Swinburne University Of Technology

Faculty of Science, Engineering and Technology

LABORATORY SHEET

Subject Code:	SWE20004
Subject Title:	Technical Software Development
Lab number and title:	Lab 2 Exercises

This lab is based on lectures 1 and 2

Questions

Task 2.1 Match the situation with the type of string

Type of string	Situation
	Hard-coded text for **cout** prompts
C++ string object	A place to store text data
	Used to initialise a C++ string
C-string (char[ ])	**const** string used for error messages
	user name (variable)
	date (not intended to be sorted or processed)
	date (intended to be sorted or processed)

Draw a line linking the situation with the type of string

Task 2.2 Match the characteristics of the string to the string type.

String type	**Characteristic**
C++ string object	Knows its length
C-string	Can be safely copied or appended
	Can be indexed like an array
	Is null-terminated
	Is created when using " "

Draw a line linking the characteristic with the type of string

Task 2.3 Classify these identifiers as: 1. Valid, 2. Bad style, 3. Invalid. If not valid, explain why.

Identifier	**Valid**	**Bad style (valid)**	**Invalid**	**Explanation**
$gravy				
.hidden_variable				
USER_INPUT_DEGREES				
string				
String				
number-of-choices				
time				
b^2				
Temperature				
3com_card_ID				
__my_constant__				

Task 2.4 Which of these operations is NOT supported for floating point data types?

+= _____

% Not Supported _____

=_____

<= _____

=< _____

Task 2.5 The C++ Boolean data type can have two values. What are they (in the correct case)?

true and false represented as 1 and 0

Task 2.6 What is the keyword for declaring a boolean number in C++?

bool

Task 2.7 What is wrong with this code?

```
const double PI;

PI = 3.14159;
```

since it is a const it has to be declared when creating it as the value becomes read only after creating

Task 2.8 What is wrong with this code?

```
float number;

cout << number;
```

null reference point value of number was not initialised

Task 2.9 What will this code output (to the screen)?

```
string length = "29"; length += " metres";

cout << length.length();
```

outputs 8 which is the number of char stored in length

Task 2.10 Programming Problem

(Hint: You will have to import a package in your program using the #include directive which will allow you to use some of the mathematical functions involved in the formula given in this exercise. Find out which package it is and the functions involved, import the package and use the functions to complete the program)

The current flowing through an AC circuit composed of a resistor (resistance R measured in Ohms), a capacitor (capacitance C measured in Farads) and an inductor (inductance L measured in Henrys) can be calculated using the following equation:

$$I = \frac{E}{\sqrt{R^2 + \left(2\pi FL - \frac{1}{2\pi FC}\right)^2}}$$

I = Current in Amps
E = Electromotive Force in Volts
R = Resistance in Ohms
F = Frequency of the Current in Hertz
L = Inductance in Henrys
C = Capacitance in Farads

Where, F is frequency (measured in Hz), E is EMF (Voltage) and I is current (measured in Amps).

A. Write a C++ program which does the following:

a) Declares PI as a constant and sets its value to 3.14159,
b) Declares all other variables described above as local variables.
c) Prompts for the input of (and inputs) resistance, frequency, capacitance, inductance and EMF.
d) Calculates and displays the current.

B. Test your program with this test data:

f=200 Hz
R=15 Ohms
C=0.0001 (100∝F)
L=0.01476 (14.76mH)
E = 15 V
Answer: I = 0.816918A (calculated)

C. Using your program, try different frequencies and try to find the resonant frequency (where the current is at a maximum.
Hint: you can estimate the resonant frequency thus:

f_r = 1 / (2.PI .sqrt(L.C))

At resonance, the inductor and capacitor will cancel each other out, so the max current should be

I = E / R = 15/15 = 1.0 Amps.

Task 2.11 Programming Problem (Need to submit this task as a part of Assignment 1)

a) The voltage gain of an amplifier is given by this formula:

$$voltage\ gain = \left[\frac{275}{\sqrt{23^2 + 0.5\,f^2}}\right]^n$$

f is the frequency in Hz.
n is the number of stages in the amplifier.

Using this formula, write, compile, and run a C++ program to determine the value of the voltage gain for a four-stage amplifier operating at a frequency of 120 Hz. Your program should produce the following display:

At a frequency of xxxxx hertz, the voltage gain is yyyyy

Your program should replace *xxxxx* with the frequency and *yyyyy* with the voltage gain.

b) Manually check the value your program produces. After verifying that your program is working correctly, modify it to determine the voltage gain of a 12-stage amplifier operating at a frequency of 9500 Hz.