Name: _____ Student ID: _____ Class: _____

Professor: Jong-Kyou Kim, PhD _____

1.

(*Display a pattern*) Write a program that displays the following pattern:

```
     J     A      V    V     A
     J     A A     V  V     A A
J    J    AAAAA     V V    AAAAA
  J J    A     A     V    A     A
```

그림 1: 실습문제

2.

(*Algebra: solve* 2×2 *linear equations*) You can use Cramer's rule to solve the following 2×2 system of linear equation:

$$ax + by = e \qquad x = \frac{ed - bf}{ad - bc} \qquad y = \frac{af - ec}{ad - bc}$$
$$cx + dy = f$$

Write a program that solves the following equation and displays the value for x and y:

$$3.4x + 50.2y = 44.5$$
$$2.1x + .55y = 5.9$$

그림 2: 실습문제

3.

(*Algebra: solve quadratic equations*) The two roots of a quadratic equation $ax^2 + bx + c = 0$ can be obtained using the following formula:

$$r_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad \text{and} \quad r_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$b^2 - 4ac$ is called the discriminant of the quadratic equation. If it is positive, the equation has two real roots. If it is zero, the equation has one root. If it is negative, the equation has no real roots.

Write a program that prompts the user to enter values for a, b, and c and displays the result based on the discriminant. If the discriminant is positive, display two roots. If the discriminant is **0**, display one root. Otherwise, display "The equation has no real roots".

Note that you can use **Math.pow(x, 0.5)** to compute $\sqrt{x}$. Here are some sample runs.

```
Enter a, b, c: 1.0 3 1 ↵Enter
The equation has two roots -0.381966 and -2.61803
```
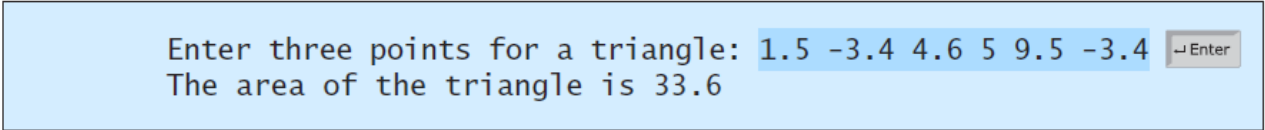
그림 3: 실습문제

4.

(*Geometry: area of a triangle*) Write a program that prompts the user to enter three points (x1, y1), (x2, y2), (x3, y3) of a triangle and displays its area. The formula for computing the area of a triangle is

$$s = (side1 + side2 + side3)/2;$$
$$area = \sqrt{s(s - side1)(s - side2)(s - side3)}$$

Here is a sample run:

```
Enter three points for a triangle: 1.5 -3.4 4.6 5 9.5 -3.4 ↵Enter
The area of the triangle is 33.6
```

그림 4: 실습문제

5.

(*Sort three integers*) Write a program that prompts the user to enter three integers and display the integers in non-decreasing order.

그림 5: 실습문제