CS-141 Basic Array Problems

1-Dimensional Arrays

1. Declare and create an array of 25 integers called myNums. Initialize the array by setting the $i^{th}$ element to the value $2i$.

2. Print all the elements of myNums using each of the following approaches:
   a. the Arrays class
   b. a for-loop
   c. an enhanced for-loop.

3. Write a method which prints the elements (one element per line) of myNums using either 2b or 2c. Test your method by calling it from main().

4. Write a method which returns a String containing all the elements of myNums which are divisible by the number 3. Elements should be separated by spaces. Test your method by calling it from main().

5. Swap the 5th element of myNums with the 10th element.

6. Write a method which swaps specified elements, e.g. its header might look like:
   ```java
   public void swap(int[] myArray, int i, int j)
   ```

   Why won’t it work to write the method as follows:
   ```java
   public void swap(int myArray[i], int myArray[j])
   ```

   What is the difference between pass by value and pass by reference?

7. Declare and create an array of 20 numbers (doubles) called nums. Initialize each element to a random number. Compute their average.

8. Insert a new value into the 5th index of nums, shifting items to make room. Note, the last item will be lost.

9. Remove the 10th index in the array nums, shifting items to remove the hole. Place the removed item into the last position of the array.

10. Use the Arrays class to sort nums. Print the array before and after the sort.

11. Copy nums into a new array using the following approaches:
   a. The Arrays.copyOf() method
   b. Create a second array of the same size and use a loop to set the values of the second array to be the same as nums.

12. Write a method which creates and returns an array of 20 random integers.

13. Write a method which takes an integer array as a parameter and doubles the value of each of its elements.

2-Dimensional Arrays

1. Declare and create (using curly brackets {...}) a 2D array of Strings called names with 2 rows and 3 columns. Use whatever values you want.

2. Declare and create a 2D array of doubles called cells with 4 rows and 8 columns. Using loops,
set the value of each element of `cells` to be equal to the product of its row and column.

3. Try to answer the following questions about `cells`: What type of variable is `cells`? What type is `cells[2]`? What type is `cells[1][2]`? What is the value of `cells.length`? What is the value of `cells[2].length`? Does `cells[2][3].length` make any sense? Why or why not?

4. Compute and print the average of the values in each row of `cells`.

5. Compute and print the average of the values in each column of `cells`.

6. Compute and print the average over all the values in `cells`.

7. Suppose you are writing a solitaire card game which begins with 7 piles of cards aligned in a row. The i\textsuperscript{th} pile contains i+1 cards. Create a 2D array to represent these cards. Set the value of each card randomly to a value in the range 0 to 51.

**ArrayLists**

1. Declare and create an `ArrayList` of Strings called `animals`.
   a. Add animal names to the list (e.g. ant, aardvark, cat, crow, snake, dog, zebra, cheetah, coyote, duck, dingo, deer).
   b. Use a loop to print out the resulting elements in the `animals`.
   c. Use a loop to remove all animals whose names begin with 'a' or 'c'.