Lab 2 – Simple Functions

Topics to be covered:

- Type conversion / casting.
- Basic function structure and syntax.
- Function calls.

Example code:

- IntCharTypeCasting.cpp
- OneSimpleFunction.cpp
- SimpleFunction.cpp

Code Segments (Entire code is in each .cpp file above):

********** IntCharTypeCasting.cpp **********

```
//explicit type casting
cout << "The character 'a' has integer value of " << (int) 'a' << endl;
cout << "The integer 40 stands for character '" << (char) 40 << "'\n";

char ch = '0';
int num = 50;
cout << "The character '0' has integer value of " << (int) ch << endl;
cout << "The integer " << num << " stands for character '"<<(char) num
     << "'" << endl;
```

********** SimpleFunction.cpp **********

```
//simple function prototype
double division (int, int);
void introduction ();
int readGrade ();
int sum (int num1, int num2);

//function call in main
int main ()
{
      ...
      introduction ();
      grade = readGrade ();
      total = sum (grade, total);
      ...
}

//function definition
double division (int total, int number)
{
     return (double)total / number;
}
```

Exercise 1 ***(Design only – not a C++ program)***

For Assignment 1 below, please write a defining diagram (input, process, output) and pseudocode for the problem. Your typed solution is to be included in the lab folder.

Assignment 1 ***(Complete C++ Program)***

A two-dimensional state of stress at a point in a loaded material is defined by three stress components $\sigma_{xx}, \sigma_{yy}, and \tau_{xy}$. The maximum and minimum normal stresses (principal stresses) at the point, $\sigma_{\max} and \sigma_{\min}$, are calculated from the stress components by:

$$\sigma_{\substack{\max \\ \min}} = \frac{\sigma_{xx} + \sigma_{yy}}{2} \pm \sqrt{\left(\frac{\sigma_{xx} - \sigma_{yy}}{2}\right)^2 + \tau_{xy}^2}$$

Write a C++ program that determines the principal stresses if the stress components are prompted for and received from the user. Your program should contain 3 functions.

The main() function should:

- prompt for and read the 3 stress components: $\sigma_{xx}, \sigma_{yy}, and \tau_{xy}$
- pass this information to a function ***Max_Normal_Stress****(parameter list)* which calculates and returns the value of $\sigma_{\max}$ to main
- pass the 3 stress components to a function ***Min_Normal_Stress****(parameter list)* which calculates and returns the value of $\sigma_{\min}$ to main.
- write out the 3 stress components and along with the resulting max and min stresses.

functionType ***Max_Normal_Stress*** *(parameter list)*

- parameter list: $\sigma_{xx}, \sigma_{yy}, and \tau_{xy}$
- return value: $\sigma_{\max}$
- return type: floating point

functionType ***Min_Normal_Stress*** *(parameter list)*

- parameter list: $\sigma_{xx}, \sigma_{yy}, and \tau_{xy}$
- return value: $\sigma_{\min}$
- return type: floating point

Assume the stresses are measured in MPa units.

Sample values with expected results:

$\sigma_{xx}, \sigma_{yy}, and \tau_{xy}$: 150 MPa, -40MPa, 80MPa

expected $\sigma_{\max} and \sigma_{\min}$: 179.1974 MPa, -69.1974 MPa

Assignment 2 ***(Complete C++ Program)***

Write a complete C++ program that accepts input of 3 lowercase letters and displays each letter along with its corresponding uppercase letter. (i.e. -if the user types in letter 'b', the program should output the letters 'b' and 'B').

Function main() should prompt for and read in the 3 lowercase letters, and make 3 separate calls to the function toUpperCase(parameter list). Each call should pass one lowercase letter to the function. toUpperCase(parameter list) will calculate and return the corresponding uppercase letter to main(). Function main() should output each set of corresponding letters. (If you know about the library function "toupper" – ***don't use it****- write one as described*).

functionType **toUpperCase(***parameter list***)**

- parameter list: one character
- return value: the corresponding uppercase letter
- return type: character type