**Directions:** Determine the answer to each of the following questions or incomplete statements, using the available space for any necessary scratch work. Then decide which is the best of the choices given and fill in the corresponding oval on the answer sheet. No credit will be given for anything written in the examination booklet (these pages). Do not spend too much time on any one problem.

Notes:

* Assume that classes listed in the Quick Reference found in Appendix have been imported where appropriate.
* Assume that declarations of variables and methods appear within the context of an enclosing class.
* Assume that method calls that are not prefixed with an object or class name and are not shown within a complete class definition appear within the context of an enclosing class.

1. Which of the following is correct syntax to declare an array of ten integers?
2. int a[10] = new int[10];
3. int [10] a = new int [10];
4. []int a =[10] int;
5. int a [10];
6. int[]a = new int[10];
7. What elements does the array data contain after the following code is executed?

int[]data =new int[8];

data[0] = 3;

data[7] = -18;

data[4] = 5;

data[1] = data[0];

int x = data [4];

data[4] =6;

data[x] = data[0] \* data[1];

1. [3, 3, 0, 0, 0, 0, -18, 0]
2. [3, 3, 0, 0, 6, 0, -18, 0]
3. [3, 3, 0, 0, 5, 0, 0, -18]
4. [3, 3, 0, 0, 5, 0, -18, 0]
5. [0, 0, 0, 0, 0, 0, 0, 0]

SECTION II

1. We have a program that holds a student’s class program (i.e. their schedule of classes) in an ArrayList named classProgram.   The classProgram ArrayList stores the classes in the order they’re taken: AP CS is first period, Spanish is second period and so on. We’ve created the following code to store the classProgram:

import java.util.ArrayList;

public class ArrayListExample {

public static void main(String[] args) {

ArrayList<String> schoolProgram = new ArrayList<String>(6);

schoolProgram.add("AP CS");

schoolProgram.add("Spanish");

schoolProgram.add("Calculus");

schoolProgram.add("English");

schoolProgram.add("History");

schoolProgram.add("Physics");

// YOUR CODE CODE GOES HERE

}

}

After a week of school, the student decides that she would like to change her school program by doing two things:

* Change her Calculus class to Geometry
* Drop Physics

In the space below, write code statements to update the schoolProgram ArrayList to reflect the student’s new school program.

SECTION II

Notes:

• Assume that the classes listed in the Quick Reference found in the Appendix have been imported where appropriate.

• Unless otherwise noted in the question, assume that parameters in method calls are not null and that methods are called only when their preconditions are satisfied.

• In writing solutions for each question, you may use any of the accessible methods that are listed in classes defined in that question. Writing significant amounts of code that can be replaced by a call to one of these methods may not receive full credit.

1. Digital sounds can be represented as an array of integer values. For this question, you will write two unrelated methods of the Sound class.

A partial declaration of the Sound class is shown below.

public class Sound {

/\*\* the array of values in this sound; guaranteed not to be null \*/

private int[] samples;

/\*\* Changes those values in this sound that have an amplitude greater than limit.

\* Values greater than limit are changed to limit.

\* Values less than -limit are changed to -limit.

\* @param limit the amplitude limit

\* Precondition: limit ≥ 0

\* @return the number of values in this sound that this method changed

\*/

public int limitAmplitude(int limit) {

/\* to be implemented in part (a) \*/ }

/\*\* Removes all silence from the beginning of this sound.

\* Silence is represented by a value of 0.

\* Precondition: samples contains at least one nonzero value

\* Postcondition: the length of samples reflects the removal of starting silence

\*/

public void trimSilenceFromBeginning()

{ /\* to be implemented in part (b) \*/ }

// There may be instance variables, constructors, and methods that are not shown.

}

(a) The volume of a sound depends on the amplitude of each value in the sound. The amplitude of a value is its absolute value. For example, the amplitude of -2300 is 2300 and the amplitude of 4000 is 4000.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 2532 | 17 | -2300 | -17 | -4000 | 2000 | 1048 | -420 | 33 | 15 | -32 | 2030 | 3223 |

Write the method limitAmplitude that will change any value that has an amplitude greater than the given limit. Values that are greater than limit are replaced with limit, and values that are less than -limit are replaced with –limit. The method returns the total number of values that were changed in the array. For example, assume that the array samples has been initialized with the following values.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 2000 | 17 | -2300 | -17 | -2000 | 2000 | 1048 | -420 | 33 | 15 | -32 | 2000 | 2000 |

When the statement

int numChanges = limitAmplitude(2000);

is executed, the value of numChanges will be 5, and the array samples will contain the following values.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 2532 | 17 | -2300 | -17 | -4000 | 2000 | 1048 | -420 | 33 | 15 | -32 | 2030 | 3223 |

Complete method limitAmplitude below.

/\*\* Changes those values in this sound that have an amplitude greater than limit.

\* Values greater than limit are changed to limit.

\* Values less than -limit are changed to -limit.

\* @param limit the amplitude limit

\* Precondition: limit ≥ 0

\* @return the number of values in this sound that this method changed

\*/

public int limitAmplitude(int limit)

(b) Recorded sound often begins with silence. Silence in a sound is represented by a value of 0. Write the method trimSilenceFromBeginning that removes the silence from the beginning of a

sound. To remove starting silence, a new array of values is created that contains the same values as the original samples array in the same order but without the leading zeros. The instance variable samples is updated to refer to the new array. For example, suppose the instance variable samples refers to the following array.

Macintosh HD:Users:christine:Desktop:Screen Shot 2015-04-06 at 9.28.53 PM.png

After trimSilenceFromBeginning has been called, the instance variable samples will refer to the following array.

Macintosh HD:Users:christine:Desktop:Screen Shot 2015-04-06 at 9.29.43 PM.png

Complete method trimSilenceFromBeginning below.

/\*\* Removes all silence from the beginning of this sound.

\* Silence is represented by a value of 0.

\* Precondition: samples contains at least one nonzero value

\* Postcondition: the length of samples reflects the removal of starting silence

\*/

public void trimSilenceFromBeginning()