Arrays in Java

CSCI 111
Data Storage

• How do we currently store data?
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Variables!
Data Storage

• How do we currently store data? Variables!

• How would we store the ages of everyone in this class?
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• How would we store the ages of everyone in this class?

• How would we store Employee instances for a company?
Arrays

• So, it would be nice to have an efficient way to store lots of data without having to create a variable for each piece of data.
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• So, it would be nice to have an efficient way to store lots of data without having to create a variable for each piece of data.

• Arrays are data structures used to store a fixed number of values of the same data type (i.e. You can’t mix Strings, ints, and Students).

```java
int x = 5
int[] x = [0, 2, 21, 37, 6, 4, 291, 3, 4, 5]
```
Java Code

What Happens?

Computer Memory
Java Code

int x;

What Happens?

A new variable, x, is created. x can ONLY hold an integer (variable declaration).
Java Code

```java
int x;
x = 5;
```

What Happens?

A new variable, \( x \), is created. \( x \) can ONLY hold an integer (variable declaration).

\( x \) is assigned the value 5 (variable assignment).
Java Code

```java
int x;
x = 5;

int[] ages;
```

What Happens?

A new variable, `ages`, is created. `ages` can ONLY hold an integer array (variable declaration).
Java Code

```java
int x;
x = 5;

int[] ages;
ages = new int[4];
```

What Happens?

A new variable, `ages`, is created. `ages` can ONLY hold an integer array (variable declaration).

A new integer array with 4 slots is created and `ages` is set to point to it.

Computer Memory

```
x = 5
indices

0 1 2 3

ages→ 0 0 0 0
```
Array Structure

dataType[] varName = new dataType[numElements];
Array Structure

dataType[] varName = new dataType[numElements];
Array Structure

```java
dataType[] varName = new dataType[numElements];
```

`varName.length` is the number of elements.
```
int[] ages;
ages = new int[4];
ages[1] = 8;
```

What Happens?

Computer Memory

```
0 1 2 3
0 0 0 0
```
Java Code

```java
int[] ages;
ages = new int[4];
ages[1] = 8;
```

What Happens?
The value in the slot in `ages` at index 1 is set to 8.

Equivalent to variable assignment.
Java Code

```java
int[] ages;
age = new int[4];
age[1] = 8;
age[0] = 4;
age[3] = 9;
```

What Happens?

Computer Memory

```
age
```

```
0 1 2 3
4 8 0 9
```
Java Code

```java
int[] ages;
ages = new int[4];
System.out.println(ages[3]);
```

What Happens?

We go to the slot at index 3 and retrieve (and print) the value.

So, 9 is printed.
Java Code

```java
int[] ages;
ages = new int[4];

System.out.println(ages[3]);
System.out.println(ages.length);
```

What Happens?

How many elements are in the array that `ages` is pointing to? 4 elements.

So, 4 is printed.