CMSC 131

Object-Oriented Programming I

Arrays

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This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane
Overview

- Arrays
Arrays are:
- Sequences of cells holding values of the same type ("base type")
- Objects (hence created using new)

To define an array variable:
```java
int[] a; // an array with base type int
```

To create an array object:
```java
a = new int[10];
```
- Creates an array of 10 cells on the heap
- The base type is int

To access individual array cells → use indexing
- a[0], a[1], ..., a[9]

Cells are just like variables:
- They may be read → `x = a[3];`
- They may be written → `a[2] = 7;`

Careful with index values
- **Example:** OutOfBounds.java
Arrays as Arguments

- Arrays → objects
- Array variables → references
- Array cells → variables of the base type (references or primitives depending on what that base type is)
- Both can be used as arguments to methods
  - Array cells → passed just like the variables of that base type
  - Array arguments → passed just like objects
    - Reference to array is passed in
    - If the method expects an array of doubles, an array of doubles of any size can be passed
    - Promotion does not apply. You cannot pass an int array when an array of doubles is expected
- **Example:** PassingValues.java
- The size of an array does not affect the amount of effort needed to pass the array
Arrays may be initialized at declaration time!

```java
int[] a = {5, 0, 1, 2};
```

Java:
- Counts elements (here, 4);
- Creates correct size of array
- Copies elements into array
- Returns reference to array

Here is another initialization
- `process(new int[]{10, 20, 30});`
- `process` expects an integer array

**Example:** GradeComputation.java
Arrays of Objects

- **Class types** can also be base types of arrays
  - e.g.
    
    ```java
    String[] acc = new String[3];
    ```
  - Array cells store references to objects
  - **Notice that they are initialized to null!**

- Array initializers can also be used
  ```java
  String[] acc = {"UMD", "UNC", "Duke"};
  ```
Arrays of Objects (Continued)

- More complicated example than strings:
  - Cat objects

- Expressions can also appear in initializers
  Cat[] kennel = {
    new Cat("Joe"),
    new Cat("Jill"),
    new Cat("Fluffy")
  };

Stack

Heap

kennel

Joe
Jill
Fluffy
Text Generation

- **Example:** words package example
- In the words example, the text is random, However we can create text that is statistically similar to other documents using Markov Text Generators (actually a project in cmsc132 😊)
- Some text generators