Programming Languages and Techniques (CIS120)

Lecture 21

Mar 2, 2012

Java Programming: Static Methods, Arrays

Announcements

- HW06 Grace period until 11:59:59pm tonight

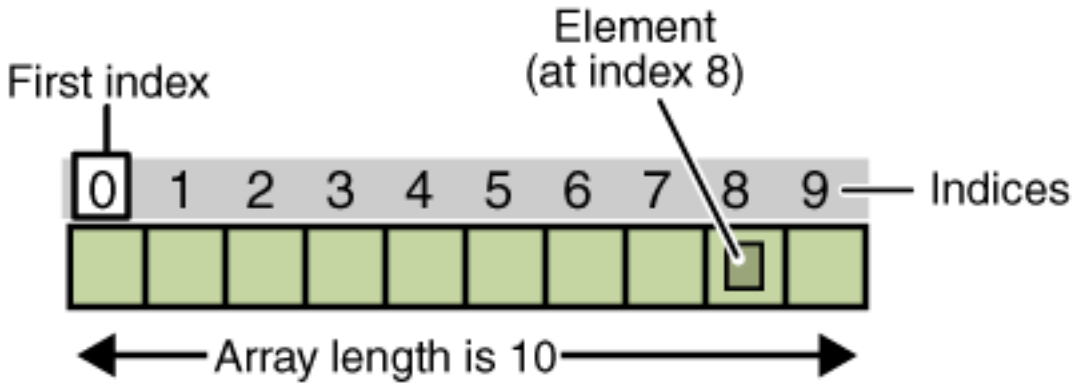
- HW07 is available on the web
  - Image processing in Java
  - Due next Thursday, March 15th at 11:59:59pm

- Have a good break!

Java arrays

Java Arrays: Indexing

- An array is a sequentially ordered collection of values that can be indexed in *constant* time.
- Index elements from 0



- Basic array expression forms

`a[i]`	access element of array `a` at index `i`
`a[i] = e`	assign `e` to element of array `a` at index `i`
`a.length`	get the number of elements in `a`

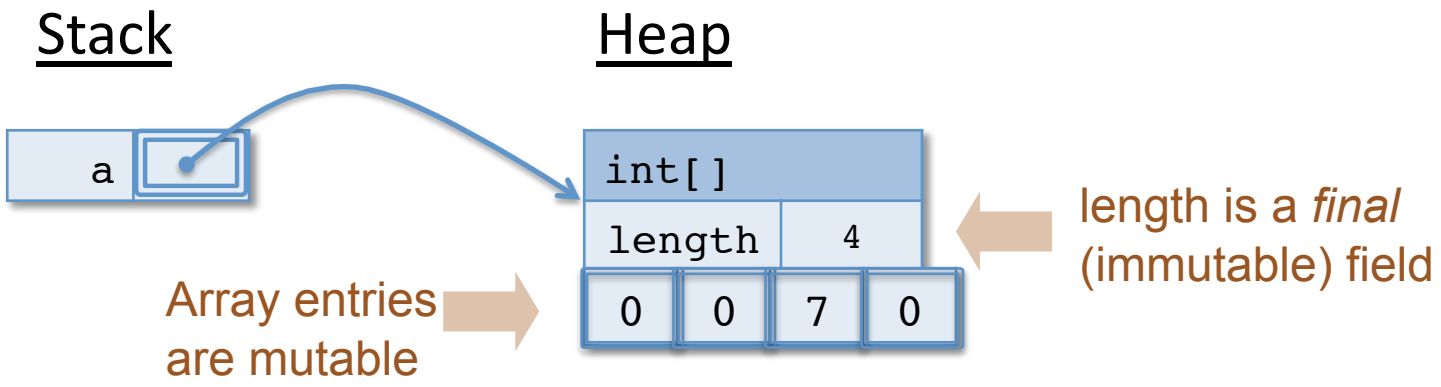
Java Arrays: Dynamic Creation

- Create an array a of size n with elements of type C

```
C[] a = new C[n];
```

- Arrays are objects that live in the heap, values with array type are mutable references

```
int[] a = new int[4];
a[2] = 7;
```



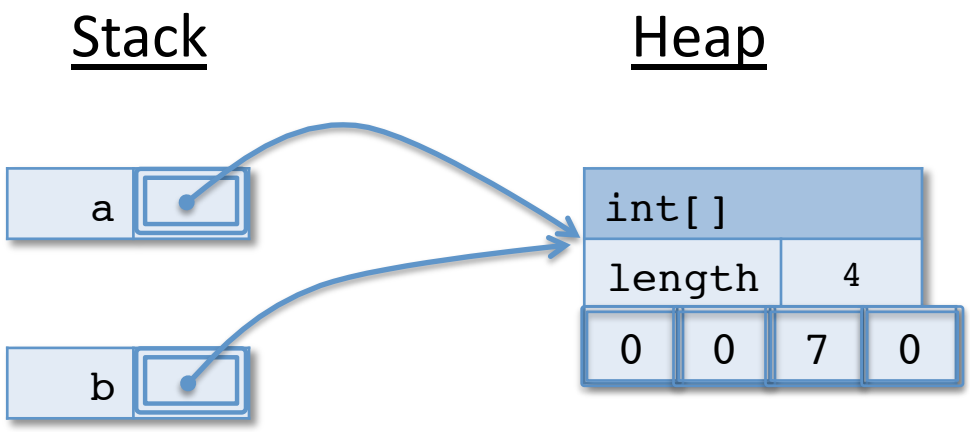
Java Arrays: Static Initialization

```
int[] myArray = { 100, 200, 300, 400, 500,
                  600, 700, 800, 900, 1000};

String[] yourArray = { “foo”, “bar”, “baz” };


Point[] herArray = { new Point(1,3),
                     new Point(5,4) };

herArray = new Point[] { new Point(2,3),
                         new Point(6,5) };
```

Java Arrays: Aliasing

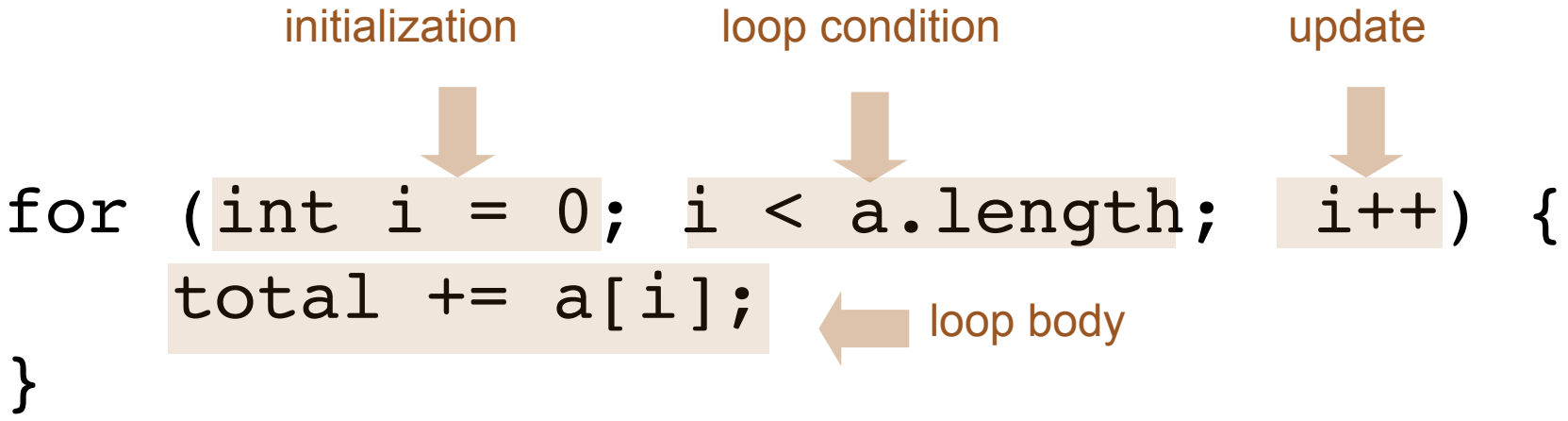
- Variables of array type are references and can be aliases

```
int[] a = new int[4];
int[] b = a;
a[2] = 7;
System.out.println(b[2]);
```



Array Iteration

For loops




```
static double sum(double[] a) {
  double total = 0;
  for (int i = 0; i < a.length; i++) {
    total += a[i];
  }
  return total;
}
```


General pattern for computing info about an array

Multi-Dimensional Arrays

A 2-d array is just an array of arrays...

```
String[][] names = {{"Mr. ", "Mrs. ", "Ms. "},
                    {"Smith", "Jones"}};

System.out.println(names[0][0] + names[1][0]);
    //  --> Mr. Smith
System.out.println(names[0][2] + names[1][1]);
    //  --> Ms. Jones
```

`String[][]` just means `(String[])[]`

`names[1][1]` just means `(names[1])[1]`

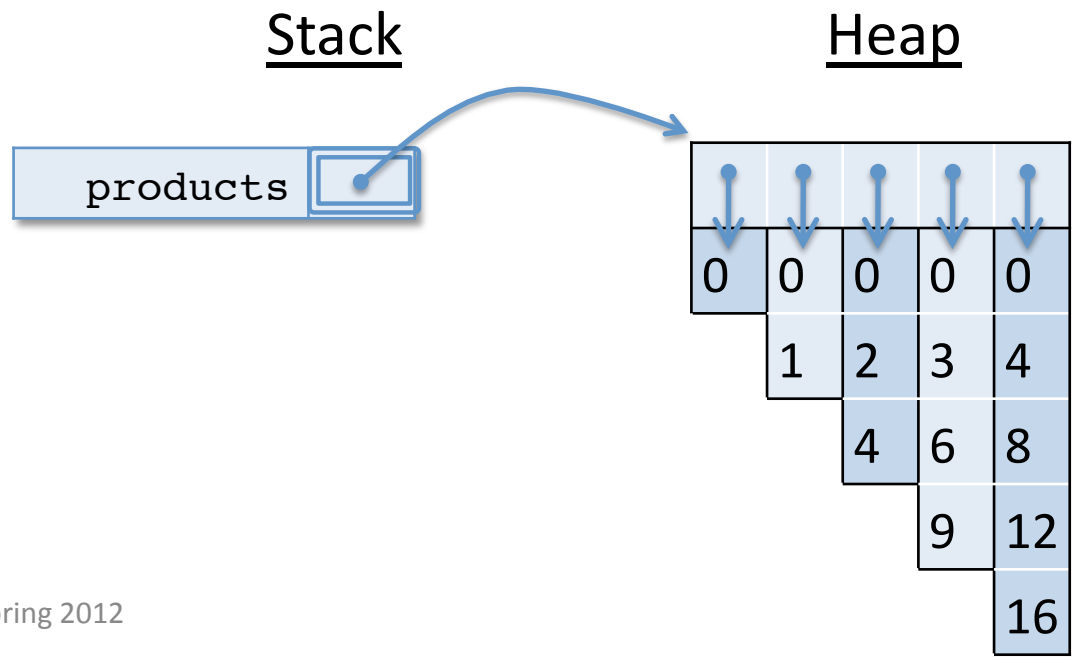
More brackets → more dimensions

Multi-Dimensional Arrays

```
int[][] products = new int[5][];
for(int col = 0; col < 5; col++) {
   products[col] = new int[col+1];
   for(int row = 0; row <= col; row++) {
      products[col][row] = col * row;
   }
}
```

Multi-Dimensional Arrays

```
int[][] products = new int[5][];
for(int col = 0; col < 5; col++) {
   products[col] = new int[col+1];
   for(int row = 0; row <= col; row++) {
      products[col][row] = col * row;
   }
}
```



Note: This heap picture is simplified – it omits the class identifiers and length fields for all 6 of the arrays depicted.

(Contrast with the array shown earlier.)

Demo

ArrayExamples.java