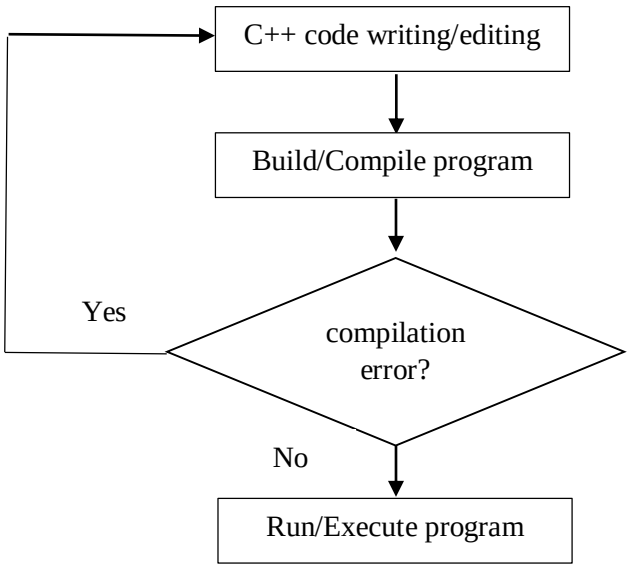
SOF103 C and C++ Programming
Lab Exercise 2:
Variables and
Data Types

Part A: Review Questions

1. The three classes of languages discussed in the lecture are high-level language, _____ language and _____ language.
2. The program that translates high-level language programs into machine language are called _____.
3. Two different types of memory in computer systems are _____ memory and _____ memory.
4. How many bits does one byte of memory contain? Ans: _____.
5. Give an example of a secondary memory. Ans: _____.
6. C++ programs are normally typed into a computer using an _____ program.
7. Complete the following steps in C++ programming when using an integrated development software (IDE) software:



8. The first line of every C++ source file is a _____ .
9. The files `iostream.h` and `math.h` are examples of _____ files.
10. Every C++ program begins execution at the function _____.
11. The _____ begins the body of every function and the ____ ends the body of every functions.
12. Every statement ends with a _____ .

13. The escape sequence **\n** represents the _____ character which causes the cursor to position to the beginning of the next line on the screen,

14. State whether each of the following is **true** or **false**.

    (a) Comments are used to explain what a program is doing and are ignored by the compiler. (True/False)

    (b) C++ considers the variables **number** and **NUMBER** to be identical. (True/False).

    (c) All variables must be declared before they are used. (True/False).

    (d) All variables must be given a type when they are declared. (True/False).

    (e) The **endl** manipulator has the same effect as the escape sequence **\n**. (True/False)

    (f) The statement **cin >> x1;** means to take in user input at run time and store the value in variable **x1**. (True/False).

15. Write a one or more C++ statements to accomplish each of the following:

    (a) Declare the variables **A, number, totalSum** and **result** to be of type **int** in a single line.

    (b) Declare a floating-point number **val** and initialize it with the value 0.99.

    (c) Declare the variable **my_value** of type **int**, **new_number** of type **double** and **my_char** of type **char**.

    (d) Read three integers from the keyboard and store them in the variables **x, y** and **z**.

    (e) Compute the product of three integers contained in variables **x, y,** and **z** and assign the result to the variable **result**.

    (f) Print "**The product is** " followed by the value of the variable **result**.

    (g) Declare a constant **FIXED_VALUE** and initialize it to 2.39.

16. Indicate which of the following are valid identifier names in C++.

    (a) `formula1` (b) `total output`

    (c) `12months`

    (d) `%sales` (e) `week1to7`

    (f) `_num_students`

Part B: Programming Exercises

Instruction: Complete the following lab programming practices. Refer to Table 1 in Appendix for C++ arithmetic operators.

1. Write a program that asks the user to enter three integer numbers, obtains the three numbers from the user, and prints the sum, product and average. An example of the screen dialogue should appear as follows:

```
Input three integers: 19 2 10
Sum is 31
Product is 380
Average is 10
```

2. Write another program similar to Question 1 but use three **floating-point** numbers. Print the sum, product and average.

3. Write a program that reads in the radius of a circle and prints the circle's diameter, circumference and area. Use the constant value π = 3.14159.

4. Write a program that calculates the squares and cubes of the numbers from 0 to 5 and uses the tabs to print the following table of values:

```
Number      Square      Cube
0           0           0
1           1           1
2           4           8
3           9           27
4           16          64
5           25          125
```

5. Write a program that asks user to enter a character. The program then converts the character into ASCII value and print the ASCII value to the screen.

6. Write a program that converts a distance in meters to the corresponding English distance in feet and inches. The conversion factors are:

   1 inch = 0.0254 meters
   1 foot = 12 inches

7. Write a program that reads in temperature in degrees Celsius and displays the corresponding temperature in degrees Fahrenheit. The conversion formula is

$$F = \frac{9}{5}C + 32$$

8. Write a program that inputs a five-digit number, separates the number into its individual digits and prints the digits separated from one another by tabs. Use the integer division and modulus operators. For example, if the user types in 21903, the program should print:

```
2	1	9	0	3
```

Appendix

Table 1: C++ Arithmetic Operations

Mathematical Symbol	Mathematical Operation	C++ Symbol	Example (assume `a = 4` and `b = 2`)
+	Addition	+	`ans = a + b;  // ans = 6`
–	Subtraction	–	`ans = a – b;  // ans = 2`
×	Multiplication	*	`ans = a * b;  // ans = 8`
÷	Division	/	`ans = a / b;  // ans = 2`
mod	Modulus	%	`ans = a % b;  // ans = 0`