

Introduction to Array

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Objectives

- To describe why arrays are necessary in programming (§7.1)
- To declare array reference variables and create arrays (§§7.2.1–7.2.2).
- To obtain array size using **arrayRefVar.length** and know default values in an array (§7.2.3)
- To access array elements using indexes (§7.2.4)
- To declare, create, and initialize an array using an array initializer (§7.2.5).

Motivating Problem. Numbers above a statistic

1. Read 10 numbers, compute a statistic (e.g., the average), and find out how many numbers are above the statistic
 2. Prompt the user to enter 10 numbers, compute a statistic (e.g., the average), and find out how many numbers are above the statistic
- Solutions?

Questions?

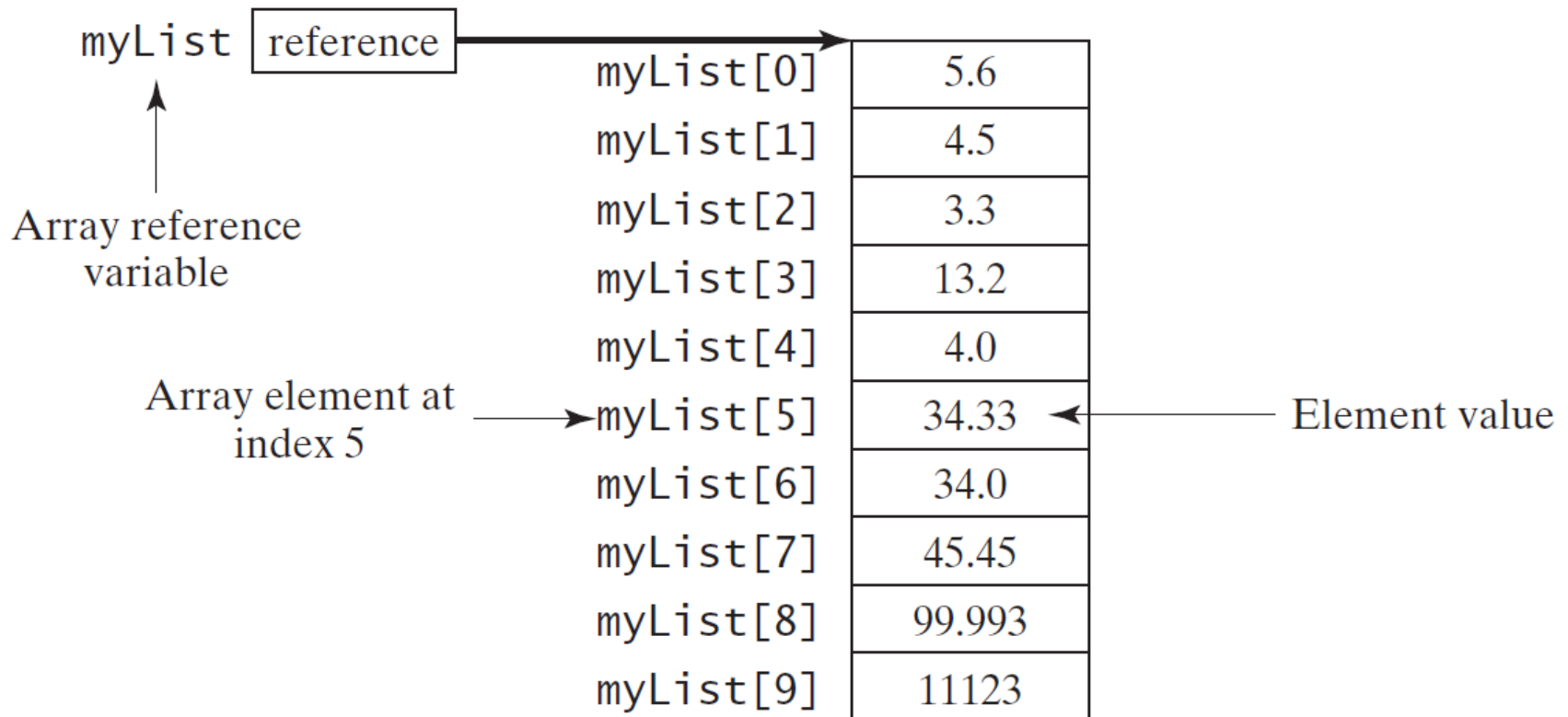
- Which solution do you like the best?
 - Using file
 - Using array

Concept of Array

- Array is a data structure that represents a collection of the same types of data.
 - Typically indexed and with equal random access time.

Example of Array

```
double[] myList = new double[10];
```



Declaring Array Variables

- `datatype[] arrayRefVar;`

- Example:

```
double[] myList;
```

- `datatype arrayRefVar[]; // This style is allowed, but not preferred`

- Example:

```
double myList[];
```

Creating Arrays

- `arrayRefVar = new datatype[arraySize];`
- Example:
 - `myList = new double[10];`

Referencing Array Elements

- Using index
 - `myList[0]` references the first element in the array.
 - `myList[9]` references the last element in the array.

Declaring and Creating in One Step

- `datatype[] arrayRefVar = new datatype[arraySize];`

- Example

```
double[] myList = new double[10];
```

- `datatype arrayRefVar[] = new datatype[arraySize];`

- Example

```
double myList[] = new double[10];
```

Questions?

- Declaring, creating, and referencing arrays

The Length of an Array

- Once an array is created, its size is fixed. It cannot be changed. You can find its size using

`arrayRefVar.length`

- Example,

`myList.length` returns 10

Default Values

- When an array is created, its elements are assigned the default value of
 - 0 for the numeric primitive data types,
 - '\u0000' for char types, and
 - false for boolean types

Indexed Variables

- The array elements are accessed through the index.
- The array indices are *0-based*, i.e., it starts from 0 to `arrayRefVar.length-1`.
- Example
 - `myList` holds ten double values and the indices are from 0 to 9
- Each element in the array is represented using the following syntax, known as an *indexed variable*
 - `arrayRefVar[index];`

Using Indexed Variables

- After an array is created, an indexed variable can be used in the same way as a regular variable.
- Example

```
// adds the value in myList[0] and myList[1] to myList[2]
```

```
myList[2] = myList[0] + myList[1];
```

Questions?

Array Initializers

- Declaring, creating, initializing in one step:

```
double[] myList = {1.9, 2.9, 3.4, 3.5};
```

- This shorthand syntax must be in one statement

Declaring, creating, initializing Using the Shorthand Notation

```
double[] myList = {1.9, 2.9, 3.4, 3.5};
```

```
double[] myList = new double[] {1.9, 2.9, 3.4, 3.5};
```

This shorthand notation is equivalent to the following statements:

```
double[] myList = new double[4];
```

```
myList[0] = 1.9;
```

```
myList[1] = 2.9;
```

```
myList[2] = 3.4;
```

```
myList[3] = 3.5;
```

Errors and Pitfalls

- Using the shorthand notation, you have to declare, create, and initialize the array all in one statement. Splitting it would cause a syntax error.
- For example, the following is wrong:

```
double[] myList;
```

```
myList = {1.9, 2.9, 3.4, 3.5};
```

Questions

Question. What are the values?

```
public class Test {  
    public static void main(String[] args) {  
        int[] values = new int[5];  
        for (int i = 1; i < 5; i++) {  
            values[i] = i + values[i-1];  
        }  
        values[0] = values[1] + values[4];  
        // what are the values of the array elements?  
    }  
}
```

Questions?