Program No.11: Code, execute and debug programs that uses array concept.

a) Java Program to illustrate how to declare, instantiate, initialize and traverse the Java array.

```
class OneDimArray
  {
    public static void main(String args[])
      {
        int a[]=new int[5];//declaration and instantiation
        a[0]=10;//initialization
        a[1]=20;
        a[2]=70;
        a[3]=40;
        a[4]=50;
        //traversing array
        System.out.println("Elements of array are");
        for(int i=0;i<a.length;i++) //length is the property of array
        System.out.println(a[i]);
  }
}
```

Output:
Elements of array are
10
20
70
40
50

b) Java Program to illustrate the use of multidimensional array

```
class MultiDimArray
  {
   public static void main(String args[])
    {
    int arr[][]={{1,2,3},{2,4,5},{4,4,5}};  //declaring and initializing 2D array
    //printing 2D array
    System.out.println("Elements of 2D array are");
    for(int i=0;i<3;i++)
    {
     for(int j=0;j<3;j++)
      {
        System.out.println(arr[i][j]+" ");
      }
    System.out.println();
    }
```

```
    }
  }
```

Output:

Elements of 2D array are

1
2
3

2
4
5

4
4
5

Program No.12: Code, execute and debug programs to perform string manipulation.

```
import java.lang.String;
class StringDemo
{
        public static void main(String arg[])
        {
            String s1 = new String("gpt athani");
            String s2 = "GPT ATHANI";
            System.out.println("The string s1 is : " + s1);
            System.out.println("The string s2 is : " + s2);
            System.out.println("Length of the string s1 is : " + s1.length());
            System.out.println("Length of the string s2 is : " + s2.length());
            System.out.println("The String s1 in Upper Case : " + s1.toUpperCase());
            System.out.println("The String s2 in Lower Case : " + s2.toLowerCase());
            System.out.println("The first occurrence of a is at the position : "+ s1.indexOf('a'));
            System.out.println("s1 equals to s2 : " + s1.equals(s2));
            System.out.println("s1 equals ignore case to s2 : " + s1.equalsIgnoreCase(s2));
            System.out.println("Character at an index of 6 is :" + s1.charAt(6));
            String s3 = s1.substring(4, 8);
            System.out.println("Extracted substring is :" + s3);
            System.out.println("After Replacing a with b in s1 : "+ s1.replace('a', 'b'));
            System.out.println("After string concat :" + s1.concat(" Karnataka"));
            String s4 = "  This is a book "; //White space before This word.
            System.out.println("The string s4 is :" + s4);
            System.out.println("After string trim :" + s4.trim());
            int result = s1.compareTo(s2);
            System.out.println("After compareTo");
            if (result == 0)
            System.out.println(s1 + " is equal to " + s2);
            else if (result > 0)
                System.out.println(s1 + " is greater than " + s2);
            else
                System.out.println(s1 + " is smaller than " + s2);
        }
    }
```

Output:

```
The string s1 is : gpt athani
The string s2 is : GPT ATHANI
Length of the string s1 is : 10
Length of the string s2 is : 10
The String s1 in Upper Case : GPT ATHANI
The String s2 in Lower Case : gpt athani
The first occurrence of a is at the position : 4
s1 equals to s2 : false
s1 equals ignore case to s2 : true
Character at an index of 6 is :h
Extracted substring is :atha
After Replacing a with b in s1 : gpt bthbni
After string concat :gpt athani Karnataka
The string s4 is :  This is a book
After string trim :This is a book
After compareTo
gpt athani is greater than GPT ATHANI
```

Program No.13: Code, execute and debug a program that implements the concept of inheritance.

```
class Room
{
        int length,breadth;
        Room(int x, int y)
        {
            length = x;
           breadth = y;
        }
        int area()
        {
           return (length * breadth);
        }
}
class ClassRoom extends Room
{
    int height;
   ClassRoom(int x, int y, int z)
    {
       super(x, y);
       height = z;
    }
int volume()
{
   return (length * breadth * height);
}
}
class SubClass
{
public static void main(String args[])
  {
        ClassRoom cr = new ClassRoom(20, 30, 10);
        int area = cr.area();
        int volume =cr.volume();

        System.out.println("Area=" + area);
        System.out.println("Volume=" + volume);
    }
}
```

Output

Area = 600

Volume = 6000

Program No.14: Design a class & implement like file parser and check compliance with OCP.

```
class Cuboid
 {
   public double length;
   public double breadth;
   public double height;
}
 class Application
 {
  public double get_total_volume(Cuboid geo_objects[])
    {

       double vol_sum = 0;
      for (Cuboid geo_obj : geo_objects)
        {
           vol_sum += geo_obj.length * geo_obj.breadth * geo_obj.height;
        }
       return vol_sum;
    }
}

public class OCP
{
   public static void main(String args[])
   {
       Cuboid cb1 = new Cuboid();
       cb1.length = 5;
       cb1.breadth = 10;
       cb1.height = 15;

       Cuboid cb2 = new Cuboid();
       cb2.length = 2;
       cb2.breadth = 4;
       cb2.height = 6;

       Cuboid cb3 = new Cuboid();
       cb3.length = 3;
       cb3.breadth = 12;
       cb3.height = 15;

       Cuboid  c_arr[] = new Cuboid[3];
       c_arr[0] = cb1;
```

```
        c_arr[1] = cb2;
        c_arr[2] = cb3;

        Application app = new Application ();
        double volume = app.get_total_volume(c_arr);
        System.out.println ("The total volume is " + volume);
    }
}
```

Output:

The total volume is 1338.0

Program No.15: Code, execute and debug programs that uses
a. static binding
b. dynamic binding

a) Static binding

```
class Dog
{
    private void eat()
      {
        System.out.println("Dog is eating...");
      }
public static void main(String args[])
   {
      Dog d1=new Dog();
     d1.eat();
   }
}
```

Output:
Dog is eating...

b) Dynamic binding

```
class Animal
  {
      void eat()
      {
        System.out.println("animal is eating...");
      }
  }
class Dog1 extends Animal
    {
        void eat()
         {
           System.out.println("dog is eating...");
         }
       public static void main(String args[])
         {
           Animal a=new Dog1();
           a.eat();
         }
    }
```

Output:
Dog is eating...

Program No.16: Code, execute and debug program that uses abstract class to achieve abstraction.

```
abstract class Shape
{
    abstract void draw();
}
//In real scenario, implementation is provided by others i.e. unknown by end user
class Rectangle extends Shape
  {
    void draw()
      {
        System.out.println("drawing rectangle");
      }
  }
class Circle extends Shape
 {
    void draw()
      {
        System.out.println("drawing circle");
      }
}
//In real scenario, method is called by programmer or user
class TestAbstraction
    {
      public static void main(String args[])
        {
          Shape s=new Circle();
              //In a real scenario, object is provided through method, e.g., getShape() method
          s.draw();
        }
    }
```

Output: drawing circle

Program No.17: Code, execute and debug program that uses interface to achieve abstraction.

```
interface Area
{
        final static float pi = 3.142F;
        float compute(float x, float y);
}

class Rectangle implements Area
{
        public float compute(float x, float y)
        {
                return ( x * y);
        }
}
class Circle implements Area

{
        public float compute(float x, float y)
        {
                return (pi * x * x);
        }
}

class InterfaceTest
{
        public static void main(String args[])
        {
                Rectangle rect = new Rectangle();
                Circle cir = new Circle();
                Area area;
                area= rect;
                System.out.println("Area of Rectangle = " + area.compute(10, 20));
                 area = cir;
                System.out.println("Area of Circle = " + area.compute(30, 0));

        }
}
```

Output:

Area of Rectangle = 200
Area of Circle =3070.8

Program No.18: Code, execute and debug program to read the content of the file and write the content to another file.

(First create one text file- inputFile.txt and another text file outputFile.txt in C:drive\test folder)

```
import java.io.File;
import java.io.FileInputStream;
import java.io.FileWriter;
import java.io.IOException;
import java.util.Scanner;
class CopyContent
{
  public static void main(String[] args) throws IOException
  {
     File file = new File("C:\\test\\inputFile.txt");
     FileInputStream inputStream = new FileInputStream(file);
     Scanner sc = new Scanner(inputStream);
     StringBuffer buffer = new StringBuffer();
      while(sc.hasNext())
        {
           buffer.append(" "+sc.nextLine());
        }
    System.out.println("Contents of the file: "+buffer);
    File dest = new File("C:\\test\\outputFile.txt");
    FileWriter writer = new FileWriter(dest);
    writer.write(buffer.toString());
    writer.close();
    System.out.println("File copied successfully.....");
  }
}
```

Output:

Contents of the file: Welcome to GPT Athani This is example for checked exceptions. It uses throws keyword. Welcome to CS dept
File copied successfully.....

Program No.19: Code, execute and debug program that handles checked and unchecked exceptions

a) Checked Exceptions:

```
import java.io.*;
 class Checked
{
   public static void main(String[] args)
   {
      FileReader file = new FileReader("C:\\test\\gpta.txt");
      BufferedReader fileInput = new BufferedReader(file);
      for (int counter = 0; counter < 3; counter++)
      System.out.println(fileInput.readLine());
      fileInput.close();
   }
}
```

Output:

```
Console
<terminated> Checked [Java Application] C:\Program Files (x86)\Java\jre6\bin\javaw.exe (28-Jul-2022 4:57:40 PM)
Exception in thread "main" java.lang.Error: Unresolved compilation problems:
        Unhandled exception type FileNotFoundException
        Unhandled exception type IOException
        Unhandled exception type IOException

        at Checked.main(Checked.java:7)
```

- To fix the above program, we either need to specify a list of exceptions using **throws**, or we need to use a **try-catch block.** We have used throws in the below program. Since *FileNotFoundException* is a subclass of *IOException*, we can just specify *IOException* in the throws list and make the above program compiler-error-free.

```
import java.io.*;
 class Checked
{
   public static void main(String[] args) throws IOException
   {
        FileReader file = new FileReader("C:\\test\\gpta.txt");
        BufferedReader fileInput = new BufferedReader(file);
        for (int counter = 0; counter < 3; counter++)
        System.out.println(fileInput.readLine());
       fileInput.close();
   }
}
```

Output:
Welcome to GPT Athani
This is example for checked exceptions.
It uses throws keyword.

a) Unchecked Exceptions:

```
class Unchecked
 {
   public static void main(String args[])
   {
      // Here we are dividing by 0  which will not be caught at compile time
      // as there is no mistake but caught at runtime because it is mathematically incorrect
      int x = 0;
      int y = 10;
      int z = y / x;
   }
}
```

Output:

```
Console
<terminated> Unchecked [Java Application] C:\Program Files (x86)\Java\jre6\bin\javaw.exe (28-Jul-2022 4:59:55 PM)
Exception in thread "main" java.lang.ArithmeticException: / by zero
        at Unchecked.main(Unchecked.java:9)
```

Program No.20: Code, execute and debug program to illustrate throwing our own exceptions or user defined exceptions.

```
import java.lang.Exception;
class MyException extends Exception
   {
         MyException(String message)
         {
           super(message);
         }
   }
class TestMyException
   {
   public static void main(String args[])
       {
         int x=5,y=1000;
         try
         {
           float z=(float) x/(float) y;
           if(z < 0.01)
             {
                  throw new MyException("Number is too small");
             }
         }
     catch(MyException e)
         {
           System.out.println("Caught my exception");
           System.out.println(e.getMessage());
         }
      finally
         {
           System.out.println("I am always here");
         }
     }
  }
```

Output:

Caught my exception
Number is too small
I am always here

Program No.21: Design an interface & implement it like one that builds different types of toys and check compliance with ISP.

```
interface Toy
  {
        void setPrice(double price);
        void setColor(String color);
  }
interface Movable
  {
        void move();
 }
interface Flyable
 {
        void fly();
  }
class ToyHouse implements Toy
  {
        double price;
        String color;
        @Override
        public void setPrice(double price)
         {
            this.price = price;
        }
        @Override
        public void setColor(String color)
        {
             this.color=color;
        }
        @Override
        public String toString()
        {
           return "ToyHouse: Toy house- Price: "+price+" Color: "+color;
        }
}

class ToyCar implements Toy, Movable
   {
        double price;
        String color;
        @Override
        public void setPrice(double price)
        {
        this.price = price;
        }
        @Override
        public void setColor(String color)
        {
        this.color=color;
        }
```

```
        @Override
        public void move()
        {
            System.out.println("ToyCar: Start moving car.");
        }
        @Override
        public String toString()
         {
           return "ToyCar: Moveable Toy car- Price: "+price+" Color: "+color;
         }
    }

class ToyPlane implements Toy, Movable, Flyable
{
        double price;
        String color;
        @Override
        public void setPrice(double price)
        {
            this.price = price;
         }
        @Override
        public void setColor(String color)
        {
           this.color=color;
        }
        @Override
        public void move()
        {
                System.out.println("ToyPlane: Start moving plane.");
        }
        @Override
        public void fly()
        {
                System.out.println("ToyPlane: Start flying plane.");
        }
        @Override
        public String toString()
        {
                return ("ToyPlane: Moveable and flyable toy plane- Price: "+price+"Color: "+color);
        }
    }

class ToyBuilder
  {
     public static ToyHouse buildToyHouse()
       {
        ToyHouse toyHouse=new ToyHouse();
        toyHouse.setPrice(15.00);
        toyHouse.setColor("green");
```

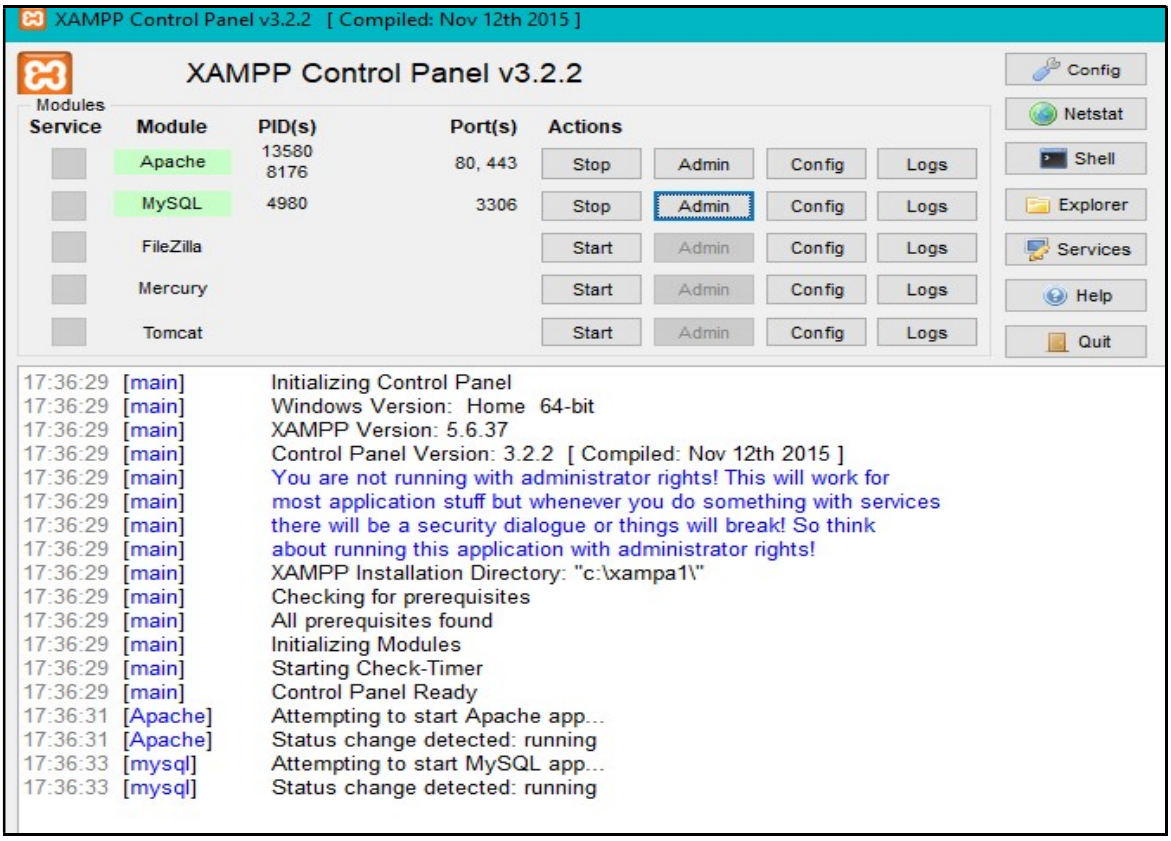
```
            return toyHouse;
          }
  public static ToyCar buildToyCar()
      {
            ToyCar toyCar=new ToyCar();
            toyCar.setPrice(25.00);
            toyCar.setColor("red");
            toyCar.move();
            return toyCar;
      }
public static ToyPlane buildToyPlane()
    {
            ToyPlane toyPlane=new ToyPlane();
            toyPlane.setPrice(125.00);
            toyPlane.setColor("white");
            toyPlane.move();
            toyPlane.fly();
            return toyPlane;
    }
}

public class ToyISPTest
 {
    public static void main(String[] args)
       {
            // TODO Auto-generated method stub
            ToyHouse toyHouse=ToyBuilder.buildToyHouse();
            System.out.println(toyHouse);
            ToyCar toyCar=ToyBuilder.buildToyCar();;
            System.out.println(toyCar);
            ToyPlane toyPlane=ToyBuilder.buildToyPlane();
            System.out.println(toyPlane);
      }
}
```

Output:
ToyHouse: Toy house- Price: 15.0 Color: green
ToyCar: Start moving car.
ToyCar: Moveable Toy car- Price: 25.0 Color: red
ToyPlane: Start moving plane.
ToyPlane: Start flying plane.
ToyPlane: Moveable and flyable toy plane- Price: 125.0 Color: white

Program No.22: Code, execute and debug programs to connect to database through JDBC and perform basic DB operations.

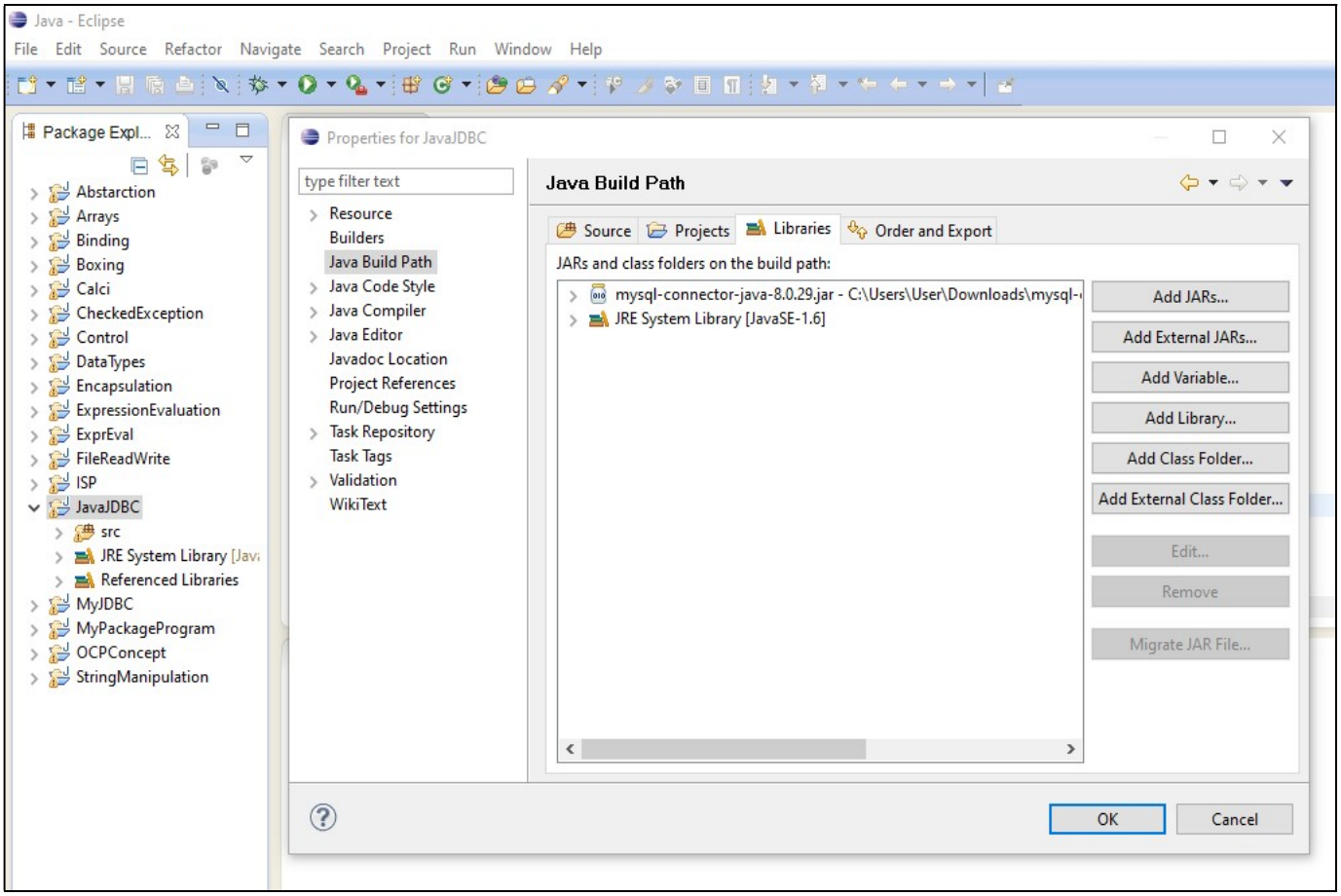
Step 1: In addition to JDK and Eclipse environment, install Xampp software for Apache server and MySql service.

Step 2: Now open Xampp control panel to start Apache and MySql services as shown below. Then click on MySql-Admin button to open MySql http://localhost/phpmyadmin/ in brower.

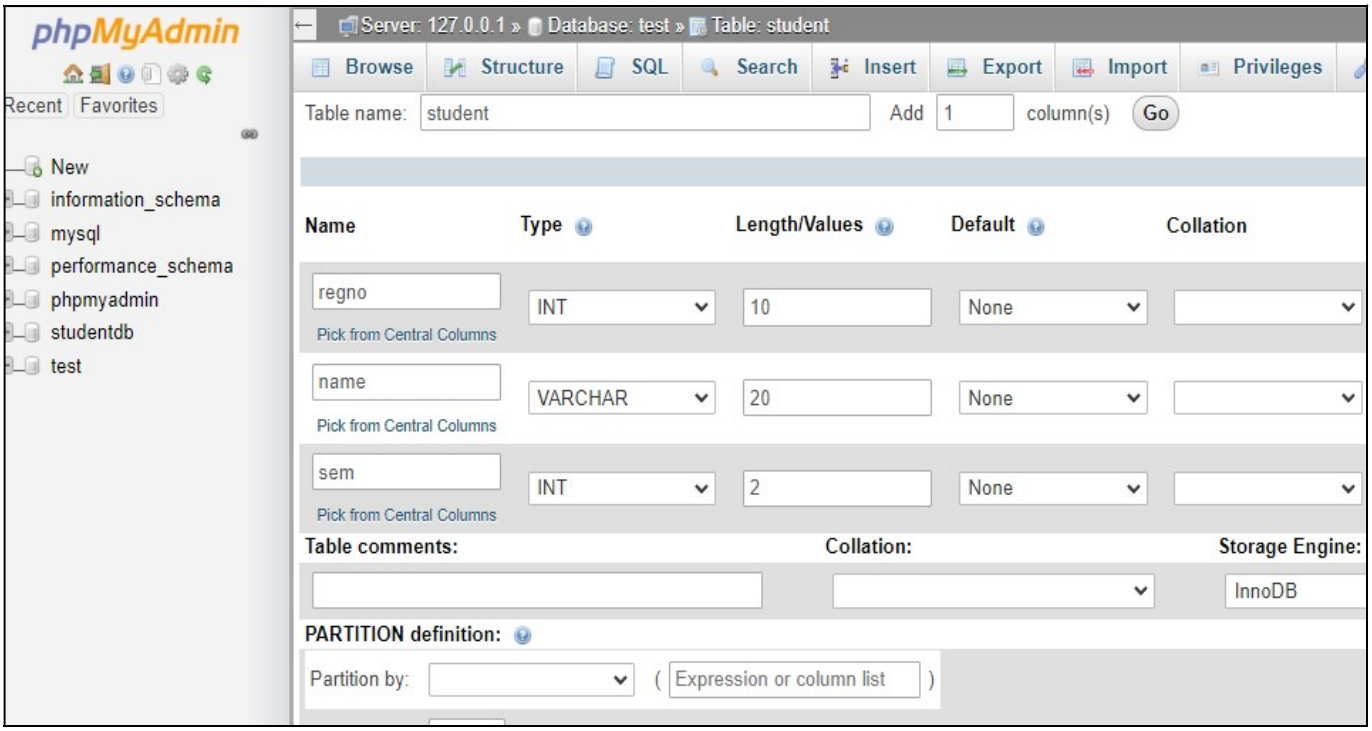


Step 3: To connect MySql databse in Java using Eclipse, follow below steps.

- Open Eclipse IDE and create new Java project named JavaJDBC and click finish.
- Create a new Java class with DBTest and click on the finish button.
- In order to connect Java program (DBTest.java) with MySQL database, we need to download and include MySQL JDBC driver which is a JAR file, namely **mysql-connector-java-8.0.29.jar.**
- Now right click on JavaJDBC project to include connector and go to properties.
- Click on Java build path option-> click on libraries and then click on Add External JARS.
- Now select downloaded jar file **mysql-connector-java-8.0.29.jar.** & click open.
- Click on OK and close.



Step 4: Now in browser go to myphpadmin page and create student table in test database with following fields as shown below and click save.



Connecting Java Program with MySQL Database

- After adding jar file, connect the Java program with MySQL Database.

  i)Establish a connection using DriverManager.getConnection(String URL) and it returns a Connection reference.

  ii) In String URL parameter write like this :

  jdbc:mysql://localhost:3306/test", "root", "password"

Where,

- jdbc is the API.
- mysql is the database.
- localhost is the name of the server in which MySQL is running.
- 3306 is the port number.
- test is the database name. If the database name is different, then replace this name with the correct database name.
- root is the username of the MySQL database. It is the default username for the MySQL database.
- password is the password that is given while installing the MySQL database.

- SQL Exception might occur while connecting to the database, try-catch block must be used.

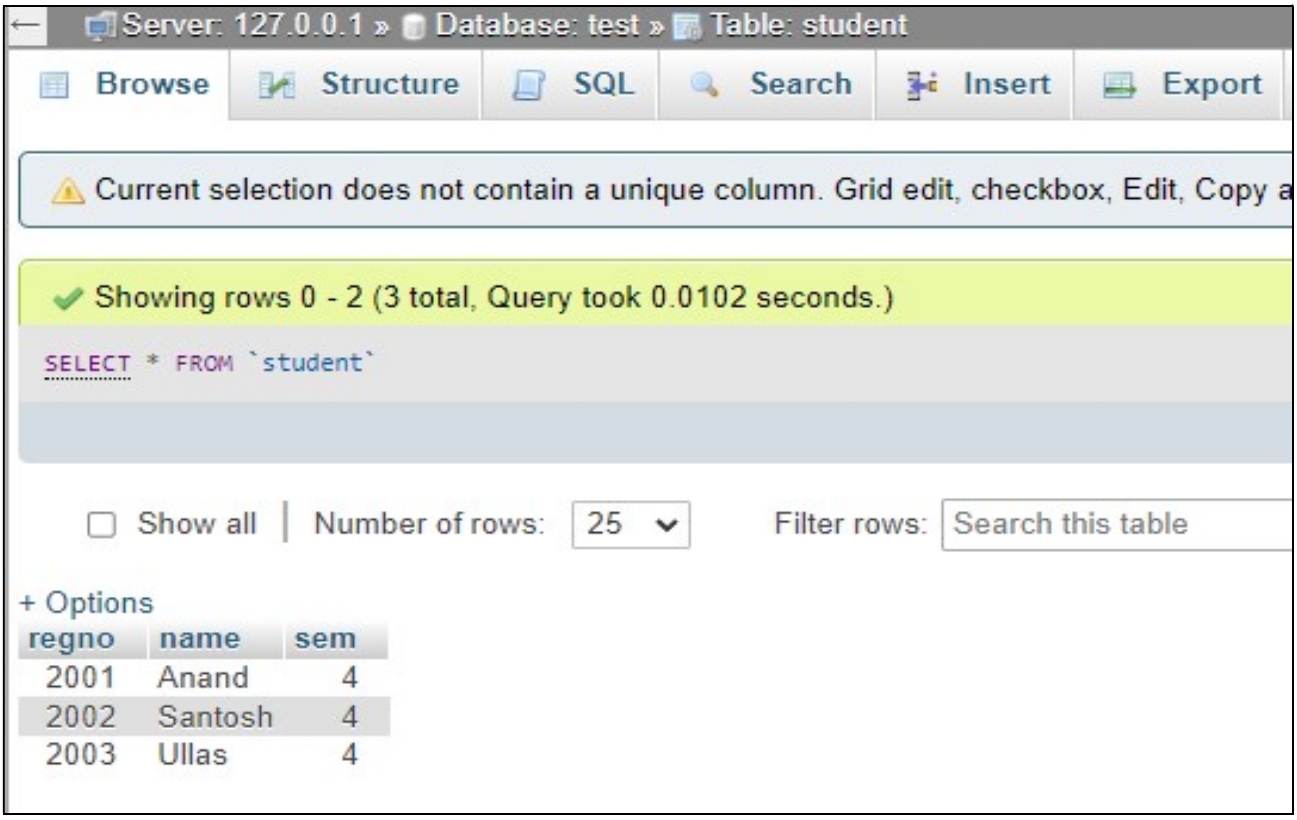
Step 5: Write below code in DBTest class Eclipse environment.

```
import java.sql.*;
public class DBTest
{
   public static void main(String[] args)
   {
   String url= "jdbc:mysql://localhost:3306/test"; // table URL
   String uname = "root"; // MySQL credentials
   String pw = "";
   try
   {
         //Loading MySQL Driver
         Class.forName("com.mysql.cj.jdbc.Driver");
         // Establishing connection with MySQL
         Connection con = DriverManager.getConnection(url,uname,pw);
         System.out.println("Java Connection to MySQL Established successfully");
         // Creating Statement object for query execution
         Statement st=con.createStatement();
         // Delete the table student if already present in the test database
         String deltbl= "DROP TABLE STUDENT";
         st.executeUpdate(deltbl);
         // Create a table STUDENT in database test
```

```
            String qrytbl= "CREATE TABLE STUDENT(regno int,name varchar(30),sem int)";
            st.executeUpdate(qrytbl);
            // Insert values into the STUDENT table
            String qry1="INSERT INTO STUDENT values(2001,'Anand',4)";
            st.executeUpdate(qry1);
            String qry2="INSERT INTO STUDENT values(2002,'Santosh',4)";
            st.executeUpdate(qry2);
            String qry3="INSERT INTO STUDENT values(2003,'Ullas',4)";
            st.executeUpdate(qry3);
            System.out.println("Table Values insertion is successful");
            // Query to retrieve values from table
            String query= "SELECT * FROM STUDENT";
            ResultSet rs = st.executeQuery(query);//Execute query
            while (rs.next())
            {
                //Retrieve row-wise values of regno, name and sem columns
                int regno = rs.getInt("regno");
                String name= rs.getString("name");
                int sem=rs.getInt("sem");
                // Display the result on console
                System.out.println(regno + " " + name+ " "+ sem);
            }
            st.close(); // close statement
            con.close(); // close connection
            System.out.println("MySQL Connection Closed successfully!");
        }
    catch(Exception e)
      {
        System.out.println("Error while executing program:" + e);
      }
    }
  }
```

Output:

```
Console
<terminated> DBTest1 [Java Application] C:\Program Files (x86)\Java\jre1.8.0_51\bin\javaw.exe (03-Aug-2022 6:27:16 PM)
Java Connection to MySQL Established successfully
Table Values insertion is successful
2001 Anand 4
2002 Santosh 4
2003 Ullas 4
MySQL Connection Closed successfully!
```


Server: 127.0.0.1 » Database: test » Table: student
Browse
Structure
SQL
Search
Insert
Export
Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy a
Showing rows 0 - 2 (3 total, Query took 0.0102 seconds.)
SELECT * FROM `student`
Show all
Number of rows: 25
Filter rows: Search this table
+ Options
regno name sem
2001 Anand 4
2002 Santosh 4
2003 Ullas 4