Programming 1

Tutorial 3

**Discussion Exercises**

Given these variables:

boolean b = false;

int x = 0;

Evaluate these boolean expressions:

a. b && x == 0

b. b || x == 0

c. !b && x == 0

d. !b || x == 0

e. b && x != 0

f. b || x != 0

g. !b && x != 0

h. !b || x != 0

**2.** Simplify the following statements.

Here, b is a variable of type boolean and n is a variable of type int.

a. if (n == 0) { b = true; } else { b = false; }

b. if (n == 0) { b = false; } else { b = true; }

c. b = false; if (n > 1) { if (n < 2) { b = true; } }

d. if (n < 1) { b = true; } else { b = n > 2; }

# Activity 1

Write a Java program that asks a user to enter a floating-point number and prints “zero” if the number is zero. Otherwise, print “positive” or “negative”. Add “small” if the absolute value of the number is less than 1, or “large” if it exceeds 1,000,000.

## Expected result (following is the results of multiple runs)

Please enter a real number: 0

The number is zero.

Please enter a real number: 0.9

A small positive number.

Please enter a real number: 1

A positive number.

Please enter a real number: 1000000

A positive number.

Please enter a real number: 1000000.1

A large positive number.

Please enter a real number: -0.1

A small negative number.

Please enter a real number: -1.0

A negative number.

Please enter a real number: -1000000

A negative number.

Please enter a real number: -1000000.1

A large negative number.

# Activity 2

Leap years are years with 366 days. Write a program to check if a year is a leap year. Test your program with different years to make sure it works correctly.

## Expected result:

Enter the year: 2018

The year 2018 is not a leap year.

Enter the year: 2012

The year 2012 is a leap year.

## Instructions:

The method to identify a leap year:

1. If it is not divisible by 4 (e.g. y % 4 != 0), it's not a leap year, show a message and stop. Otherwise, move on.

2. If a year is divisible by 4, but not 100, like 2012, it is a leap year, show a message and stop here. If a year is divisible by both 4 and 100, like 2000, continue.

3. If a year is divisible by 100, but not 400, like 1900, then it is not a leap year. If a year is divisible by both, then it is a leap year.

# Activity 3

Write a program to take two floating-point numbers from user and test if they are the same up to two decimal places.

## Expected result

Enter the two numbers separated by a space: 1.2345 1.2321

They are the same up to 2 decimal places.

## Hint

Use Math.floor() to round down a number. Math.floor(1.99) would result in 1.0.

1.2345 \* 100 -> 123.45 -> floor() -> 123.0

1.2321 \* 100 -> 123.21 -> floor() -> 123.0

1.2345 \* 100 -> 123.45 -> floor() -> 123.0

1.3221 \* 100 -> 132.21 -> floor() -> 132.0

# Activity 4

## Task

Write a program to take 3 real numbers *a*, *b* and *c* from user and solve the quadratic equation:

*ax*2 + *bx* + *c* = 0

Show a message to tell the user if the equation has one, two, infinitely many roots or none, and show the value(s) of *x*.

## Expected result:

Please enter a: 2

Please enter b: 2

Please enter c: -4

The equation has two roots:

x1 = 1.0, x2 = -2.0

## Instructions:

These are the rules for solving the quadratic equation:

- If *a*, *b* and *c* are all zeros, there's nothing to be solved.

- If *a* and *b* are zeros and *c* is not, the equation has no root.

- If *a* is zero while *b* and *c* are not, there is one root:

If none of the above cases are met, we can apply the quadratic formula.

- If , the equation has no real root.

- Otherwise, there are two roots:

and

Use Math.sqrt() to calculate the square root of a number (or expression). For instance:

double x = Math.sqrt(10); // calculate square root of 10

double dsqrt = Math.sqrt(b \* b – 4 \* a \* c);

# Activity 5

Write a Java program that asks the user to provide a single character from the alphabet. Print Vowel or Consonant, depending on the user input. If the user input is not a letter (a-z or A-Z), or is longer than 1 character, print an error message.

## Hint

char values can be compared just like integers. Search for an ASCII table to see the equivalent integers of characters.

a e i o u y

Use getChar() method from a Scanner object to get a char from the keyboard.

# Activity 6

Write a program that reads a word, compares the first and second half of the word, and prints “first and second half same” or “first and second half different”. If the length of the word is odd, ignore the middle letter. For examples:

“abcdef” -> first half: “abc”, second: “def”

“abcdefg” -> first half: “abc”, second: “efg”