

Programming 1: Tutorial 8

Introduction

For this tutorial you are going to be looking at the C++ standard library, including header files and using function contained there in.

You can either over write previous question solutions with new ones or you can have a project for each of the exercises – don't forget to make them blank applications.

Hopefully you remember the basic layout of a C++ program? If not refer to one of the previous tutorials, last weeks maybe more appropriate as you may wish to add functions to your programs.

It may also help if you go through a design stage for each exercise where you plan and puzzle through the logic before actually coding.

To complete these exercises you may need to reference the notes, either online or use the printed ones provided. Doing this isn't a bad thing; most programmers have to look up the syntax to make sure there code is correct.

There is sample code at the end of the tutorials, typing and running this code may help you when it comes to solving the exercises.

It is also important to understand what is happening with the questions, rather than just typing it into the compiler. If you look at it, run it and don't understand then just ask.

Exercises

To complete these exercises you may need to reference the notes, either online or use the printed ones provided. Please note there are some additional notes online that inform you of common library functions available.

There is also sample code available, it has been included in hard copy format at the back of the tutorial notes.

Exercises

1) For this question I want you to generate 3 numbers between the ranges 0-100, 0-200, 100-200. Print the results to screen. Don't forget to seed the pseudo-random number generation first.

Hints:

You will need to include the relevant header files:

```
/* Include the relevant header files */
#include <cstdlib>    // For rand and srand
#include <ctime>      // For time
#include <iostream>   // For cin and cout
```

2) The aim of this is code a simple program that asks for user input in the form of a character, it then checks that the user has entered an alpha based character and not a number or misc character. If the user hasn't entered a character force him to re-input a character.

After you have obtained character input check to see if it is lower or upper, then perform the relevant conversion on it – converting it to uppercase if it is lowercase or converting it to lowercase if the character entered was uppercase. Print out the changed character.

Hints:

To do this you will need to included the <cctype> header file and use functions provided in that file to perform the relevant character checks/operations.

Sample Programs

Basic Initialisation Examples

The following code generates a number in the range 0 to RAND_MAX, displaying it to the screen.

```
#include <iostream> // For cout.
#include <cstdlib>  // For rand.

int main()
{
    cout << rand() << '\n';
    return 0;
}
```

RAND_MAX

The value of RAND_MAX varies between compilers and can be as low as 32767, which would give a range from 0 to 32767 for rand(). To find out the value of RAND_MAX for your compiler run the following small piece of code:

```
#include <iostream> // For cout.
#include <cstdlib>  // For rand.

using namespace std;

int main()
{
    cout << "The value of RAND_MAX is " << RAND_MAX
        << endl;

    return 0;
}
```

srand()

```
#include <ctime>    // For time
#include <iostream> // For cout.
#include <cstdlib>  // For rand, seed.

using namespace std;

int main()
{
```

```

    srand((unsigned)time(0));
    cout << rand() << endl;
}

```

Generating a number in a specific range

```

#include <ctime>    // For time
#include <iostream> // For cout.
#include <cstdlib>  // For rand, seed.

using namespace std;

int main()
{
    srand((unsigned)time(0));
    // Generates random number between 1 and 26
    cout << 1 + rand()%26 << endl;
}

```

Increased Randomisation

This more complicated example uses the slightly more advanced way of generating random numbers.

```

#include <cstdlib>
#include <ctime>
#include <iostream>

using namespace std;

// function prototype
int random_range(int lowest_number, int highest_number);

int main()
{
    // random seed, using time
    srand(unsigned(time(0)));
    int random_integer;

    // generate and print 10 random numbers
    for(int index=0; index<10; index++)
    {
        // calll random range function and
        // assign return value to variable
        random_integer = random_range(0,26);
        // print out result
        cout << random_integer << endl;
    }
}

// random range function definition
int random_range(int lowest_number, int highest_number)

```

```
{  
    if(lowest_number > highest_number){  
        swap(lowest_number, highest_number);  
    }  
  
    int range = highest_number - lowest_number + 1;  
    return lowest_number + int(range * rand()/(RAND_MAX + 1.0));  
}
```