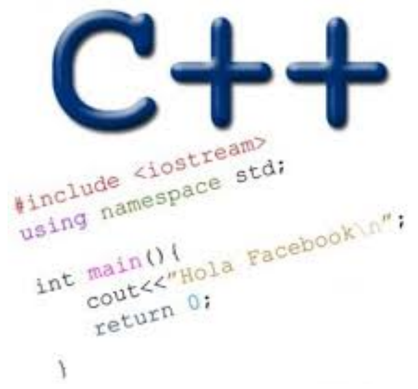
FUNCTIONS, LOOPS

Problem Solving with Computers-I



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

int main(){
    cout<<"Hola Facebook\n";
    return 0;
}
```

Functions: Basic abstraction in programs

- Keep programs DRY !
- Three steps when using functions
  1. DECLARE: void drawSquare(int y);

  2. DEFINE: Write the actual code inside the function

  3. CALL: drawSquare(20);

You must always declare/define functions before calling them.

Demo the use of functions

Pass by value

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

void bar(int x){
      x = x+5;

}

int main(){
   int y = 0
   bar(y);
   cout<<y;
   return 0;
}
```

What is printed by this code?

A. 0
B. 5
C. Something else

While loops

A while loop is used to repeat code while some condition is true

```
while(BOOLEAN_EXPRESSION)
   //Code
}
Check if the BOOLEAN_EXPRESSION is true.
     * If true, the statements in loop will execute.
          * at the end of the loop, go back to 1.
     * If false, the statements in the loop will not execute.
          * the program execution after the loop continues.
```

do-while loops

A while loop is used to repeat code until some condition is no longer true

```
do{
     // Code
     // This code is executed at least once
}while(BOOLEAN_EXPRESSION);
1. Execute the code in the loop
2. Check if BOOLEAN_EXPRESSION is true.
     * If true, then go back to 1.
     * If false, then exit the loop and resume program
execution.
```

C++ for loops

For loop is used to repeat code (usually a fixed number of times)

General syntax of a for loop:

```
for (INITIALIZATION; BOOLEAN_EXPRESSION; UPDATE) {
        // code
        // ...
}
```

```
1. Execute the INITIALIZATION statement.
2. Check if BOOLEAN_EXPRESSION is true.
     * if true, execute code in the loop.
          * execute UPDATE statement.
          * Go back to 2.
     * if false, do not execute code in the loop.
          * exit the loop and resume program execution.
```

Continue and break

- `continue`;
  - can be used to stop the current iteration of a loop,
  - perform the UPDATE statement if necessary, re-check the BOOLEAN_EXPRESSION, and
  - continue with the next iteration of the loop.

* `break;` can be used to break out of the **current** loop and continue execution after the end of the loop.

```
for (int i = 0; i < 10; i++) {
      if (i == 4)
            continue;
      if (i == 7)
            break;
      cout << “i = “ << i << endl;
}
```

The accumulator pattern

Write a function that takes a parameter n and prints the sum of the series:
1+ 1/2+ 1/3+ ….1/n

Write another function that returns the sum of the series

Formatting output to terminal

```
See pages 91 and 190 of textbook
int i =10;
double j = 1/static_cast<double>(i);
cout.setf(ios::fixed);     // Using a fixed point representation
cout.setf(ios::showpoint); //Show the decimal point
cout.precision(3);
cout<<j;
```

What is printed by the above code?

A. 0
B. 0.1
C. 0.10
D. 0.100
E. None of the above

Nested for loops – ASCII art!

Write a function that prints a square of a given width

```
drawSquare(5);

* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
```

Draw a triangle

Which line of the drawSquare code (show on the right) would you modify to draw a right angled triangle

```
drawTriangle(5);
```

```
*
* *
* * *
* * * *
* * * * *
```

```
6     for(int i = 0;  i < n;  i++){ //A
7         for(int j=0; j < n; j++){ //B
8             cout<<"* ";   //C
9         }
10        cout<<endl;    //D
11    }
12    cout<<endl;      //E
13
```

Infinite loops

```
for(int y=0;y<10;y--)
    cout<<"Print forever\n";
```

```
int y=0;
for(;;y++)
    cout<<"Print forever\n";
```

```
int y=0;
for(;y<10;);
    y++;
```

```
int y=0;
while(y<10)
    cout<<"Print forever\n";
```

```
int y=0;
while(y=2)
    y++;
```

Next time

- Automating the compilation process with Makefiles
- Intro to lab02