WEEK 8 Polymorphism, Abstract Classes, final Keyword

1. Final Variable:

- Once a variable is declared `final`, its value cannot be changed after it is initialized.
- It must be initialized when it is declared or in the constructor if it's not initialized at declaration.
- It can be used to define constants

```
final int MAX_SPEED = 120;  // Constant value, cannot be changed
```

2. Final Method:

- A method declared `final` cannot be overridden by subclasses.
- It is used to prevent modification of the method's behavior in derived classes.

```
public final void display() {
    System.out.println("This is a final method.");
}
```

3. Final Class:

- A class declared as `final` cannot be subclassed (i.e., no other class can inherit from it).
- It is used to prevent a class from being extended and modified.
- public final class Vehicle {
  // class code
  }

Given a Java Program that contains the bug in it, your task is to clear the bug to the output.

you should delete any piece of code.

For example:

Test	Result
1	The maximum speed is: 120 km/h This is a subclass of FinalExample.

class FinalExample {

// Final variable

final int maxSpeed = 120;

```
    // Final method
    public final void displayMaxSpeed() {
        System.out.println   ("The maximum speed is: " + maxSpeed + "
km/h");
    }
}

class SubClass extends FinalExample {

  // public void displayMaxSpeed() {
 //     System.out.println("Cannot override a final method");
 //  }

    // You can create new methods here
    public void showDetails() {
        System.out.println("This is a subclass of FinalExample.");
    }
}

class prog {
    public static void main(String[] args) {
        FinalExample obj = new FinalExample();
```

```
        obj.displayMaxSpeed();


        SubClass subObj = new SubClass();

        subObj.showDetails();

    }

}
```

	Test	Expected	Got	
✓	1	The maximum speed is: 120 km/h This is a subclass of FinalExample.	The maximum speed is: 120 km/h This is a subclass of FinalExample.	✓

Passed all tests! ✓

As a logic building learner you are given the task to extract the string which has vowel as the first and last characters from the given array of Strings.

Step1: Scan through the array of Strings, extract the Strings with first and last characters as vowels; these strings should be concatenated.

Step2: Convert the concatenated string to lowercase and return it.

If none of the strings in the array has first and last character as vowel, then return no matches found

input1: an integer representing the number of elements in the array.

input2: String array.

Example 1:

input1: 3

input2: {“oreo”, “sirish”, “apple”}

output: oreoapple

Example 2:

input1: 2

input2: {“Mango”, “banana”}

output: no matches found

Explanation:

None of the strings has first and last character as vowel.

Hence the output is no matches found.

Example 3:

input1: 3

input2: {“Ate”, “Ace”, “Girl”}

output: ateace

For example:

Input	Result
3 oreo sirish apple	oreoapple
2 Mango banana	no matches found
3 Ate Ace Girl	ateace

```
import java.util.Scanner;

public class Main{

   public static void main (String[]args){

 Scanner dc=new Scanner (System.in);

 int a=dc.nextInt();

 dc.nextLine();

String opp =dc.nextLine();

String line =opp.toLowerCase();


 String [] arr= line.split(" ");
```

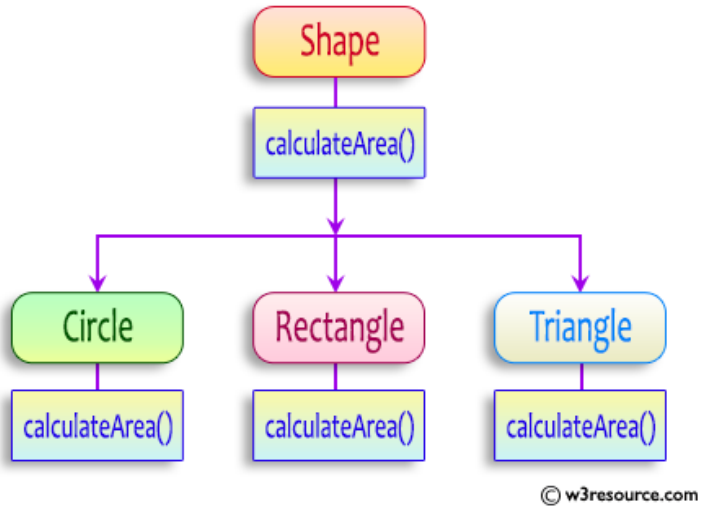
```
   int count=0;



   for (String word : arr){

      if (word.charAt(0)=='a'|| word.charAt(0)=='e'|| word.charAt(0)=='i' ||
word.charAt(0)=='o'|| word.charAt(0)=='u'){

         if (word.charAt(word.length()-1)=='a'|| word.charAt(word.length()-1
)=='e'|| word.charAt(word.length()-1)=='o'|| word.charAt(word.length()-
1)== 'i'|| word.charAt(word.length()-1)=='u' ){

            System.out.print(word);

            count--;

         }

      }

   }

   if (count>=0){

      System.out.print("no matches found");

   }

   }

}
```

	Input	Expected	Got	
✓	3 oreo sirish apple	oreoapple	oreoapple	✓
✓	2 Mango banana	no matches found	no matches found	✓
✓	3 Ate Ace Girl	ateace	ateace	✓

Passed all tests! ✓

Create a base class Shape with a method called calculateArea(). Create three subclasses: Circle, Rectangle, and Triangle. Override the calculateArea() method in each subclass to calculate and return the shape's area.

In the given exercise, here is a simple diagram illustrating polymorphism implementation:




```
 abstract class Shape {
    public abstract double calculateArea() ;
    }
}
```

System.out.printf("Area of a Triangle :%.2f%n",((0.5)*base*height)); // use this statement

sample Input :

4 // radius of the circle to calculate area PI*r*r

5 // length of the rectangle

6 // breadth of the rectangle to calculate the area of a rectangle

4 // base of the triangle

3 // height of the triangle

OUTPUT:

Area of a circle :50.27
Area of a Rectangle :30.00
Area of a Triangle :6.00

For example:

Test	Input	Result
1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00
2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32

```
import java.util.Scanner;

abstract  class Shape{

   public abstract double CalculateArea();



}

 class Circle extends Shape{


  private double radius;

   public Circle(double radius){

     this.radius=radius;

   }
```

```
  @Override
   public double CalculateArea(){
      return (3.14159*radius *radius);
   }
}
 class Rectangle extends Shape{
   private double length;
   private double breadth;
   public Rectangle (double length,double breadth){
      this.length=length;
      this.breadth=breadth;

   }
   @Override
   public double CalculateArea( ){
      return length*breadth;
   }
}
  class Triangle extends Shape {
   private double base ;
  private double height;
   public Triangle(double base, double height){
```

```
        this.base=base;
       this.height=height;
    }
   @Override
    public double CalculateArea(){
        return 0.5*base*height;
    }
}
public class Main {
    public static void main (String[] args){
        Scanner sc= new Scanner(System.in);
        double  r,l,br,b,h;
        r=sc.nextDouble();
        l=sc.nextDouble();
        br=sc.nextDouble();
        b=sc.nextDouble();
        h=sc.nextDouble();
        Circle c1=new Circle(r);
        Rectangle r1=new Rectangle (l,br);
        Triangle t1 = new Triangle (b,h);
        System.out.print("Area of a circle: ");
        System.out.printf("%.2f", c1.CalculateArea());
```

```
        System.out.println();
        System.out.print("Area of a Rectangle: ");
        System.out.printf("%.2f", r1.CalculateArea());
        System.out.println();
        System.out.print("Area of a Triangle: ");
        System.out.printf("%.2f", t1.CalculateArea());
    }
}
```

	Test	Input	Expected	Got	
✓	1	4 5 6 4 3	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00	Area of a circle: 50.27 Area of a Rectangle: 30.00 Area of a Triangle: 6.00	✓
✓	2	7 4.5 6.5 2.4 3.6	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32	Area of a circle: 153.94 Area of a Rectangle: 29.25 Area of a Triangle: 4.32	✓

Passed all tests! ✓