CS 149

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(adapted from slides originally developed by Alvin Chao)

Arrays

- Arrays are collections of the same type of element. We can have arrays of type **boolean**, **int**, **double**, **char**, or **String**
- Declaration
  - Syntax: BaseType[] ArrayName;
  - Example: int[] score;
- Memory Allocation:
  - Syntax: arrayName = new BaseType[Length];
  - Example: score = new int[10];
- Accessing Elements:
  - Syntax: ArrayName[Index]
  - Example: score[5] = 8;

Multiple uses of [ ]

Uses of [ ]:

- To declare that a variable is an array
- To indicate the amount of memory to allocate
- An operator to access an element of an array

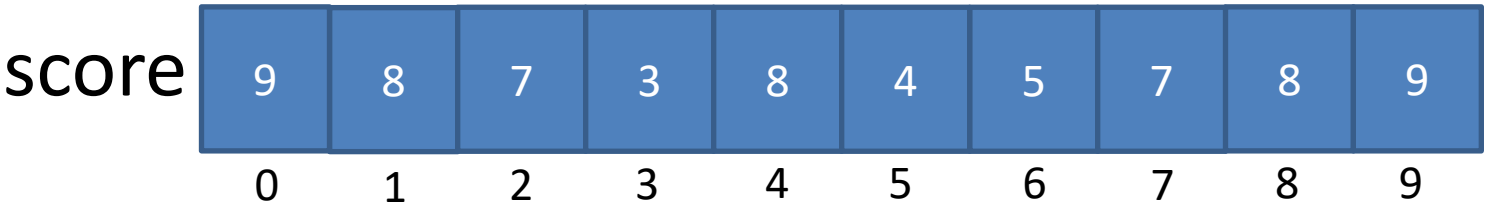
An Example:

```
int[]  i;                // i is declared to be an array of int
i  = new int[5];         // Memory is allocated for 5 int values
i[0] = 10;               // Assign 10 to the 0th element of i
```

System.out.printf("%d\n", i[0]); // Print the 0^{th} element of i

Array Parameters

- Array state diagram



Formal declaration parameters examples:

- public static void countPopular(int[ ] votes);
- public static void main(String[ ] args);

Example of actual parameters passed

- countPopular(myVotes);

Loops and Arrays

- **Example**: We declare an integer array score to hold bowling scores for each frame.

- What is stored in each element?

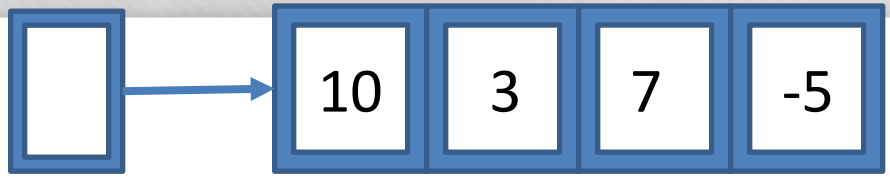
```
int i;
int[]  score;

score= new int[10];

for (i=0; i < score.length; i++) {
    score[i] = i;
}
```

Array Length vs. String length

- score.length returns the length of the array.
- Notice this is different from a String length
- str.length() we have the () because string length is a **method** call to the String class versus score.length is an attribute of the array.

Array Memory Diagram

int[ ] nums = {10, 3, 7, -5};



Draw a memory diagram for the following array declarations:

1) int[] sizes = new int[5];
2) sizes[2] = 7;
3) char[] codes = new char[3];
4) codes[2] = 'X';
5) double[] costs = new double[4];
6) costs[0] = 0.99;
7) Die[] dice = new Die[2];
8) dice[1] = new Die(6);

Array Initialization

Arrays can be initialized using an initialization list enclosed in braces:

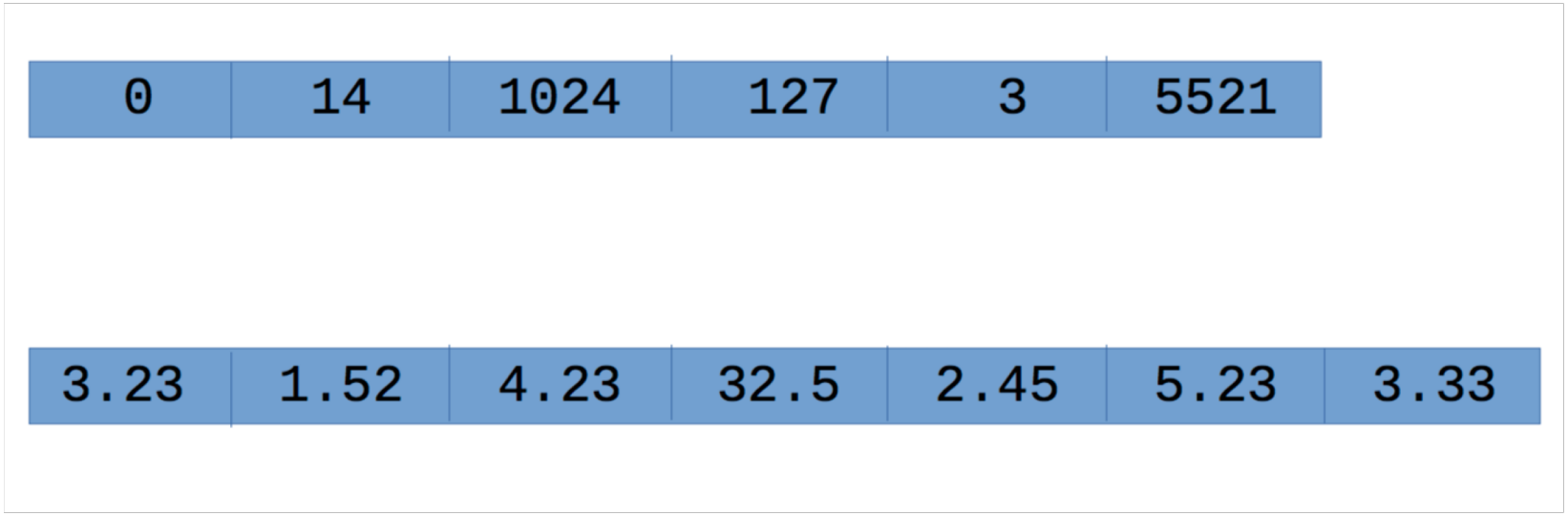
```
int[] sizes = {3, 5, 7, 2, 1};
String[] names = {"James", "Madison", "University"};
```

However, this syntax only works for initialization. If an array has already been initialized, its contents can be changed with the following notation:

```
sizes = new int[] {55};
names = new String[] {"bob", "ann", "sue", "sam"};
```

In Class Exercise
Array Initialization

- Write *statements* that declare and initialize variables for the arrays.



Array Types and Values

What is the type and value for each of the *expressions* below?

1) int[] a = {3, 6, 15, 22, 100, 0};
2) double[] b = {3.5, 4.5, 2.0, 2.0, 2.0};
3) String[] c = {"alpha", "beta", "gamma"};
4) a[3] + a[2]
5) b[2] - b[0] + a[4]
6) c[1].charAt(a[0])
7) a[4] * b[1] <= a[5] * a[0]

- **Acknowledgements**

Parts of this activity are based on materials developed by David Bernstein.

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