Variables and Expressions

Assignment Operators

Lecture Contents

- Operator Types
- Review of the Java Arithmetic Operators
- The basic Java Assignment Operator (**=**)
- Other Java Assignment Operators
- Operator Precedence

Operator Types

- Java uses the following types of operators
  - **arithmetic**
  - **assignment** (this lecture)
  - **increment/decrement**
  - **comparison**
  - **logical**
  - **bitwise**

Note: **bitwise** operators are <u>not</u> part of the AP Java Subset.

Review of the Java Arithmetic Operators

- Recall the Java ***arithmetic operators***:
  - Add: `x + y`
  - Subtract: `x – y`
  - Multiply: `x * y`
  - Divide: `x / y`
  - Modulus: `x % y`
    - Modulus is the remainder after integer division
- There is no exponential operator; exponentiation is implemented as a method in Java.

Review of the Java Arithmetic Operators

- The order of operations is the same as in mathematics:
  - multiplication, division and modulus are are higher precedence than addition or subtraction.
  - Operation at the same level are performed left-to right.

Level	Operators	Associativity
16	( )	Left-to-right
12	*, /, %	Left-to-right
11	+, -	Left-to-right

  - *Note*: we will fill the missing **Levels** as we add more operators.

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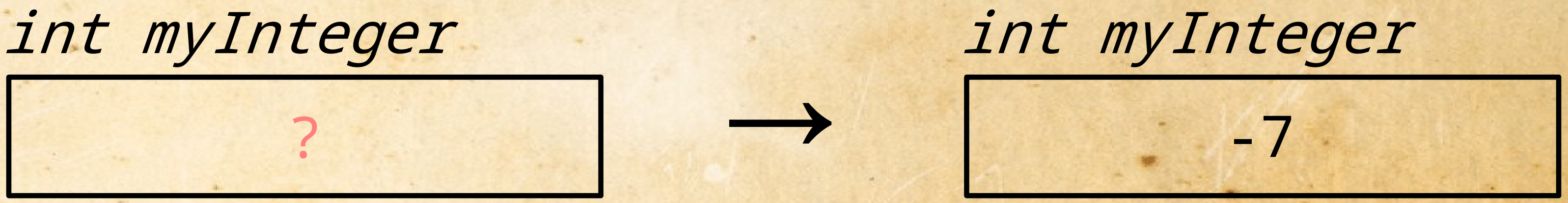
Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.

Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.
- We used an *assignment operator*, **=**, when we ***initialized*** variables:

```
myInteger = -7;
```



int myInteger

?

→

int myInteger

-7

Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.
- We used an *assignment operator*, **=**, when we ***initialized*** variables:

```
public static void main(String[] args) {
    int myNumber = 13;                      ← declaration and initialization
    System.out.println(myNumber);
}
```

```
public static void main(String[] args) {
    int myNumber;                           ← declaration
    myNumber = 13;                          ← initialization
    System.out.println(myNumber);
}
```

Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.
- We used the ***assignment operator*** when we *assigned* a new value to a variable after initializing it:

```
public static void main(String[] args) {
    int myNumber = 13;
    myNumber = 7;
    System.out.println(myNumber);
}
```

```
7
```

Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.
- We used the ***assignment operator*** when we *assigned* a calculated value to a variable:

```
public static void main(String[] args) {
    int myNumber = 13;
    myNumber = myNumber + 7;
    System.out.println(myNumber);
}
```

Java Assignment Operators

- An ***assignment operator*** is used to set the value of a variable.
- We used the ***assignment operator*** when we *assigned* a calculated value to a variable:
  - Note the difference between how we would treat this expression in mathematics!

```
public static void main(String[] args) {
    int myNumber = 13;
    myNumber = myNumber + 7;
    System.out.println(myNumber);
}
```

```
20
```

Operator Precedence

- The assignment operator is the very lowest precedence
  - all calculations on the right side are performed
  - *then* the left side is assigned that value.
  - the left side is always a variable or constant, not an expression

Level	**Operators**	**Associativity**
16	( )	Left-to-right
12	*, /, %	Left-to-right
11	+, -	Left-to-right
1	=	**Right-to-Left**

  - *Note*: there are more assignment operators that will be added to level 1.

Lecture Contents

- Operator Types
- Review of the Java Arithmetic Operators
- The basic Java Assignment Operator (**=**)
- **Other Java Assignment Operators**
- Operator Precedence

Other Java Assignment Operators

- Study the following code and its output.

```
public static void main(String[] args) {
    int myNumber = 13;
    myNumber *= 3;
    System.out.println(myNumber);
}
```

```
39
```

Other Java Assignment Operators

- There are assignment operators that combine ***arithmetic*** operations. For each row, the two expressions are equivalent:

	Arithmetic Operation and Assignment	Combined Operation
Addition	`x = x + 5`	`x += 5`
Subtraction	`x = x - 7`	`x -= 7`
Multiplication	`x = x * 3`	`x *= 3`
Division	`x = x / 6`	`x /= 6`
Modulus	`x = x % 4`	`x %= 4`

- Note: There are also ***bitwise assignment*** operators not shown in the table.

Operator Precedence

- The assignment operator is the very *lowest* precedence
  - all calculations on the right side are performed
  - *then* the left side is assigned that value.
  - the left side is always a variable or constant, not an expression

Level	Operators	Associativity
16	( )	Left-to-right
12	*, /, %	Left-to-right
11	+, -	Left-to-right
1	=, +=, -= *=, /=, %=	Right-to-Left

Variables and Expressions

Assignment Operators