Activity 8: Arrays

Activity (in-lab): Monday, October 10, 2011 by the end of lab
Homework: Tuesday, August 11, 2011 by 11:59 PM

Goals:

By the end of this activity you should be able to do the following:

- Understand the basics of instantiating arrays and assigning / accessing array elements.
- How to iterate through arrays using loops.

Description:

In this activity you will create two classes. Scores will hold an array of numerical values. ScoresViewer will allow users to interact with the Scores class.

Directions:

Part 1: Scores - Method Stubs

- Create a class called Scores.
- Add method stubs for the following methods**. The first two are given; do the rest on your own**.
  - The constructor has a parameter that references an array of int values

```
public Scores(int[] numbersIn) {

}
```

  - findEvens: no parameter, returns an array of ints (all of the even-valued scores)

```
public int[] findEvens() {
    return null;
}
```

An array is an object, so null is a placeholder return.

  - findOdds: no parameter, returns an array of ints (all of the odd-valued scores)
  - calculateAverage: no parameters; returns a double (the average of all scores)
  - toReverseString: no parameters; returns a String (all scores in reverse order)
  - toString: no parameters; returns a String (all scores)

Compile Scores and run the following in interactions. **Do not continue until your program compiles and the following code runs without error in interactions.**

```
Scores s = new Scores(null);
int[] e = s.findEvens();
int[] o = s.findOdds();
double avg = s.calculateAverage();
```

Part 2: Scores - instance variables, Constructor

- Add an instance variable with the name *numbers* to your class that is an array of int values:

```
int[] numbers;
```

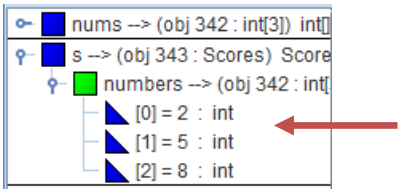
- In your constructor, add code that will set the value of *numbers* to *numbersIn*. **You access the entire array object using its variable name with no brackets.**

```
numbers = ____________;
```

- Compile Scores. In the interactions pane set up an array of int values using an initializer list and send it to the constructor of scores:

```
int[] nums = {2, 5, 8};
Scores s = new Scores(nums);
```

Open the Scores object *s* on the Workbench in the upper left corner and open the instance variable numbers. You should be able to see your values.



Part 3: Scores - toString, toReverseString

- The toString method will create a local String and then concatenate all of the values of numbers to the String.

```
public String toString() {
    String output = "";

    for (int i = 0; i < numbers.length; i++) {

    }

    return output;
}
```

- The variable i iterates from 0 the length of numbers - 1. Within the for loop, get the number at each index and add it to the output:

```
output += numbers[i] + "\t";
```

- Check the toString return in interactions:

```
int[] nums = {2, 5, 8};
Scores s = new Scores(nums);
s
2  5  8
```

- The toReverseString method will be exactly the same as toString, but will iterate from the length of numbers - 1 to 0.

```
String output = "";

for (int i = numbers.length - 1; _________; _________) {
    output += numbers[i] + " ";
}

return output;
```

Compile Scores and run the following code in the interactions pane. **Do not continue until the following code runs without error in interactions.**

```
int[] nums = {2, 5, 8};
Scores s = new Scores(nums);
s.toReverseString()
8  5  2
```

Part 4: Scores - findEvens, findOdds

- There are two parts to the findEvens method. First, count the number of evens in the array:

```
int numberEvens = 0;

for (int i = 0; i < numbers.length; i++) {
    if (_________ % 2 == 0) {
        numberEvens++;
    }
}
```

- You will then need to create an array with the appropriate length to store the number of even numbers.

```
int[] evens = new int[numberEvens];
```

- Add the even numbers to the evens array. In the following loop, *i* represents the current index of numbers and *count* is the current index of evens.

```
int count = 0;
for (int i = 0; i < numbers.length; i++) {
    if (numbers[_________] % 2 == 0) {
        evens[_________] = numbers[_________];
        count++;
    }
}
return evens;
```

- Compile Scores and test the return of findEvens. The array return does not have a toString representation including the value at each index, so you will use a method from the Arrays class.

```
import java.util.Arrays;
int[] nums = {2, 5, 8, 1, 10};
Scores s = new Scores(nums);
int[] evens = s.findEvens();
evens // toString output of an array object (will vary)
[D@5abb7465
Arrays.toString(evens)
[2, 8, 10]
```

- **Create the findOdds method. It will perform the exact same function as findEvens, but it will find all odd numbers in the array (numbers that are not divisible by 2).**

- Test findOdds in the interactions pane. **Do not continue until your output is correct.**

```
import java.util.Arrays;
int[] nums = {1, 5, 8, 3, 10};
Scores s = new Scores(nums);
Arrays.toString(s.findOdds())
[1, 5, 3]
```

Part 5: Scores - calculateAverage (20%)

- First, find the sum of all values in the numbers array.

```
int sum = 0;

for (int i = 0; i < numbers.length; i++) {
    sum += numbers[i];
}
```

- Return the sum divided by the number of elements in the array. Remember that sum and arrays.length are both integers.

```
return _____ / _____;
```

Compile NumberOperations and run the following code in the interactions pane.

```
int[] nums = {2, 5, 8, 7, 19};
Scores s = new Scores(nums);
s.calculateAverage()
8.2
```

Your GTA will ask you to demonstrate all methods in the interactions pane with a different set of values than shown above.

Homework:

- Download the Polygon.java from the lecture notes on the COMP 1210 website (remember to unzip the folder before attempting to compile the files).

- Add a method called **calculatePerimeter** that accepts no parameters and returns the sum of all sides (a double value).

- Add a method called **getSidesGreaterThan** that takes a double parameter and returns an array of double values (double[]). The array that the method returns should contain all of the sides of the polygon that are greater than the value sent as a parameter.

- You will need to run Checkstyle on your file, but you will not need to include Javadoc comments in your file. In other words, you can ignore the following error in Checkstyle:

```
Polygon.java:__:__: Missing a Javadoc comment.
```