Exercise 1

You are given the Java classes `Circle`, `Rectangle` and `RectangleUser` below.

```
public class Circle
{  private double radius;

 public Circle(double r) {
  radius = r;
 }

 public double area() {
  return radius*radius*Math.PI;
 }
}
```

```
public class Rectangle
{          private double length;
private double width;

     public Rectangle(double l, double w)
{           length = l;
width = w;
     }

     public double area()
{                    return length * width;
     }
}
```

```
public class Test {
 public static void main(String [] args) {   Rectangle
r = new Rectangle(30.1, 10.2);
  Circle c = new Circle(5.3);

  System.out.println("r=" + r);
  System.out.println("c=" + c);
 }
}
```

Execute `Test` and write down the output.

r=lab14.Rectangle@2f92e0f4 c=lab14.Circle@28a418fc

Exercise 2

You are given the Java classes `Test2` below. Execute the program together with the `Rectangle` class in Exercise 1.

```
public class Test2 {  public static void main(String
[] args) {
  Rectangle r = new Rectangle(1, 2);
  System.out.println("r=" + r);
  System.out.println("area=" + r.area());
```

```
  r = new Rectangle(3, 4);   System.out.println("r=" +
r);
  System.out.println("area=" + r.area());

  r = null;
  System.out.println("r=" + r);
  System.out.println("area=" + r.area());
 }
}
```

Execute `Test` and write down the output. Can you explain the output?

r=lab14.Rectangle@372f7a8d area=2.0
r=lab14.Rectangle@28a418fc
area=12.0
r=null error

Exercise 3

You are given the Java classes `Triangle` below.

```
public class Triangle
{  private int base;
private int height;
  public Triangle()
{   base = 0;
  height = 0;
 }

 public Triangle(int base, int height) {
  this.base = base;
  this.height = height;
 }
  public void printThis()
{   System.out.println(this);
 }
  public static void main(String [] args) {
  Triangle t = new Triangle(1, 2);
System.out.println(t);   t.printThis();
 }
}
```

Execute `Triangle` and write down the output. Can you explain the output? Discuss what `this` is in an object instance.

lab14.Triangle@4517d9a3 lab14.Triangle@4517d9a3

Exercise 4

You are given the Java classes `Date` and `DateUser` below.

```
public class Date
{  private int day;
private int month;  private
int year;
  public Date() {
  this(1, 1, 1970);
 }

 public Date(int day, int month, int year) {
  this.day = day;   this.month =
month;
  this.year = year;
 }

 public String toString() {
  return "[" + day + "/" + month + "/" + year + "]";
 }
}
```

```
public class DateUser {  public static void
main(String [] args) {
  Date d1 = new Date();

  System.out.println(d1);
 }
}
```

(a) Execute `DateUser` and observer the output. Can you explain the purpose of the program statement "`this(1, 1, 1970)`" in the no-argument constructor of `Date`?

each object instance has the this reference which is a reference to the object instance itself

(b) Remove the `toString()` method from the `Date` class. Compile and execute the program again. What is the difference?

lab14.Date@372f7a8d

END.