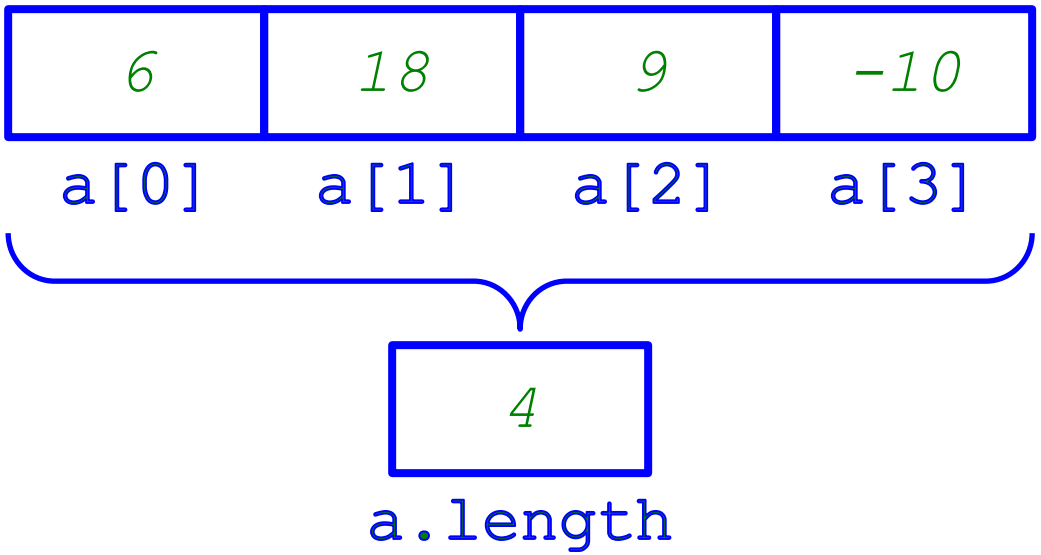
Arrays and References

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., `a[0]`, `a[1]`, …, acts like a single variable of the type used in the declaration of array `a`
- The variable named `a.length` contains the number of array elements

The Original (Partial) Picture

```
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`

The Full Picture

```
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```

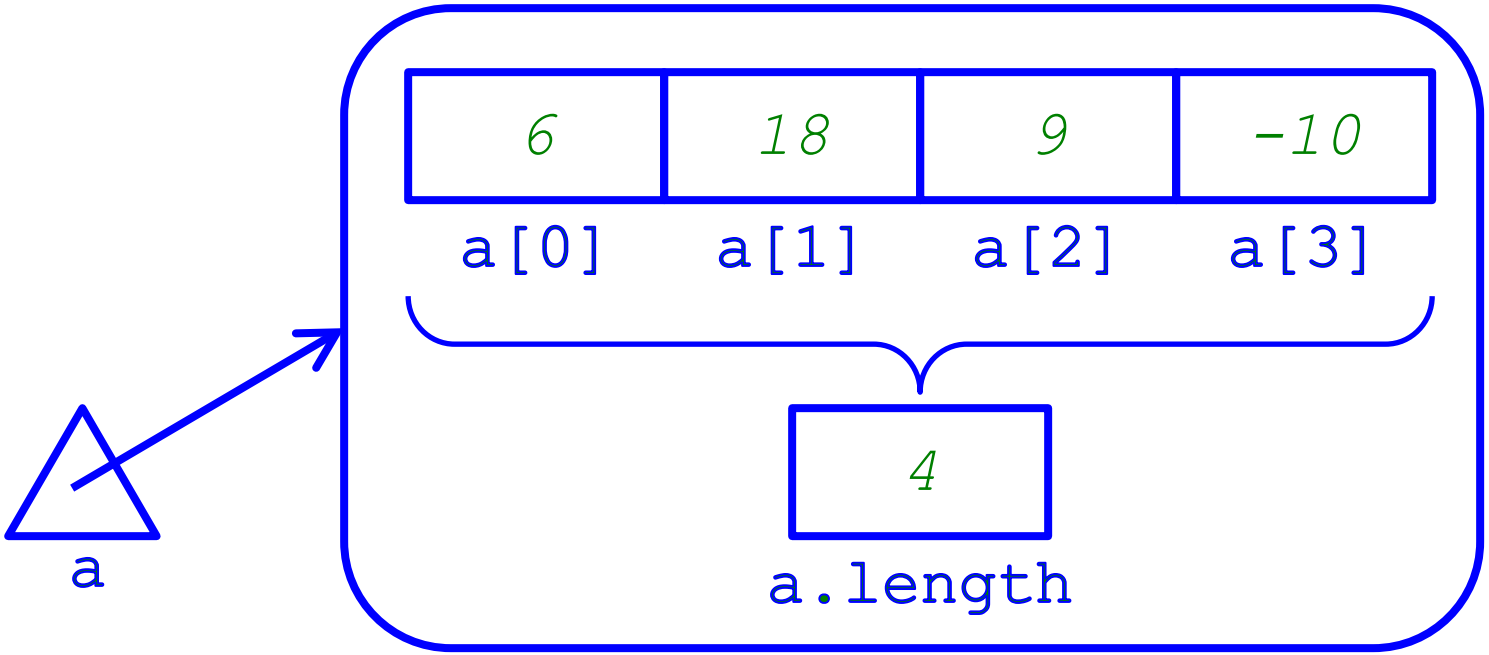

Arrays Are Reference Types

- 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, SpotBugs 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.equals` (or `Arrays.deepEquals` if comparing arrays of arrays)

What Can Be Done?

This is the handiest ***package*** in the Java libraries for general-purpose use; you should know about it.

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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: `Sequence`

Resources

- Java Tutorials
  - http://docs.oracle.com/javase/tutorial/java/nutsandbolts/arrays.html
- *Java for Everyone*, Section 6.1
  - http://proquest.safaribooksonline.com.proxy.lib.ohio-state.edu/book/-/9781118063316/chapter-6-arrays-and-array-lists/250
- *Effective Java*, Item 25
  - http://proquest.safaribooksonline.com.proxy.lib.ohio-state.edu/book/programming/java/9780137150021/chapter-5-generics/ch05