Math 5370: Transitioning to C++ for Scientific Computations

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Agenda for the week

Class tasks: Factorial finding using the while loop.

Distinguish between ++i and i++

Programs discussed so far

- Root finding program (if-else loop) and Factorial calculation (while loop).
- Binomial theorem verification: needed a recursive call for the factorial subroutine introduce functions.

factorial_function example


```
#include<iostream>
#include<cmath>

unsigned int factorial (unsigned int _n)
    {
   ...
     }

int main()
{
unsigned int m =20 ;
unsigned int  calculated_factorial;
calculated_factorial = factorial(m);

return 0 ;
}
```

Input Output Stream

- Input Stream: Flow of data into the program.
  Could be through the keyboard using std::cin.
- Output Stream: Flow of data out of the program.
  Could be flow of data to the screen through std::cout.

Both cin and cout are defined in the library with the header iostream so we include it via :
#include<iostream>

Writing/reading data to/from a file

- ifstream: "input to a file " stream,
- ofstream: "output from a file" stream.

These are dfined in the library with the header file fstream and we need to include its directive at the beginning of the program. i.e,
#include<fstream> as well as the namespace std.

An example


```
#include<fstream>
using namespace std ;

int main()
{
ofstream out_stream ;
out_stream.open("filename.txt");
//could use .dat as well.

int a(1), b(2);
out_stream << a << "\n" <<  b
   << endl;
//compare this with printing to the screen.
out_stream.close();
return 0 ;
}
```

Arrays

- One dimensional: int b[3] = {0,1,2}; (Vector)
- Two dimensional: int mat[2][2]={{1, 0},{0,1}} (Matrix)