```
import java.util.Scanner;

public class Palindrome {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      String str;
      System.out.println("Enter a string: ");
      str = sc.nextLine();
      str=str.toLowerCase();
      String rev="";
      for(int i=0; i<str.length(); ++i)
      {
         char ch = str.charAt(i);
         rev = ch+rev;
      }
      System.out.println(rev);
      if(str.equals(rev))
         System.out.println("The string you have entered is a palindrome");
      else
         System.out.println("The string you have entered is not a palindrome");
      sc.close();
   }
}
```

```
Enter a string:
Malayalam
malayalam
The string you have entered is a palindrome


Process finished with exit code 0
```

```
Enter a string:
Hello world this is a program to find the frequency of a particular character
Enter the character whose frequency you want to find:
e
Frequency = 5

Process finished with exit code 0
```

```
import java.util.Scanner;

public class CharFreq {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      String str;
      System.out.println("Enter a string: ");
      str = sc.nextLine();
      System.out.println("Enter the character whose frequency you want to find:");
      char ch = sc.next().charAt(0);
      int frequency=0;
      for(int i=0; i<str.length(); ++i)
      {
         if(ch == str.charAt(i))
            frequency++;
      }
      System.out.println("Frequency = "+frequency);
      sc.close();
   }
}
```

```
Enter the number of rows of first matrix: 2
Enter the number of columns first matrix: 2
Enter 4 elements of the first matrix:
1 2 3 4
Enter the number of rows of second matrix: 2
Enter the number of columns second matrix: 2
Enter 4 elements of the second matrix:
5 6 7 8
The product of the two matrices is:
19 22
43 50

Process finished with exit code 0
```

```
import java.util.Scanner;

public class Matrix {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);

      //First Matrix
      int row1,col1;
      System.out.print("Enter the number of rows of first matrix: ");
      row1 = sc.nextInt();
      System.out.print("Enter the number of columns first matrix: ");
      col1 = sc.nextInt();
      int[][] matrix1 = new int[row1][col1];
      System.out.println("Enter "+(row1*col1)+" elements of the first matrix:");
      matrix1 = MatrixInput(row1,col1,matrix1);

      //Second Matrix
      int row2,col2;
      System.out.print("Enter the number of rows of second matrix: ");
      row2 = sc.nextInt();
      System.out.print("Enter the number of columns second matrix: ");
      col2 = sc.nextInt();
      System.out.println("Enter "+(row2*col2)+" elements of the second matrix:");
      int [][] matrix2 = new int[row2][col2];
      matrix2 = MatrixInput(row2,col2,matrix2);

      //Matrix Multiplication Algorithm
      if(col1 == row2)
      {
         int[][] matrix3 = new int[row1][col2];
         for(int i=0; i<row1; ++i)
         {
            for(int j=0; j<col2; ++j)
            {
               for(int k=0; k<col1; ++k)
               {
                  matrix3[i][j] += matrix1[i][k] * matrix2[k][j];
               }
            }
         }
         //Printing the product matrix
         System.out.println("The product of the two matrices is:");
         MatrixDisplay(row1,col2,matrix3);
      }
      sc.close();
   }
   public static int[][] MatrixInput(int row, int col, int[][] mat) {
      Scanner sc = new Scanner(System.in);
      for(int i=0; i<row; ++i)
```

```
        {
            for(int j=0; j<col; ++j)
            {
                mat[i][j] = sc.nextInt();
            }
        }
        return mat;
    }

    //Function for printing the matrices
    public static void MatrixDisplay(int row, int col, int[][] mat) {
        for(int i=0; i<row; ++i)
        {
            for(int j=0; j<col; ++j)
            {
                System.out.print(mat[i][j]+" ");
            }
            System.out.println();
        }
    }
}
```

```
Input the base length of the triangle: 23
Input the height of the triangle: 44
Area of triangle = 506.0
Input the length of the rectangle: 23
Input the breadth of the rectangle: 33
Area of the rectangle = 759
Input the radius of the circle: 25
Area of the circle = 1964.2856

Process finished with exit code 0
```

```
import java.util.Scanner;

public class Area {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      int length,breadth;
      float base,height,radius;
      //Triangle
      System.out.print("Input the base length of the triangle: ");
      base = sc.nextFloat();
      System.out.print("Input the height of the triangle: ");
      height = sc.nextFloat();
      System.out.println("Area of triangle = "+(area(base,height)));
      //Rectangle
      System.out.print("Input the length of the rectangle: ");
      length = sc.nextInt();
      System.out.print("Input the breadth of the rectangle: ");
      breadth = sc.nextInt();
      System.out.println("Area of the rectangle = "+(area(length, breadth)));
      //Circle
      System.out.print("Input the radius of the circle: ");
      radius = sc.nextFloat();
      System.out.println("Area of the circle = "+(area(radius)));
      sc.close();
   }

   static float area(float base, float height) {
      return ((base*height)/2);
   }

   static int area(int length, int breadth) {
      return (length*breadth);
   }

   static float area(float radius) {
      return ((22f/7f)*radius*radius);
   }
}
```

```
import java.util.Scanner;

class Employee{
   String name;
   short age;
   long phone;
   String address;
   int salary;

   public void printSalary() {
      System.out.println("Salary: "+salary);
   }

}

class Officer extends Employee{
   String specialization;
}

class Manager extends Employee{
   String department;
}

public class Inheritance {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      Officer off = new Officer();
      Manager man = new Manager();
      System.out.print("Enter the name of the officer: ");
      off.name = sc.nextLine();
      System.out.print("Enter the age of the officer: ");
      off.age = sc.nextShort();
      System.out.print("Enter the phone number of the officer: ");
      off.phone = sc.nextLong();
      System.out.print("Enter the address of the officer: ");
      sc.nextLine();
      off.address = sc.nextLine();
      System.out.print("Enter the salary of the officer: ");
      off.salary = sc.nextInt();
      System.out.print("Enter the specialization of the officer: ");
      sc.nextLine();
      off.specialization = sc.nextLine();

      System.out.println();
      System.out.print("Enter the name of the manager: ");
      man.name = sc.nextLine();
      System.out.print("Enter the age of the manager: ");
      man.age = sc.nextShort();
      System.out.print("Enter the phone number of the manager: ");
```

```
        man.phone = sc.nextLong();
        System.out.print("Enter the address of the manager: ");
        sc.nextLine();
        man.address = sc.nextLine();
        System.out.print("Enter the salary of the manager: ");
        man.salary = sc.nextInt();
        System.out.print("Enter the department of the manager: ");
        sc.nextLine();
        man.department = sc.nextLine();

        System.out.println();
        System.out.println("Details of the Officer");
        System.out.println("Name: "+off.name);
        System.out.println("Age: "+off.age);
        System.out.println("Phone Number: "+off.phone);
        System.out.println("Address: "+off.address);
        off.printSalary();
        System.out.println("Specialization: "+off.specialization);

        System.out.println();
        System.out.println("Details of Manager");
        System.out.println("Name: "+man.name);
        System.out.println("Age: "+man.age);
        System.out.println("Phone Number: "+man.phone);
        System.out.println("Address: "+man.address);
        man.printSalary();
        System.out.println("Department: "+man.department);
        sc.close();
    }
}
```

```
Enter the Base pay: 70000
Enter the DA: 2
Enter the HRA: 3
The name of this class is Employee
The salary of the Employee is 73500
The name of the class is Engineer
The salary of the Engineer is 147000
```

```
Enter the name of the officer: Tony Stark
Enter the age of the officer: 45
Enter the phone number of the officer: 9283767213
Enter the address of the officer: Los Angeles, California
Enter the salary of the officer: 10000000
Enter the specialization of the officer: Iron Man

Enter the name of the manager: Bruce Banner
Enter the age of the manager: 47
Enter the phone number of the manager: 9772312475
Enter the address of the manager: Manhattan, New York
Enter the salary of the manager: 5000000
Enter the department of the manager: Radiology


Details of the Officer
Name: Tony Stark
Age: 45
Phone Number: 9283767213
Address: Los Angeles, California
Salary: 10000000
Specialization: Iron Man

Details of Manager
Name: Bruce Banner
Age: 47
Phone Number: 9772312475
Address: Manhattan, New York
Salary: 5000000
Department: Radiology
```

```
import java.util.Scanner;

class Employees {
    int basePay,da,hra,grossPay;
    void display() {
        System.out.println("The name of this class is Employee");
    }
    void calcSalary() {
        System.out.println("The salary of the Employee is "+grossPay);
    }
}

class Engineer extends Employees {
    Engineer(int bp, int da, int hra) {
        this.basePay = bp;
        this.da = da;
        this.hra = hra;
        this.grossPay = bp + (bp*da/100) + (bp*hra/100);
    }
    void display() {
        System.out.println("The name of the class is Engineer");
    }
    void calcSalary() {
        super.display();
        super.calcSalary();
        this.display();
        System.out.println("The salary of the Engineer is "+(grossPay*2));
    }
}

public class Salary {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int bp,da,hra,gp;
        System.out.print("Enter the Base pay: ");
        bp = sc.nextInt();
        System.out.print("Enter the DA: ");
        da = sc.nextInt();
        System.out.print("Enter the HRA: ");
        hra  =sc.nextInt();
        Engineer engineer = new Engineer(bp,da,hra);
        engineer.calcSalary();
    }
}
```

```
abstract class Shape{
   abstract void numberOfSides();
}

class Rectangle extends Shape{
   void numberOfSides() {
      System.out.println("I am a Rectangle, I have 4 sides");
   }
}

class Triangle extends Shape{
   void numberOfSides(){
      System.out.println("I am a Triangle, I have  3 sides");
   }
}

class Hexagon{
   void numberOfSides() {
      System.out.println("I am a Hexagon, I have 6 sides");
   }
}

public class Abstract {
   public static void main(String[] args) {
      Rectangle rectangle = new Rectangle();
      Triangle triangle = new Triangle();
      Hexagon hexagon = new Hexagon();
      rectangle.numberOfSides();
      triangle.numberOfSides();
      hexagon.numberOfSides();
   }
}
```

```
I am a Rectangle, I have 4 sides
I am a Triangle, I have  3 sides
I am a Hexagon, I have 6 sides
```

```
class Animal{
    int legs;
    String name;
    Animal(int legs){
        this.legs = legs;
    }
    void walk(){
        System.out.println("This animal walks on "+legs+" legs");
    }
    void eat(){
        System.out.println("Eating");
    }
}

interface Pet{
    String getName();
    void setName(String name);
    void play();
}

class Spider extends Animal{
    Spider(int legs){
        super(legs);
    }
    void eat() {
        System.out.println("Spider eats Insects");
    }
}

class Cat extends Animal implements Pet{
    Cat(int legs, String name){
        super(legs);
        this.name = name;
    }
    void eat() {
        System.out.println("Cat eats Fish");
    }
    public String getName() {
        return name;
    }
    public void setName(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println("Cat plays with people");
    }
}

class Fish extends Animal implements Pet{
```

```
    Fish(int legs, String name){
        super(legs);
        this.name = name;
    }
    void eat() {
        System.out.println("Fish eats plants");
    }
    void walk() {
        System.out.println("Fish has no legs");
    }
    public String getName() {
        return name;
    }
    public void setName(String name) {
        this.name = name;
    }
    public void play() {
        System.out.println("Fish likes to swim around");
    }
}

public class Interface {
    public static void main(String[] args) {
        Fish fish = new Fish(0, "Mimi");
        System.out.println("This fish's name is "+fish.getName());
        fish.eat();
        fish.walk();
        fish.setName("Momo");
        System.out.println("This fish's name is "+fish.getName());
        fish.play();
        System.out.println();

        Cat cat = new Cat(4, "Fluffy");
        System.out.println("This cat's name is "+cat.getName());
        cat.eat();
        cat.walk();
        cat.setName("Moose");
        System.out.println("This cat's name is "+cat.getName());
        cat.play();
        System.out.println();

        Spider spider = new Spider(8);
        spider.eat();
        spider.walk();
    }
}
```

```
This fish's name is Mimi
Fish eats plants
Fish has no legs
This fish's name is Momo
Fish likes to swim around

This cat's name is Fluffy
Cat eats Fish
This animal walks on 4 legs
This cat's name is Moose
Cat plays with people

Spider eats Insects
This animal walks on 8 legs


Enter Number1: 56
Enter Number2: 0
/ by zero
End of the operation
Do you want to continue?(y/n): y
Enter Number1: 43
Enter Number2: 9
43/9=4
End of the operation
Do you want to continue?(y/n): n
```

```
import java.util.Scanner;

public class Exceptions {
   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      char choice;
      do {
         System.out.print("Enter Number1: ");
         int num1 = sc.nextInt();
         System.out.print("Enter Number2: ");
         int num2 = sc.nextInt();
         try {
            int result = num1 / num2;
            System.out.println(num1 + "/" + num2 + "=" + result);
         } catch (ArithmeticException e) {
            System.out.println(e.getMessage());
         }
         System.out.println("End of the operation");
         System.out.print("Do you want to continue?(y/n): ");
         sc.nextLine();
         choice = sc.next().charAt(0);
      }while(choice == 'y');
   }
}
```