

CISC 1110 (CIS 1.5)

Introduction to Programming Using C++

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Class Hours: MW 2:40 – 4:45PM 4428N

Agenda

- Reading strings from the keyboard
- Arrays
- String
- Constant values
- Arrays of Strings

ARRAYS

- arrays are used to hold sets of related types of data the data could be integers (int) or floating point numbers (double) or boolean values (bool)
- the data could also be characters; arrays of characters are special arrays called **strings**.
- common things to do with numeric data stored in arrays:
 - *find the largest (or smallest) element
 - *add up the elements
 - *compute the average of the elements
 - *count the number of elements with some feature

WHAT IS AN ARRAY?

- you can think of an array as a set of variables of the same data type, which are grouped together and all use the same name

- whereas the example below declares one integer variable:

Program Code:

```
int x;
```

- This is an example of five variables: `int a[5];`

Computer's Memory:

x --> 

a --> 

- the square brackets [] indicate to the compiler that it is dealing with an array
- elements of the array *a* are just integers, and we can do exactly the same things with them that we can do with
Integers
- the only difference is how we address (i.e., refer to) them

- we assign a value to x as follows: $x = 12$;
- to assign a value to one of the **elements** of a , we have to specify which element it is, using an index (i.e., a number in the brackets):

$a[0] = 12$;

which refers to the first element in array a

- all of the following are legal operations on array a :

$a[0] += 2$;

$a[1] = 7 \% 3$;

$a[2] = a[1] - 5$;

$a[3] = a[1] / a[2]$;

ARRAY INDEXES

- one thing to be careful of is the limits on the **index**, that is the number inside the square brackets []
- the first element of an array always has index 0
- so the first element of a is:

a[0]

and, since a has 5 elements, the last element of a is:

a[4]

- in other words, the last *index* is *the length of the array minus 1*
- this type of counting (from 0 to length-1) is standard in C++, C, Java and many other computer languages

WHY USE ARRAYS?

- arrays are useful when you want to store lots of data in memory
- if I want to use 3 integers in my program, then I would just declare 3 different integer variables
- however, if I wanted to use 30,000 integers in my program, it would be a lot easier to use an array than to declare 30,000 different integer variables!
- arrays also go very nicely with for loops :-)

EXAMPLE: ARRAY AND FOR LOOP

- here is some sample code that declares an integer array of 100 values and uses a for loop to **store** random numbers in the array:

```
int a[100]; // array
int i; // loop counter

for ( i=0; i<100; i++ ) {
    a[i] = rand();
} // end for
```

- once the data is stored in the array, we can do all kinds of stuff with it
- for example, let's print out the values in the array:

```
for ( i=0; i<100; i++ ) {
    cout << a[i] << endl;
} // end for
```

A COMPLETE EXAMPLE: COMPUTING THE SUM OF THE VALUES IN THE ARRAY

```
#include <iostream>
#include <time.h>
#include <stdlib.h>
using namespace std;

int main() {
    int a[100];
    int i, sum; // store random values in array

    for ( i=0; i<100; i++ ) {
        a[i] = rand();
    } // end for

    // compute sum of values in array
    sum = 0;
    for ( i=0; i<100; i++ ) {
        sum += a[i];
    } // end for

    cout << "the sum of all the values in the array is: " <<
        sum << endl;

    return 0;
} // end of main()
```