SUGGESTED SKILLS

1.C

Determine code that would be used to interact with completed program code.

3.D

Write program code to create, traverse, and manipulate elements in 1D array or `ArrayList` objects.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 8.1—Arrays in Java
- Practice-It!: BJP4 Chapter 7: Array—Self-Check 7.1–7.9
- CodingBat Java: Array-1

TOPIC 6.1
Array Creation and Access

Required Course Content

ENDURING UNDERSTANDING

VAR-2

To manage large amounts of data or complex relationships in data, programmers write code that groups the data together into a single data structure without creating individual variables for each value.

LEARNING OBJECTIVE

VAR-2.A

Represent collections of related primitive or object reference data using one-dimensional (1D) array objects.

ESSENTIAL KNOWLEDGE

VAR-2.A.1

The use of array objects allows multiple related items to be represented using a single variable.

VAR-2.A.2

The size of an array is established at the time of creation and cannot be changed.

VAR-2.A.3

Arrays can store either primitive data or object reference data.

VAR-2.A.4

When an array is created using the keyword `new`, all of its elements are initialized with a specific value based on the type of elements:

- Elements of type `int` are initialized to `0`
- Elements of type `double` are initialized to `0.0`
- Elements of type `boolean` are initialized to `false`
- Elements of a reference type are initialized to the reference value `null`. No objects are automatically created

VAR-2.A.5

Initializer lists can be used to create and initialize arrays.

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Array

LEARNING OBJECTIVE

VAR-2.A

Represent collections of related primitive or object reference data using one-dimensional (1D) array objects.

ESSENTIAL KNOWLEDGE

VAR-2.A.6

Square brackets (`[ ]`) are used to access and modify an element in a 1D array using an index.

VAR-2.A.7

The valid index values for an array are 0 through one less than the number of elements in the array, inclusive. Using an index value outside of this range will result in an `ArrayIndexOutOfBoundsException` being thrown.

SUGGESTED SKILLS

2.B
Determine the result or output based on statement execution order in a code segment without method calls (other than output).

3.D
Write program code to create, traverse, and manipulate elements in 1D array or `ArrayList` objects.

4.B
Identify errors in program code.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 8.3—Using a For Loop to Loop through an Array
- CodingBat Java: Array-2
- Practice-It!: BJP4 Chapter 7: Arrays—Exercise 7.1–7.18

TOPIC 6.2
Traversing Arrays

Required Course Content

ENDURING UNDERSTANDING

VAR-2

To manage large amounts of data or complex relationships in data, programmers write code that groups the data together into a single data structure without creating individual variables for each value.

LEARNING OBJECTIVE

VAR-2.B

Traverse the elements in a 1D array.

ESSENTIAL KNOWLEDGE

VAR-2.B.1

Iteration statements can be used to access all the elements in an array. This is called traversing the array.

VAR-2.B.2

Traversing an array with an indexed `for` loop or `while` loop requires elements to be accessed using their indices.

VAR-2.B.3

Since the indices for an array start at 0 and end at the number of elements − 1, "off by one" errors are easy to make when traversing an array, resulting in an `ArrayIndexOutOfBoundsException` being thrown.

TOPIC 6.3
Enhanced `for` Loop for Arrays

Required Course Content

ENDURING UNDERSTANDING

VAR-2

To manage large amounts of data or complex relationships in data, programmers write code that groups the data together into a single data structure without creating individual variables for each value.

LEARNING OBJECTIVE

VAR-2.C

Traverse the elements in a 1D array object using an enhanced `for` loop.

ESSENTIAL KNOWLEDGE

VAR-2.C.1

An enhanced `for` loop header includes a variable, referred to as the enhanced `for` loop variable.

VAR-2.C.2

For each iteration of the enhanced `for` loop, the enhanced `for` loop variable is assigned a copy of an element without using its index.

VAR-2.C.3

Assigning a new value to the enhanced `for` loop variable does not change the value stored in the array.

VAR-2.C.4

Program code written using an enhanced `for` loop to traverse and access elements in an array can be rewritten using an indexed `for` loop or a `while` loop.

SUGGESTED SKILLS

3.D

Write program code to create, traverse, and manipulate elements in 1D array or `ArrayList` objects.

4.C

Determine if two or more code segments yield equivalent results.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 8.2—Looping with the For-Each Loop
- Practice-It!: BJP4 Chapter 7: Arrays—Exercises 7.1–7.18

SUGGESTED SKILLS

1.B
Determine code that would be used to complete code segments.

3.D
Write program code to create, traverse, and manipulate elements in 1D array or `ArrayList` objects.

5.D
Describe the initial conditions that must be met for a program segment to work as intended or described.

AVAILABLE RESOURCES

- Runestone Academy: AP CSA—Java Review: 8.13—Free-Response Questions
- CodingBat Java: Array 3
- Practice-It!: BJP4 Chapter 7: Array—Exercises 7.1–7.18

TOPIC 6.4
Developing Algorithms Using Arrays

Required Course Content

ENDURING UNDERSTANDING

CON-2

Programmers incorporate iteration and selection into code as a way of providing instructions for the computer to process each of the many possible input values.

LEARNING OBJECTIVE

CON-2.I

For algorithms in the context of a particular specification that requires the use of array traversals:

a. Identify standard algorithms.

b. Modify standard algorithms.

c. Develop an algorithm.

ESSENTIAL KNOWLEDGE

CON-2.I.1

There are standard algorithms that utilize array traversals to:

- Determine a minimum or maximum value
- Compute a sum, average, or mode
- Determine if at least one element has a particular property
- Determine if all elements have a particular property
- Access all consecutive pairs of elements
- Determine the presence or absence of duplicate elements
- Determine the number of elements meeting specific criteria

CON-2.I.2

There are standard array algorithms that utilize traversals to:

- Shift or rotate elements left or right
- Reverse the order of the elements