Tutorial 08

Objects & Classes: User-defined classes | Creating objects | Accessing object's members

Exercise 1:

Given the class Point, what is the output of each of the following code fragments?

```
class Point {
  public int x;
  public int y;
  public static int count;
}
```

A.
```
Point p1 = new Point();
System.out.println(p1.x + "," + p1.y + ":" + p1.count);
```

B.
```
Point p1 = new Point();
p1.x = 5;  p1.y = 3; p1.count = 2;
Point p2 = new Point();
p2.x = 3;  p2.y = 5; p2.count = 1;
System.out.println(p1.x + "," + p1.y + ":" + p1.count);
```

C.
```
Point p1 = new Point ();
p1.x = 5;  p1.y = 3; p1.count = 1;
Point p2 = new Point ();
p2.x = p1.y;  p2.y = p1.x; p2.count = 1;
System.out.println(p2.x + "," + p2.y + ":" + p2.count);
```

D.
```
Point p=null;
for (int i=1; i <= 5; i++) {
  p = new Point ();
  p.x = i;  p.y = 2*i*i+2;
  p.count++;
}
System.out.println(p.x + "," + p.y + ":" + p.count);
```

E.
```
Point p1=null, p2=null;
for (int i=1; i <= 5; i++) {
  p1 = new Point();
  p2 = new Point();
  p1.x = i;  p1.y = 2*i+1;  p1.count++;
  p2.x = i;  p2.y = 3*i-1;  p2.count++;
}
System.out.println(p1.count++);
```

Exercise 2:

Each of the following code fragments causes an error. Indicate the line that causes the error, type of error (compile/run time) and the specific error message.

A.
```
01 class TestPoint {
02   public static void main(String[] args) {
03     Point p=null;
04     System.out.println(p.count);
05     System.out.println(p.x);
06   }
07 }
```

B.
```
01 class TestPoint {
02   public static void main(String[] args) {
03     System.out.println(Point.count);
04     System.out.println(Point.x);
05   }
06 }
```

C.
```
01 class TestPoint {
02   public static void main(String[] args) {
03     Point p;
04     for (int i=1; i <= 5; i++) {
05       p = new Point ();
06       p.x = i;  p.y = 2*i*i+2;
07     }
08     System.out.println(p.x);
09   }
10 }
```

Exercise 3

To solve the quadratic equation of the form: $a.x^2 + b.x + c = 0$, where x represents an unknown variable, and the coefficients a, b, and c are constants with $a \neq 0$, find the discriminant: $\Delta = b^2 - 4.a.c$ and based on the value of Δ, we recognize 3 cases:

Δ > 0, there are two distinct solutions: $x = \frac{-b \pm \sqrt{\Delta}}{2a}$

Δ = 0, there is one solution: $x = \frac{-b}{2a}$

Δ < 0, the equation does not have a real solution

A. Implement the class Equation in Java

B. Write a program to read the equation coefficients, create an equation object, try to solve it, and print the results.

Exercise 4

(Java Programming: From Problem Analysis to Program Design, example 1-2)

The monthly salary of a salesperson is broken down into:

- ❏ A basic salary
- ❏ A bonus that varies according to service period:
  - ○ If the salesperson has been with the store for five years or less, the bonus is $10 per year.
  - ○ If the salesperson has been with the store for more than five years, the bonus is $20 per year.
- ❏ An additional bonus:
  - ○ If the total sales made by the salesperson for the month are more than $5,000 but less than $10,000, he or she receives a 3% commission on the sale.
  - ○ If the total sales made by the salesperson for the month are at least $10,000, he or she receives a 6% commission on the sale.

A. Design a class the represents the salesperson's record including his name, his salary, and any other needed information.
B. Write a program that reads the salesperson information (name, basic salary, service years and total sales), calculates the total salary and print it out.

Exercise 5:

The triangle inequality principle states that the sum of the lengths of any two sides of a triangle always exceeds the length of the third side.

Pythagoras' theorem states that the square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the other two sides

Using the class Triangle, write a program that:
A. prompts the user to enter the lengths of three sides of a triangle
B. displays a message indicating whether the lengths represent a triangle, and if it is,
C. displays a message indicating whether the triangle is a right triangle.

Exercise 6:

Given the class PhoneBill where:
accNo is the bill's account number
month is the number of the month for which the bill is issued
lMins the total minutes of all local calls in the given month
iMins the total minutes of all international calls in the given month
The bill cost is calculated according the table:

minutes	up to 100 minutes	more than 100 minutes
local calls	minutes x S.R. 0.30	
international calls	S.R. 50.00 flat rate	extra minutes x S.R. 0.70

A. implement the PhoneBill class in Java
B. write a program to:
   1. read information for phone bills of one year
   2. find the monthly average cost of a phone bills
   3. find the month of the lowest bill cost
   4. find the month of the highest minutes usage