Assignment 1: Using the wheels and asking How long is the short?

Due: Sunday, April 07, 2019, 11:59pm

Aim

By working on this assignment you should be able to:

- Understand and use preprocessor macros
- Understand and use library functions
- Write your first big C++ program from scratch and run it!

How to work on this assignment?

This assignment has 3 parts with increasing level of difficulty. Each part tells you how to work on it as well as why we want you to work on it.

If you already haven't, take the Exercise Quiz on Mimir from this week before attempting this assignment. That should give you some idea along with the lab sessions that you attend.

Finally, do not be afraid to ask for help on Piazza (You can also post anonymously!). We are all here to learn and there are no stupid questions.

Points

In addition to the points for each part of this assignment, there are 20 pts for Program Style & Comments.

To gain these points, make sure that you include a program header (10 pts) in your code, in addition to proper indentation/spacing and other comments (10 pts) for each major thing that you are doing in your function.

Make sure you review the style guidelines [0] for this class, and begin trying to follow them, i.e. don't align everything on the left or put everything on one line!

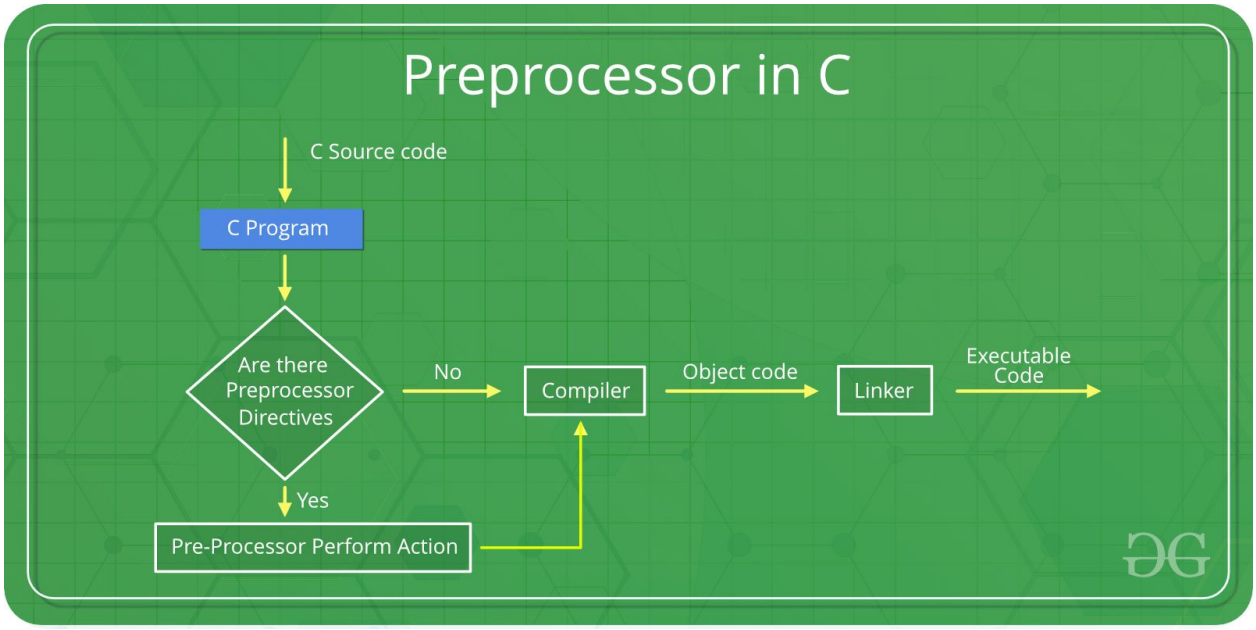
[0]https://oregonstate.instructure.com/courses/1725107/files/74623886/download?wrap=1

Below is an example of how we expect your program to be styled:

```cpp
/*****************************************************
** Program: wingardium_leviosa.cpp
** Author: Hermione Granger
** Date: 07/04/1776
** Description: Makes a C++ object from the heap float in air and prints
where it floated
** Input: None
** Output: The height at which the object floated will be printed on the
screen
*****************************************************/

//this library allows us to print and get input from user
#include <iostream>

int main() { //this is the main function which will be executed
    int myObjectNumber; //variable to store our object's number

    //send the object number to the fly function which returns how high it
flew and the print the object number
    std::cout << "The object flew up at " << fly(myObjectNumber)<<" feet";
    return 0;
}
```

Part A: Printing size of data types using pre-processor Macros (30 points)

About this assignment



As this picture from geeksforgeeks.org shows, pre-processor directives, as the name implies, are the things which are processed *before* your C++ code is compiled. (Yes, it's same for C and C++)

The `#include <iostream>` line you have seen until now is also a pre-processor directive or a macro. In this assignment, you will use pre-processor **macro constants** which are like variables but they have a fixed value and that value is inserted in your program before your code is compiled.

Deliverable

Use the preprocessor macros in the climits library and print the max and min sizes of signed and unsigned ints, longs, and shorts.

How do I work on this assignment?

Refer to this cplusplus.com reference [0] (read carefully!!!) for a list of all pre-processor macros.
[0] http://www.cplusplus.com/reference/climits/?kw=climits

Part B: Printing the size of data types using an in-built function (25 points)

About this assignment

Number spaces in memory can be declared as unsigned (only holding positive numbers) or signed (holding both positive and negative numbers) in C++.

By default, you are given signed number spaces, unless you explicitly declare them as unsigned. In addition, you can specify the exact number of bytes for a number depending on the type used to create the memory spaces, i.e. int, short, and long. This assignment explores the size of different types of numbers to make you aware of your limitations in C++.

Deliverable

Print the sizes of all the primitive data types using the `sizeof()` function.
Make sure you label your output like:

```
Size of unsigned int is 4
```

How do I work on this assignment?

First, figure out what are the different primitive data types.
Then, use the function to get and print the size of each data type.
Finally, print that value!

The `sizeof()` function returns the number of bytes used by the type supplied to the function. For example, you can use this function by passing the type as an argument, i.e. `sizeof(short)`, `sizeof(int)`, etc. You can then pass this value to `cout` to print it!

Part C: Using a library function (25 points)

About this assignment

C++ libraries provide you a way to build programs without reinventing the wheel. Imagine having to write assembly code to do simple things like printing something on the screen!

Deliverable

Choose ANY ONE function from one of [0], [1], [2] or [3] and use it in your code to perform a mathematical calculation and print it.

How do I work on this assignment?

First, look at the different functions and figure out what each one does.
Then, choose the one that you want to use.
Understand carefully how it works -- what does it require as input and what output does it give.
Finally, start writing your program with that function making sure that you provide the correct required input data in the correct data type variable for the function.
Oh and do not forget to include the library!

As you would see on the links, there is sample code provided. You can definitely refer to this code while working on this assignment, but do not copy paste the code.

[0] http://www.cplusplus.com/reference/cmath/pow/
[1] http://www.cplusplus.com/reference/cmath/sqrt/
[2] http://www.cplusplus.com/reference/cmath/round/
[3] http://www.cplusplus.com/reference/cmath/abs/