Arrays and References
The Original (Partial) Story

- An **array** is a group of similar variables, all of the same type, and with systematically related names that involve special syntax using [...]
- Each **array element**, e.g., \texttt{a[0]}, \texttt{a[1]}, ..., acts like a single variable of the type used in the declaration of array \texttt{a}
- The variable named \texttt{a.length} contains the number of array elements
```java
int[] a = { 6, 18, 9, -10 };
```
The Full Story

• In addition, you need to know:
  – Arrays are *reference types*
  – The name of the array (e.g., `a` in the example) is *a reference to the entire collection* of element variables `a[0], a[1], ..., and a.length`
```java
int[] a = { 6, 18, 9, -10 };
```
Arrays Are Reference Types

• You should now be able to predict what happens when you do the following:
  – Assign one array to another using =
  – Pass an array as a parameter to a method
  – Return an array from a method
  – Compare two arrays for equality with ==
  – But... what does `equals` do?
One of the Many Warts of Java

• The `equals` method for arrays does arguably the wrong thing: it compares reference values just like `==`
  – You might expect it would compare arrays “element-wise”, and the lengths of the arrays, but it does not
  – Fortunately, FindBugs flags the use of `equals` and explains it is equivalent to `==`
What Can Be Done?

• You can try to write your own code to check whether two arrays are element-wise equal (but this is surprisingly hard to get right!)
• You can use code from the Java libraries in the package java.util
  – See the class Arrays
  – Use the static method Arrays.deepEquals
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  – See the class `Arrays`
  – Use the static method `Arrays.deepEquals`
Best Practices for Arrays

• Avoid them in industrial-strength software
  – OK in exercises intended to demonstrate the basics of arrays (because there is so much Java code “in the wild” that uses arrays), and in simple throw-away programs

• Recommended alternatives:
  – Java libraries: `java.util.List` interface with `ArrayList` implementation
  – OSU CSE components: `Array`, `Sequence`
Resources

• Java Tutorials
  – http://docs.oracle.com/javase/tutorial/java/nutsandbolts/arrays.html

• Java for Everyone, Section 6.1

• Java Libraries API: Arrays
  – http://docs.oracle.com/javase/7/docs/api/

• Effective Java, Item 25