

# Lecture 5 – Loops & Arrays

08-671

Java Programming for App Developers

September 15, 2015

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# 08-671 Lecture Topics

(subject to change – but only a little bit)

#1 Intro

#2 Primitive Types

#3 Java Classes

#4 Reference Types

#5 Loops & Arrays

#6 Lists & Sorting

#7 Maps

#8 File & Network I/O

#9 Swing Interfaces

#10 Swing Actions

#11 Threads

#12 Exceptions

#13 Functional Programming

#14 In-class Written Exam

\* Final Exam – this will be a 3-hour programming problem

# Outline

→ Questions

Conditionals

Loops

Arrays

Homework #4 & Readings

Sample Final Exam Questions

# If Statements

- If-then  
`if (booleanExpr) stmt1;`
- If-then-else  
`if (booleanExpr) stmt1; else stmt2;`
- If-then-else chain  
`if (booleanExpr) stmt1;  
else if (booleanExpr2) stmt2;  
else if (booleanExpr3) stmt3;  
else stmt4;`

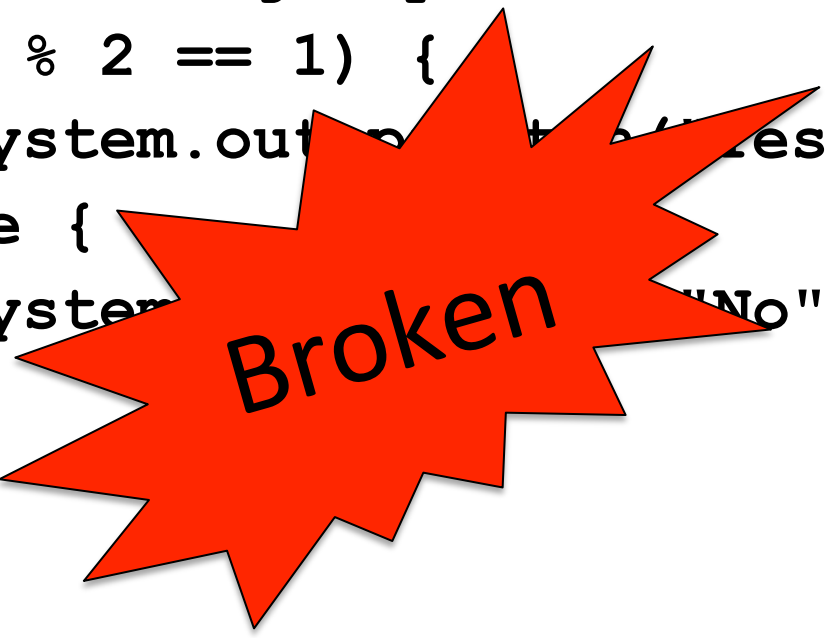
# Things to notice

- Semicolons end each statement
- Blocks (curly braces) used to group statements
- The indentation and position of the braces

```
if (x == y) {  
    System.out.println("Good") ;  
    y = 0 ;  
} else {  
    System.out.println("Bad") ;  
    x = 0 ;  
}
```

# Example – Is Odd

```
public class IsOdd {  
    public static void main(String[] args) {  
        int x = Integer.parseInt(args[0]);  
        if (x % 2 == 1) {  
            System.out.println("Yes");  
        } else {  
            System.out.println("No");  
        }  
    }  
}
```



# Example – Is Odd

```
public class IsOdd {  
    public static void main(String[] args) {  
        int x = Integer.parseInt(args[0]);  
        if (x % 2 != 0) {  
            System.out.println("Yes");  
        } else {  
            System.out.println("No");  
        }  
    }  
}
```

# The if-then-else Chain

```
if (month == 1) {  
    System.out.println("Jan");  
} else if (month == 2) {  
    System.out.println("Feb");  
} else if (month == 3) {  
    System.out.println("Mar");  
} else if (month == 4) {  
    System.out.println("Apr");  
} else if (month == 5) {  
    System.out.println("May");  
} else if (month == 6) {  
    System.out.println("Jun");  
} else if (month == 7) {  
    System.out.println("Jul");  
} else if (month == 8) {  
    System.out.println("Aug");  
} else if (month == 9) {  
    System.out.println("Sep");  
} else if (month == 10) {  
    System.out.println("Oct");  
} else if (month == 11) {  
    System.out.println("Nov");  
} else if (month == 12) {  
    System.out.println("Dec");  
} else {  
    System.out.println("Invalid Month");  
}
```



# Switch Statements

- Switch (on any primitive type)

```
switch (expr) {  
  case <lit>:  
    ...  
    break;  
  case <lit>:  
    ...  
    break;  
  case <lit>:  
    ...  
}
```



Starting in Java 8,  
you can use  
Strings in switch  
statements.

# Example switch Statement

```
switch (month) {  
case 1:  
    System.out.println("Jan");  
    break;  
case 2:  
    System.out.println("Feb");  
    break;  
case 3:  
    System.out.println("Mar");  
    break;  
case 4:  
    System.out.println("Apr");  
    break;  
case 5:  
    System.out.println("May");  
    break;  
case 6:  
    System.out.println("Jun");  
    break;  
case 7:  
    System.out.println("Jul");  
    break;
```

```
case 8:  
    System.out.println("Aug");  
    break;  
case 9:  
    System.out.println("Sep");  
    break;  
case 10:  
    System.out.println("Oct");  
    break;  
case 11:  
    System.out.println("Nov");  
    break;  
case 12:  
    System.out.println("Dec");  
    break;  
default:  
    System.out.println("???");  
}
```

Most common mistake is leaving out the "break" statement. If you do, control continues into the next case.

# While Loops

- While loops are repeated if-then's
- If-then

```
if (booleanExpr) stmt1;
```

- While *this* is true do *that*

```
while (booleanExpr) stmt;  
do stmt; while (booleanExpr);
```

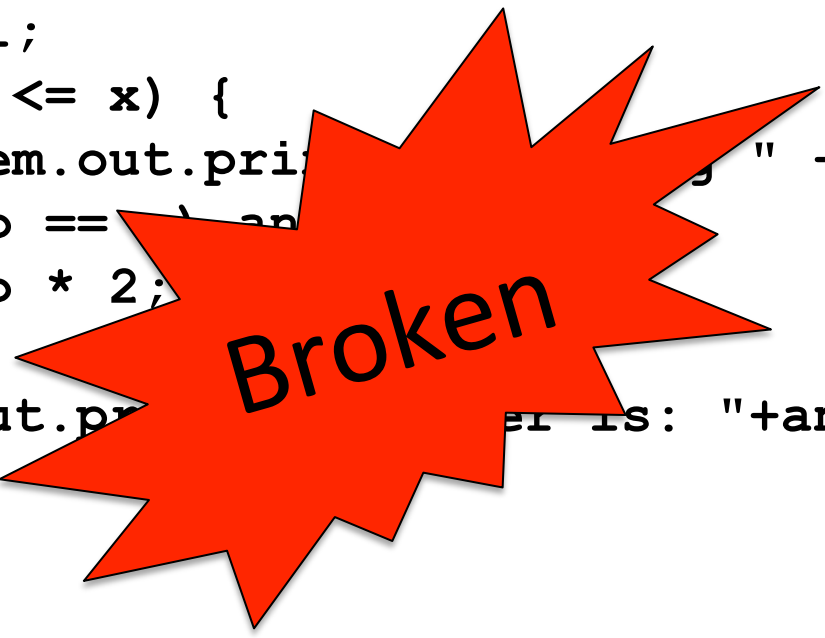
# Example -- ReverseDigits

```
public class ReverseDigits {  
    public static void main(String[] args) {  
        int x = Integer.parseInt(args[0]);  
        while (x != 0)  
            int digit = Math.abs(x % 10);  
            System.out.print(digit);  
            x = x/10;  
        }  
        System.out.println()  
    }  
}
```

Still doesn't  
quite work  
for  $x \leq 0$

# Example -- IsPowerOfTwo

```
public class IsPowerOfTwo {  
    public static void main(String[] args) {  
        int x = Integer.parseInt(args[0]);  
        boolean answer = false;  
        int p = 1;  
        while (p <= x) {  
            System.out.print(p + " ");  
            if (p == x) {  
                answer = true;  
            }  
            p = p * 2;  
        }  
        System.out.println("Is: " + answer);  
    }  
}
```



# Why is it Broken?

- Range for int: -2,147,438,648 to 2,147,438,647
- The internal representation is this:

1	0000 0000 0000 0000 0000 0000 0000 0001
2	0000 0000 0000 0000 0000 0000 0000 0010
...	
536,870,912	0010 0000 0000 0000 0000 0000 0000 0000
1,073,741,824	0100 0000 0000 0000 0000 0000 0000 0000
-2,147,483,648	1000 0000 0000 0000 0000 0000 0000 0000
0	0000 0000 0000 0000 0000 0000 0000 0000

# For Loops

- Formalizes loop variable initialization & increment  
`for (initialization; condition; increment) stmt;`

- Example

```
for (int i=0; i<max; i++) stmt;
```

Is equivalent to:

```
{  
    int i=0;  
    while (i<max) {  
        stmt;  
        i++;  
    }  
}
```

- The loop index (*i*) can only be used in `stmt`

# Example -- IsPowerOfTwoAgain

```
public class IsPowerOfTwoAgain {  
    public static void main(String[] args) {  
        int x = Integer.parseInt(args[0]);  
        boolean answer = false;  
        for (int p=1; p<=x; p=p*2) {  
            System.out.println("Testing " + p);  
            if (p == x) answer = true;  
        }  
        System.out.println("Answer is: "+answer);  
    }  
}
```



Still  
Broken



# More on Loops

- Loops can be nested – example coming up
- You can use a break statement to get out of a loop (similar to getting out of a switch statement)
- Loops can be labeled so that you can reference an outer loop with a break
- (We'll cover the Java 1.5 “for each” loop soon)

# Outline

- ✓ Questions
- ✓ Conditionals
- ✓ Loops
- Arrays

Homework #4 & Readings

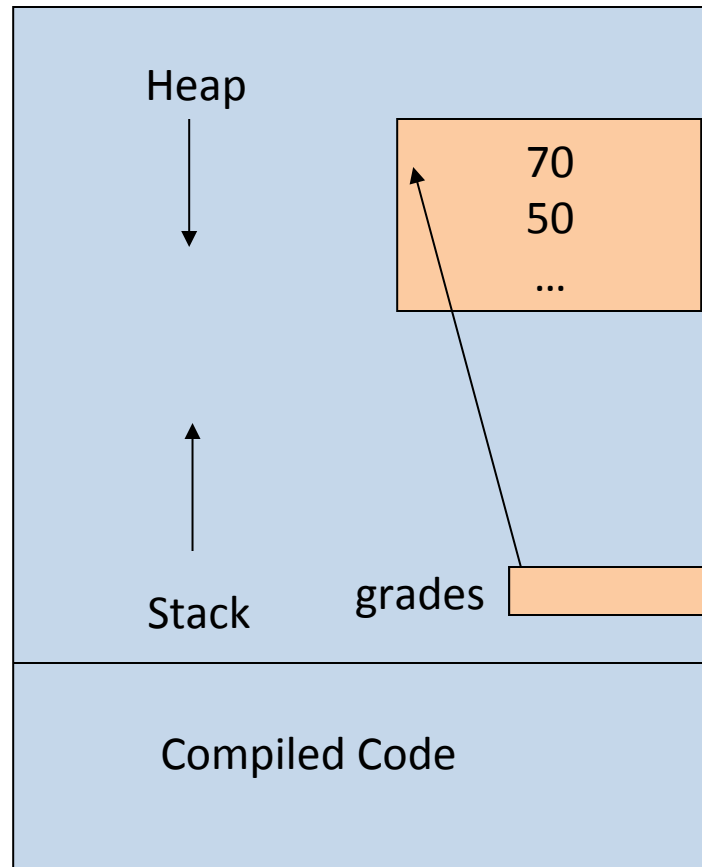
Sample Final Exam Questions

# “Array” In Olden Days (e.g., C)

```
int grades[];
```

```
grades = malloc(sizeof(int) * numStudents);
```

# How Did It Work?



# Arrays in Java

- Ability to declare a bunch of the same thing

```
String[] args;
```

```
int[] grades = new int[numStudents];
```

```
int[] grades = {70,50,66,43,99,85,73};
```

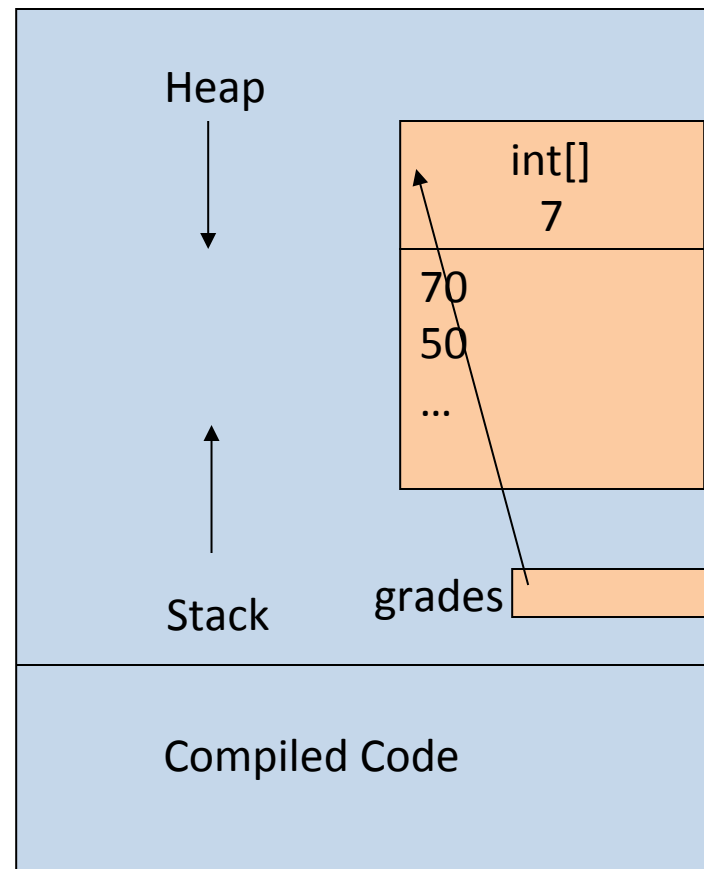
- Access the array with square brackets
- Arrays start with zero!

```
args[0];
```

- Array length is `.length`

```
for (int i = 0; i < grades.length; i++)  
    grade[i]...
```

# How Do Arrays Work?



# Unlike C Arrays

- Java Arrays
  - Know their size
    - Array index bounds are checked on every access
  - Know their type
    - Like all other Java objects
    - We'll discuss the ramifications of this later

# Example – PrintArgs

```
public class PrintArgs {  
    public static void main(String[] args) {  
  
        // Prints out the arguments  
        for (int i=0; i<args.length; i++) {  
            System.out.println("args[" +  
                i + "]=\"" + args[i] + "\"");  
        }  
    }  
}
```



# Example – LoadGrades

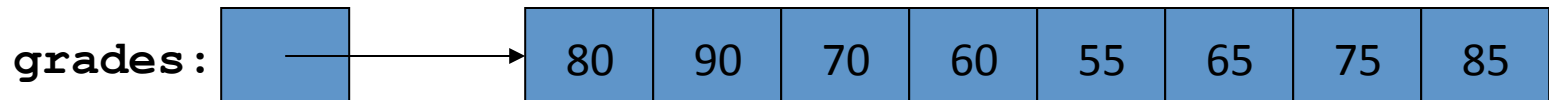
```
public class LoadGrades {  
    public static void main(String[] args) {  
  
        int[] grades = new int[args.length];  
        for (int i=0; i<args.length; i++) {  
            grades[i] = Integer.parseInt(args[i]);  
        }  
  
        // insert something interesting here  
  
        for (int i=0; i<grades.length; i++) {  
            System.out.println(grades[i]);  
        }  
    }  
}
```

# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```

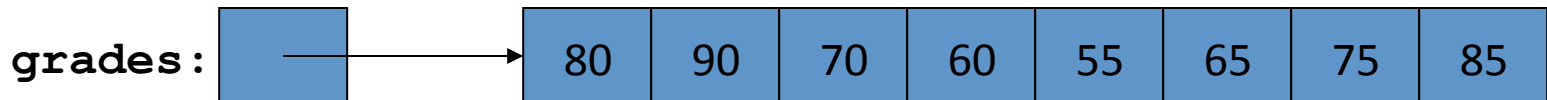
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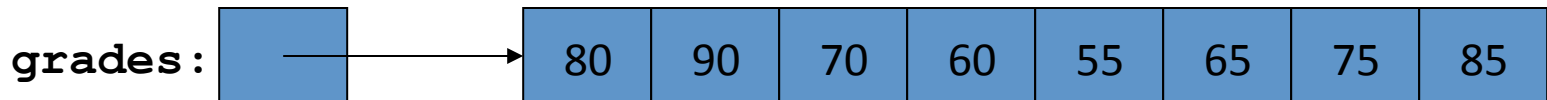
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    }
}
```



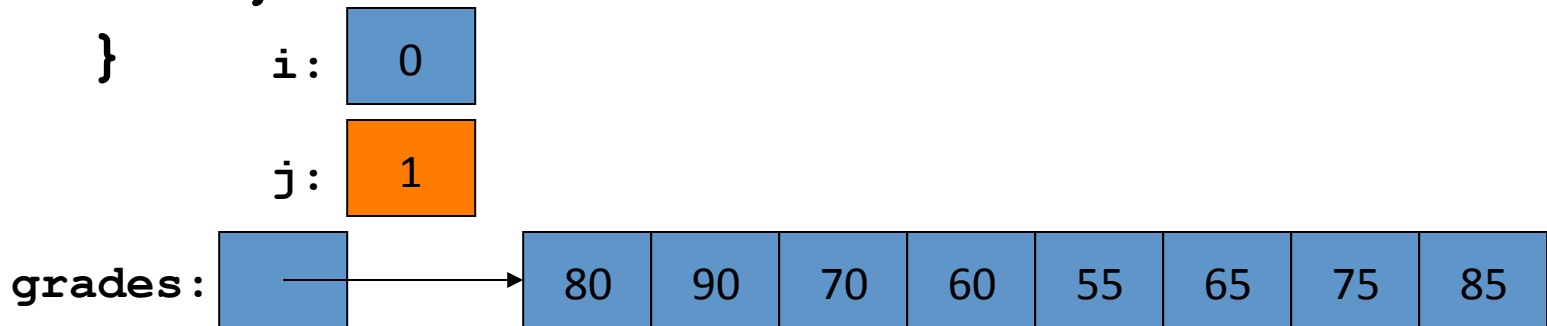
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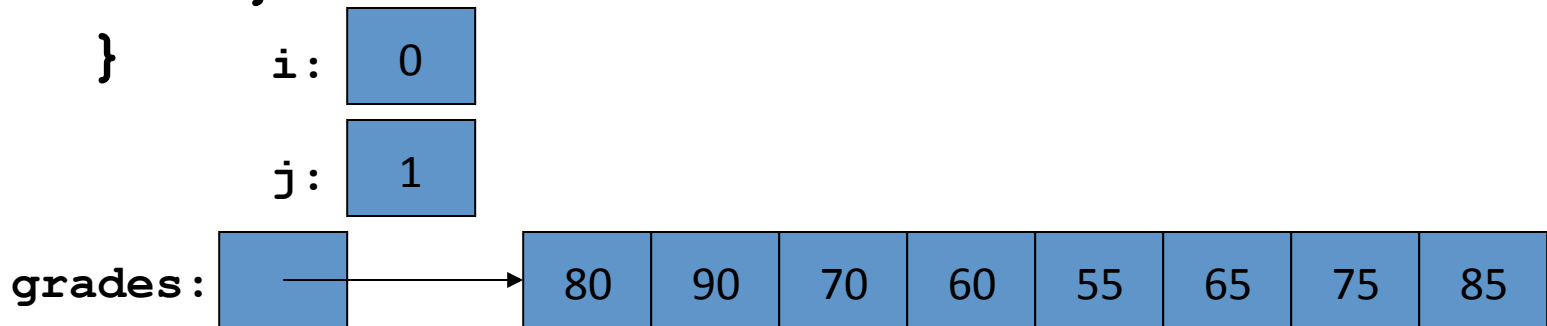
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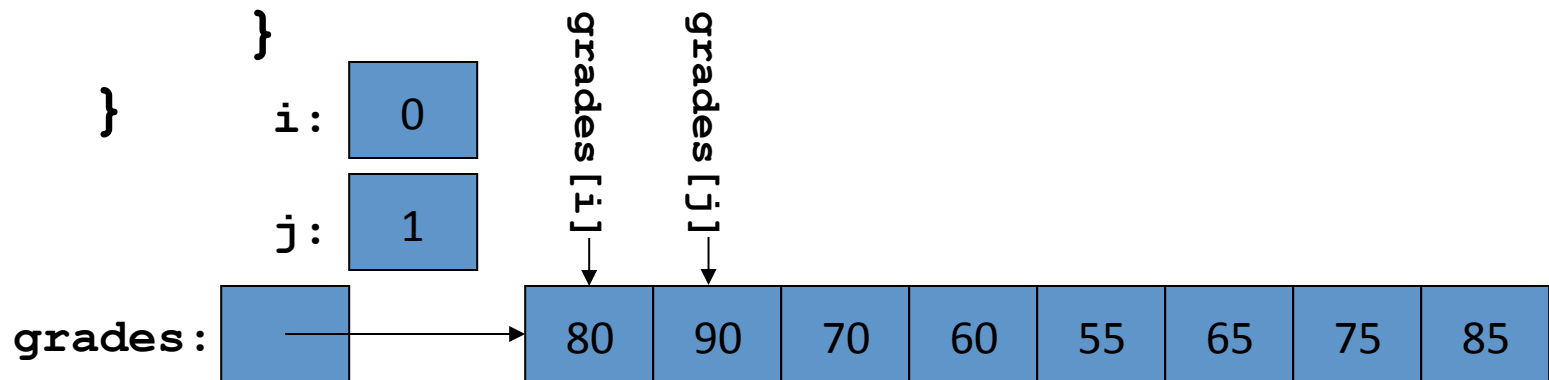
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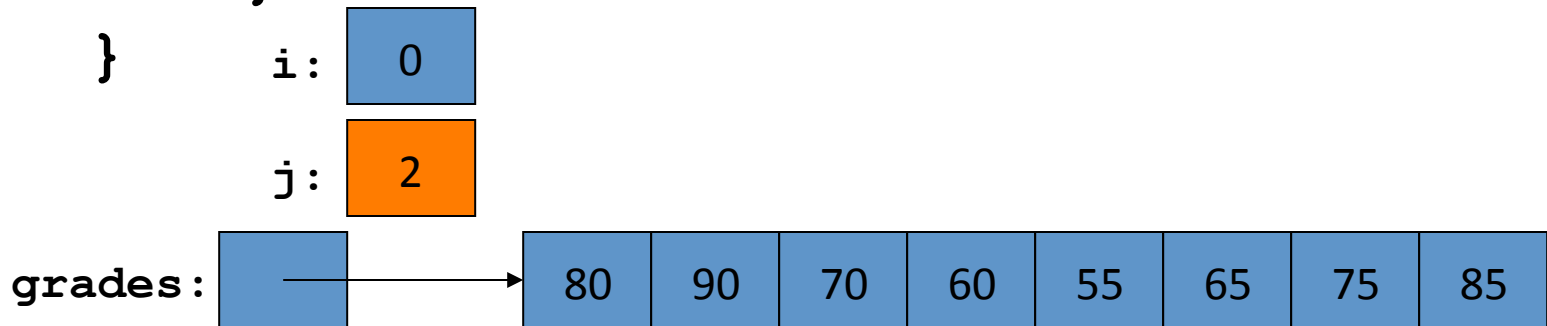
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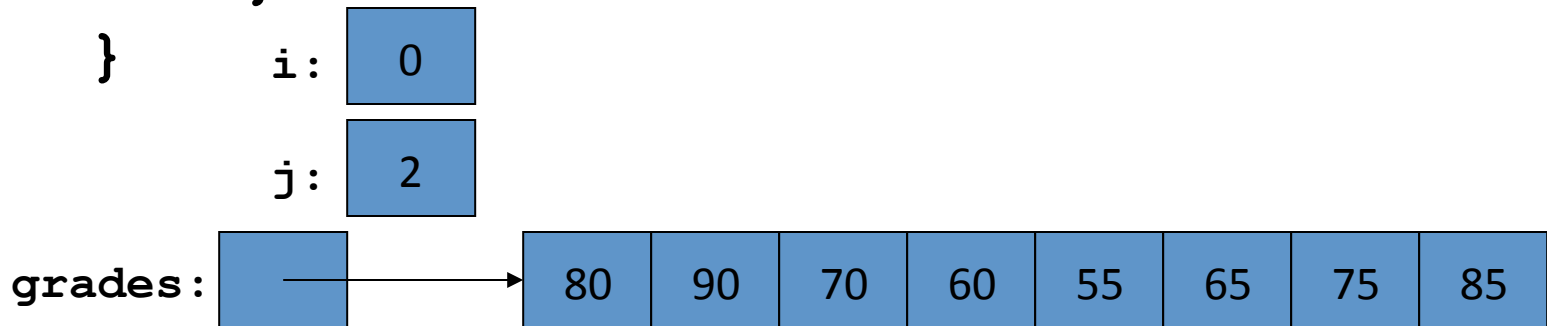
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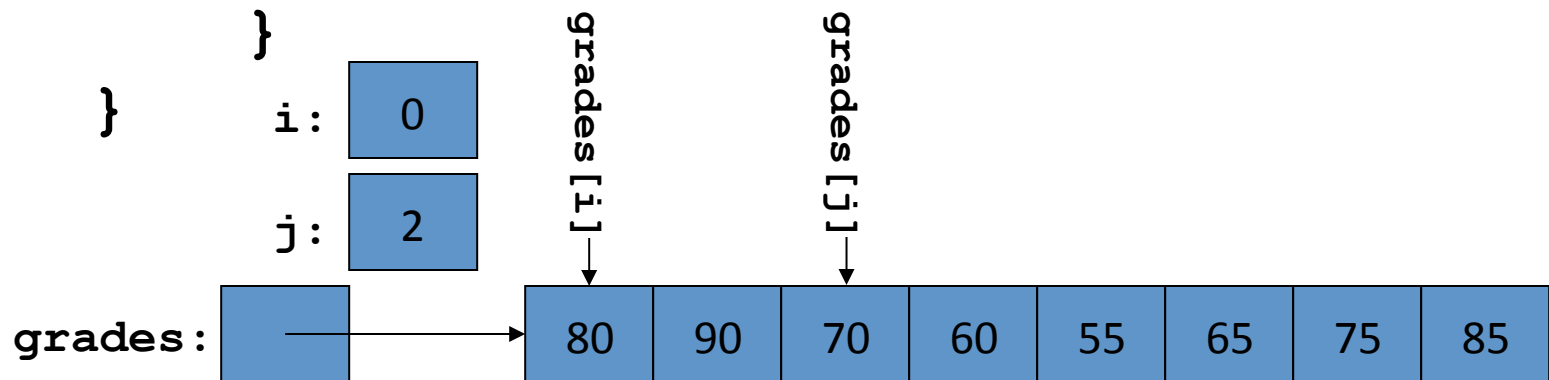
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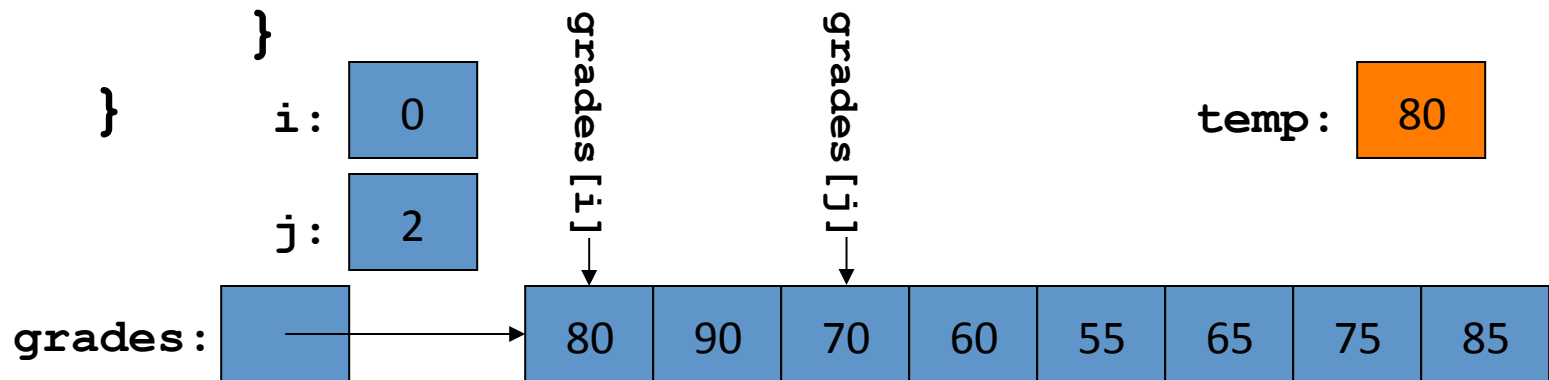
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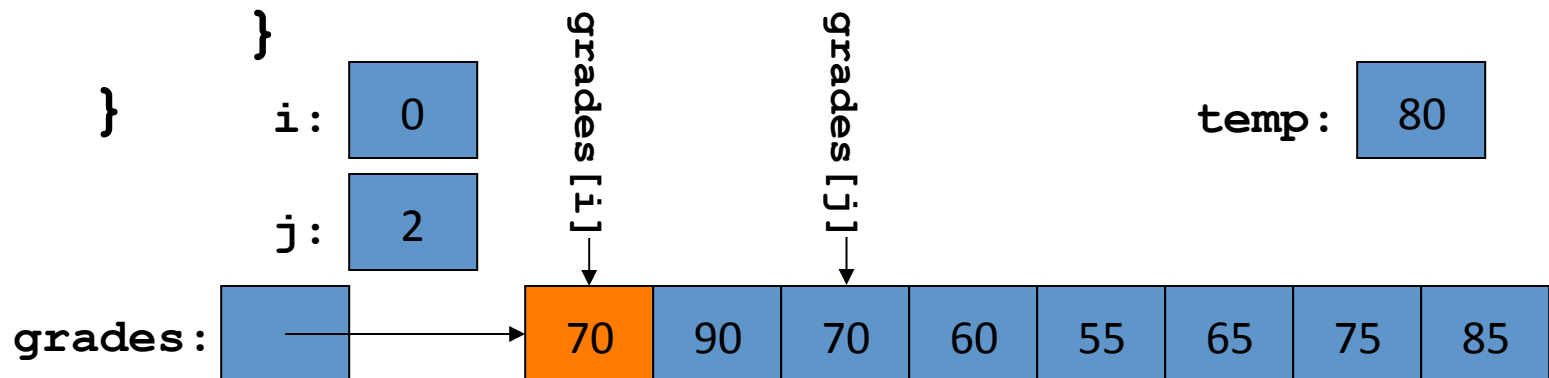
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```



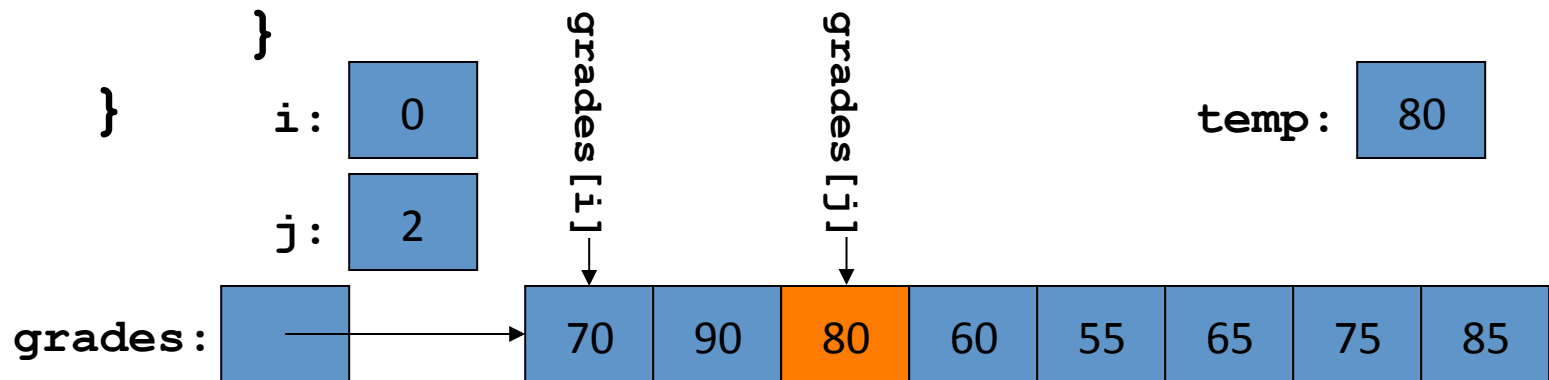
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}
```



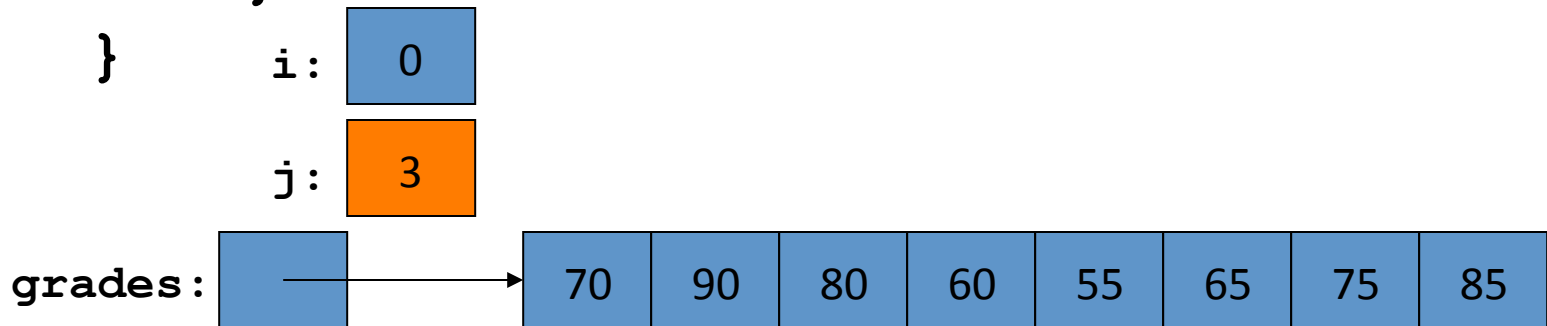
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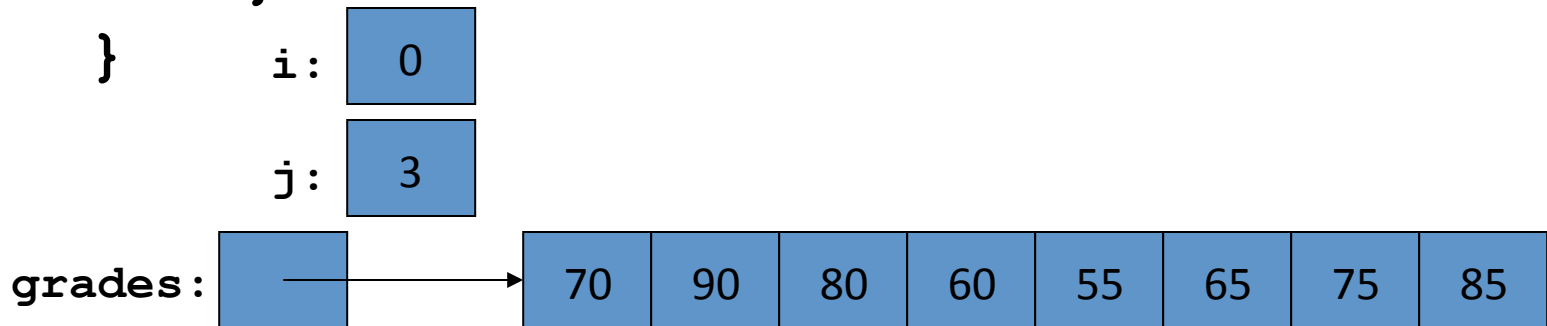
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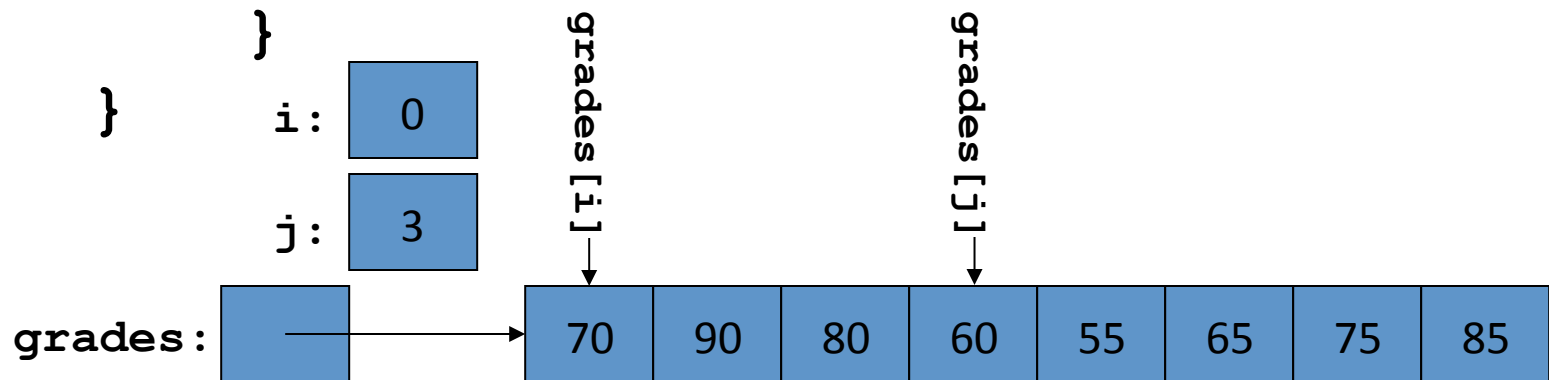
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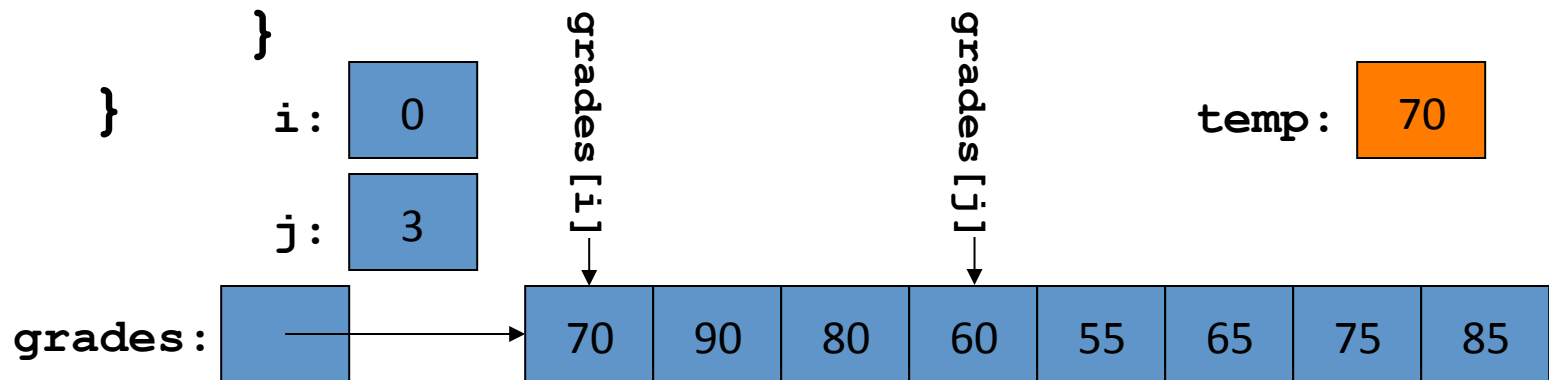
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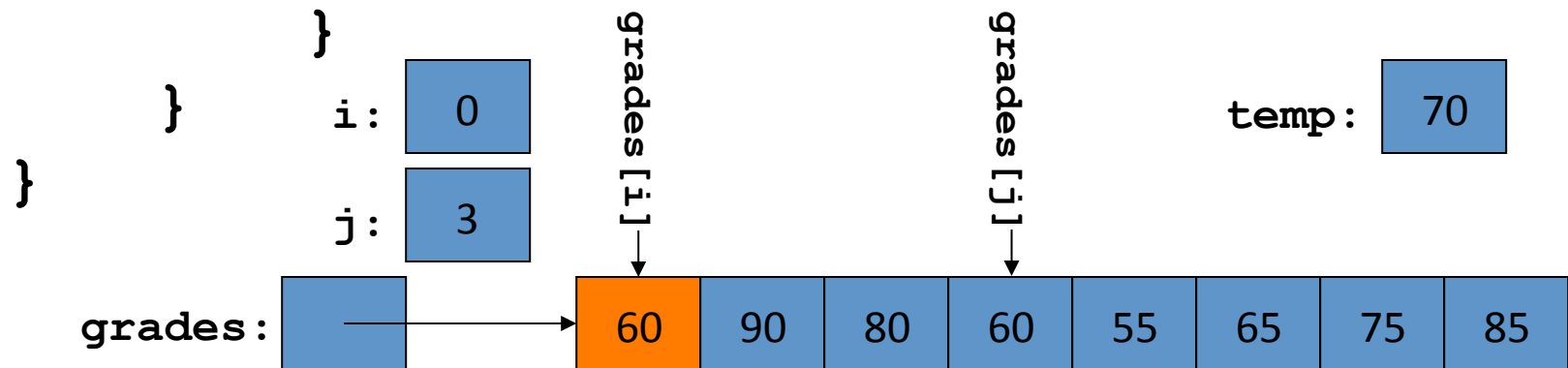
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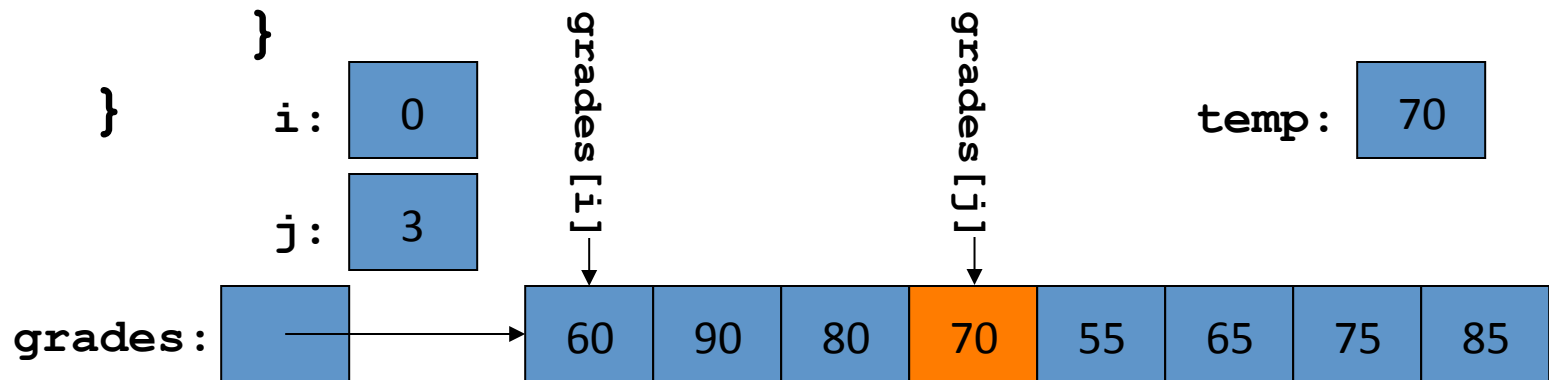
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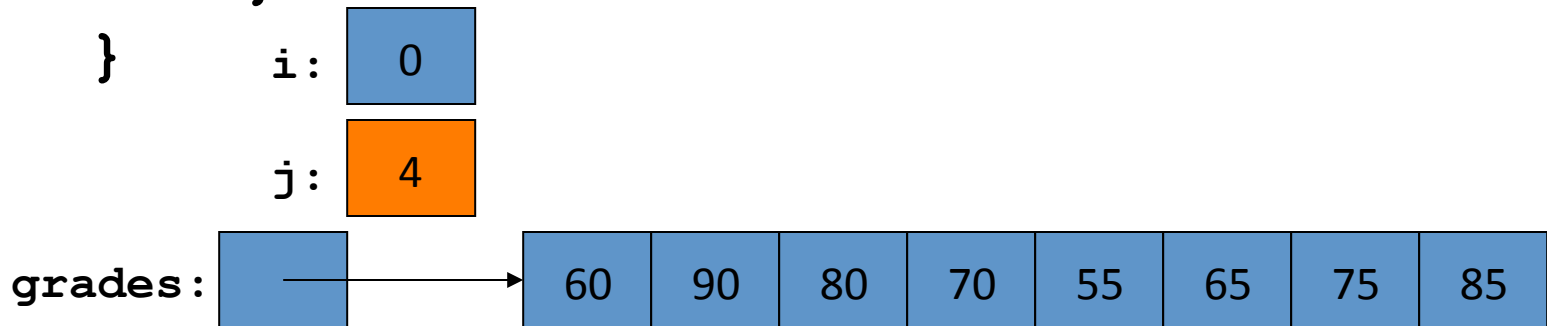
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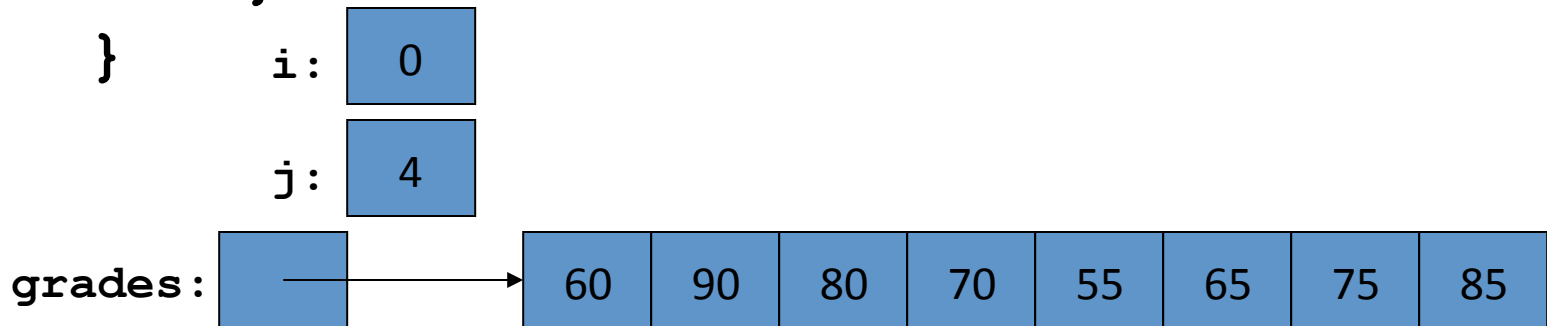
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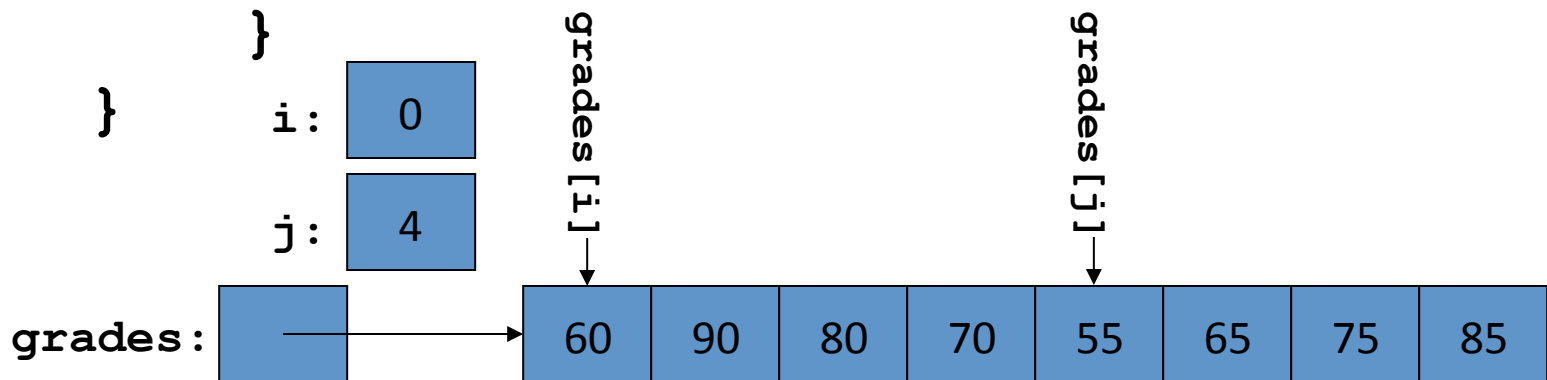
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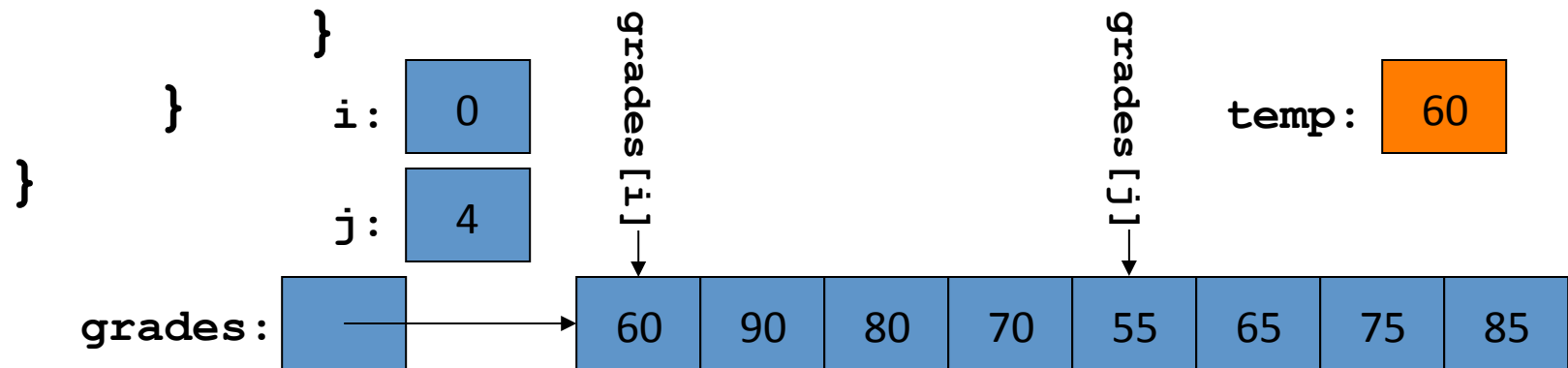
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# Example – SortGrades

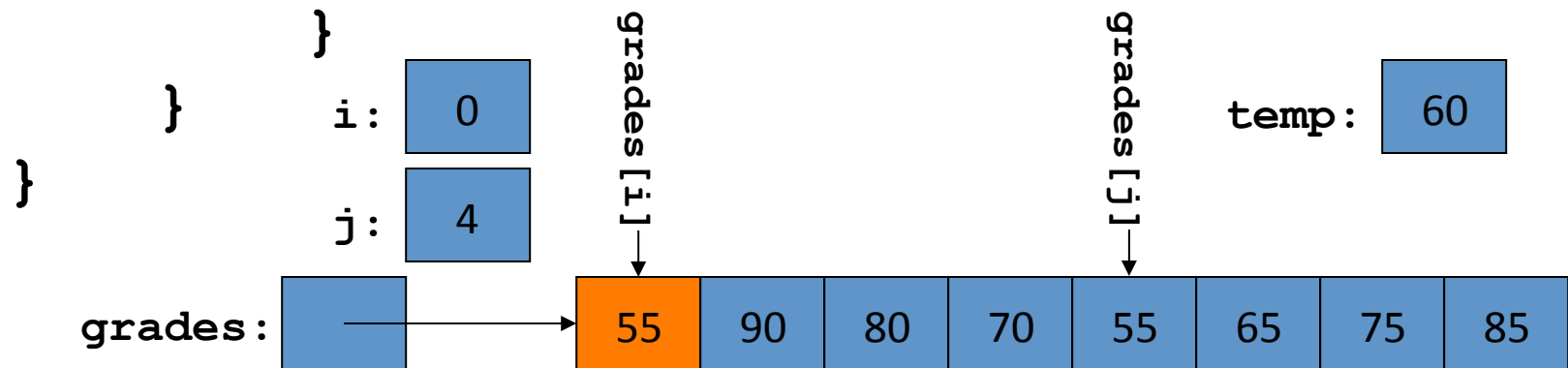
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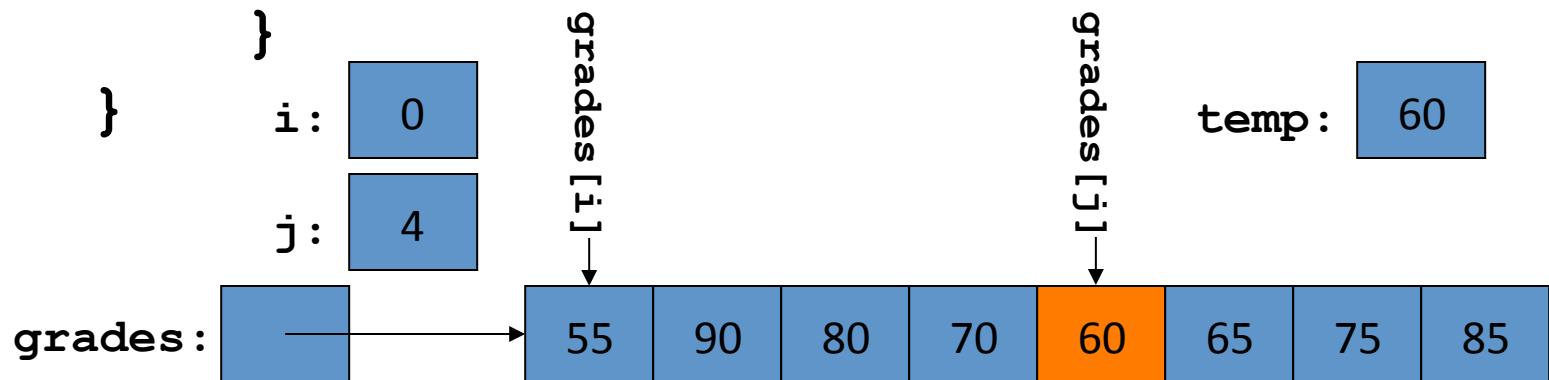
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}
```



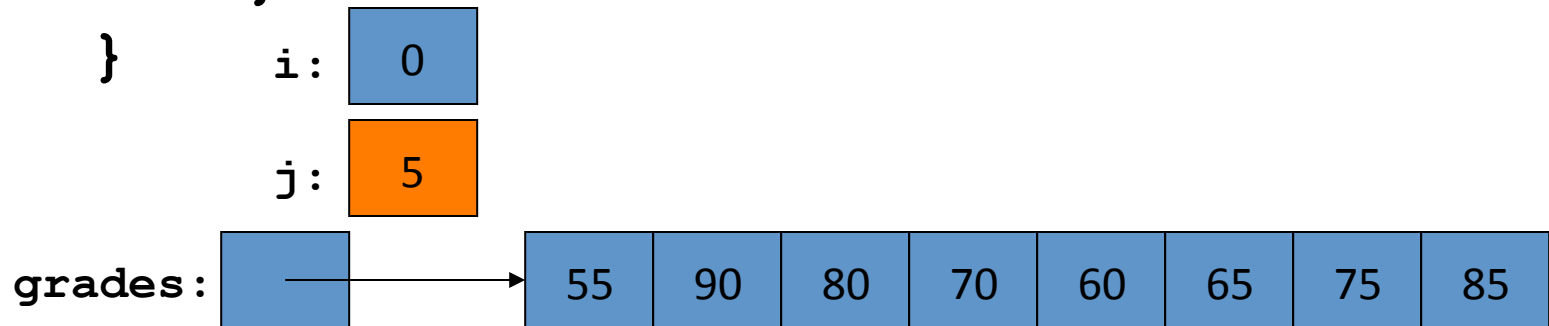
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



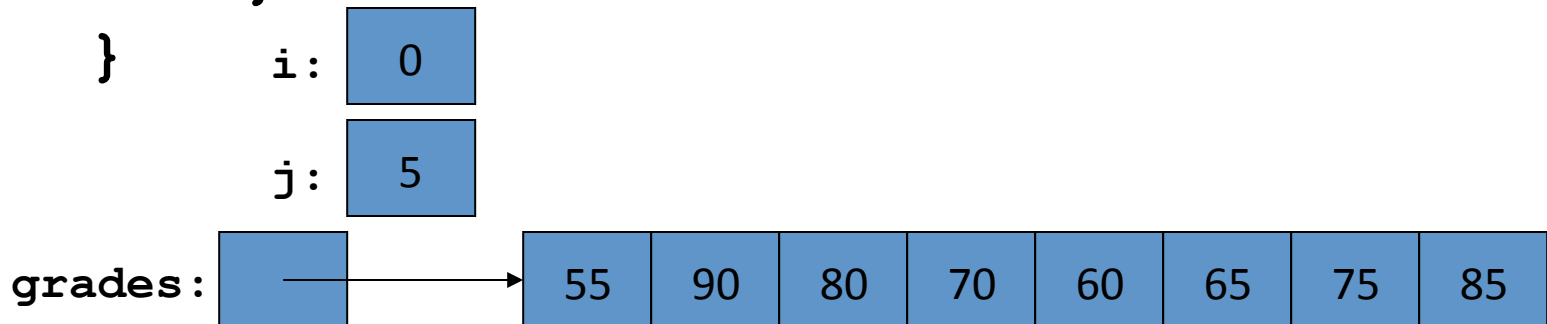
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



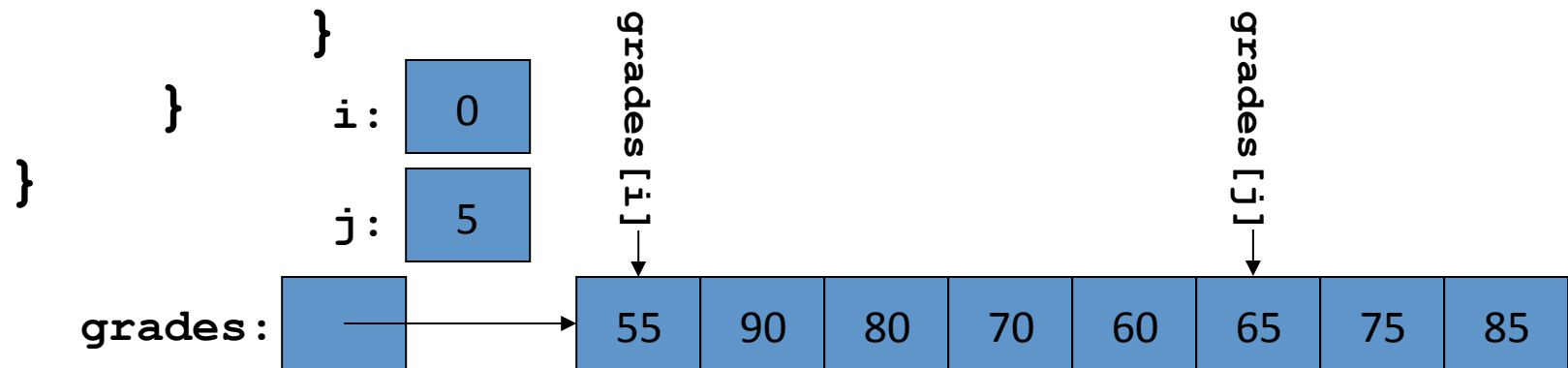
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



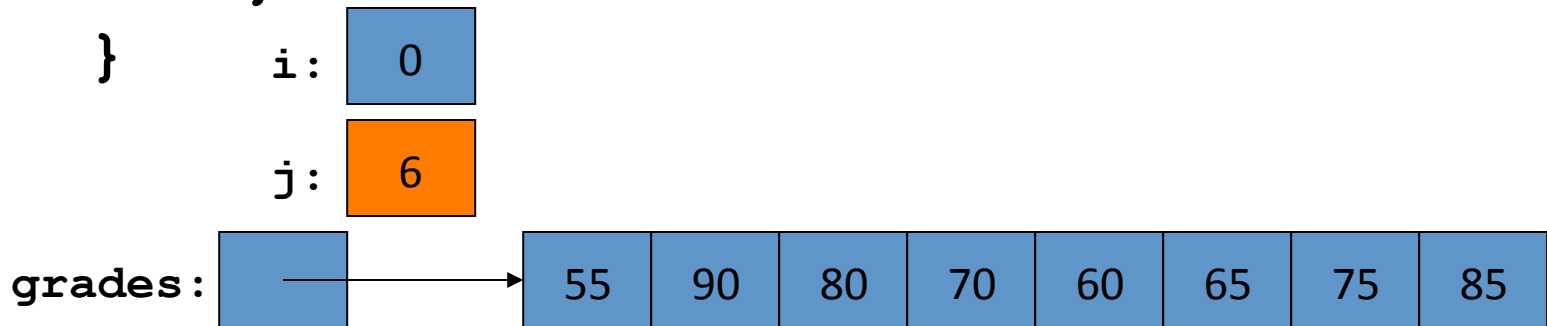
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



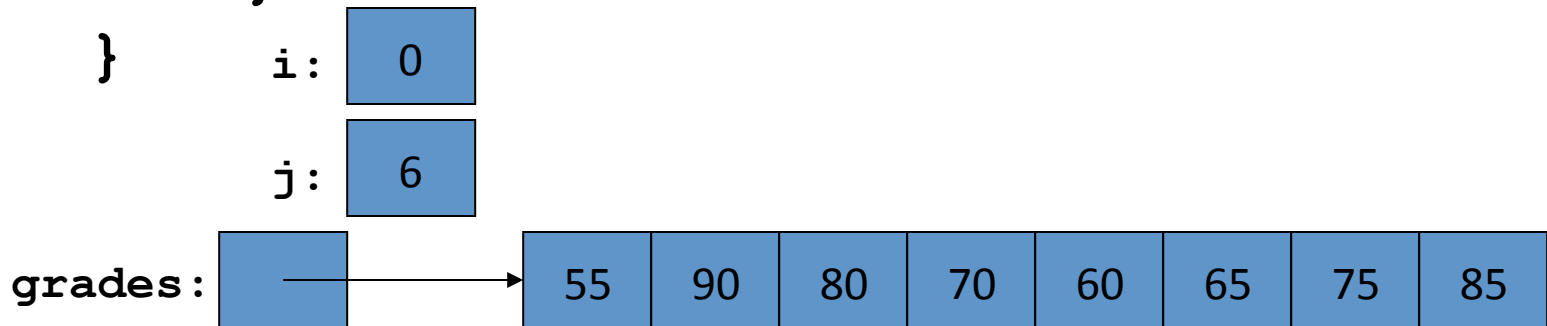
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



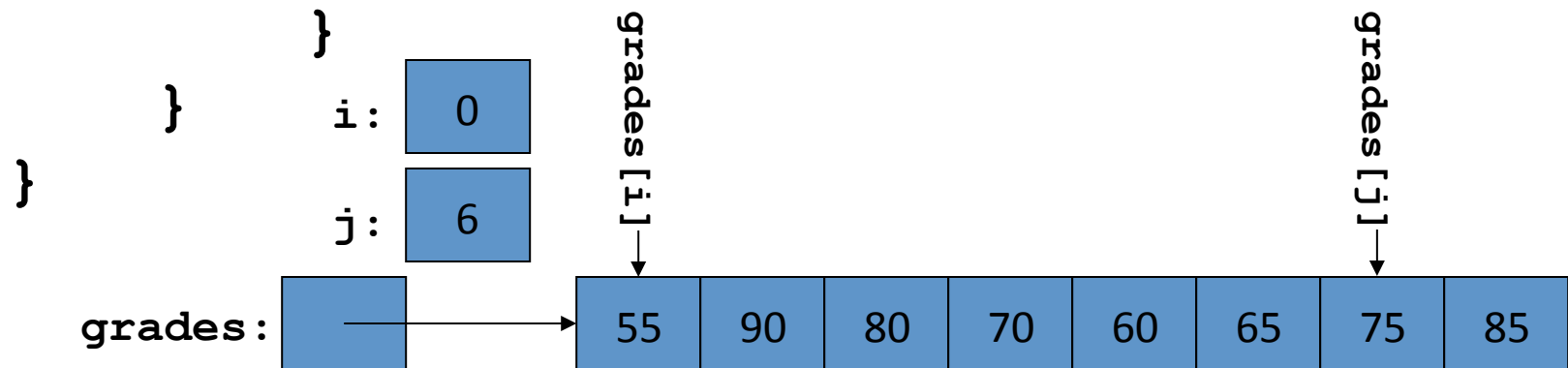
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```





# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```

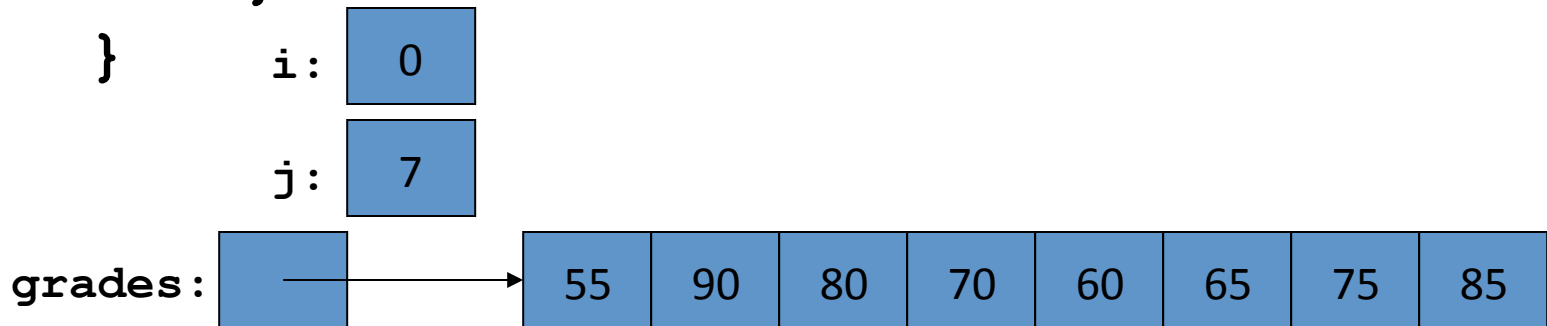
i: 0

j: 7

grades: [ ] → [ 55 | 90 | 80 | 70 | 60 | 65 | 75 | 85 ]

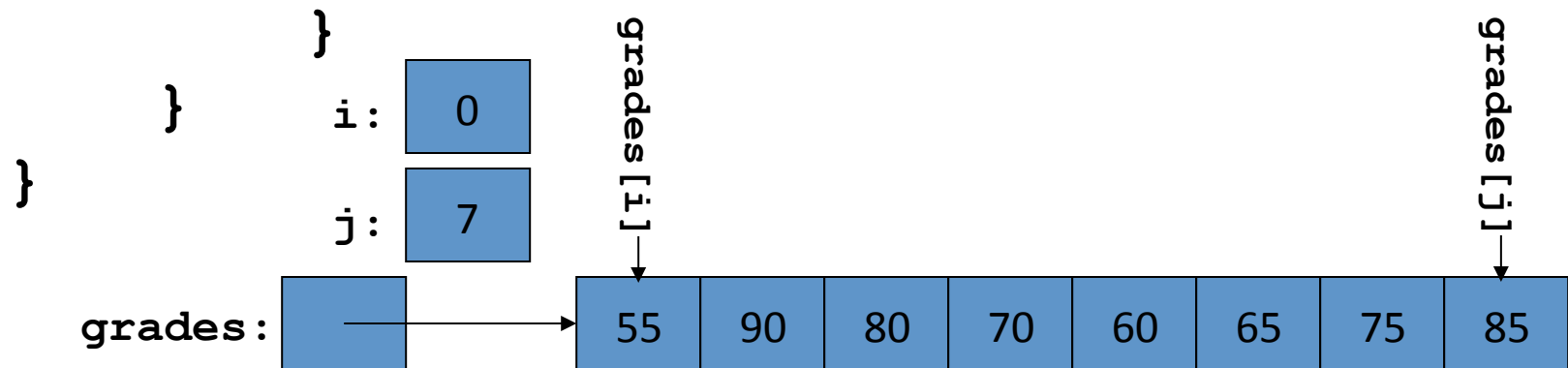
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



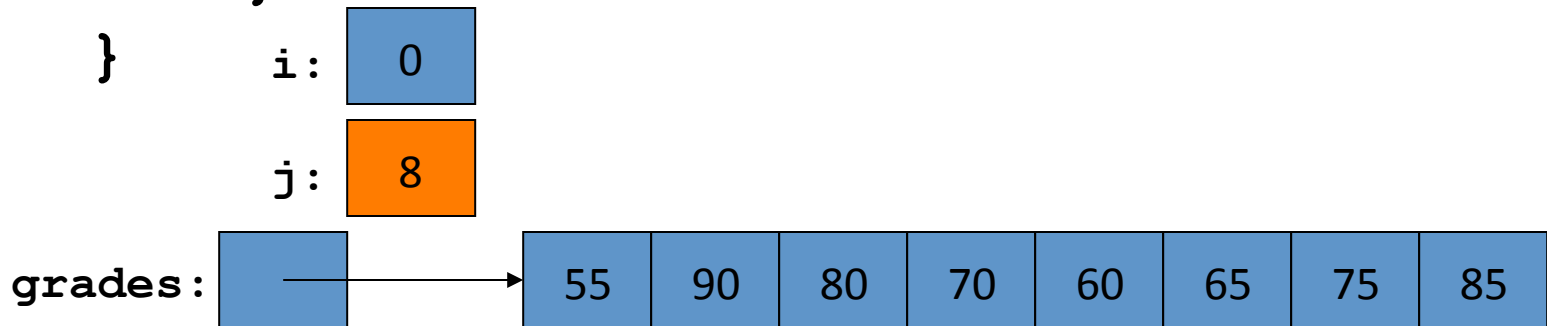
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



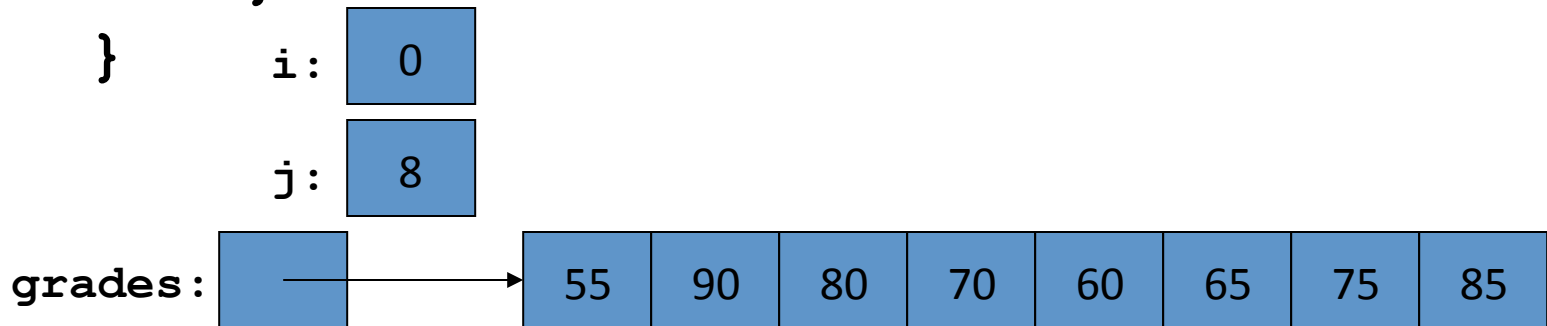
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



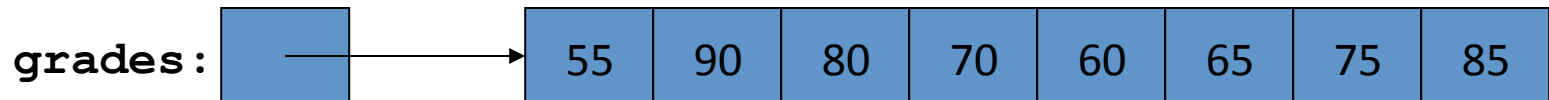
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



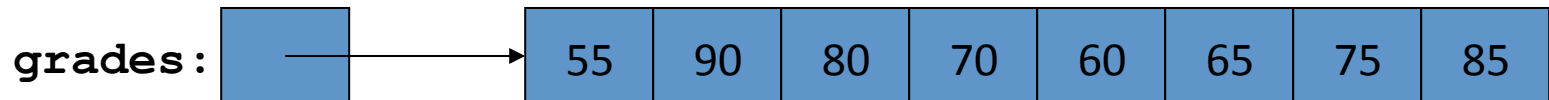
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
    i: 1
}
```



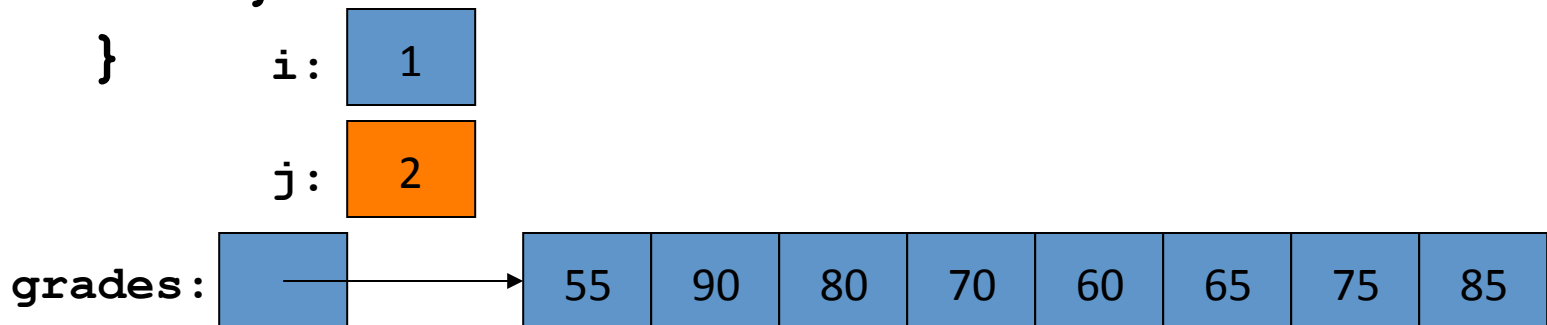
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
    i: 1
}
}
```



# Example – SortGrades

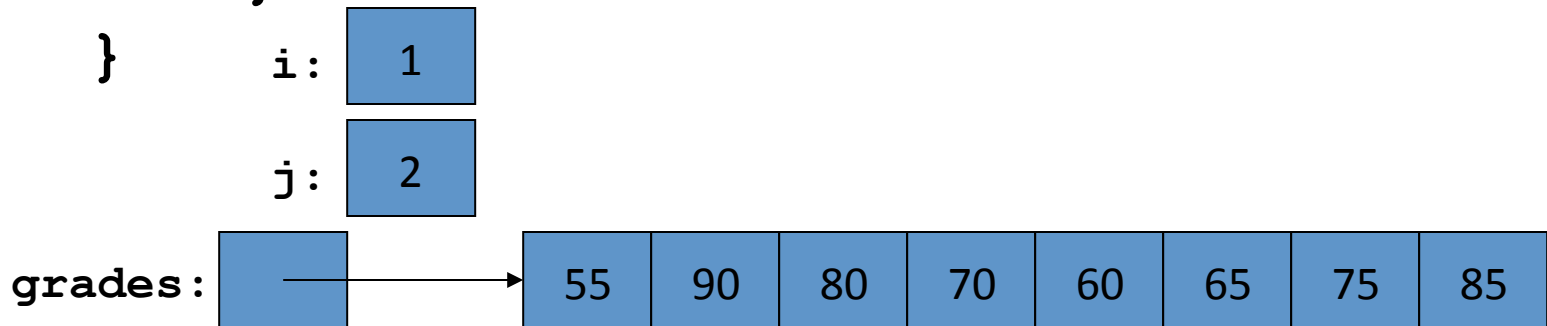
```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```





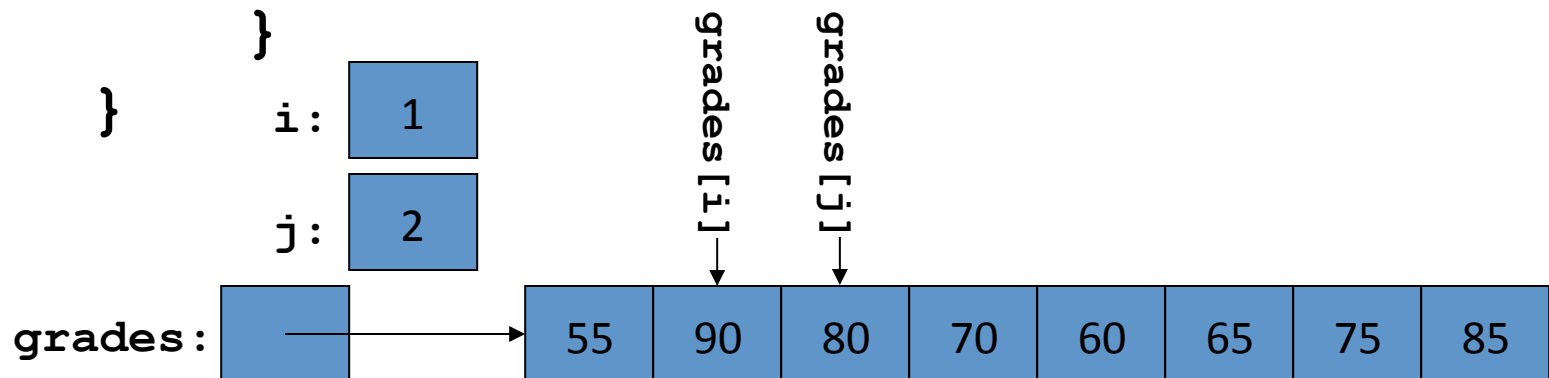
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



# Example – SortGrades

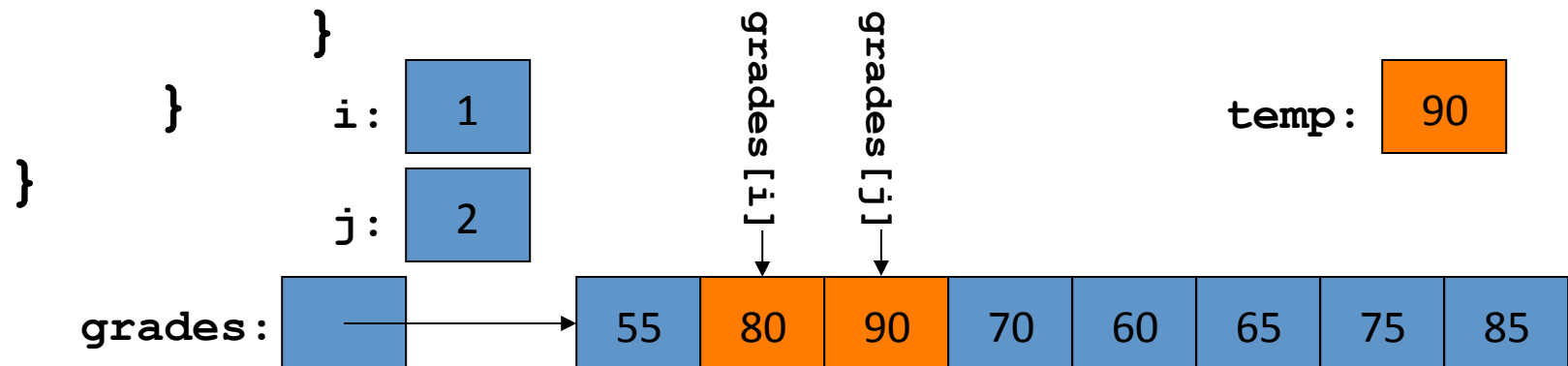
```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



# Example – SortGrades

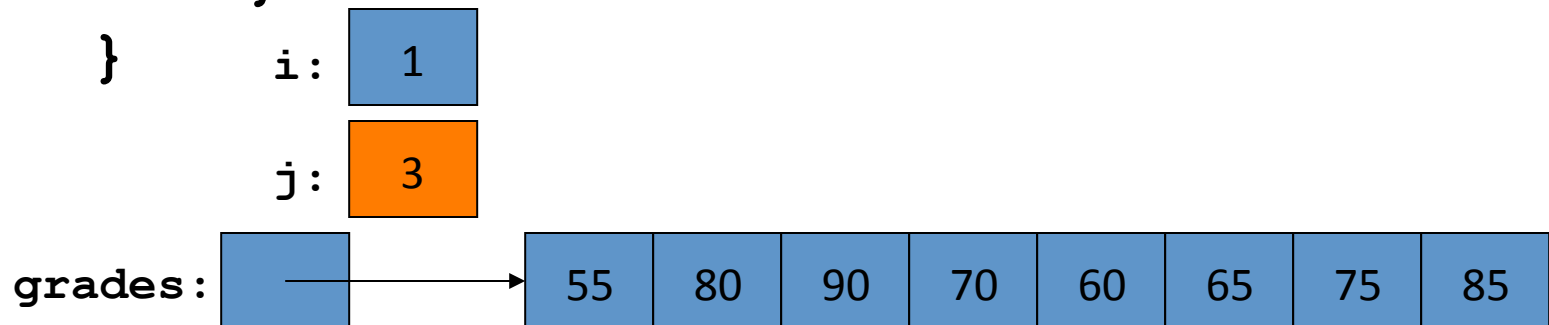
```
// Here's something interesting...  
for (int i=0; i<grades.length; i++) {  
    for (int j=i+1; j<grades.length; j++) {  
        if (grades[j] < grades[i]) {
```

```
            int temp = grades[i];  
            grades[i] = grades[j];  
            grades[j] = temp;
```



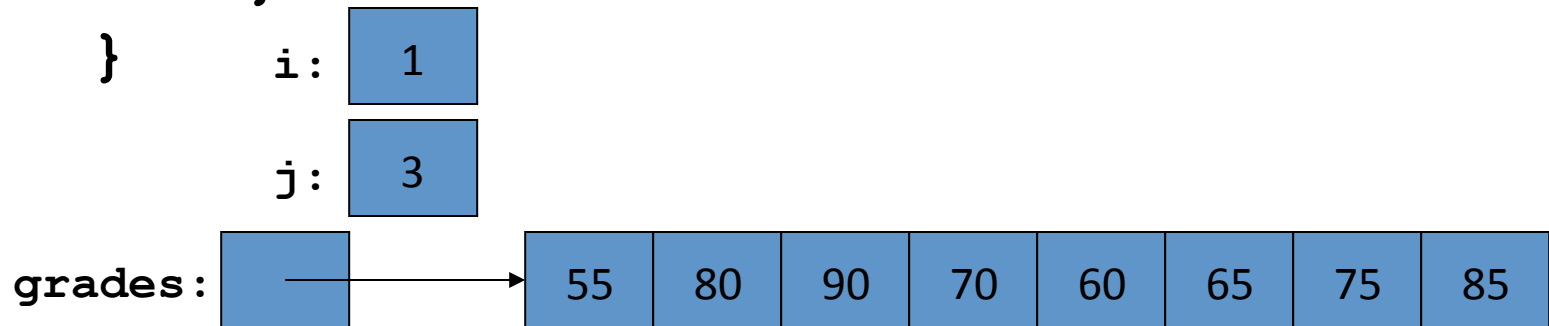
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



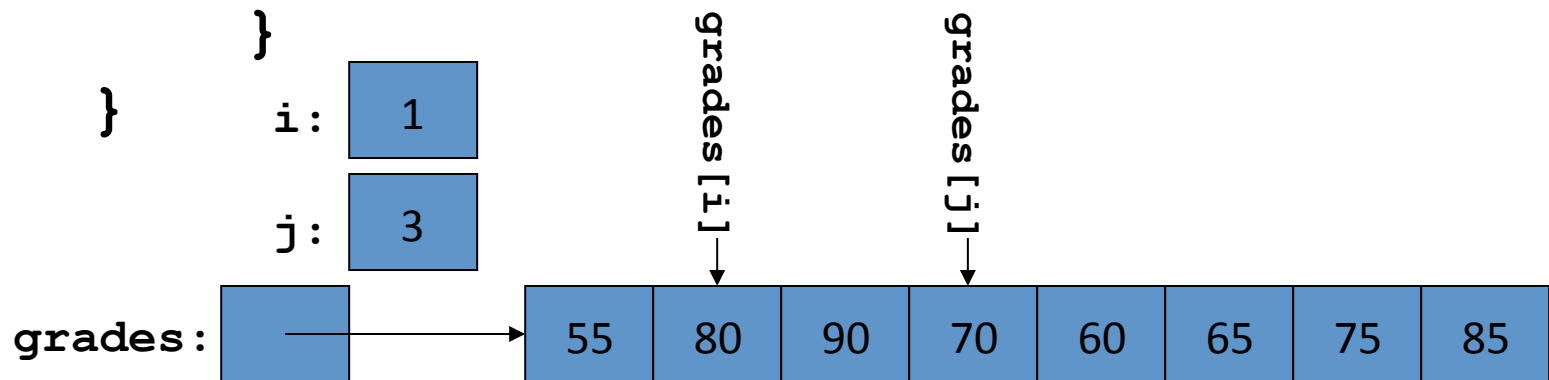
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



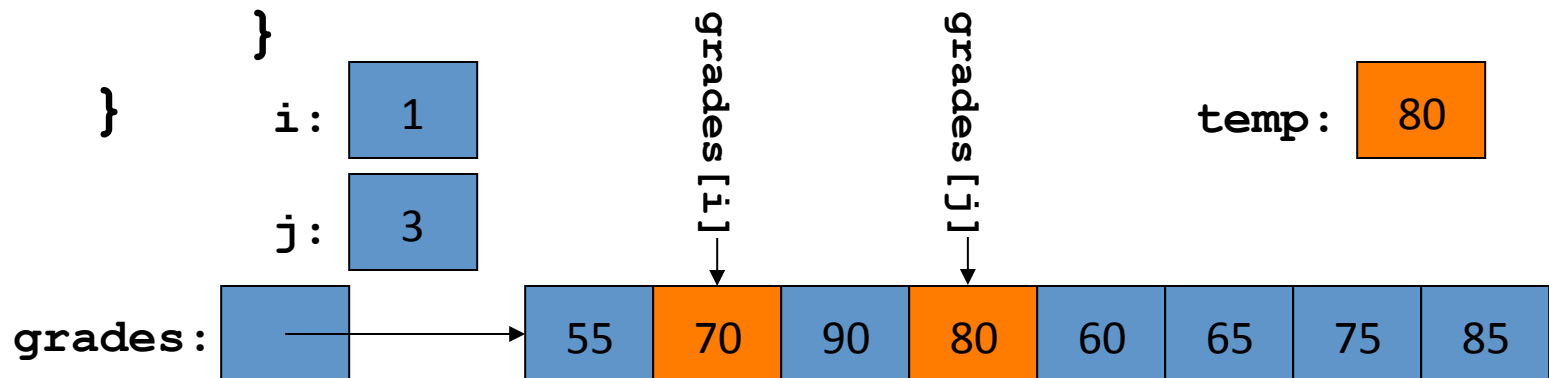
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



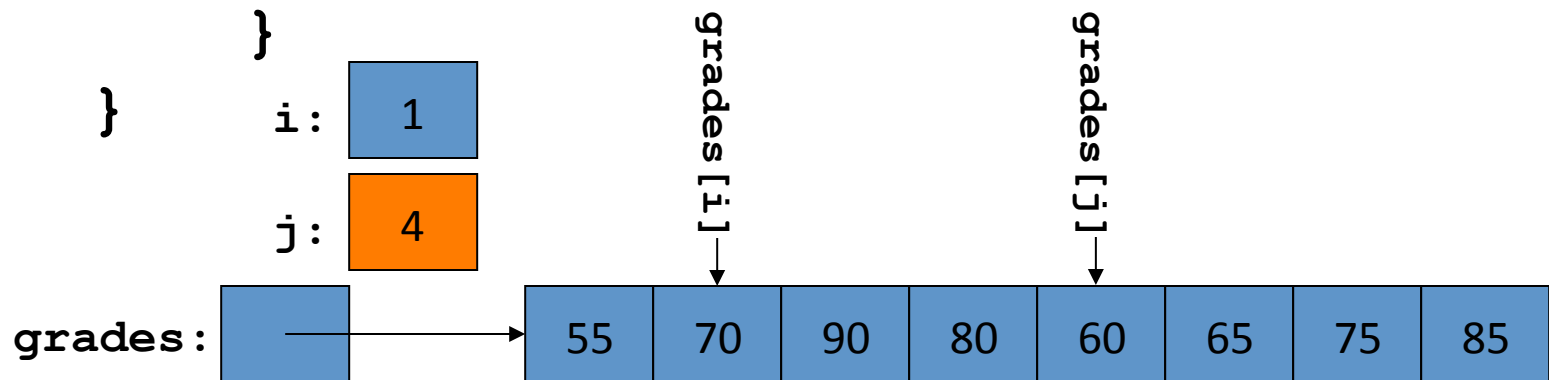
# Example – SortGrades

```
// Here's something interesting...  
for (int i=0; i<grades.length; i++) {  
    for (int j=i+1; j<grades.length; j++) {  
        if (grades[j] < grades[i]) {  
            int temp = grades[i];  
            grades[i] = grades[j];  
            grades[j] = temp;  
        }  
    }  
}
```



# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```

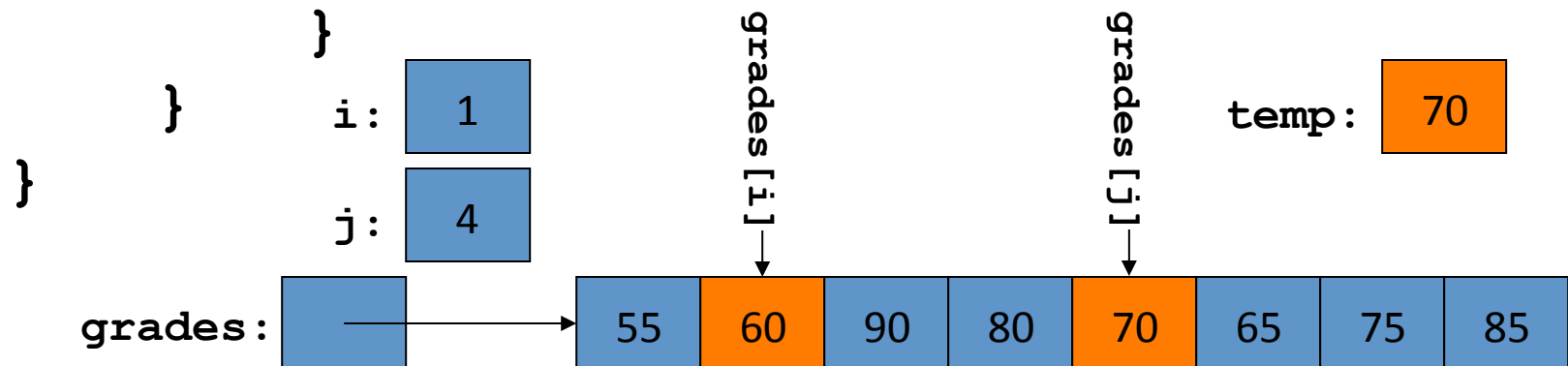




# Example – SortGrades

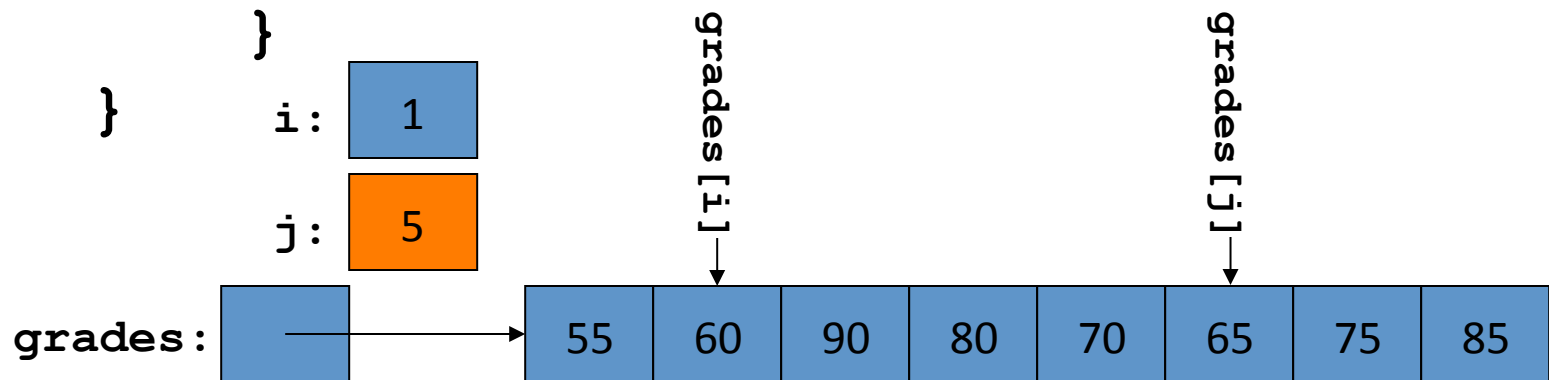
```
// Here's something interesting...  
for (int i=0; i<grades.length; i++) {  
    for (int j=i+1; j<grades.length; j++) {  
        if (grades[j] < grades[i]) {
```

```
            int temp = grades[i];  
            grades[i] = grades[j];  
            grades[j] = temp;
```



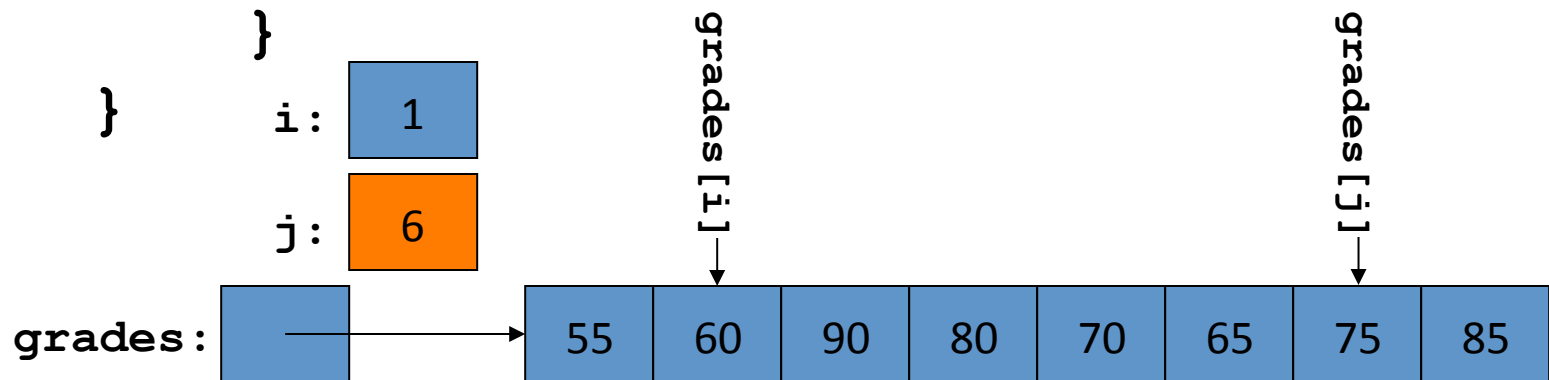
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



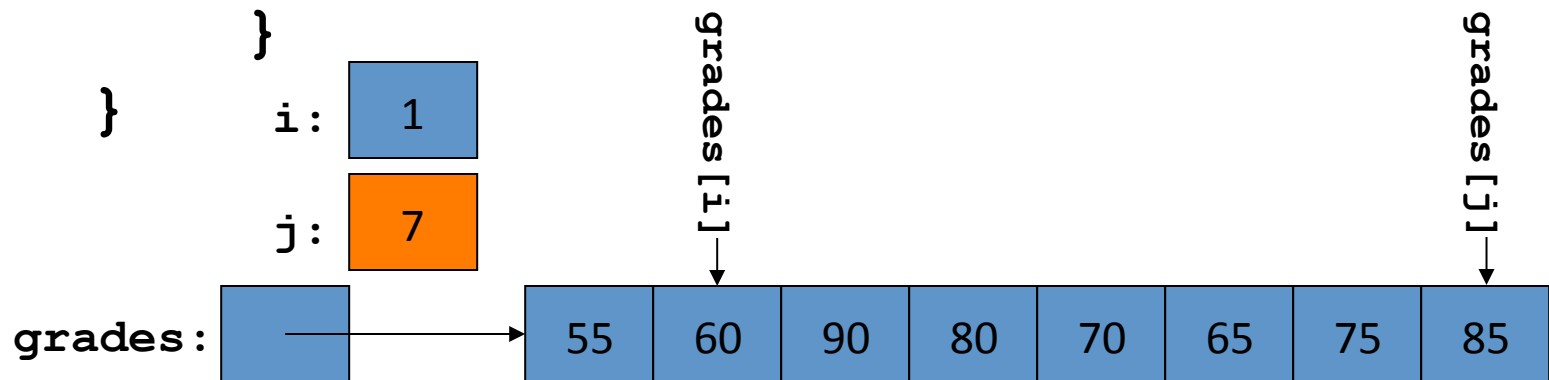
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



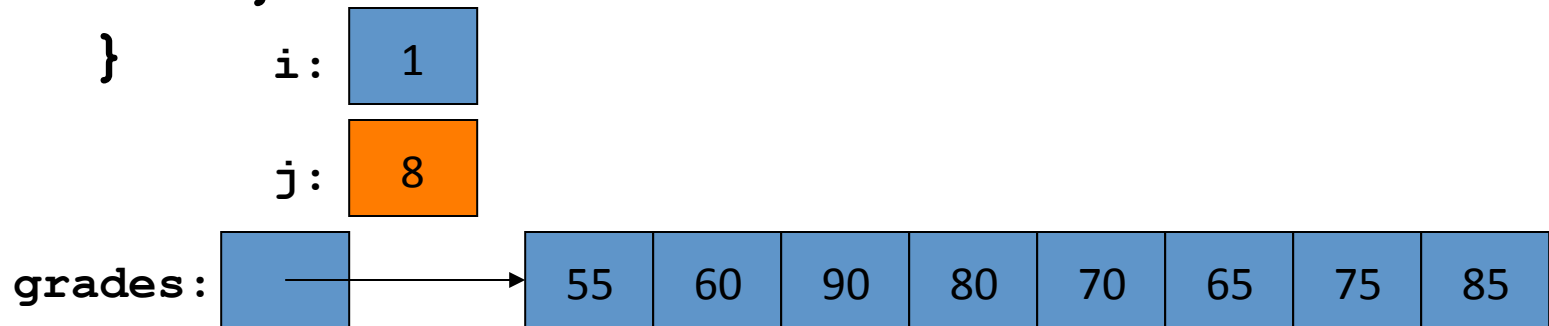
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



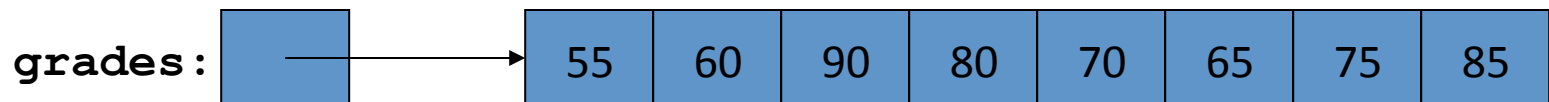
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
    i: 2
}
```

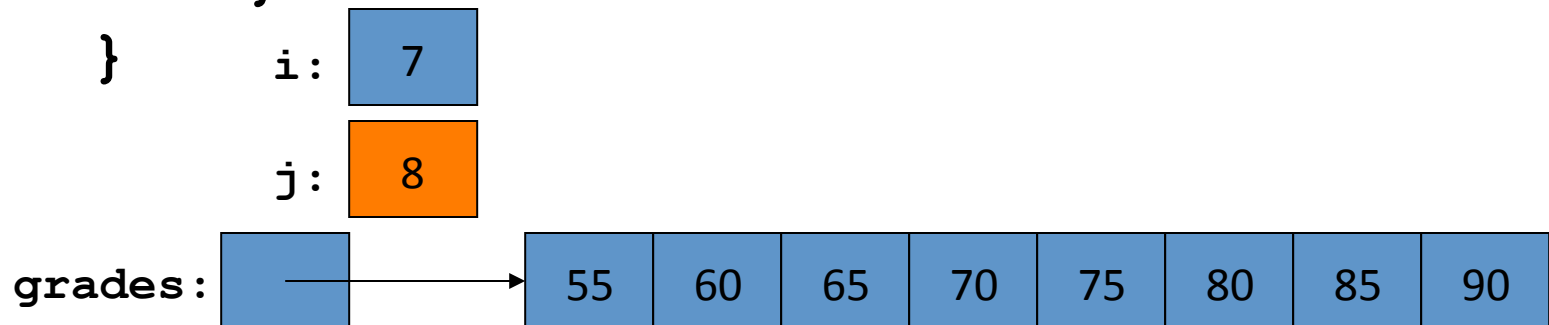


# Sorting Grades

Initial Values:	80	90	70	60	55	65	75	85
End of i=0 loop:	55	90	80	70	60	65	75	85
End of i=1 loop:	55	60	90	80	70	65	75	85
End of i=2 loop:	55	60	65	90	80	70	75	85
End of i=3 loop:	55	60	65	70	90	80	75	85
End of i=4 loop:	55	60	65	70	75	90	80	85
End of i=5 loop:	55	60	65	70	75	80	90	85
End of i=6 loop:	55	60	65	70	75	80	85	90

# Example – SortGrades

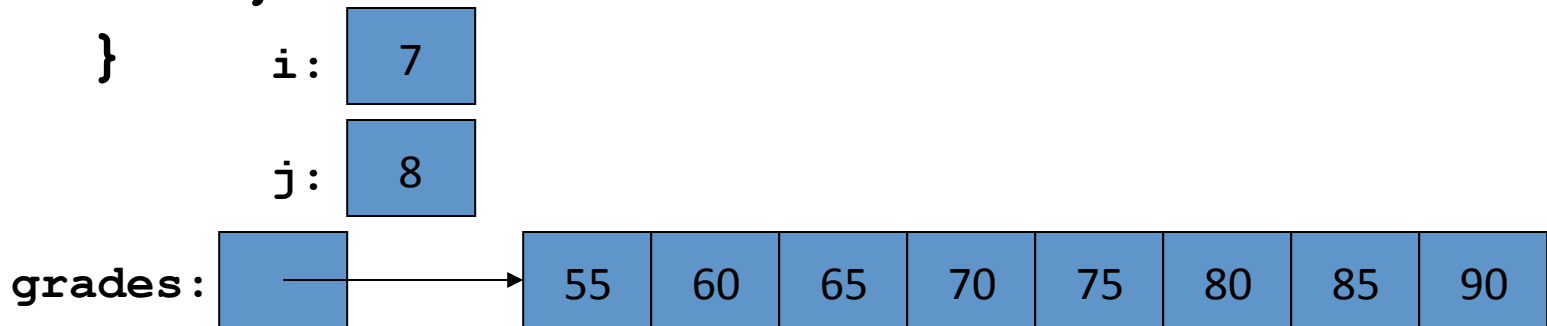
```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```





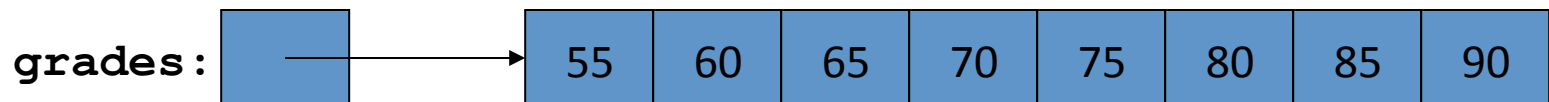
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



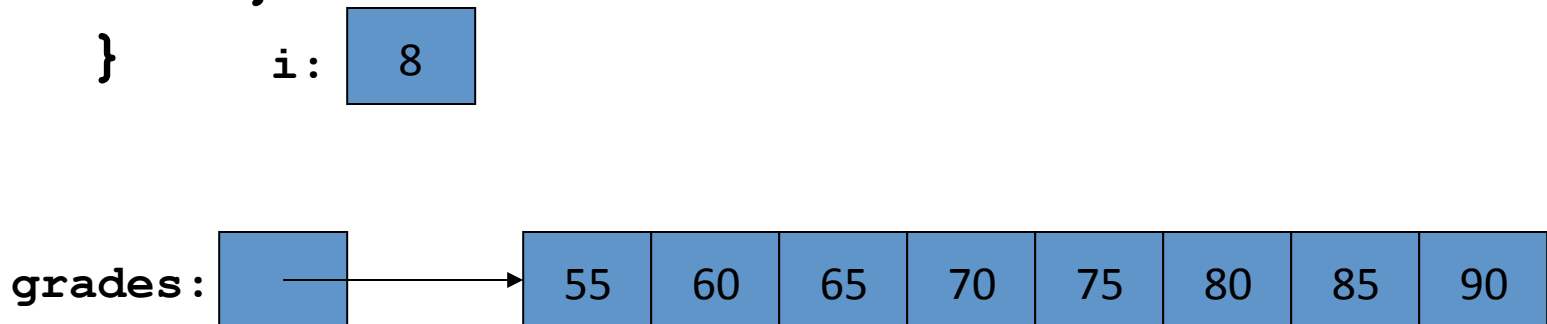
# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
    i: 8
}
```



# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```



# Example – SortGrades

```
// Here's something interesting...
for (int i=0; i<grades.length; i++) {
    for (int j=i+1; j<grades.length; j++) {
        if (grades[j] < grades[i]) {
            int temp = grades[i];
            grades[i] = grades[j];
            grades[j] = temp;
        }
    }
}
```

Initial Values:

80	90	70	60	55	65	75	85
----	----	----	----	----	----	----	----

Final Values:

55	60	65	70	75	80	85	90
----	----	----	----	----	----	----	----

# The Java For-Each Loop

- So often you just want to iterate over each element in an array

- The Java for-each loop is much simpler

**`for (vardecl : array) stmt;`**

- Example

**`for (String s : args) stmt;`**

- You only get **s** to use in the statement(s)
- Notice: they didn't call it foreach or use in

# For-Each Loops

- Example

```
for (String s : args) stmt;
```

Is equivalent to:

```
for (int i=0; i<args.length; i++) {  
    String s = args[i];  
    stmt;  
}
```

- Each time through the loop, **s** is a different element in the **args** array

# Example – PrintArgsAgain

```
public class PrintArgsAgain {  
    public static void main(String[] args) {  
        // Print out the arguments  
        for (String s : args) {  
            System.out.println(s);  
        }  
    }  
}
```

# Example – LoadGradesAgain

```
public class LoadGradesAgain {  
    public static void main(String[] args) {  
        int[] grades = new int[args.length];  
        for (int i=0; i<args.length; i++) {  
            grades[i] = Integer.parseInt(args[i]);  
        }  
        // insert something interesting here  
        for (int g : grades) System.out.println(g);  
    }  
}
```



# Remember This? (StockHolding.java from Lecture 4)

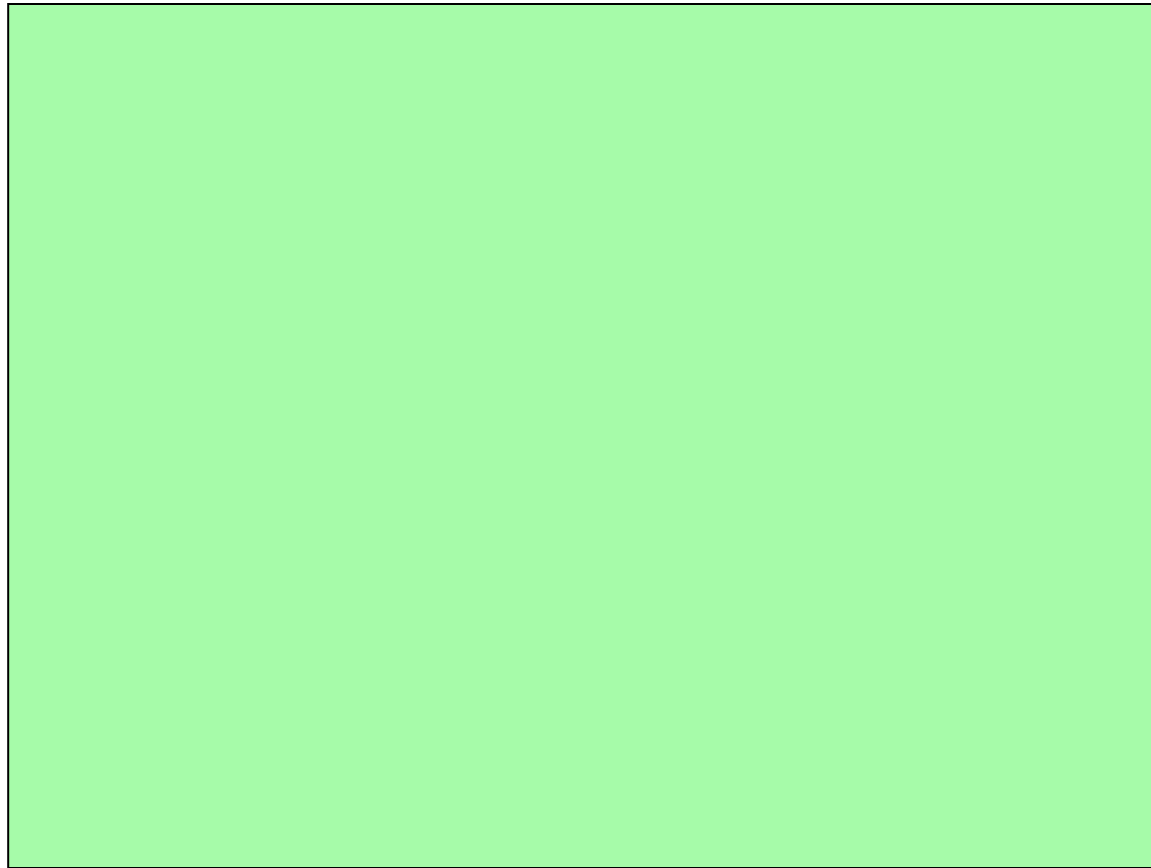
```
public class StockHolding {
    String ticker;
    int    shares;
    String name;
    float  price;

    // This is a constructor method...
    public StockHolding(String newTicker, int newShares) {
        ticker = newTicker;
        shares = newShares;
        StockQuote sq = new StockQuote(ticker);
        name    = sq.getName();
        price   = sq.getPrice();
    }
}
```

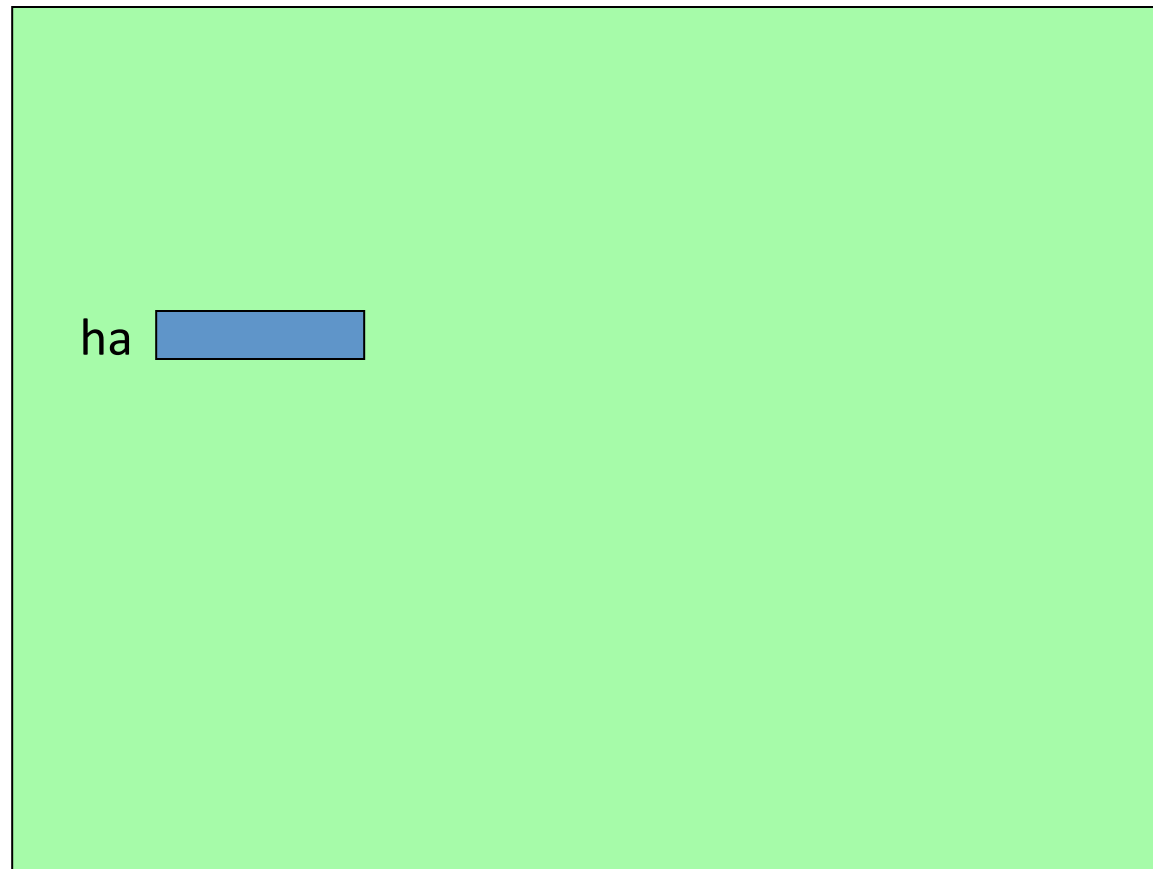
# An Array of StockHolding Objects

```
public class StockHoldingTest2 {  
    public static void main(String[] args) {  
        StockHolding[] ha = new StockHolding[5];  
        ha[0] = new StockHolding("IBM",100);  
        ha[1] = new StockHolding("MSFT",200);  
        ha[2] = new StockHolding("CSCO",300);  
        ha[3] = new StockHolding("DELL",400);  
        ha[4] = new StockHolding("EMC",500);  
  
        for (int i=0; i<ha.length; i++) {  
            System.out.println(...);  
        }  
    }  
}
```

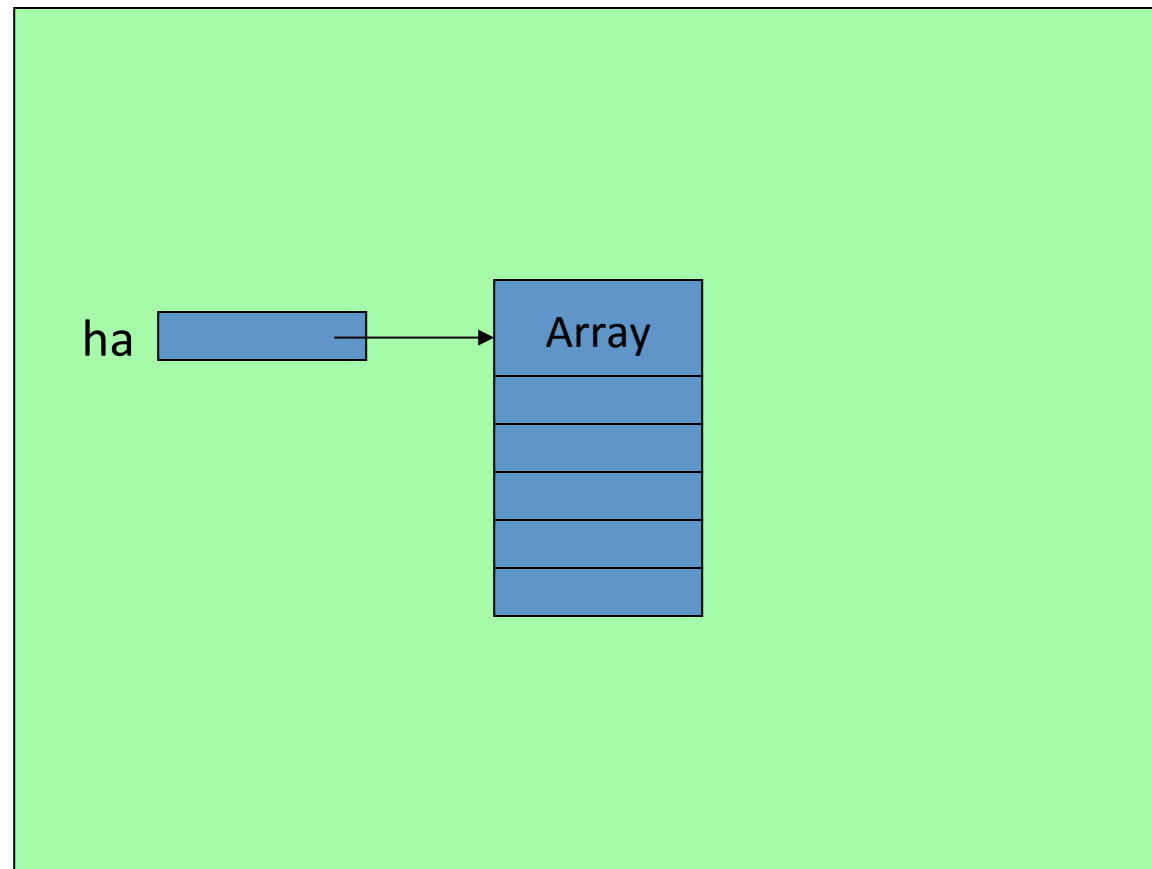
# How Does It Work?



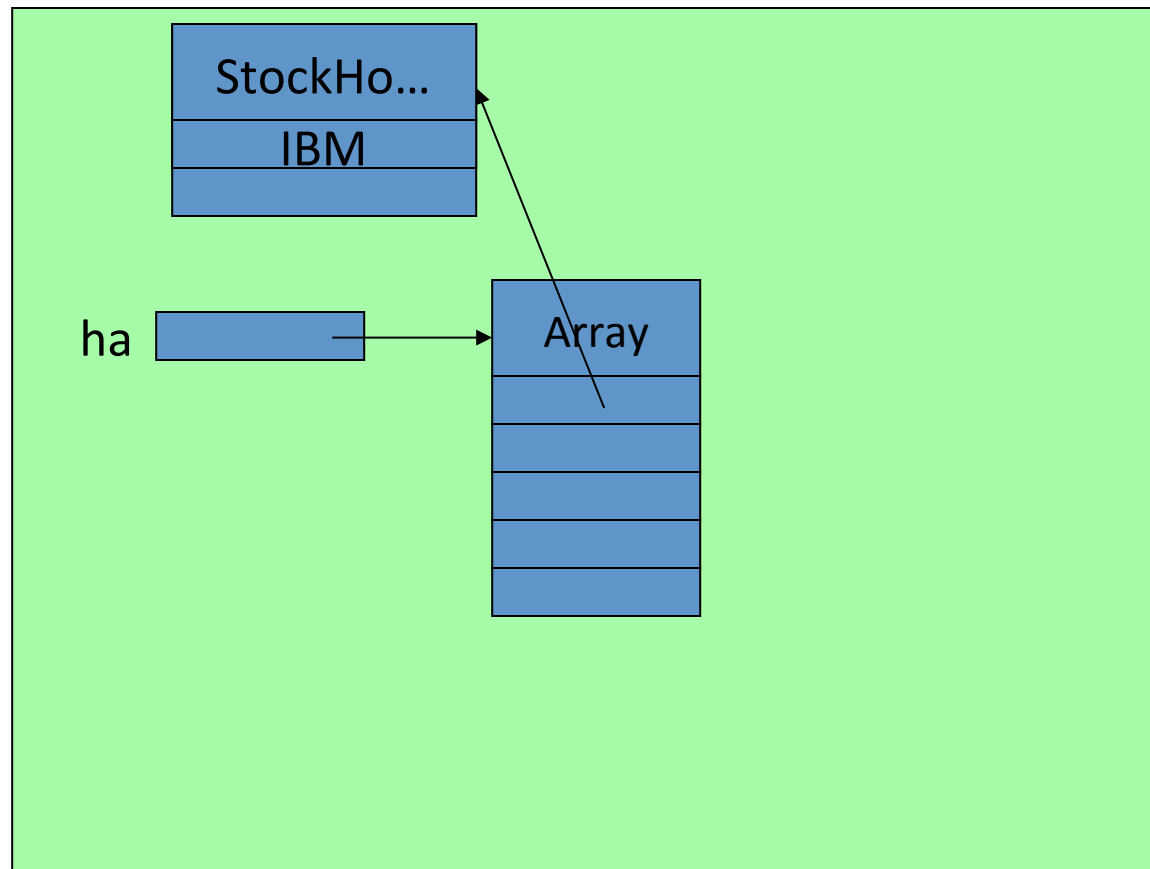
# How Does It Work?



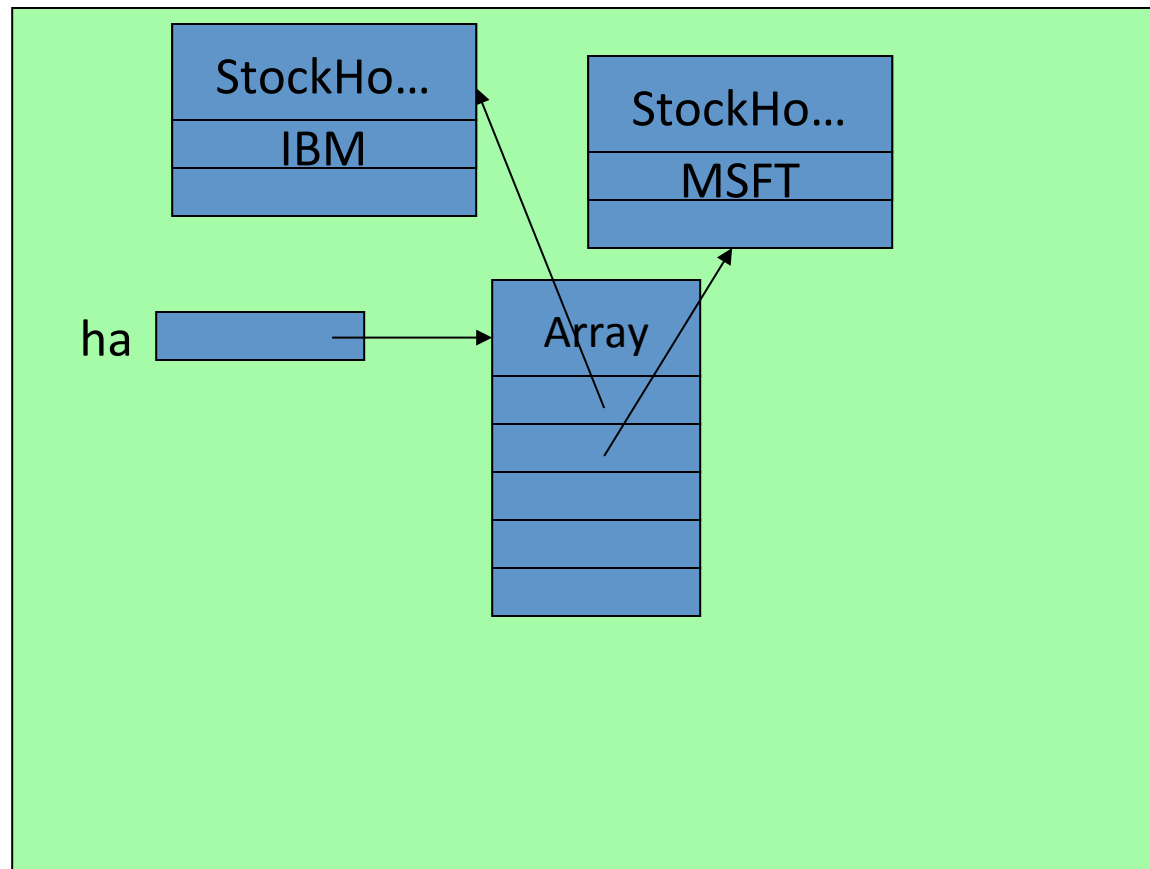
# How Does It Work?



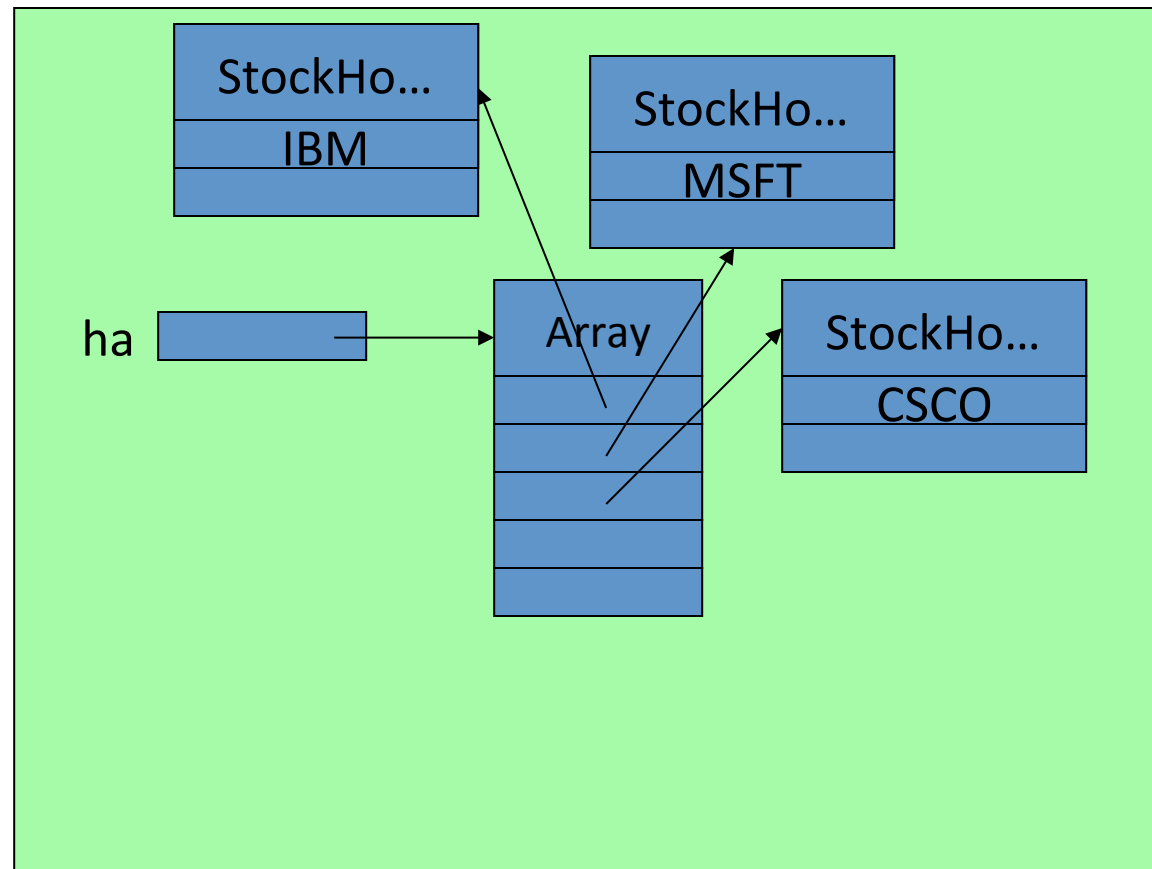
# How Does It Work?



# How Does It Work?

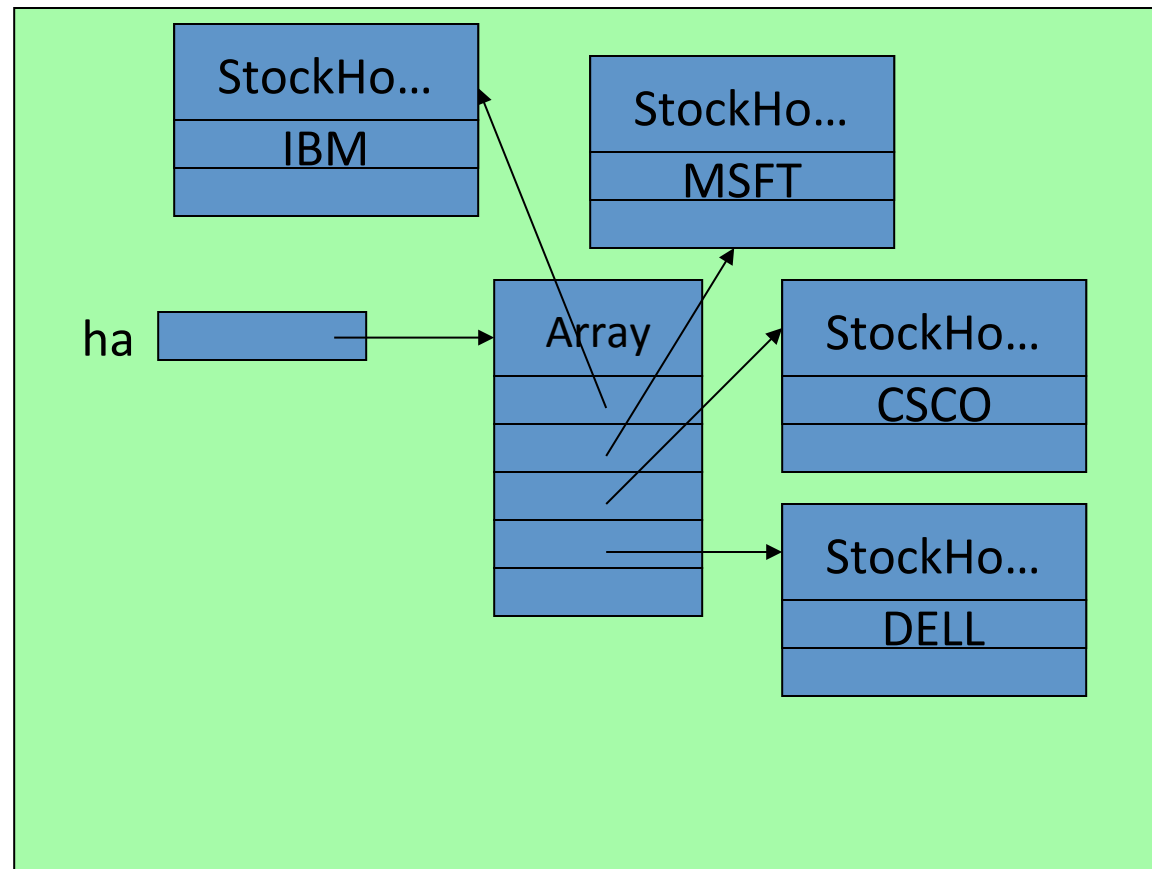


# How Does It Work?

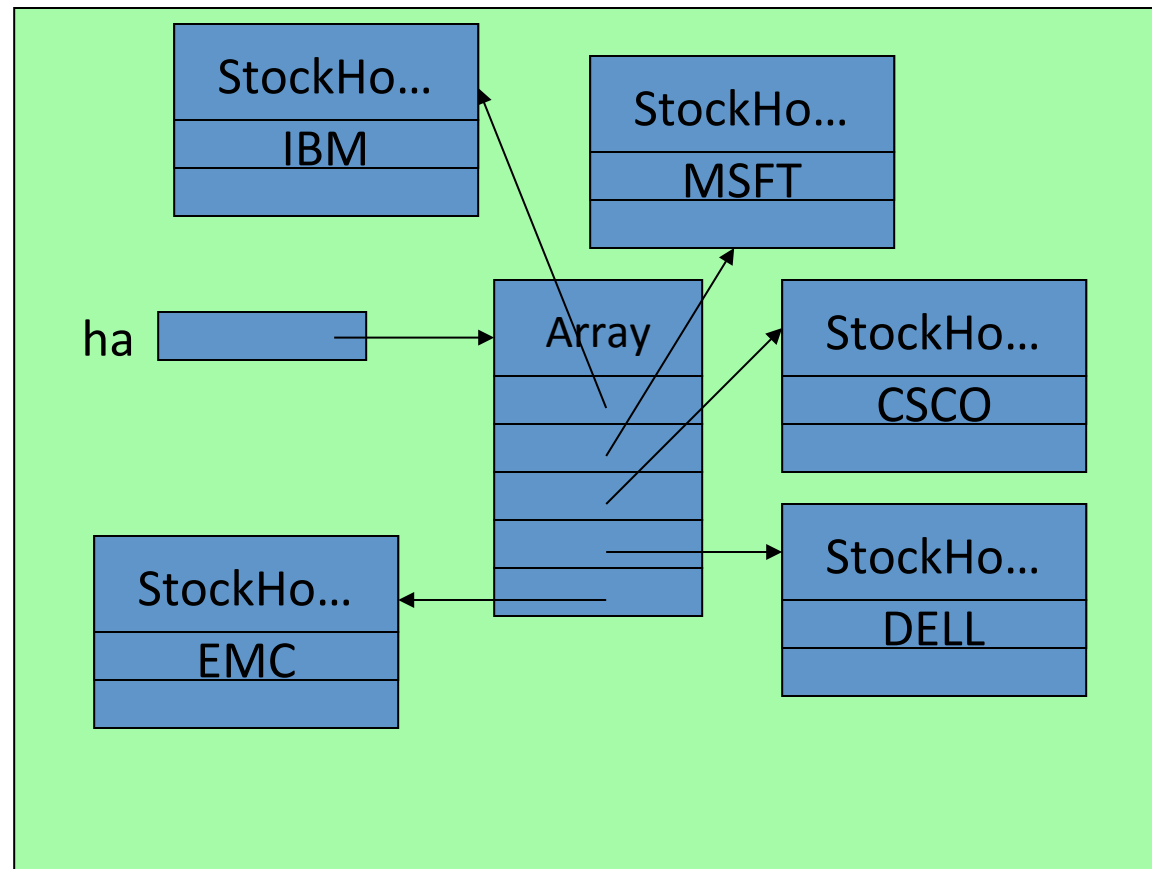




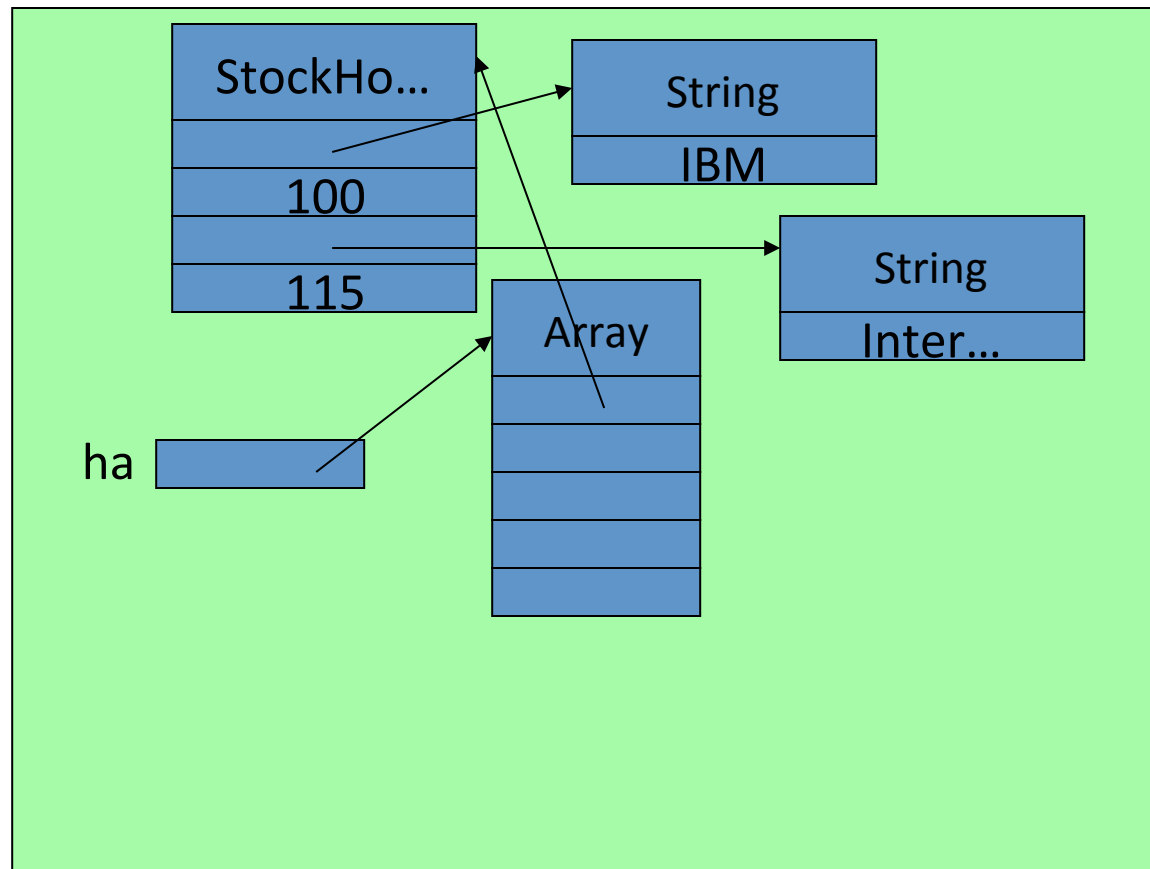
# How Does It Work?



# How Does It Work?



# How Does It Really Work?



# You can sort objects

- Check out StockHoldingSortTest
- (Check out HW#4)

# Outline

- ✓ Questions
- ✓ Conditionals
- ✓ Loops
- ✓ Arrays

→ Homework #4 & Readings

Sample Final Exam Questions

# Homework #4

- Due Mon, Sept 21<sup>st</sup>
- HW#4 Spec on the blackboard @ 1:30pm

# Next Lecture

- More basics:
  - More on methods
  - More on classes:
    - Use of static
    - Use visibility rules

# Outline

- ✓ Questions
- ✓ Conditionals
- ✓ Loops
- ✓ Arrays
- ✓ Homework #4 & Readings
- Sample Final Exam Questions



# Compare and Contrast

- The if-then-else chain vs the switch statement
  - Which is more efficient?

# The if-then-else Chain

```
if (month == 1) {  
    System.out.println("Jan");  
} else if (month == 2) {  
    System.out.println("Feb");  
} else if (month == 3) {  
    System.out.println("Mar");  
} else if (month == 4) {  
    System.out.println("Apr");  
} else if (month == 5) {  
    System.out.println("May");  
} else if (month == 6) {  
    System.out.println("Jun");  
} else if (month == 7) {  
    System.out.println("Jul");  
} else if (month == 8) {  
    System.out.println("Aug");  
} else if (month == 9) {  
    System.out.println("Sep");  
} else if (month == 10) {  
    System.out.println("Oct");  
} else if (month == 11) {  
    System.out.println("Nov");  
} else if (month == 12) {  
    System.out.println("Dec");  
} else {  
    System.out.println("Invalid Month");  
}
```

# Example switch Statement

```
switch (month) {  
  case 1:  
    System.out.println("Jan");  
    break;  
  case 2:  
    System.out.println("Feb");  
    break;  
  case 3:  
    System.out.println("Mar");  
    break;  
  case 4:  
    System.out.println("Apr");  
    break;  
  case 5:  
    System.out.println("May");  
    break;  
  case 6:  
    System.out.println("Jun");  
    break;  
  case 7:  
    System.out.println("Jul");  
    break;  
  case 8:  
    System.out.println("Aug");  
    break;  
  case 9:  
    System.out.println("Sep");  
    break;  
  case 10:  
    System.out.println("Oct");  
    break;  
  case 11:  
    System.out.println("Nov");  
    break;  
  case 12:  
    System.out.println("Dec");  
    break;  
  default:  
    System.out.println("???");  
}
```

# Compiled: if-then-else vs switch

```
    if (month <> 1) goto B
    print "Jan"
    goto N
B:   if (month <> 2) goto C
    print "Feb"
    goto N
C:   if (month <> 3) goto D
    print "Mar"
    goto N

    ...

J:   if (month <> 10) goto K
    print "Oct"
    goto N
K:   if (month <> 11) goto L
    print "Nov"
    goto N
L:   if (month <> 12) goto M
    print "Dec"
    goto N
M:   print "???"
N:   ...
```

```
    if (month < 1) goto M
    if (month > 12) goto M
    goto X[month-1]
X:   A
    B
    ...
    K
    L
A:   print "Jan"
    goto N
B:   print "Feb"
    goto N
C:   print "Mar"
    goto N

    ...

K:   print "Nov"
    goto N
L:   print "Dec"
    goto N
M:   print "???"
N:   ...
```

# More Sample Final Exam Questions

- What's special about arrays in Java?
  - as compared to arrays in non-object-oriented programming languages, like C?

# TA Office Hours

- Easier to find on Blackboard