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

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

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

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.

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- Create a new project in eclipse and name it **`lab04`**

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):

```java
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 Temperature is less than -58F or more than 41F
            Print "Temperature must be between -58F and 41F"

        Else
            ... // Ask the user to enter the wind speed

            If speed is less than 2
                ... // Prompt the user that his input is wrong

            Else
                windChillIndex = 35.74 + 0.6215 * fahrenheit - 35.75
                        * Math.pow(speed, 0.16) + 0.4275 * fahrenheit
                        * Math.pow(speed, 0.16);
                Print windChillIndex
            End If

        End If

    }
}
```

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

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

6- Use the same project **`lab04`** that you created before

7- Create a new class and name it **`QuadEquation`**. Make sure you choose the `public static void main` option.

8- 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 is less than 0
        Print "The equation has no real roots"

    ElseIf discriminant equals 0
        r1 = -b / (2 * a)
        ... // print the result

    Else
        Calculate r1 & r2
        ... // print the result

    EndIf
  }
}
```

9- When you are done, save your program and run it. Make sure it prints the output as shown above.

10- Submit your program to WebCAT through. Ask your TA for help.

Lab Exercise 3

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: 1 2 -1 3 0 ↵
The number of positives is 3
The number of negatives is 1
The total is 5
The average is 1.25
```

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

Solution

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

```java
import java.util.Scanner;

public class CountPosNeg {
  public static void main(String[] args) {
    int countPositive = 0, countNegative = 0;
    int count = 0, total = 0, num;

    Scanner input = new Scanner(System.in);
    System.out.print("Enter integers ending with 0: ");
    num = input.nextInt();

    while (num != 0) {
      if (num > 0)
        countPositive++;
      else if (num < 0)
        countNegative++;

      total += num;
      count++;

      // Read the next number
      num = input.nextInt();
    }

    if (count == 0)
      System.out.println("no numbers are entered except 0");
    else {
      System.out.println("The number of positives is " + countPositive);
      System.out.println("The number of negatives is " + countNegative);
      System.out.println("The total is " + total);
      System.out.println("The average is " + total * 1.0 / count);
    }
  }
}
```

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 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 is a 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
```

Solution

11- Use the same project **`lab04`** that you created before

12- Create a new class and name it **`HighScore`**. Make sure you choose the `public static void main` option.

13- Write the program as following (you can ignore comments):

```java
import java.util.*;

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

    // Prompt the user to enter the number of students
    System.out.print("Enter the number of students: ");
    int numberOfStudents = input.nextInt();

    System.out.print("Enter a student name: ");
    String student1 = input.next();

    System.out.print("Enter a student score: ");
    double score1 = input.nextDouble();

    System.out.print("Enter a student name: ");
    String student2 = input.next();

    System.out.print("Enter a student score: ");
    double score2 = input.nextDouble();

    // Make sure that student1 is for the highest
    // and student2 is for the second highest
    if (score1 < score2) {
      // Swap
      String tempString = student1;
      double tempScore = score1;

      student1 = student2;
      score1 = score2;

      student2 = tempString;
      score2 = tempScore;
    }
```

```
    for (int i = 0; i < numberOfStudents - 2; i++) {
      System.out.print("Enter a student name: ");
      String student = input.next();

      System.out.print("Enter a student score: ");
      double score = input.nextDouble();

      if (score > score1) {
        student2 = student1; // student1 now is the second highest
        score2 = score1;

        student1 = student; // new student becomes the highest
        score1 = score;
      }
      else if (score > score2) {
        student2 = student; // new student becomes the second highest
        score2 = score;
      }
    }

    System.out.println("Top two students:");
    System.out.println(student1 + "'s score is " + score1);
    System.out.println(student2 + "'s score is " + score2);
  }
}
```

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…