

## Lab 5

**Instructions:** Complete the steps below. Be sure to upload a copy of all your source code (.java) files to the link on Brightspace by its deadline, so that you can receive credit for this lab.

1. 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 roots.”

**Note:** you can use *Math.pow(x, 0.5)* to compute  $\sqrt{x}$ .

Enter *a, b, c* : 1.0 3 1

The equation has two roots  $-0.381966$  and  $-2.61803$

Enter *a, b, c* : 1 2.0 1

The equation has one root  $-1.0$

Enter *a, b, c* : 1 2 3

The equation has no real roots.

2. A shipping company use the following function to calculate the cost (in dollars) of shipping based on the weight of the package (in pounds).

$$c(w) = \begin{cases} 3.5, & \text{if } 0 < w \leq 1 \\ 5.5, & \text{if } 1 < w \leq 3 \\ 8.5, & \text{if } 3 < w \leq 10 \\ 10.5, & \text{if } 10 < w \leq 20 \end{cases}$$

Write a program that prompts the user to enter the weight of the package and displays the shipping cost. If the weight is negative or zero, display a message “Invalid input.” If the weight is greater than 20 display a message “The package cannot be shipped.”

3. Write a program that reads the following, in this order:
  - premium: a floating-point number that represents the normal (base) cost of a particular auto insurance policy
  - age: a positive integer that represents a person’s age

- gender: a string that can be either "Male" or "Female"

The program prints the floating-point premium the user has to pay. The following policies are used:

- if age is between 18 (inclusive) and 21 (exclusive) and gender is "Male", then 100% of the premium is paid
- If age is between 18 (inclusive) and 21 (exclusive) and gender is "Female", then 90% of the premium is paid
- if age is between 21 (inclusive) and 30 (exclusive), regardless of gender, then 75% of the premium is paid
- if age is between 30 (inclusive) and 60 (exclusive) and gender is "Male", then 60% of the premium is paid
- If age is between 30 (inclusive) and 60 (exclusive) and gender is "Female", then 70% of the premium is paid
- if age is above 60 (inclusive), regardless of gender, 100% of premium is paid
- In all other cases the function prints -1.0

#### Examples

Please enter in the premium price of the auto insurance policy: 150

Please enter in the person's age: 20

Please enter in either Male or Female for gender: Female

135.0

Please enter in the premium price of the auto insurance policy: 300

Please enter in the person's age: 25

Please enter in either Male or Female for gender: Male

225.0

Please enter in the premium price of the auto insurance policy: 50

Please enter in the person's age: 41

Please enter in either Male or Female for gender: Female

35.0

**Grading Guidelines:** This lab is graded on a scale of **0-3 points**, assigned as follows:

- **0** - The student did not attend the lab,
- **3** - The solutions are complete OR the student spent the entire lab solving the required lab problems (in this case, the students may not arrive at the lab after the lab started and may not leave until the lab ends).