CMPSC 112

Lecture 8: Arrays

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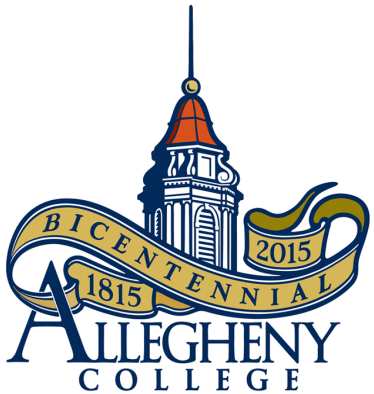


Last Time

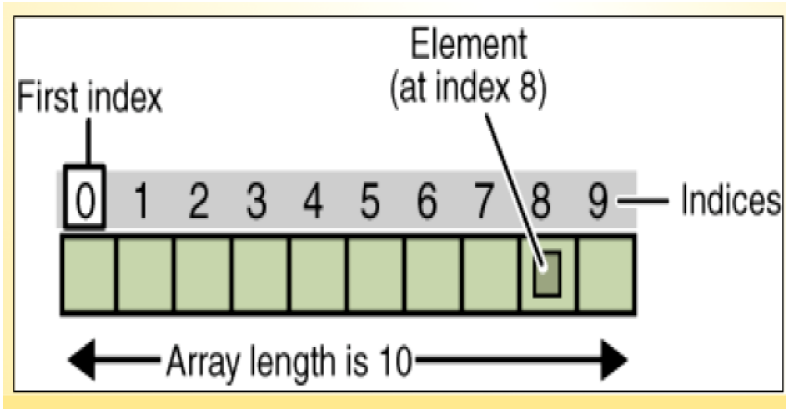
- Live project coding

Reminder: Mastery Quiz.

What is an Array?

- Consecutive blocks of data in memory

```
int fibo[] = new int[100];
fibo[0] = 0;
fibo[1] = 1;
```



Array Properties

- We can put any type of object in an array: integers, doubles, booleans, Strings, Clocks,...
- We can get the size of the array by calling a.length;
- We can iterate across an array using a for loop!

Fibonacci Numbers

The Fibonacci Sequence

1,1,2,3,5,8,13,21,34,55,89,144,233,377...

1+1=2	13+21=34
1+2=3	21+34=55
2+3=5	34+55=89
3+5=8	55+89=144
5+8=13	89+144=233
8+13=21	144+233=377

Calculating Fibonacci Numbers

```
int fibo = new int[100];
fibo[0] = 0;
fibo[1] = 1;
for (int i = 2; i < 100; i++) {
fibo[i] = fibo[i-1] + fibo[i-2];
} //for
System.out.println(fibo[72]);
System.out.println(fibo[41]);
```

New Challenge

- Given this array, print the array indices where the smallest and largest values are located, and calculate the average:

```
double[] a = {3, 6.5, 2, -6, 19, 0, 3};
```

Practical use of arrays

- One variable storing a series of data values.
  - Useful for time series (value at time/iteration x).
  - Useful for Fibonacci calculations.
- Not so useful if your data is a table, or if it has multiple fields.
  - Can't put a crossword puzzle or a chessboard in an array (easily), right?

What do we want to do in a data structure?

- Add data
- Retrieve data
- Remove data

Can we do all of these?

Two-Dimensional Arrays

- Solution: Add a second dimension!

```
int myArray[][] = new int[10][5];
```

- Format is [rows][columns]
- Each element still must be the same type
- Can still access each item individually
  - myArray[6][1]

Complications (Try to find out?)

- Each row doesn't need to have the same length!

```
int myArray[][] = {
{1, 2, 3, 4, 5},
{6, 7},
{8, 9, 0, 1},
{2, 3, 4}
}; //myArray[][]
```

Length

- Given myArray[3][4], what is:
- myArray.length?
  - 3 - the number of rows
- myArray[0].length?
  - 4 - the number of columns (in the first row)

No Limit on Dimmensions

- myArray[1][2][3]
- myArray[1][2][3][4]
- myArray[1][2][3][4][5]
- myArray[1][2][3][4][5][6]...

...if you get this far, you may want to rethink your data storage ...

Programming challenge

- Given the following array, find the indices for the minimum value, maximum value, and calculate average for the entire array.

```
int myArray[][] = {
{7, 12, 4, -1},
{-2, 3},
{8, 9, 0, 1},
{-12, 3, 4},{2}
}; //myArray[][]
```

Any Questions

- Reminder 01: REVIEW FORM