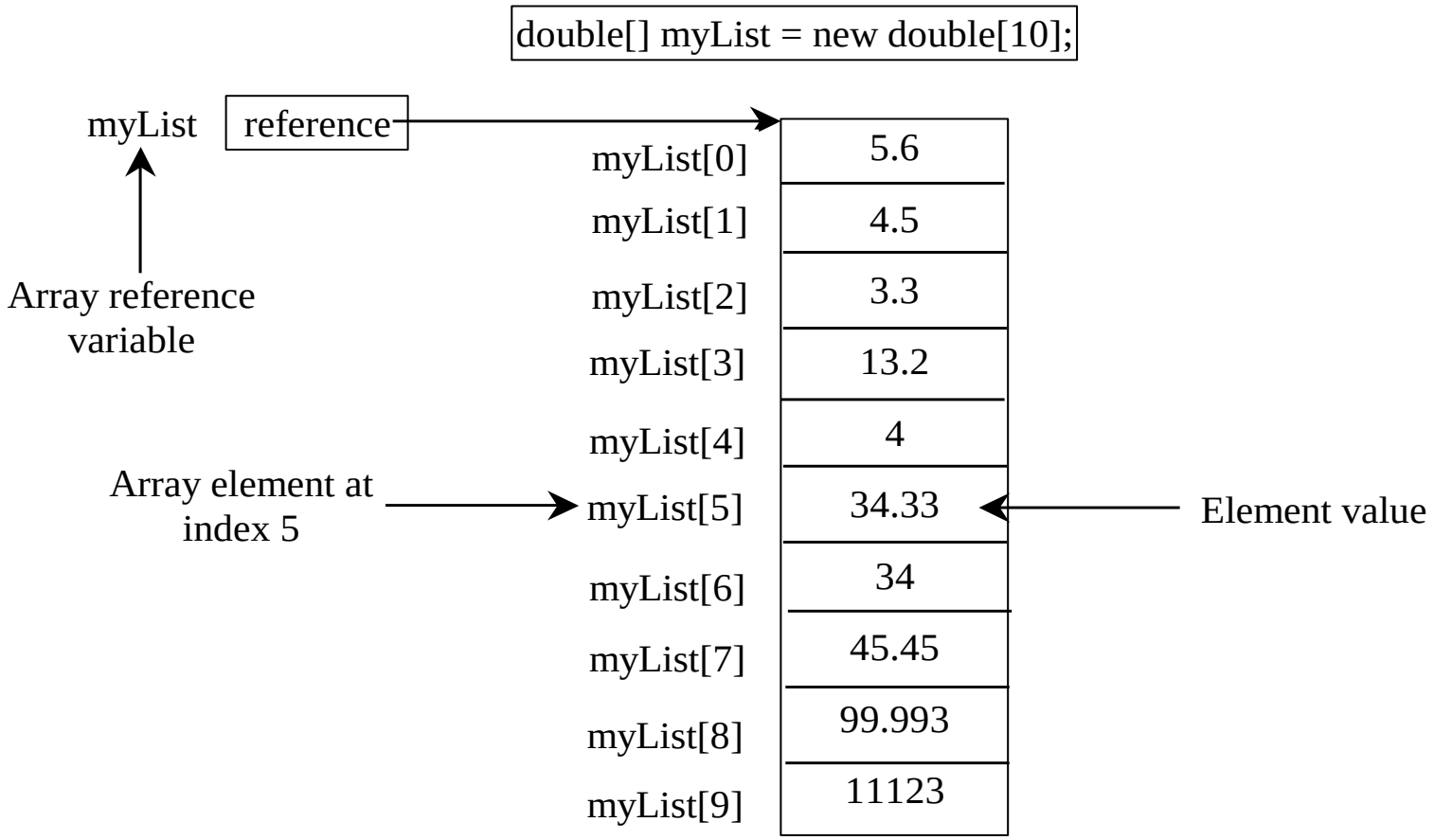
CSE 2101: Object Oriented Design and Design Patterns

Array

Introducing Arrays

- Array is a data structure that represents a collection of the same types of data.
- Arrays in Java are objects that can be treated just like other objects in the language



Declaring Array Variables

- Syntax: datatype[] arrayRefVar;

  Example:

  double[] myList;

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

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

  Example:

  double myList[];

Creating Arrays

Declaring and Creating in Two Steps

- Example:

  double[] myList;

  myList = new double[10];

  (myList[0] references the first element in the array.

  myList[9] references the last element in the array)

Declaring and Creating in One Step

- Example:
  double[] myList = new double[10];

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

For example,

myList.length returns 10

Declaring, creating, initializing Using the Shorthand Notation

```
double[] myList = {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;
```

Initializing arrays with input values

```
public class InputArray{
public static void main(String args[]){

        double[] myList=new double[5];
        Scanner input = new  Scanner(System.in);
            System.out.print("Enter " + myList.length + " values: ");
        for (int i = 0; i < myList.length; i++) {
                myList[i] = input.nextDouble();
        }
        for (int i = 0; i < myList.length; i++) {
                System.out.println(myList[i]);
        }
    }
}
```

Initializing arrays with random values

```
public class InputRandomArray{
public static void main(String args[]){


        double myList[]=new double[5];
        for (int i = 0; i < myList.length; i++) {
        myList[i] = Math.random() * 100;
        System.out.println(myList[i]);
        }
    }
}
```

Summing all elements

```
public class SumInputArray{
public static void main(String args[]){

        double myList[]=new double[5];
        Scanner input = new  Scanner(System.in);
            System.out.print("Enter " + myList.length + " values: ");
        for (int i = 0; i < myList.length; i++) {
              myList[i] = input.nextDouble();
        }
        double total = 0;
        for (int i = 0; i < myList.length; i++) {
             total += myList[i];
        System.out.println(total);
         }

}
```

Finding the largest element

```
public class SumInputArray{
public static void main(String args[]){

        double myList[]=new double[5];
        Scanner input = new  Scanner(System.in);
            System.out.print("Enter " + myList.length + " values: ");
        for (int i = 0; i < myList.length; i++) {
              myList[i] = input.nextDouble();
        }
        double max = myList[0];
        for (int i = 1; i < myList.length; i++) {
         if (myList[i] > max) max = myList[i];
        }
        System.out.println(max);

    }
}
```

Enhanced for Loop (for-each loop)

In general, the syntax is

```
for (elementType value: arrayRefVar) {
  // Process the value
}
```

```
public class Test{
public static void main(String args[]){
    int[] numbers ={10,20,30,40,50};
    for(int x : numbers ){
            System.out.print(x);
            System.out.print(",");
      }
  }
}
```

Output:

10,20,30,40,50,

Sending an Array as a parameter to a Method

```
public class ArrayMethod {
static public void add(int[] a)
{
        int sum=0;
        for(int i=0; i<a.length; i++){
          sum=sum+a[i];
          System.out.println("array value:" + a[i]);
        }
      System.out.println("summation:" + sum);
}

public static void main(String[] args) {
      int[] a={2, 3, 5} ;
      add(a);
}
}
```

Output is:

array value:2
array value:3
array value:5
summation:10

Declare/Create Two-dimensional Arrays

// Declare array ref var

dataType[ ][ ] refVar;

// Create array and assign its reference to variable

refVar = new dataType[10][10];

// Combine declaration and creation in one statement

dataType[ ][ ] refVar = new dataType[10][10];

// Alternative syntax

dataType refVar[ ][ ] = new dataType[10][10];

Declaring Variables of Two-dimensional Arrays and Creating Two-dimensional Arrays

```
int[][] matrix = new int[10][10];
  or
int matrix[][] = new int[10][10];
//matrix[0][0] = 3;


for (int i = 0; i < matrix.length; i++)
  for (int j = 0; j < matrix[i].length; j++)
    matrix[i][j] = (int)(Math.random() * 1000);
     //double[ ][ ]  x;
```

Declaring, Creating, and Initializing Using Shorthand Notations

You can also use an array initializer to declare, create and initialize a two-dimensional array. For example,

```
int[][] array = {
  {1, 2, 3},
  {4, 5, 6},
  {7, 8, 9},
  {10, 11, 12}
};
```

Same as

```
int[][] array = new int[4][3];
array[0][0] = 1; array[0][1] = 2; array[0][2] = 3;
array[1][0] = 4; array[1][1] = 5; array[1][2] = 6;
array[2][0] = 7; array[2][1] = 8; array[2][2] = 9;
array[3][0] = 10; array[3][1] = 11; array[3][2] = 12;
```