Exercises module 5 – Operators and If-statements

5.1 Incremental operators

1. Run this code and make sure you understand the result:

```
int x=42;

System.out.println(x);
System.out.println(x++);
System.out.println(x);
System.out.println(++x);
System.out.println(x);
```

2. We have received some code that we need to maintain and we need to figure out how it works:

```
int x=42;

int y= x++ + ++x;

System.out.println(y);
```

Run the application, try to understand how the result was calculated. Perhaps break it down into smaller steps.

5.2 - Compound assignment expression

1. Understand what **Compound assignment** expression are and rewrite the following expressions using compound assignment:

```
int x=42;

x=x+100;
x=x-23;
x=x*2;
x=x/5;
```

5.3 – Modulus

1. Write a program that using the modulus operator prints out if an integer value is **even** or **odd**.

2. What possible values can this code output?

```
int x =???;
System.out.println(x % 5);
```

(Where ??? can be any value)

5.4 – IF statements

1. We are working on some existing code and we found this code in the application.

```
if (x >= 0)
    if (x == 0)
        System.out.println("Output1");
    else System.out.println("Output2");
System.out.println("Output3");
```

   a. What is the output of the code when the value of x is -5, 0, 5 ?

2. Search the web about what **refactoring** means and apply some refactorings to make the code more readable.

5.5 – Else If

1. **If** statements are not limited to just two cases, there is also a construct called **else if.** Lookup how it works and then write a program that based on the age of a person outputs to the screen one of the following strings:

Age > 60	Old
Age => 40	Middle aged
Age > 20	Young adult
Age <=20	Under age

5.6 – Fizzbuzz

Write a program that prints the numbers from 1 to 100 with the following rules:

- for multiples of three print “Fizz” instead of the number (0,3,6,9…)
- for multiples of five print “Buzz”. (0,5,10,15…)
- For numbers which are multiples of both three and five print “FizzBuzz”.

The output should be:

```
1
2
Fizz
4
Buzz
Fizz
7
8
Fizz
Buzz
11
Fizz
13
14
FizzBuzz
…
```

5.7 – IF-logic

The following program prints out 5,6,7,8,9,10:

```
for(int i=0;i<100;i++){
    if( i>=5 && i<=10)
    {
        System.out.println(i);
    }
}
```

Without modifying the output, rewrite the if-statement so that it uses the **||** operator instead of the **&&** operator.

Hints:

- Only use one if-statement, and no else-statement
- You need to use the **!** operator

Being able to reason about and do this kind of conversions is a crucial skill for a developer.

5.8 – IF-logic - Advanced

Let's work on a slightly more advanced problem.

The following program prints out 5,6,7,8,9,10,42:

```
for (int i = 0; i < 100; i++) {

    if (i >= 5 && i <= 10 || i == 42) {
        System.out.println(i);
    }
}
```

The if-statement can be written in many different ways, try to rewrite it at least two times using different combinations of:

```
&&
||
!=
!
( )
<= => < >
```

(The output should not change after the rewrite, only use one if-statement and no else statement)

To help you, you can try to:

1. Replace && with ||
2. Replace || with &&
3. Use != instead of ==

Questions and concepts to study further on your own:

- Binary vs octal vs hexadecimal numbers
- Float vs double
- What is IEEE 754
- The modulus operator
- Java Equality, Relational, and Conditional Operators
- Difference between & and && , | and ||
- Learn about the **CTRL+ALT + L** shortcut in IntelliJ reformat your code: https://www.jetbrains.com/help/idea/2017.1/reformatting-source-code.html

- Boolean algebra
  - Boolean Algebra Explained part-1
    https://www.youtube.com/watch?v=2zRJ1ShMcgA
  - How Does Boolean Logic Work in Java?
    https://blog.udemy.com/java-boolean/
  - Java If and Boolean Logic
    http://codingbat.com/doc/java-if-boolean-logic.html