

ITEC 120

Lecture 13
Arrays (2)

Review

- Questions?
- Arrays
 - Creation
 - Access
 - Storage
 - Algorithms

Arrays 2

Arrays

- Problems
 - Create one that holds 300 doubles?
 - Store 0.5 in all the locations?
 - Print sum of all array contents?

Arrays 2

Objectives

- Algorithms
- Copying arrays
- Inserting values into arrays

Arrays 2

Algorithms

- Solve problems
- Manipulate information
 - Find min
 - Find max
 - Find average

Arrays 2

Standard Deviation

- 2000 acres of corn
- Average yield of 140 bushels an acre (normal population)
- Applying fertilizer increases yield
- Obvious
 - 10 acres that produce 80 bushels an acre
- Not obvious
 - How much is it going to take to improve the worst 14% of your fields?

Arrays 2

80% gain from 20% effort

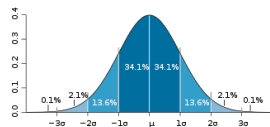
Math

- Yield from each acre
- Average yield
- Figure out the standard deviation

$$\sigma = \sqrt{\frac{(x_1 - \mu)^2 + (x_2 - \mu)^2 + \dots + (x_N - \mu)^2}{N}}$$

English version:
Take square root of the division of the sum of the square of every element minus the average over the number of items

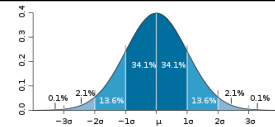
Arrays 2



Application

- Lower than Average – Standard Deviation = Worst offenders
- Go through each element in the array and print out that it needs to be fertilized if its yield is less than the previous value

Arrays 2




Purpose

- Tools for serious work
 - Farming
 - Engineering
 - Business decisions
 - Computer gaming
- Capable of a scale not easily done by hand


Arrays 2

Variables




int x;
double y;

Total ram in computer




int[]

Designed to hold food
What it holds is up to you



vs



new int[2]; new int[6];

Arrays 2

WARNING

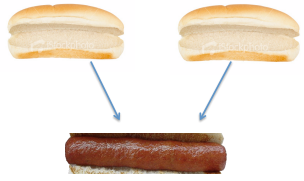
- Systems view of arrays different than your view!

```

int[] array1;                      → Points to an array of integers
int[] array2;                      → Points to an array of integers
new int[1];                        → Creates an array of integers w/ size 1
array1 = new int[1];                → array1 points to a new array
array1[0] = 3;                      → Set array1s value
array2 = array1;                    → array2 now points to the same array
                                   that array1 points to
    
```

Arrays 2

Problem



```

int[] x = new int[10];
int[] y;
y = x;

x[3] = 4;
y[3] = 2;

if (x[3] == 4)
    System.out.println("Mystery");
    
```

Arrays 2

Issues

- Copying one array to another

```

int array1 = new int[10];
int array2 = new int[array1.length];
for (int i=0; i<array1.length; i++)
{
    array1[i] = fc.getSensorData();
}
for (int i=0; i<array2.length; i++)
{
    array2[i] = array1[i];
}

```

Same length

Get data

Copy data

Arrays 2

Why are we copying each value?

Coding example

- Create 2 arrays
- Fill with random values
- Print each out
- Use array2= array1, modify, check contents
- Use proper copy method and repeat

Arrays 2

Issues

- Array mirrors books on your shelf
- Bookshelf, add book in middle
- Array is fixed size...
- How do we add a book to an array

Arrays 2

Usage

```

//Current list of books on shelf
String[] books = { "War", "Sci-Fi", "Adventure", "Biography"};
//List of books on shelf after Java added
String[] result = addBook(books, "Java");
for (int i=0; i<result.length; i++)
{
    System.out.println(result[i]);
}
for (int i=0; i<books.length; i++)
{
    System.out.println(books[i]);
}

```

What should this print?

What should this print?

Is books.length == result.length?

Arrays 2

Code

```
public String[] addBook(String[] current, String newBook)
{
    String[] added = new String[current.length+1];
    for (int i=0; i<current.length/2; i++)
    {
        added[i] = current[i];
    }
    added[current.length/2] = newBook;
    for (int i=current.length/2; i<current.length; i++)
    {
        added[i+1] = current[i];
    }
    return added;
}
```

Arrays 2

Case study

The distance to wall function

```
for (int a=0; a<8; a++) //Perform the process 8 times
{
    for (int i=0; i<8; i++) //Perform the measurement 8 times
    {
        m_ultra.ping(); //Start the echo-location
        //Minimum time to sleep that allows us to get
        //consistent numbers
        try { Thread.sleep(30); } //Sleep so echo has time to come back
        catch (InterruptedException e) {}
        m_array[i] = m_ultra.getDistance(); //Get distance echo traveled
    }
    sort(m_array); //Sort array contents
    //Discard beginning and end b/c sensor is not so good...
    int value = (m_array[m_array.length-6] + m_array[m_array.length-5] +
        m_array[m_array.length-4])/3;
    m_results[a] = value;
}
```

Arrays 2

Next, sum results and return the average

Summary

- Arrays
 - Copying
 - References
 - Inserting new element into middle of array

Arrays 2