

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

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## Objectives:

The students should learn how to:

1. Program using selection statements with combined conditions.
2. Combine conditions using logical operators (!, &&, and ||)
3. Write expressions using the conditional expression

## Lab Exercise 1

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

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

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.

## 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

```
import java.util.Scanner;

public class WindChill {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("Enter the temperature in Fahrenheit: ");
        double fahrenheit = in.nextDouble();
        if(fahrenheit >= -58 && fahrenheit <= 41) {
            System.out.print("Enter the wind speed miles per hour: ");
            double windSpeed = in.nextDouble();
            if(windSpeed >= 2) {
                double windChill = 35.74
                    + 0.6215 * fahrenheit
                    - 35.75 * Math.pow(windSpeed, 0.16)
                    + 0.4275 * fahrenheit
                    * Math.pow(windSpeed, 0.16);
                System.out.println("The wind chill index is "
                    + windChill);
            } else {
                System.out.println("Speed must be greater than or equal to 2");
            }
        } else {
            System.out.println("Temperature must be between -58F and 41F");
        }
    }
}
```

```
}
```

## Lab Exercise 2

The two roots of a quadratic equation 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

```
import java.util.Scanner;
```

```

public class Roots {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("Enter a, b, c: ");
        double a = in.nextDouble();
        double b = in.nextDouble();
        double c = in.nextDouble();
        double discriminant = b * b - (4 * a * c);
        if (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);
        } else if (discriminant == 0) {
            double r1 = (-b + Math.pow(discriminant, 0.5)) / (2 * a);
            System.out.println("The equation has one roots " + r1);
        } else {
            System.out.println("The equation has no real roots");
        }
    }
}

```

## Lab Exercise 3

We are going to write a program that reads an unspecified number of integers, determines how many positive and negative values have been read, and computes the total and average of the input values (not counting zeros). Your program ends with the input 0. Display the average as a floating-point number.

Here are some sample runs:

```

Enter integers ending with 0: 4 2 -1 3 -2 0 ↵
The number of positives is 3
The number of negatives is 2
The total is 6
The average is 1.2

```

```

Enter integers ending with 0: 0 ↵
no numbers are entered except 0

```

## Solution

```

import java.util.Scanner;
public class CountPosNeg {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.print("Enter integers ending with 0: ");
        int x = input.nextInt(), pos = 0, neg = 0, sum = 0, count = 0;
        while (x != 0) {
            if (x > 0)
                pos++;
            else
                neg++;
            count++;
            sum += x;
            x = input.nextInt();
        }
        double avg = ((double) sum) / count;
        System.out.println("The number of positives is " + pos);
        System.out.println("The number of negatives is " + neg);
        System.out.println("The total is " + sum);
        System.out.println("The average is " + avg);
    }
}

```

## Lab Exercise 4

Write a program that prompts the user to enter the number of students and each student's name and score (at least two students), and finally displays the student with the highest score and the student with the second-highest score.

Here are sample runs:

```

Enter the number of students: 4 ↵
Enter a student name: Mohammed ↵
Enter a student score: 75 ↵
Enter a student name: Ali ↵
Enter a student score: 85 ↵
Enter a student name: Fahad ↵
Enter a student score: 98 ↵
Enter a student name: Khalid ↵
Enter a student score: 65 ↵
Top two students:
Fahad's score is 98.0
Ali's score is 85.0

```

Enter the number of students: 4 ↵  
Need at least two students.

## Solution

```
import java.util.Scanner;
public class HighestScore {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        String n1 = null, n2 = null;
        double s1 = 0, s2 = 0;
        System.out.print("Enter the number of students: ");
        int numOfStudents = in.nextInt();
        if (numOfStudents < 2) {
            System.out.println("Incorrect, you need at least two students.");
        } else {
            for (int i = 0; i < numOfStudents; i++) {
                System.out.print("Enter a student name: ");
                String name = in.next();
                System.out.print("Enter a student score: ");
                double score = in.nextDouble();

                if (s1 < score) {
                    s2 = s1;
                    n2 = n1;

                    s1 = score;
                    n1 = name;
                } else if (s2 < score) {
                    s2 = score;
                    n2 = name;
                }
            }
            System.out.println("Top two students:");
            System.out.println(n1 + "'s score is " + s1);
            System.out.println(n2 + "'s score is " + s2);
        }
    }
}
```

```
import java.util.Scanner;
public class HighestScore {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        String name1 = null, name2 = null;
        double score1 = 0, score2 = 0;
        System.out.print("Enter the number of students: ");
        int numOfStudents = in.nextInt();
        if (numOfStudents < 2) {
```

```

        System.out.println("Incorrect, you need at least two students.");
    } else {
        System.out.print("Enter a student name: ");
        name1 = in.next();
        System.out.print("Enter a student score: ");
        score1 = in.nextDouble();
        System.out.print("Enter a student name: ");
        name2 = in.next();
        System.out.print("Enter a student score: ");
        score2 = in.nextDouble();

        if(score2 > score1) {
            String nTemp = name2;
            name2 = name1;
            name1 = nTemp;
            double sTemp = score2;
            score2 = score1;
            score1 = sTemp;
        }

        for (int i = 0; i < numOfStudents -2; i++) {
            System.out.print("Enter a student name: ");
            String name = in.next();
            System.out.print("Enter a student score: ");
            double score = in.nextDouble();

            if (score1 < score) {
                score2 = score1;
                name2 = name1;

                score1 = score;
                name1 = name;
            } else if (score2 < score) {
                score2 = score;
                name2 = name;
            }
        }
    }
    System.out.println("Top two students:");
    System.out.println(name1 + "'s score is " + score1);
    System.out.println(name2 + "'s score is " + score2);
}

```

Done...