Arrays of Objects

CSC 1051 – Data Structures and Algorithms I

Dr. Mary-Angela Papalaskari
Department of Computing Sciences
Villanova University

Course website:
www.csc.villanova.edu/~map/1051/

Some slides in this presentation are adapted from the slides accompanying Java Software Solutions by Lewis & Loftus
Arrays - Review

• Declaration:

```java
double[] scores = new double[10];
```

The entire array has a single name

• Initialization:

scores[0] = 7.9;
scores[1] = 8.7;
scores[2] = 9.4;
scores[3] = 8.2;
scores[4] = 6.7;
scores[5] = 9.8;
scores[6] = 8.7;
scores[7] = 8.1;
scores[8] = 7.4;
scores[9] = 9.1;

This array holds 10 values of type double that are indexed from 0 to 9
The size of the array is given by: `scores.length = 10`

• Alternative declaration/instantiation/Initialization:

```java
double[] scores = {7.9, 8.7, 9.4, 8.2, 6.7, 9.8, 8.7, 8.1, 7.4, 9.1};
```
Example: An array of Strings

- `String[] words = new String[5];`

At this point, the following line of code would throw a `NullPointerException`:

```java
System.out.println(words[0]);
```
Example: An array of Strings

- `String[] words = new String[5];`

- Now, store some `String` objects in the array:
  
  ```java
  words[0] = "friendship";
  words[1] = "loyalty";
  words[2] = "honor";
  ```

```java
words[0] = "friendship";
words[1] = "loyalty";
words[2] = "honor";
```
Arrays of Objects

- The following declaration creates an array object called `verbs` and fills it with four `String` objects created using string literals:

  ```java
  String[] verbs = {"play", "work", "eat", "sleep", "run"};
  ```
Arrays of Objects

• Example: managing a collection of DVD objects

Movies.java

DVDCollection.java

DVD.java
```java
public class Movies {
    public static void main (String[] args) {
        DVDCollection movies = new DVDCollection();
        movies.addDVD ("The Godfather", "Francis Ford Coppala", 1972, 24.95, true);
        movies.addDVD ("District 9", "Neill Blomkamp", 2009, 19.95, false);
        movies.addDVD ("Iron Man", "Jon Favreau", 2008, 15.95, false);
        movies.addDVD ("All About Eve", "Joseph Mankiewicz", 1950, 17.50, false);
        movies.addDVD ("The Matrix", "Andy & Lana Wachowski", 1999, 19.95, true);
        System.out.println (movies);
        movies.addDVD ("Iron Man 2", "Jon Favreau", 2010, 22.99, false);
        movies.addDVD ("Casablanca", "Michael Curtiz", 1942, 19.95, false);
        System.out.println (movies);
    }
}
```
public class Movies {

    // Creates a DVDCollection object and adds some DVDs to it. Prints reports on the status of the collection.

    public static void main (String[] args) {
        DVDCollection movies = new DVDCollection();
        movies.addDVD("The Godfather", "Francis Ford Coppala", 1972, 24.95, true);
        movies.addDVD("District 9", "Neill Blomkamp", 2009, 19.95, false);
        movies.addDVD("Iron Man", "Jon Favreau", 2008, 15.95, false);
        movies.addDVD("All About Eve", "Joseph Mankiewicz", 1950, 17.50, false);
        movies.addDVD("The Matrix", "Andy & Lana Wachowski", 1999, 19.95, true);
        System.out.println(movies);
        movies.addDVD("Iron Man 2", "Jon Favreau", 2010, 22.99, false);
        movies.addDVD("Casablanca", "Michael Curtiz", 1942, 19.95, false);
        System.out.println(movies);
    }
}
public class Movies {
    //-----------------------------------------------------------------
    //  Creates a DVDCollection object and adds some DVDs to it. Prints
    //  reports on the status of the collection.
    //-----------------------------------------------------------------
    public static void main (String[] args) {
        DVDCollection movies = new DVDCollection();
        movies.addDVD("The Godfather", "Francis Ford Coppala", 1972, 24.95, true);
        movies.addDVD("District 9", "Neill Blomkamp", 2009, 19.95, false);
        movies.addDVD("Iron Man", "Jon Favreau", 2008, 15.95, false);
        movies.addDVD("All About Eve", "Joseph Mankiewicz", 1950, 17.50, false);
        movies.addDVD("The Matrix", "Andy & Lana Wachowski", 1999, 19.95, true);
        System.out.println(movies);
        movies.addDVD("Iron Man 2", "Jon Favreau", 2010, 22.99, false);
        movies.addDVD("Casablanca", "Michael Curtiz", 1942, 19.95, false);
        System.out.println(movies);
    }
}
import java.text.NumberFormat;

public class DVDCollection {
    private DVD[] collection;
    private int count;
    private double totalCost;

    // Constructor: Creates an initially empty collection.
    public DVDCollection () {
        collection = new DVD[100];
        count = 0;
        totalCost = 0.0;
    }
}
// Adds a DVD to the collection, increasing the size of the
// collection array if necessary.
public void addDVD (String title, String director, int year,
        double cost, boolean bluRay)
{
    if (count == collection.length)
        increaseSize();

    collection[count] = new DVD (title, director, year, cost, bluRay);
    totalCost += cost;
    count++;
}
public String toString()
{
    NumberFormat fmt = NumberFormat.getCurrencyInstance();

    String report = "~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
";
    report += "My DVD Collection\n\n";
    report += "Number of DVDs: " + count + "\n";
    report += "Total cost: " + fmt.format(totalCost) + "\n";
    report += "Average cost: " + fmt.format(totalCost/count) + "\n"
    report += "\n\nDVD List:\n\n";

    for (int dvd = 0; dvd < count; dvd++)
    {
        report += collection[dvd].toString() + "\n";
    }

    return report;
}
continue

//------ ---------------------------------------------
//  Increases the capacity of the collection by creating a
//  larger array and copying the existing collection into it.
//------ ---------------------------------------------
private void increaseSize ()
{
    DVD[] temp = new DVD[collection.length * 2];

    for (int dvd = 0; dvd < collection.length; dvd++)
        temp[dvd] = collection[dvd];

    collection = temp;
}
}
import java.text.NumberFormat;

public class DVD {
    private String title, director;
    private int year;
    private double cost;
    private boolean bluRay;

    //-----------------------------------------------------------------
    // Creates a new DVD with the specified information.
    //-----------------------------------------------------------------
    public DVD (String title, String director, int year, double cost, boolean bluRay) {
        this.title = title;
        this.director = director;
        this.year = year;
        this.cost = cost;
        this.bluRay = bluRay;
    }

    continue
```java
public String toString()
{
    NumberFormat fmt = NumberFormat.getCurrencyInstance();

    String description;

    description = fmt.format(cost) + "\t" + year + "\t";
    description += title + "\t" + director;

    if (bluRay)
        description += "\t" + "Blu-Ray";

    return description;
}
```