**Problem Statement:** Define a application to find the area() and perimeter() of various shapes [Ex: Circles,Triangle,Rectangle and Square]

| **1.What ?** | **2.How ?** |
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| 1. What are the shapes we have to consider ?  **Ans:** Circle,Rectangle, Square and Triangle  2. What are the parameters we have to consider ?  **Ans:** Length, Breadth, Side, Radius  3. What are the formulas we have to use to calculate area and perimeter ?  **Ans: Circle:** PI\*Radius^2, **Rectangle:** Length\*Breadth  **Square:** Side\*Side, **Triangle:** 1/2\* Breadth\* Length  **Circle Perimeter:** 2\*PI\*Radius, **Rectangle Perimeter:**2\*(Breadth+Length)  **Square Perimeter:** 4\*Side , **Triangle Perimeter:** Side1+Side2+Side3  4. Any predefined values are required ?  **Ans:** PI=3.14 | 1. Using Single Class read all the required inputs and calculate area  and perimeter.And display the result.  2. Using Single class and method overloading calculate area and  perimeter and display the result.  3. Using different classes for various shapes and calculate area and  perimeter and display the result.  4. Using different classes for various shapes and inherit the common  properties from a class called "Shape" and calculate area and perimeter  and display the result.  5.Using different classes for various shapes and inherit the common  properties from a abstract class called "Shape" and calculate area and  perimeter and display the result.  6. Using different classes for various shapes and Inherit the common  properties from a abstract class called "Shape" and implements the  interface called "ShapePlan" and calculate area and perimeter and  display the result. |
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| **3.Why ?** | **4.Why Not ?** |
| 6. Using different classes for various shapes and Inherit the common  properties from a abstract class called "Shape" and implements the interface  called "ShapePlan" and calculate area and perimeter and display the result.  **Ans:** 1.We can separate the common properties.  2. We can only declare in the interface (Secure).  3. We can declare and also can define in abstract.  4. We can achieve 100% abstraction in the interface.  5. Code reusability.  6. We can make a plan by using the interface.  7. Code flexibility (Updation). | 4. Using different classes for various shapes and inherit the common  properties from a class called "Shape" and calculate area and perimeter  and display the result.  5. Using different classes for various shapes and inherit the common  properties from a abstract class called "Shape" and calculate area and  perimeter and display the result.  **Ans:** 1. Compared to this 2 that is more secure.  2. This 2 comes without an interface.  3. We can't achieve 100% abstraction.  4. The 2nd one is partially completed.  5. When we compare that code flexibility is less efficient in this 2.  6. We can't plan in this 2 solutions because of absence of  interface. |
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**Algorithm:**

**Step 1:** Start

**Step 2:** Create interface for shape which is a ShapePlan.

**Step 3:** Declare the methods(Area, Perimeter) in the interface and define the value of PI.

**Step 4:** Create a superclass as abstract called “Shape” and implement the interface.

**Step 5:** Create subclasses for the shapes like Rectangle,Square,Circle and Triangle and extends the abstract class.

**Step 6:** Declare parameters and define the methods in the subclasses with the formula.

**Step 7:** Create objects and give value to the parameters for the shapes.

**Step 8:** Call the method by the object.

**Step 9:** Display the result.

**Step 10:** Stop.

**Code:**

**interface** ShapePlan{

**void** area();

**void** perimeter();

**double** ***PI***=3.14;

}

**abstract** **class** Shape **implements** ShapePlan{

**public** **abstract** **void** area();

**public** **abstract** **void** perimeter();

}

**class** Circle **extends** Shape{

**int** radius;

Circle(**int** radius){

**this**.radius=radius;

}

**public** **void** area() {

**double** area=***PI***\*(radius\*radius);

System.***out***.println("The area of circle is: "+area);

}

**public** **void** perimeter() {

**double** perimeter=2\*(***PI***\*radius);

System.***out***.println("The perimeter of circle is: "+perimeter);

}

}

**class** Square **extends** Shape{

**int** side;

Square(**int** side){

**this**.side=side;

}

**public** **void** area() {

**double** area=side\*side;

System.***out***.println("The area of square is: "+area);

}

**public** **void** perimeter() {

**double** perimeter=4\*side;

System.***out***.println("The perimeter of square is: "+perimeter);

}

}

**class** Rectangle **extends** Shape{

**int** length;

**int** breadth;

Rectangle(**int** length,**int** breadth){

**this**.length=length;

**this**.breadth=breadth;

}

**public** **void** area() {

**double** area=length\*breadth;

System.***out***.println("The area of rectangle is: "+area);

}

**public** **void** perimeter() {

**double** perimeter=2\*(length\*breadth);

System.***out***.println("The perimeter of rectangle is: "+perimeter);

}

}

**class** Triangle **extends** Shape{

**int** length;

**int** breadth;

**int** side1,side2,side3;

Triangle(**int** length,**int** breadth,**int** side1,**int** side2,**int** side3){

**this**.length=length;

**this**.breadth=breadth;

**this**.side1=side1;

**this**.side2=side2;

**this**.side3=side3;

}

**public** **void** area() {

**double** area=(length\*breadth)/2;

System.***out***.println("The area of triangle is: "+area);

}

**public** **void** perimeter() {

**double** perimeter=side1+side2+side3;

System.***out***.println("The perimeter of triangle is: "+perimeter);

}

}

**public** **class** ShapeProblemSolving {

**public** **static** **void** main(String[] args) {

Circle a=**new** Circle(8);

a.area();

a.perimeter();

Square b=**new** Square(12);

b.area();

b.perimeter();

Rectangle c=**new** Rectangle(8,10);

c.area();

c.perimeter();

Triangle d=**new** Triangle(6,8,12,14,16);

d.area();

d.perimeter();

}

}

**Output:**

The area of circle is: 200.96

The perimeter of circle is: 50.24

The area of square is: 144.0

The perimeter of square is: 48.0

The area of rectangle is: 80.0

The perimeter of rectangle is: 160.0

The area of triangle is: 24.0

The perimeter of triangle is: 42.0