

## Arrays and Pointers

1-18-2001

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## Opening Discussion

- Do you have any questions about the syllabus or what we will be doing in this class?
- What do you remember about arrays? What are they? What do they allow us to do?
- What is a pointer? What things can you do with pointers? What do they allow us to do in programs?

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## Arrays

- An array in C++ is a sequential collection of objects of a single type. They are arranged one after another in the memory of the computer.
- They give us a way to store multiple values under a single name and index them with integer values. This way we have the ability to loop through the values to do many operations with little code.

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## Pointers

- A pointer variable stores an address in memory. It "points" to a given memory location.
- When we use pointers we typically also use dynamic memory. Pointers don't inherently point to anything, we have to give them a value. We can do this with `new`, but make sure you free it with `delete`.

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## Arrays as Pointers

- A standard array is really nothing more than a pointer to a block of memory that holds all the elements of the array.
- The bracket notation is short for some pointer arithmetic so `a[i]=*(a+i)`.
- Note that adding and subtracting with a pointer changes the value by the size of what is pointed to.

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## Vectors

- In C++ most people these days use the vector class instead of arrays.
- The vector class is a templated class in the STL (Standard Template Library). Most modern C++ compilers support the STL. You have to `#include<vector>` to use it.
- The `[]` operator of vector is overloaded so you can access it like an array.

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## Pointers to Pointers

- Pointers to types are types themselves and so you can have pointers to pointers of types (or take it further).
- A pointer to a pointer stores the address of a the pointer that stores the address of something of the type involved.
- A pointer to a pointer is often called a handle though you are probably less likely to use those now than 5 years ago.

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## Multidimensional Arrays

- Arrays can have more than one dimension. This is implemented in basically the same way that pointers to pointers are.
- You have a pointer to an array of pointers and in a 2D array each of those points to an array.
- You can create vectors of vectors as well to get multidimensional vectors.

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## Writing Some Code

- Lets write a little piece of code to do a class that is a Connect-4 board.
- Before we start writing we should think about the design a bit as well. What are the limitations in Connect-4? In what way can you interact with one of these boards?

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## Minute Essay

- Write a function that accepts a 2D array of ints and adds 1 to every element of it.
- Next class we will talk about structures.
- I'll be playing basketball from noon until about 2:00pm today but I should be available after that.
- Have a good weekend.

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