NATIONAL INSTITUTE OF TECHNOLOGY SILCHAR

Cachar, Assam

B.Tech. IVth Sem

Subject Code: CS213

Subject Name: Object Oriented Programming

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Part-4 ①

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B.Tech IVth Sem 27th April, 2021

Q.1.o

Ans:

```
import java.util.*;

class Matrix {
        int row, col;
        int[][] output;

        public Matrix (int r_row, int c_col) {
                row = r_row;
                col = c_col;
               output = new int [row][col];
         }

         public int getRow () {
                 return row;
          }

          public int getColumn() {
                  return col;
           }

           public int getElements (int r_row, int c_col) {
                   return output [r_row][c_col];
            }

            public void setAt (int r_row, int c_col, int element) {
                    output [r_row][c_col] = element;
             }
```

```
public static Matrix addMat (Matrix m1, Matrix m2) {
    if ((m1.row == m2.row) && (m1.col == m2.col)) {
        Matrix m = new Matrix (m1.row, m2.col);
        for (int i=0; i<m.row; ++i) {
            for(int j=0; j<m.col; ++j) {
                m.setAt (i, j, (m1.getElements(i,j)+
                                m2.getElements(i, j)));
            }
        }
        return m;
    }
    else {
        System.out.println("Matrices cannot be added");
        return new Matrix(0, 0);
    }
}
public static Matrix product (Matrix m1, Matrix m2) {
    Matrix m = new Matrix (m1.row, m2.col);
    for (int i = 0; i<m1.row; ++i) {
        for (int K=0; K<m2.col; ++K) {
            int sum = 0;
            for (int j=0; j<m1.col; ++j) {
                sum+ = m1.getElements (i,j) *
                       m2.getElements (j,K);
            }
            m.setAt (i, K, Sum);
        }
    }
    return m;
}
```

```
    public void printMatrix (char num) {
        System.out.println ("The matrix "+ num + " is: ");
        for(int i = 0; i<row; ++i) {
            for (int j = 0; j<col; ++j) {
                System.out.print (output[i][j] + "\t");
            }
            System.out.print ("\n");
        }
    }
}
public class Main {
    public static void main (String[] args) {
        Matrix mat1 = new Matrix (3,3);
        Matrix mat2 = new Matrix (3,3);
        int randomValue = 1;
        for (int i=0; i<3; ++i) {
            for (int j=0; j<3; ++j) {
                mat1.setAt (i, j, randomValue);
                ++randomValue;
                mat2.setAt (i, j, randomValue);
                ++randomValue;
            }
        }
        mat1.printMatrix ('1');
        mat2.printMatrix ('2');
        Matrix sum = Matrix.addMat (mat1, mat2);
        sum.printMatrix ('+');
        Matrix pro = Matrix.product (mat1, mat2);
        pro.printMatrix ('*');
    }
}
```

Q.2.

Ans:

```
import java.io.*;
import java.util.*;
import java.lang.Math;

class Shape {
        protected static int L, B;

        public void enterDimension() {
                Scanner Scan = new Scanner(System.in);
                int l, b;
                System.out.print("Enter length: ");
                l=Scan.nextInt();
                System.out.print("Enter breadth: ");
                b = Scan.nextInt();
                this.L = l;
                this.B = b;
        }
        double area() {
                return 0;
        };
}

class Circle extends Shape {
        double area() {
                int R = super.L;
                return (Math.PI * Math.pow(R,2));
        }
}
```

```
class Rectangle extends Shape {
        double area () {
            int l, b;
            l = super.L;
            b = super.B;
            return l*b;
        }
}
class Trapezoid extends Shape {
        double area () {
            int h, b;
            h = super.L;
            b = super.B;
            return (0.5*h*b);
        }
}
public class Main {
        public static void main (String[] args) {
            Shape newShape = new Shape ();
            newShape.enterDimension ();
            Circle C = new Circle ();
            System.out.println ("Area of circle is " + C.area());

            Rectangle R = new Rectangle ();
            System.out.println ("Area of rectangle is " + R.area());

            Trapezoid T = new Trapezoid ();
            System.out.println ("Area of trapezoid is " + T.area());
        }
}
```

1. **Create a class called 'Matrix' containing a constructor that initializes the number of rows and number of columns of a new Matrix object. The Matrix class has the following information:**
   - **number of rows of matrix**
   - **number of columns of matrix**
   - **elements of matrix in the form of 2D array**

   The Matrix class has the following methods:
   - **get the number of rows**
   - **get the number of columns**
   - **set the elements of the matrix at given position (i,j)**
   - **adding two matrices. If the matrices are not addable, "Matrices cannot be added" will be displayed.**
   - **multiplying the two matrices**

ANS:

```
//Program saved as "Q1.java"

import java.util.*;

class Matrix {
    int row, col;
    int[][] output;

    public Matrix (int r_row, int c_col) {
        row = r_row;
        col = c_col;
        output = new int[row][col];
    }

    public int getRow () {
        return row;
    }

    public int getColumn () {
        return col;
    }

    public int getElements (int r_row, int c_col) {
        return output[r_row][c_col];
    }

    public void setAt (int r_row, int c_col, int element) {
        output[r_row][c_col] = element;
```

```
    }

    public static Matrix addMat (Matrix m1, Matrix m2) {
        if ((m1.row==m2.row) && (m1.col==m2.col)) {
            Matrix m = new Matrix (m1.row, m2.col);
            for (int i=0; i<m.row; ++i) {
                for (int j=0; j<m.col; ++j) {
                    m.setAt(i, j, (m1.getElements(i, j)+m2.getElements(i, j)))
;
                }
            }
            return m;
        }
        else {
            System.out.println ("Matrices cannot be added");
            return new Matrix(0, 0);
        }
    }

    public static Matrix product (Matrix m1, Matrix m2) {
        Matrix m = new Matrix (m1.row, m2.col);

        for (int i=0; i<m1.row; ++i) {
            for (int k=0; k<m2.col; ++k) {
                int sum = 0;
                for (int j=0; j<m1.col; ++j) {
                    sum += m1.getElements(i, j)*m2.getElements(j, k);
                }
                m.setAt(i, k, sum);
            }
        }
        return m;
    }

    public void printMatrix (char num) {
        System.out.println ("The matrix " + num + " is: ");
        for (int i=0; i<row; ++i) {
            for (int j=0; j<col; ++j) {
                System.out.print (output[i][j] + "\t");
            }
            System.out.print ("\n");
        }
    }
}

public class Q1 {
    public static void main (String[] args) {
        Matrix mat1 = new Matrix (3, 3);
```

```
        Matrix mat2 = new Matrix (3, 3);
        int value=1;
        for (int i=0; i<3; ++i) {
            for (int j=0; j<3; ++j) {
                mat1.setAt (i, j, value);
                ++value;
                mat2.setAt (i, j, value);
                ++value;
            }
        }

        mat1.printMatrix('1');
        mat2.printMatrix('2');

        Matrix sum = Matrix.addMat(mat1, mat2);
        sum.printMatrix('+');

        Matrix pro = Matrix.product(mat1, mat2);
        pro.printMatrix('*');
    }
}
```

OUTPUT:

```
Windows PowerShell
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Try the new cross-platform PowerShell https://aka.ms/pscore6

PS C:\Users\Subhojit Ghimire>  & 'c:\Users\Subhojit Ghimire\.vscode\extensions\vscjava.vscode-java-debug-0.32.1\scripts\launcher.bat' 'C:\Users\Subhojit Ghimire\AppData\Local\Programs\AdoptOpenJDK\jdk-11.0.9.101-hotspot\bin\java.exe' '-Dfile.encoding=UTF-8' '-cp' 'C:\Users\Subhojit Ghimire\AppData\Local\Temp\vscodesws_813d5\jdt_ws\jdt.ls-java-project\bin' 'Q1'
The matrix 1 is:
1       3       5
7       9       11
13      15      17
The matrix 2 is:
2       4       6
8       10      12
14      16      18
The matrix + is:
3       7       11
15      19      23
27      31      35
The matrix * is:
96      114     132
240     294     348
384     474     564
PS C:\Users\Subhojit Ghimire>
```

2. **Write a program to create a class shape with functions to find the area of the shapes. Create derived classes circle, rectangle and trapezoid each having overridden functions area and display.**

Base class:

- **Member Variables: (protected) length, breadth**
- **Member Function: (public) virtual function area**

ANS:

```
import java.io.*;
import java.util.*;
import java.lang.*;

class Shape {
    protected static int L, B;

    public void enterDimension () {
        Scanner Scan = new Scanner (System.in);
        int l, b;
        System.out.print ("Enter length: ");
        l = Scan.nextInt ();
        System.out.print ("Enter Breadth: ");
        b = Scan.nextInt ();
        this.L = l;
        this.B = b;
    }

    double area () {
        return 0;
    };
}

class Circle extends Shape {
    double area () {
        int R = super.L;
        return (Math.PI*Math.pow(R, 2));
    }
}

class Rectangle extends Shape {
    double area () {
        int l, b;
        l = super.L;
        b= super.B;
        return l*b;
    }
}

class Trapezoid extends Shape {
```

```
    double area () {
        int h, b;
        h = super.L;
        b = super.B;
        return (0.5*h*b);
    }
}

public class Q2 {
    public static void main (String[] args) {
        Shape newShape = new Shape();
        newShape.enterDimension ();
        Circle C = new Circle ();
        System.out.println ("Area of the circle is " + C.area());
        Rectangle R = new Rectangle ();
        System.out.println ("Area of the Rectangle is " + R.area());
        Trapezoid T = new Trapezoid ();
        System.out.println ("Area of the Trapezoid is " + T.area());
    }
}
```

OUTPUT: