

Questions and Exercises

These questions and exercises is an opportunity to see what you've learnt from the lecture as well as practice the new things we've been talking about. In other words, these questions and exercises are completely optional but it's recommended to do them. In the end of the document you will find the answers to the questions as well as possible solutions to the exercises, note that one can solve an exercise in different ways. There will also be some suggestions about what one could code if one want to continue with some more advanced things. These suggestions will not come with a possible solution and might include things that haven't been covered in the lecture.

Question 1

How do you make a simple infinite loop with the while loop, the do while loop and the for loop?

Question 2

One can use both break and continue to control the flow in loops. What's the difference between them?

Question 3

This code is supposed to sum the first 5 integers that is greater than zero. What's wrong with the code?

```
int sum = 0;
for (int i = 1; i <= 5) {
    sum += i;
    i++;
}
System.out.println(sum);
```

Question 4

While loops and do while loops are in many ways the same. What's the difference between them apart from the syntax?

Question 5

What would the following code print out on the screen? Answer the question before you run the code.

```
for (int i = 3; i < 50 || i % 10 == 1; i *= 3) {
    System.out.println(i);
}
```

Exercise 1

Write a program that asks the user for a positive integer and then splits that integer up so it prints out the ones, the tens, the hundreds etc. separated. For instance, 45613 would be printed out as $40000 + 5000 + 600 + 10 + 3$.

Tip: It might be easier to retrieve a word from the user rather than an integer. In the end of this document there is one possible solution reading the number as a String and one solution that is reading it as an integer.

Exercise 2

Write a program that asks the user for an integer (1 to 20) and then returns the factorial of that number. Make sure that the integer the user has entered is a valid one.

The factorial of a number is basically all the integers from 1 to that number multiplied with each other. For instance, the factorial of 5 is 120 since $1 * 2 * 3 * 4 * 5 = 120$.

Note that the program should be able to handle the factorials all the way up to the factorial of 20.

Exercise 3

Write a program that allows the user to guess a random number. The random number should be between 1 and 100 (inclusive). If the user makes a guess that is too high or too low the program should say so. When the user manages to get the number right the program should end and tell the user how many guesses that was used.

Further explorations

Write a program that asks the user for a string to search in and then a string to search for. Print out which index the first occurrence of the string that you were searching for was found. For instance if the user enters the string "Hello Hello" and wants to find "lo" it should output 3.

This can be achieved using the inbuilt `indexOf`, more information can be found here [http://docs.oracle.com/javase/6/docs/api/java/lang/String.html#indexOf\(java.lang.String\)](http://docs.oracle.com/javase/6/docs/api/java/lang/String.html#indexOf(java.lang.String)).

One could do it something like the following

```
System.out.println(haystack.indexOf(needle));
```

where `haystack` is the string to search in and `needle` is the string to search for. When writing the program, first do it with `indexOf`. **When you got it to work with `indexOf`, do it again but now do it without `indexOf`.**

Answers and solutions

Answer to Question 1

```
While loop  
while (true) {
```

```
}
```

Do while loop

```
do {
```

```
}while(true);
```

For loop

```
for (;;) {
```

```
}
```

To make the infinite loops with the while loop or the do while loop one simply uses true as the condition. For the for loop one does just leave all the parts out, if there's no end condition it will never stop unless the loop's body stops it with a break.

Answer to Question 2

Break and continue can be used in any type of loop. When a break is reached the code will continue to be executed in the end of the loop, it will break out of the loop. When a continue is executed the loop's current iteration will end and the next one (if any) will start, it will continue iterating.

Answer to Question 3

A for loop must have the initial value part, the condition part and the modification part, these can be empty but must still be there. The code should look like this, observe the extra semi colon.

```
int sum = 0;
for (int i = 1; i <= 5;) {
    sum += i;
    i++;
}
System.out.println(sum);
```

Answer to Question 4

While loops check the condition in the beginning of the loop while the do while loop checks it in the end of the loop. This allows the do while loop to always run its code at least once, even if the condition is false the first time it is being evaluated.

Answer to Question 5

The given code will print out the following

```
3
9
27
```

81

Each time it loops the value will be multiplied by three. The reason why it goes to 81 and then stops is because 3, 9 and 27 are all less than 50 while 81 ends with a 1. 243 would be the next number in the sequence but is greater than 50 and doesn't end with a 1.

Possible solution A to Exercise 1

```
import java.util.Scanner;

//This solution is reading the number as a string
public class Exercise1 {
    public static void main(String[] args) {
        Scanner myScanner = new Scanner(System.in);

        System.out.println("Please enter a positive integer");

        String number = myScanner.next();

        for (int i = 0; i < number.length(); i++) {
            //The first number shouldn't be preceded by a plus symbol
            if (i != 0) {
                System.out.print(" + ");
            }

            //calculate the amount of zeroes we need
            int zeroes = number.length() - i - 1;

            //print out the number
            System.out.print(number.charAt(i));
            for (int j = 0; j < zeroes; j++) {
                System.out.print("0");
            }
        }
        System.out.println("");
    }
}
```

Possible solution B to Exercise 1

```
import java.util.Scanner;

//This solution is reading the number as an integer
public class Exercise1 {
    public static void main(String[] args) {
        Scanner myScanner = new Scanner(System.in);

        System.out.println("Please enter a positive integer");
```

```

    int number = myScanner.nextInt();

    //calculate the amount of digits we have
    int digits = (int)(Math.log10(number) + 1);

    for (int i = 0; i < digits; i++) {
        //The first number shouldn't be preceded by a plus symbol
        if (i != 0) {
            System.out.print(" + ");
        }

        //calculate the amount of zeroes we need
        int zeroes = digits - i - 1;

        //create a number with a 1 and the amount of zeroes we need
        int mult = (int)Math.pow(10, zeroes);

        //print out the number
        System.out.print(((number / mult) % 10) * mult);
    }

    System.out.println("");
}
}

```

Possible solution to Exercise 2

```

import java.util.Scanner;

public class Exercise2 {

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

        System.out.println("Please enter an integer between 1 and 20 (inclusive)");

        //get the number from the user and continue to do so until a valid number has been received
        int number = myScanner.nextInt();
        while (number < 1 || number > 20) {
            System.out.println("That number is not valid, it should be between 1 and 20 (inclusive)");
            System.out.println("Please enter a valid integer");
            number = myScanner.nextInt();
        }

        //declare the result as a long integer to be able to store bigger numbers
        long result = 1;

        //calculate the factorial
    }
}

```

```
    for (int i = 2; i <= number; i++) {  
        result *= i;  
    }  
  
    System.out.println("The factorial of " + number + " is " + result);  
}  
  
}
```

Possible solution to Exercise 3

```
import java.util.Scanner;  
import java.util.Random;  
  
public class Exercise3 {  
    public static void main(String[] args) {  
        Scanner myScanner = new Scanner(System.in);  
        Random myRandomGenerator = new Random();  
  
        //randomize the number  
        int number = myRandomGenerator.nextInt(100) + 1;  
        int answer;  
        int guesses = 0;  
  
        System.out.println("Please guess the number. It's between 1 and 100 (inclusive)");  
        do {  
            answer = myScanner.nextInt();  
  
            //print out the messages that tell you which direction the correct one is  
            if (answer > number) {  
                System.out.println("It's lower than that");  
            } else if (answer < number) {  
                System.out.println("It's higher than that");  
            }  
  
            guesses++;  
        } while (number != answer); //end the loop when the user has guessed the correct number  
  
        System.out.println("Good job, the correct number was " + number);  
        System.out.println("You managed to guess it with " + guesses + " guesses");  
    }  
}
```