1. **Problem Statement:** Create an abstract class Figure with following properties and functions:

   Properties: double dim1;
   Methods: abstract void findArea();
   abstract void findPerimeter();

   Create three subclasses Circle, Rectangle and Triangle that extends Figure class and define both the methods.
   Write a program that will find the area and perimeter of 3 Figures and print the details for all.

1.1 Source Code: file name – Shape.java

```
import java.util.Scanner;
abstract class Figure //creation of Abstract Class with provided information
in statement
{
	double dim1;
	double len,wid;
	abstract void findArea();
	abstract void findPerimeter();
}
class Circle extends Figure
{
	double cArea;
	double cPeri;

	void findArea() //Defining the abstract method
	{
		cArea=3.14*dim1*dim1;
		System.out.println("Area of the Circle - "+cArea);
	}
	void findPerimeter() //Defining the abstract method
	{
		cPeri=2*3.14*dim1;
		System.out.println("Perimeter of the Circle - "+cPeri);
	}
}
class Rectangle extends Figure
{

	double rArea;
	double rPeri;
	void findArea() //Defining the abstract method
	{
		rArea=len*wid;
		System.out.println("Area of the Rectangle - "+rArea);
	}
	void findPerimeter() //Defining the abstract method
	{
		rPeri=2*(len+wid);
		System.out.println("Perimeter of the Rectangle - "+rPeri);
	}
}
class Triangle extends Figure
```

```
{
	double tArea;
	double tPeri;
	void findArea()
	{
		tArea= (len*wid)/2; //Defining the abstract method
		System.out.println("Area of the Triangle - "+tArea);
	}
	void findPerimeter()
	{
		tPeri=dim1+len+wid; //Defining the abstract method
		System.out.println("Perimeter of the Triangle - "+tPeri);
	}
}
public class Shape
{

	public static void main(String[] args)
	{
		Figure f; //creating reference for Abstract class
		f=new Circle();
		Scanner sc=new Scanner(System.in);
		System.out.println("*** The Area and Perimeter of
Circle,Rectangle and Triangle ***");
		//providing input values for the variables of abstract class
		System.out.println("\nEnter radius of the Circle - ");
		f.dim1=sc.nextDouble();
		f.findArea(); //calling the abstract methods
		f.findPerimeter(); //calling the abstract methods
		f=new Rectangle();
		System.out.println("\nEnter length and width of the Rectangle -
");
		f.len=sc.nextDouble();
		f.wid=sc.nextDouble();
		f.findArea(); //calling the abstract methods
		f.findPerimeter(); //calling the abstract methods
		f=new Triangle();
		System.out.println("\nEnter the dimensions of the Triangle -");
		f.dim1=sc.nextDouble();
		f.len=sc.nextDouble();
		f.wid=sc.nextDouble();
		f.findArea(); //calling the abstract methods
		f.findPerimeter(); //calling the abstract methods
		sc.close();

	}
}
```

1.2 Output:

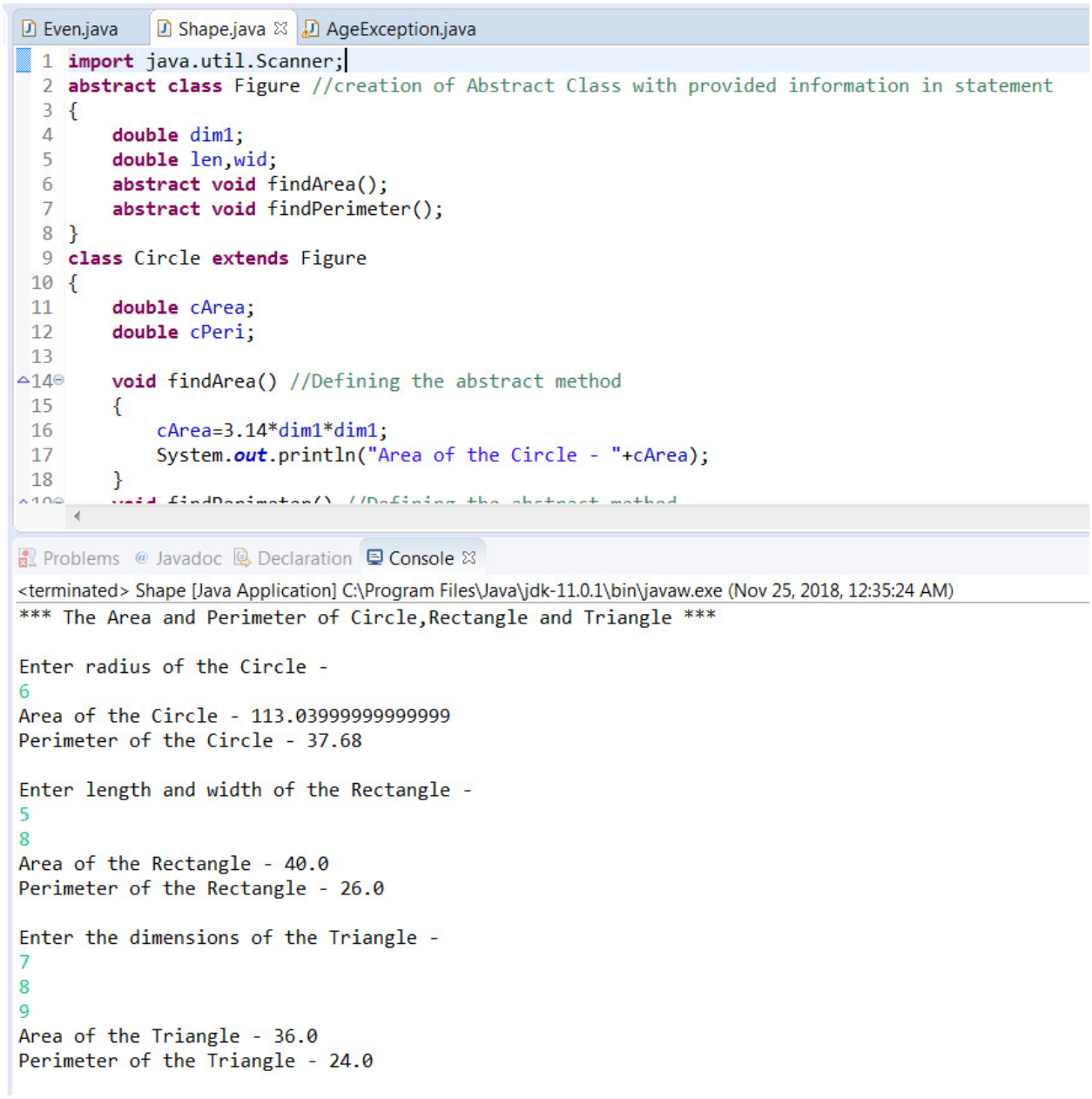
```
*** The Area and Perimeter of Circle,Rectangle and Triangle ***

Enter radius of the Circle -
6
Area of the Circle - 113.03999999999999
Perimeter of the Circle - 37.68
```

```
Enter length and width of the Rectangle -
5
8
Area of the Rectangle - 40.0
Perimeter of the Rectangle - 26.0

Enter the dimensions of the Triangle -
7
8
9
Area of the Triangle - 36.0
Perimeter of the Triangle - 24.0
```

1.3 Output Screenshots:



2. **Problem Statement:** Declare an integer array of size 10. Initialize using for loop with 1 to 10, and print all even numbers from an array.

2.1 Source Code: File Name – Even.Java

```
import java.util.Scanner;
class Even
{
	public static void main(String args[])
```

```
	{
		int[] num; // Declaring Array for the numbers
		Scanner sc=new Scanner(System.in);
		num = new int[10]; // providing array size as per the statement
		System.out.println("*** Print Even Numbers ***");
		for(int i=0;i<num.length;i++)//loop for taking the values into
array
		{
			System.out.println("Enter the number");
			num[i]=sc.nextInt();
		}
		System.out.println("The numbers entered are - ");

		for (int i=0;i<num.length;i++)//loop for printing the array
		{
			System.out.print(+num[i]+",");
		}
		System.out.println("\nThe Even numbers are - ");
		for (int i=0;i<num.length;i++)//loop for checking the EVEN
numbers
		{
			if((num[i]%2)==0)
			{
				System.out.print(+num[i]+",");
			}
		}
		sc.close();
	}
}
```

2.2 Output:

```
*** Print Even Numbers ***
Enter the number
1
Enter the number
2
Enter the number
3
Enter the number
4
Enter the number
5
Enter the number
6
Enter the number
7
Enter the number
8
Enter the number
8
Enter the number
7
The numbers entered are -
1,2,3,4,5,6,7,8,8,7,
The Even numbers are -
2,4,6,8,8,
```

2.3 Output Screenshots:

Even.java | Shape.java | AgeException.java

```
1  import java.util.Scanner;
2  class Even
3  {
4      public static void main(String args[])
5      {
6          int[] num; // Declaring Array for the numbers
7          Scanner sc=new Scanner(System.in);
8          num = new int[10]; // providing array size as per the statement
9          System.out.println("*** Print Even Numbers ***");
10         for(int i=0;i<num.length;i++)//loop for taking the values into array
11         {
12             System.out.println("Enter the number");
13             num[i]=sc.nextInt();
14         }
```

Problems | Javadoc | Declaration | Console

```
<terminated> Even [Java Application] C:\Program Files\Java\jdk-11.0.1\bin\javaw.exe (Nov 25, 2018, 1:04:30 AM)
*** Print Even Numbers ***
Enter the number
1
Enter the number
2
Enter the number
3
Enter the number
4
Enter the number
5
Enter the number
6
Enter the number
7
Enter the number
8
Enter the number
8
Enter the number
7
The numbers entered are -
1,2,3,4,5,6,7,8,8,7,
The Even numbers are -
2,4,6,8,8,
```

3. **Problem Statement:** Write a program to generate a user-defined exception called NegativeAgeException if the user inputs negative value for age.

3.1 Source Code: File Name – `AgeException.java`

```
import java.util.Scanner;

@SuppressWarnings("serial")
class NegativeAgeException extends Exception//Inheriting the Super class
Exception
{
```

```
        NegativeAgeException(String a)
        {
                System.out.println(a);
        }
}
public class AgeException
{
        //if user inputs a negative value for age then user defined exception
should be thrown
    @SuppressWarnings("resource")
        public static void main(String[]args)
        {
                Scanner sc=new Scanner(System.in);
                System.out.println("Enter your age");
                int age=sc.nextInt(); //user inputs the age

                try //try block used for validating the age
                {
                        if(age<0)
                                //here a user defined "NegativeAgeException"
exception is created, it means a class.
                                //that means it acts as a subclass
                                throw new NegativeAgeException("Entered age is
Invalid");
                        else
                                System.out.println("Entered age is "+age);
                }
                catch(Exception e) //on failure of the condition the exception is
caught
                {
                        System.out.println("Age of a person cannot be less than
0");
                }
     sc.close();
        }
}
```

3.2 Output:

```
Enter your age
-26
Entered age is Invalid
Age of a person cannot be less than 0
```

3.3 Output Screenshots:

Even.java | Shape.java | AgeException.java

```java
import java.util.Scanner;

@SuppressWarnings("serial")
class NegativeAgeException extends Exception//Inheriting the Super class Exception
{
    NegativeAgeException(String a)
    {
        System.out.println(a);
    }
}
public class AgeException
{
    //if user inputs a negative value for age then user defined exception should be thrown
    @SuppressWarnings("resource")
    public static void main(String[]args)
    {
        Scanner sc=new Scanner(System.in);
        System.out.println("Enter your age");
        int age=sc.nextInt(); //user inputs the age

        try //try block used for validating the age
        {
            if(age<0)
                //here a user defined "NegativeAgeException" exception is created, it means a class.
                //that means it acts as a subclass
                throw new NegativeAgeException("Entered age is Invalid");
            else
                System.out.println("Entered age is "+age);
        }
        catch(Exception e) //on failure of the condition the exception is caught
```

Problems | Javadoc | Declaration | Console

```
<terminated> AgeException [Java Application] C:\Program Files\Java\jdk-11.0.1\bin\javaw.exe (Nov 25, 2018, 1:11:01 AM)
Enter your age
-26
Entered age is Invalid
Age of a person cannot be less than 0
```

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