Programming 1

Tutorial 3

Activity 1

Task

Write a program named `BMI` in which you ask user to enter his **weight** (in kilograms) and his **height** (in meters), then show his BMI value. The Body Mass Index can be calculated as follows:

$$BMI = \frac{weight}{height^2}$$

Expected program output

```
Enter your weight (kg): 51
Enter your height (m): 1.63
Your BMI: 19.195302796492154 (kg/m2)
```

Hints

- Choose the suitable data types for your variables.
- Pay attention to the priority of calculation (precedence rules) in your expression.
- Use String concatenation when displaying the result.

Deliverable

BMI.java

Activity 2

Task

Ask the user for his age. If his age is less than 13, print the message "You're too young", or if it's greater than 19, print "You're too old". If his age is within the range [13, 19], show message "Welcome, teenager".

Expected program output:

```
What's your age? 15
Welcome, teenager!

What's your age? 11
Not for kids!

What's your age? 20
You're too old!
```

Deliverable

AgeCheck.java

Activity 3

(optional)

Task

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 program output

```
Enter the year: 2018
The year 2018 is not a leap year.
Enter the year: 2012
The year 2012 is a leap year.
```

Instructions

Following is the method to identify a leap year:

1. If it is not divisible by 4 (i.e. `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.

Remember to test your program against all cases: `1600, 1700, 2012, 2010, 2009`

Deliverable

LeapYear.java

Activity 4

(optional)

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 program output

```
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: $x = -c/b$

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

- If $b^2 - 4ac < 0$, the equation has no real root.

- Otherwise, there are two roots:

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

and

$$x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

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);
```

Deliverable

QuadraticEquation.java

Submission

Submit a **zip** file containing all Java programs to this tutorial's submission box in the course website on FIT Portal.