Two topics: Project 0 and arrays

Engin 101

Lecture 5

Lots of issues with project 0

- I wrote this project over the break.
  - Lots of things I'd change now knowing how the class has progressed.

Syntax you don't know:

- a%b returns the *remainder* of a/b
  - So 5%3=2
- i++ is the same as i=i+1;
- if(bob)
  - bob is "true" unless bob==0
- Main is declared oddly
  - Just ignore it.
- exit(1) causes the program to exit at that point.
  - It is like a return statement for the whole program.

Other issues

- There is a comment that is **wrong.**
  - `// Computes C(x,y)=x!/(y!*(x-y!). x>=y`
  - This should be
  - `// Computes C(x,y)=x!/(y!*(x-y)!).`
    - For x greater than or equal to y.
- And an error in the directions:
  - "You may not change the function names, arguments or return values"
  - That should be:
    - "You may not change the function names, arguments or return types".

Okay.

- Sorry for the errors.
  - Should be able to avoid similar problems in the future.
- Now lets look at some of this as a group.

```
double my_sin(double x)
{
double sum=x;
double term;
int i=1;
int sign;
int value;
while(i<STEPS)
{
value=1+2*i;
sign=i%2;  // % is the mod function.  In this case sign is
   1 if i is odd,
           // and 0 if i is even.
term=my_intpow(x,value)*my_factorial(value);
if(sign)
sum=sum-term;
else
sum=sum+term;
}
}
```

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


// Very silly program that prompts the user to enter a set of numbers.
// The user then enters one more number and the program tells the user
// which numbers from the original set are larger than his final number.
main()
{
    const int NUM=5;   // number of values user must enter
    int list[NUM];
    int i=0;
    int ans;           // number user enters.
    int any=0;         // set to 1 if any number is greater.

    cout << "You will be prompted to enter " << NUM << " numbers" << endl;
    while(i<NUM)
    {
        cout << "Enter a number ";
        cin >> list[i];
        i=i+1;
    }
    cout << "Now pick a number ";
    cin >> ans;
    i=0;
    cout << endl;
```

Continued on next page

Continued from previous page

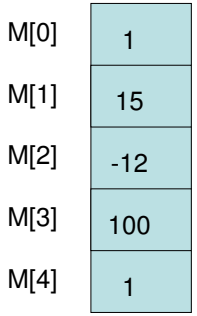
```
    while(i<NUM)
    {
        if(ans<list[i])
        {
            cout << "Your number " << ans << " is less than " << list[i];
            cout << " from your list" << endl;
            any=1;
        }
        i=i+1;

    }
    if(any==0)
        cout << "Your number was greater than all numbers in the list" <<
endl;
    cout << endl << "Bye!" << endl << endl;

}
```

General issues

- int bob[4] creates 4 ints
  - bob[0], bob[1], bob[2], and bob[3]
- If you try to access a value that doesn't exist (say bob[5] or bob[-1]) *very* strange things will happen.
  - Be very careful. Debugging such problems is probably the hardest single task for most programmers!

Arrays

- Traditional to draw the array with 0 on the top.



An algorithm on an array: sorting

- Say we have an array declared as
  - int M[5]
- We want a to print the list in order (say lowest to highest)
  - How do we do it?

Algorithm: step 1

- We know what we want to do
  - We need to figure out *how* to do it.
- The big trick is to think in terms of an algorithm.
  - That is, to think about the steps, but not the C++ syntax.

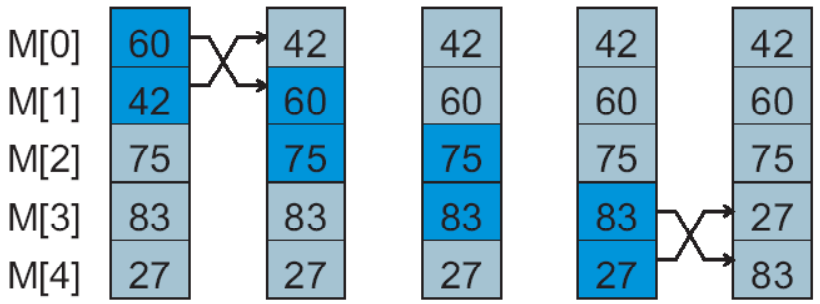
Step 2

- Is to code the algorithm.
  - I'm going to do step 1, we will do step 2 as a group.
- Bubble sort
  - Walk through the list from top to bottom.
  - At each step swap with element below if out of order.
  - Repeat N-1 times.

How do we know this works?

- Well, at the end of the first pass the bottom element must be in order
  - Why?
- At the end of the 2nd pass the two last elements must be in order.
  - Etc.

Example



Stolen from: knight.cis.temple.edu/~lakaemper/ courses/cis068_2003/slides/cis068_09.ppt