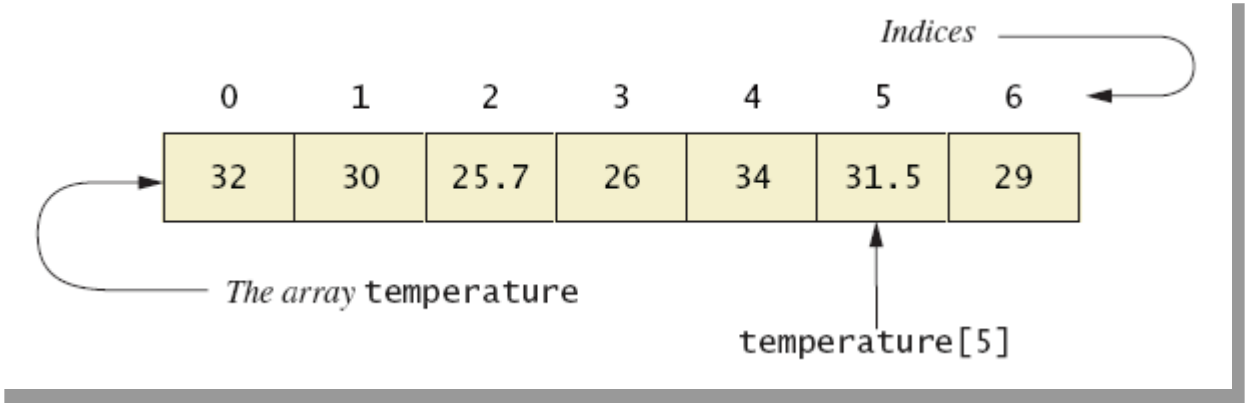
Arrays

Creating and Accessing Arrays

- An array is a special kind of object
- Think of as collection of variables of same type
- Creating an array with 7 variables of type double called temperatures
  - double [] temperatures = new double[7];
- To access an element use
  - The name of the array
  - An index number enclosed in braces
- Array indices begin at zero

Creating and Accessing Arrays

- Figure 7.1 A common way to visualize an array



Sample Java code

```
double [] temperatures = new double[5];
double sumOfTemps = 0.0;
for (int index = 0; index < 5; index++){
        System.out.print(“Enter temp” + index + 1 + “: “);
        temperatures[index] = keyboard.nextDouble();
        sumOfTemps = sumOfTemps + temperatures[index];
}
System.out.println(“The sum of the temperatures is “ + sumOfTemps);
```

Play this out assuming the user enters 75, 77, 80, 82, and 80

(The sum should be 394)

Getting the array size from the user

The array does NOT need to be sized by hard coding. The size can be derived and then assigned in the program

```
System.out.println("How many temperatures do you have?");
int size = keyboard.nextInt();
double[] temperatures = new double[size];
```

More About Array Indices

- Index of first array element is 0
- Last valid Index is `arrayName.length - 1`
- Array indices must be within bounds to be valid
  - When program tries to access outside bounds, run time error occurs

Initializing Arrays

- Possible to initialize at declaration time

```
double[] reading = {3.3, 15.8, 9.7};
```

- Also may use normal assignment statements
  - One at a time
  - In a loop

```
int[] count = new int[100];
for (int i = 0; i < 100; i++)
    count[i] = 0;
```

Indexed Variables as Method Arguments

- Indexed variable of an array
  - Example … `a[i]`
  - Can be used anywhere variable of array base type can be used
  - Simply pass the value just you would any other piece of data
- Passing an entire array
  - You can also pass an entire array

Programming Assignment
Rewrite the GradeAverage program

```
public static void main(String[] args) {
   int numOfGrades;
   double grade;
   double total = 0, average = 0;
   int counter = 1;

   Scanner keyboard = new Scanner(System.in);
   System.out.print("Enter the number of test grades to average: ");
   numOfGrades = keyboard.nextInt();
   while (counter <= numOfGrades) {
       System.out.print("Enter grade " + counter + ": ");
       grade = keyboard.nextDouble();
       total = total + grade;
       counter = counter + 1;
   }

   average = total / numOfGrades;
   System.out.print("The average is " + average + ". ");
   if (average >= 90)
       System.out.print("That is an A.");
   else if (average >= 80)
       System.out.print("That is a B.");
   else if (average >= 70)
       System.out.print("That is a C.");
   else if (average >= 60)
       System.out.print("That is a D.");
   else
       System.out.print("That is an F.");
}
```

Steps

- After you get the number of grades from the user, create an array to hold those grades.
- Rewrite the loop to load the array.
- Cycle again through the loop to get the total and then the average.
- Output the average grade amount and its corresponding letter.

Programming Assignment One Possible Solution

```
public static void main(String[] args) {
        int numOfGrades;
        double grade;
        double total = 0, average = 0;
        int counter = 0;

        Scanner keyboard = new Scanner(System.in);
        System.out.print("Enter the number of test grades to average: ");
        numOfGrades = keyboard.nextInt();
        double[] grades = new double[numOfGrades];
        while (counter < numOfGrades) {
            System.out.print("Enter grade " + (counter + 1) + ": ");
            grades[counter] = keyboard.nextDouble();
            counter = counter + 1;
        }
        counter = 0;
        while (counter < numOfGrades) {
            total = total + grades[counter];
            counter = counter + 1;
        }

        average = total / numOfGrades;
        System.out.print("The average is " + average + ". ");
        if (average >= 90)
            System.out.print("That is an A.");
        else if (average >= 80)
            System.out.print("That is a B.");
        else if (average >= 70)
            System.out.print("That is a C.");
        else if (average >= 60)
            System.out.print("That is a D.");
        else
            System.out.print("That is an F.");
    }
```