



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

COMP 110

Introduction to Programming

Fall 2015

Time: TR 9:30 – 10:45

Room: AR 121 (Hanes Art Center)

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Previous Class

- What did we discuss?



Today

- Announcements
 - Assignment 2 : Due Friday, Oct 2 @ 11:55 PM
<http://comp110.com/assignments/the-worried-wizard>
- Midterm on Thu, Oct 8
 - in class, no computers
- Study guide
<http://comp110.com/midterm-study-guide>
- Arrays

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Indices and For-Loops

- In programming, a for-loop usually starts with counter $i = 0$. There is a reason

```
for (int i = 0; i < 5; i++) {  
    scores[i] = keyboard.nextInt();  
    scoreSum += scores[i];  
}
```

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Creating an Array

- Array is a special class and we create its objects
 - Syntax for creating an array:
 - `Base_Type[] Array_Name = new Base_Type[Length];`
 - Example:
 - `int[] pressure = new int[100];`
 - Alternatively:
 - `int[] pressure;`
 - `pressure = new int[100];`

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Do not be OUT OF BOUNDS!

- Indices MUST be in bounds
 - `double[] entries = new double[5]; // from [0] to [4]`
 - `entries[5] = 3.7; // ERROR! Index out of bounds`
- Your code will compile if you are using an index that is out of bounds, but it will give you a run-time error!

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Initializing Arrays

- You can initialize arrays when you declare them
 - `int[] scores = { 68, 97, 102 };`
- Equivalent to
 - `int[] scores = new int[3];`
 - `scores[0] = 68;`
 - `scores[1] = 97;`
 - `scores[2] = 102;`
- Or, you can use for-loop
 - When in doubt, for-loop!

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Joke

- Q: Why did the programmer quit his job?
- A: Because he didn't get arrays.

Hint: A raise ;-)

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2D Arrays

- Arrays having more than one index are often useful
 - Tables
 - Grids
 - Board games

	0: Open	1: High	2: Low	3: Close
0: Apple Inc.	99.24	99.85	95.72	98.24
1: Walt Disney Co.	21.55	24.20	21.41	23.36
2: Google Inc.	333.12	341.15	325.33	331.14
3: Microsoft Corp.	21.32	21.54	21.00	21.50

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Declaring and Creating 2D Arrays

- Two pairs of square brackets means 2D
 - `int[][] table = new int[3][4];`
- or
 - `int[][] table;`
 - `table = new int[3][4];`

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Declaring and Creating 2D Arrays

- Array (or 1D array) gives you a list of variables
 - `int[] score = new int[5]` gives you `score[0]`, `score[1]`, ... , `score[5]`
- 2D array gives you a table of variables
 - `int[][] table = new int[3][4];`

<code>table[0][0]</code>	<code>table[0][1]</code>	<code>table[0][2]</code>	<code>table[0][3]</code>
<code>table[1][0]</code>	<code>table[1][1]</code>	<code>table[1][2]</code>	<code>table[1][3]</code>
<code>table[2][0]</code>	<code>table[2][1]</code>	<code>table[2][2]</code>	<code>table[2][3]</code>

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Using a 2D Array

- We use a loop to access 1D arrays

```
for (int i = 0; i < 5; i++) {
    scores[i] = keyboard.nextInt();
    scoreSum += scores[i];
}
```

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Using a 2D Array

- We use nested loops for 2D arrays

```
int[][] table = new int[4][3];
for (int i = 0; i < 4; i++) {
    for (int j = 0; j < 3; j++) {
        table[i][j] = i * 3 + j;
        System.out.println(table[i][j]);
    }
}
```

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Multidimensional Arrays

- You can have more than two dimensions
 - `int[][][] cube = new int[4][3][4];`
- Use more nested loops to access all elements
 - for (int i...)
 - for (int j...)
 - for (int k...)

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Arrays Example

```
import java.util.*;
public class SampleArray
{
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);
        int[] myArray = new int[5];

        for ( int i = 0; i < myArray.length; i++) {
            System.out.println("Please input a number");
            myArray[i] = keyboard.nextInt();
            System.out.println(myArray[i]);
        }
        System.out.println(Arrays.toString(myArray)); // to print the entire array
    }
}
```

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Comparing Scores/Averages w/ Arrays

```
System.out.println("Enter 5 basketball scores:");
Scanner keyboard = new Scanner(System.in);
int[] scores = new int[5];
int scoreSum = 0;
for (int i = 0; i < 5; i++) {
    scores[i] = keyboard.nextInt();
    scoreSum += scores[i];
}
double average = (double) scoreSum / 5;
System.out.println("Average score: " + average);

for (int i = 0; i < 5; i++) {
    if (scores[i] > average)
        System.out.println(scores[i] + ": above average");
    else if (scores[i] < average)
        System.out.println(scores[i] + ": below average");
    else
        System.out.println(scores[i] + ": equal to the average");
}
```

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Next class

- More on arrays