatement ps= conn.prepareStatement("select * from
student");

                  ResultSet rs= ps.executeQuery();
```

--here we get the records from the DB, in the form of java.sql.ResultSet(I) object.

--in order to get the details or data from the ResultSet object we need to know the structure of the ResultSet object.

Note: ResultSet structure will depends upon the query whatever we are executing. it does not depend upon on the table structure.

now to move the cursur from the BFR to the record area we need to use following method of ResultSet obj.

```
public boolean next();
```

--this method will move the cursor from the BFR to the record area and if it points to any record then it returns true other if no record is there , i.e point to ALR then it returns false.

--to access/get the column fields value from the cursor pointed record we need to use following method of the ResultSet obj.

```
public XXX getXXX(String columnName);  // here XXX will be replaced with
the appropriate data type :
```

ex:

```
public int getInt("roll");

public String getString("name");

public String getString("address");

public int getInt("marks");
```

Note: to move the cursor from the BFR to the record area we need to follow following stategy:

1. if we sure that only 0 or 1 record will come (atmost 1) in that case we need to use if-else condition.
(when our search condition is on PK)

2.if there may be a chance of getting more than one row then we need to use "while" loop.

example:

Demo.java:

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

	public static void main(String[] args) {


		try {
			Class.forName("com.mysql.cj.jdbc.Driver");
		} catch (ClassNotFoundException e) {
			// TODO Auto-generated catch block
			e.printStackTrace();
		}


		String url= "jdbc:mysql://localhost:3306/ratandb";


		try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {


			PreparedStatement ps= conn.prepareStatement("select *
from student");

			ResultSet rs= ps.executeQuery();

			while(rs.next()) {

				int r= rs.getInt("roll");
				String n= rs.getString("name");
				String a= rs.getString("address");
				int m= rs.getInt("marks");


				System.out.println("Roll is "+r);
				System.out.println("Name is "+n);
				System.out.println("Address is "+a);
				System.out.println("Marks is "+m);


	System.out.println("==============================");

			}



		} catch (SQLException e) {
			// TODO Auto-generated catch block
```

```
                e.printStackTrace();
            }



      }

}
```

Develop a searching application using JDBC:
==========

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {


            Scanner sc= new Scanner(System.in);

            System.out.println("Enter Roll to Search the Student");
            int roll= sc.nextInt();


            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";


            try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {


                  PreparedStatement ps= conn.prepareStatement("select *
from student where roll =?");

                  ps.setInt(1, roll);

                  ResultSet rs= ps.executeQuery();
```

```
                if(rs.next()) {


                      int r= rs.getInt("roll");
                      String n= rs.getString("name");
                      String a= rs.getString("address");
                      int m= rs.getInt("marks");


                      System.out.println("Roll is "+r);
                      System.out.println("Name is "+n);
                      System.out.println("Address is "+a);
                      System.out.println("Marks is "+m);



                }else
                      System.out.println("Student does not exist with
Roll :"+roll);







            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }



      }

}
```

example 2:

```
package com.masai;

import java.sql.Connection;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.Statement;
import java.util.Scanner;

import com.mysql.cj.jdbc.Driver;

public class Demo {

      public static void main(String[] args) {


            Scanner sc= new Scanner(System.in);
```

```
            System.out.println("Enter Name to Search the Student");
            String name= sc.next();


            try {
                  Class.forName("com.mysql.cj.jdbc.Driver");
            } catch (ClassNotFoundException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }


            String url= "jdbc:mysql://localhost:3306/ratandb";


            try(Connection conn = DriverManager.getConnection(url, "root",
"root")) {


                  PreparedStatement ps= conn.prepareStatement("select *
from student where name =?");

                  ps.setString(1, name);

                  ResultSet rs= ps.executeQuery();

                  boolean flag=true;

                  while(rs.next()) {

                        flag=false;
                        int r= rs.getInt("roll");
                        String n= rs.getString("name");
                        String a= rs.getString("address");
                        int m= rs.getInt("marks");


                        System.out.println("Roll is "+r);
                        System.out.println("Name is "+n);
                        System.out.println("Address is "+a);
                        System.out.println("Marks is "+m);

                  }


                  if(flag)
                        System.out.println("record does not exist.");







            } catch (SQLException e) {
                  // TODO Auto-generated catch block
                  e.printStackTrace();
            }
```

```
      }

}
```

--all the above examples are not the reusable:

--to make our Data access logic reusable and efficient we need to use a pattern called DAO (Data access object) pattern.