CS 149

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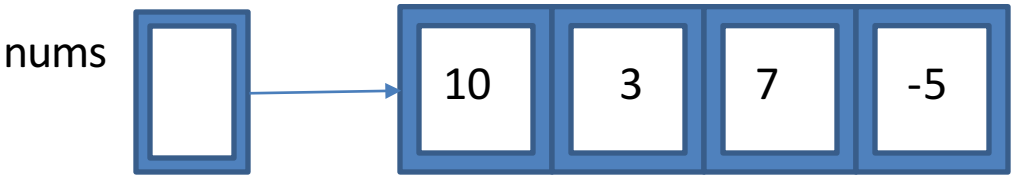
CS149 – Array Activities

JAMES MADISON UNIVERSITY

Array Memory Diagram

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



Draw a memory diagram for the following array declarations:

- int[] sizes = new int[5];
- sizes[2] = 7;
- char[] codes = new char[3];
- codes[2] = 'X';
- double[] costs = new double[4];
- costs[0] = 0.99;
- Die[] dice = new Die[2];
- 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"};
```

Array Initialization

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

0	14	1024	127	3	5521

3.23	1.52	4.23	32.5	2.45	5.23	3.33

Array Types and Values

- What is the type and value for each of the four *expressions* below?
  int[] a = {3, 6, 15, 22, 100, 0};
  double[] b = {3.5, 4.5, 2.0, 2.0, 2.0};
  String[] c = {"alpha", "beta", "gamma"};
- a[3] + a[2]
- b[2] - b[0] + a[4]
- c[1].charAt(a[0])
- a[4] * b[1] <= a[5] * a[0]

Arrays and Loops

- **The real power of arrays is the ability to process them using loops, i.e., performing the same task for multiple elements. The standard form of iteration is as follows:**

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

- **For example:**

```
// set all of the elements of x to -1.0
double[] x = new double[100];
for (int i = 0; i < x.length; i++) {
        x[i] = -1.0;
}
// sum the elements of scores
int sum = 0;
for (int i = 0; i < scores.length; i++) {
        sum += scores[i];
}
```

Tracing Array Code

- **What is the value of array and accumulator after the following iteration? Trace the loop by hand.**

```
int[] array = {5, 26, 13, 12, 37, 15, 16, 4, 1, 3};
int accumulator = 0;
for (int i = 0; i < array.length; i++) {
        if (array[i] % 2 == 1 && i + 1 < array.length) {
                array[i] *= -1;
                accumulator += array[i+1];
        }
}
```

Tracing Array Code

- **What is the value of array and accumulator after the following iteration? Trace the loop by hand.**

```
int[] array = {5, 26, 13, 12, 37, 15, 16, 4, 1, 3};
int accumulator = 0;
for (int i = 0; i < array.length; i++) {
        if (array[i] % 2 == 1 && i + 1 < array.length) {
                array[i] *= -1;
                accumulator += array[i+1];
        }
}
```

Accumulator: 72
0: -5
1: 26
2: -13
3: 12
4: -37
5: -15
6: 16
7: 4
8: -1
9: 3

- **Acknowledgements**

Parts of this activity are based on materials developed by Chris Mayfield and Nathan Sprague.

</end>