# Lab 3

# Loops in Java

## ASSESSMENT INFORMATION

**This worksheet *is* one of the seven assessed lab sheets.**

**It can be assessed within the next *5* weeks. Let me know *in advance* when you’d like to be assessed.**

**Do not forget to have it ‘signed off’ after you have been assessed.**

## 1 Introduction

The laboratory session covers loops in Java. Again we will be implementing some of the examples given during the lecture, followed by some additional examples. We will then look at a few sections of the help pages.

## 2 Preliminaries

Create a new project and Java class called CS1002\_Lab3.

## 3 Conditions and Loops

### Exercise 1

In exercise 4 of lab sheet 3 from last week, we wrote three programs that decided if a single number had some sort of property, for example one of the programs was to determine if a number (>0) was divisible by two and three.

Copy these three programs and amend each of them so that you use a for loop to test all of the number between **1 and 100** in a single run of each program.

1. Displays if a whole number (>0) is divisible by 2 and 3
2. Displays if a whole number (>0) is divisible by 7 or 9
3. Displays if a whole number (>0) is divisible by 2 and 3 but not 5

## 4 Generating Sequences Using For Loops

### exercise 2

Implement the following for loop and consider what it does.

**int** i;

**for**(i=0;i<10;i++)

{

System.*out*.println(i);

}

Modify the loop to produce the following sequences:

1. 4,5,6,7,8,9,10,11
2. 10, 13, 16, 19
3. 1, 4, 7, 10, 13, 16
4. 2, 4, 6, 8, 10, 12
5. 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
6. -10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10
7. -20, -15, -10, -5, 5, 10, 15, 20 //notice that there is no zero between -5 and 5

**Note**: you *may* have to add conditional statements as part of the for loop code block of 7).

## 5 Generating Patterns Using For Loops

### exercise 3

Implement the following for loop and consider what it does.

**for**(int i=0;i<10;i++)

{

System.*out*.print("\*");

}

Modify the loop to produce the following sequences:

1. ++++++++++
2. ---------
3. +-+-+-+-+-
4. \*+-\*+-\*+-
5. \*+-\*+-\*+-\*
6. \*\*++\*\*++\*\*++
7. \*\*\*+++---\*\*\*+++---
8. \*\*\*+++------+++\*\*\*

**Note**: you may need to use conditional statements as part of the for loop in 8)

## 6 While Loops

### exercise 4

Implement **two** of the for loop solutions of Exercise 2 using a while loop.

This can initially be done by implementing one of the while loop examples from the lecture notes.

### exercise 5

Next, implement Euclid's algorithm (*Highest Common Factor* - HCF) by using a while loop.

The *Highest Common Factor* of two or more non-zero integers, is the largest positive integer that divides the numbers without a remainder. For example, the HCF of 8 and 12 is 4.

Test your program on the following:

1. HCF(88,26)=2
2. HCF(54,87)=3
3. HCF(16,84)=4
4. HCF(55,25)=5
5. HCF(42,72)=6
6. HCF(77,28)=7
7. HCF(80,88)=8

Verify that HCF(*a*,*b*) = HCF(*b*,*a*). For example, the same result should be produced for:

*a=88, b=26* as well as *a=26, b=88.*

This task may seem daunting at first; however it is straightforward if you consider two of the flow charts in the **lecture** notes. Look at the flow chart for Euclid's algorithm and also the flow chart for the while loop. By comparing them, you should be able to construct a solution to this problem.

## 7 Nested Loops

### exercise 6

Implement the following for loops and consider what they do.

**for**(int i=1;i<5;i++)

{

**for**(int j=1;j<i+1;j++)

{

System.*out*.print(i);

}

}

Modify the loops to produce the following sequences:

1. 122333444455555
2. 22333444455555666666
3. 133355555
4. 1335557777
5. 555554444333221
6. 544333222211111
7. +\*\*+++\*\*\*\*+++++
8. --\*\*\*++++-----\*\*\*\*\*\*+++++++

**Note**: you *may* need to use conditional statements as part of the for loops in 3), 4), 7) and 8)

### exercise 7

Write nested loops that perform the following tasks:

1. Display all of the possible pairs of numbers between 1 and 10 (Hint: there are 100 pairs)
2. Display all possible pairs for the numbers *i* and *j* that are *i* < *j* and 0 < *i* and *j* < 11 (Hint: there are 45 pairs)
3. Display all possible pairs of the numbers 1,2,3,4 paired with 4,5,6,7,8 (Hint: there are 20 pairs)

### exercise 8

Write a program that keeps taking a character from the user as input and determines whether the character entered is a capital letter, a small case letter, a digit or a special symbol and displays appropriately.

Example Input: A

Output: Capital letter

The program will keep taking input from the user until the user enters the word ”Done”, then the program will terminate and displays “Thank you”