Due: Sun 23:50

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
```

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

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

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

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

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

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

$b^2 - 4ac$ 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 discrimeinant is positive, display two roots. If the discriminant is 0, display one root. Otherwise, display "The equation has no real roots".

Not 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
The equation has two roots -0.38196 and -2.61803
```

4. *(Greometry: 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

$$s = (\text{side1} + \text{side2} + \text{side3})/2$$

$$\text{area} = \sqrt{s(s - \text{side1})(s - \text{side2})(s - \text{side3})}$$

Here is a sample run:

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

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