

King Saud University
College of Computer & Information Science
CSC111 – Lab04
Conditional Statements
All Sections

Instructions

Web-CAT submission URL:

<http://10.131.240.28:8080/Web-CAT/WebObjects/Web-CAT.woa/wa/assignments/eclipse>

Objectives:

- 1- Student should learn how to program using selection statements with combined conditions.
- 2- Student should learn how to combine conditions using logical operators (!, &&, and ||)
- 3- Student should learn how to write expressions using the conditional expression

Lab Exercise 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 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 3 1 ↵
The equation has two roots -0.3819660112501051 and -
2.618033988749895
```

```
Enter a, b, c: 1 2 1 ↵
The equation has one root -1.0
```

```
Enter a, b, c: 1 2 3 ↵
The equation has no real roots
```

Solution

- 1- Create a new project in eclipse and name it **lab04**
- 2- Create a new class and name it **QuadEquation**. Make sure you choose the `public static void main` option.
- 3- Write the program as following (you can ignore comments):

```

import java.util.Scanner;

public class QuadEquation {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);

        System.out.print("Enter a, b, c: ");
        double a = input.nextDouble();
        double b = input.nextDouble();
        double c = input.nextDouble();

        double discriminant = b * b - 4 * a * c;

        if (discriminant < 0) {
            System.out.println("The equation has no real roots");
        }
        else if (discriminant == 0) {
            double r1 = -b / (2 * a);
            System.out.println("The equation has one root " + r1);
        }
        else { // (discriminant > 0)
            double r1 = (-b + Math.pow(discriminant, 0.5)) / (2 * a);
            double r2 = (-b - Math.pow(discriminant, 0.5)) / (2 * a);
            System.out.println("The equation has two roots " + r1 + " and " + r2);
        }
    }
}

```

- 4- When you are done, save your program and run it. Make sure it prints the output as shown above.
- 5- Submit your program to WebCAT through. Ask your TA for help.

Lab Exercise 2

How cold is it outside? Temperature by itself is not enough. In 2001, the National Weather Service (NWS) in United States implemented the new **wind-chill temperature** to measure the coldness using temperature and wind speed. The formula is

$$t_{wc} = 35.74 + 0.6215t_a - 35.75v^{0.16} + 0.4275t_av^{0.16}$$

where t_a is the outside temperature measured in degrees Fahrenheit and v is the speed measured in miles per hour. t_{wc} is the wind-chill temperature. The formula cannot be used for wind speeds below 2 mph or temperatures below -58°F or above 41°F .

Write a program that prompts the user to enter a temperature and a wind speed. The program displays the wind-chill temperature if the input is valid; otherwise, it displays a message indicating whether the temperature and/or wind speed is invalid.

Here are sample runs:

```
Enter the temperature in Fahrenheit: 32 ↵
Enter the wind speed miles per hour: 30 ↵
The wind chill index is 17.59665069469402
```

```
Enter the temperature in Fahrenheit: 80 ↵  
Temperature must be between -58F and 41F
```

```
Enter the temperature in Fahrenheit: 20 ↵  
Enter the wind speed miles per hour: 1 ↵  
Speed must be greater than or equal to 2
```

Solution

- 1- Use the same project **lab04** that you created before
- 2- Create a new class and name it **WindChill**. Make sure you choose the `public static void main` option.
- 3- Write the program as following (you can ignore comments):

```

import java.util.Scanner;

public class WindChill {
    // Main method
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        // Enter the temperature in Fahrenheit
        System.out.print("Enter the temperature in Fahrenheit: ");
        double fahrenheit = input.nextDouble();

        if (fahrenheit < -58 || fahrenheit > 41) {
            System.out.println("Temperature must be between -58F and 41F");
        } else {

            // Enter the wind speed miles per hour
            System.out.print("Enter the wind speed miles per hour: ");
            double speed = input.nextDouble();

            if (speed < 2) {
                System.out.println("Speed must be greater than or equal to 2");
            } else {
                // Compute wind chill index
                double windChillIndex = 35.74 + 0.6215 * fahrenheit - 35.75
                    * Math.pow(speed, 0.16) + 0.4275 * fahrenheit
                    * Math.pow(speed, 0.16);

                // Display the result
                System.out.println("The wind chill index is " + windChillIndex);
            }
        }
    }
}

```

- 6- When you are done, save your program and run it. Make sure it prints the output as shown above.
- 7- Submit your program to WebCAT through. Ask your TA for help.

Done...