Primitive Types

Operators: *Assignment* and *Arithmetic*

Lecture Contents

- Operator Types
- Java Arithmetic Operators
- Java Assignment Operators
- Operator Precedence

Operator Types

- ***Arithmetic***
- ***Assignment***
- *Comparison*
- *Logical*
- *Bitwise*

Java Arithmetic Operators

- We should know the word "***operator***" from mathematics
- Java ***arithmetic operators***:
  - Add: `x + y`
  - Subtract: `x - y`
  - Multiply: `x * y`
  - Divide: `x / y`
  - Modulus: `x % y`

Java Arithmetic Operators

- We used arithmetic operators when we examined primitive types

```
System.out.println(3 + 5);
System.out.println(3.0 / 5.0);
System.out.println(3.0 + 5);
System.out.println(3 / 5);
```

```
8
0.6
8.0
0
```

Java Assignment Operators

- The ***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:

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

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

Java Assignment Operators

- The ***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

- The ***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

- The ***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 the expression in mathematics!

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

```
20
```

Java Assignment Operators

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

```
39
```

Java Assignment Operators

- Assignment operators that combine ***arithmetic*** operations:

	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.

Operator Precedence

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

Operator Precedence

```
public static void main(String[] args) {
	int v = 10;
	int w = 20;
	System.out.println(w + v / w);
}
```

Operator Precedence

```
public static void main(String[] args) {
	int v = 10;
	int w = 20;
	System.out.println(w + v / w);
}
```

```
20
```

Operator Precedence

```
public static void main(String[] args) {
	int a = 1;
	int b = 2;
	int c = 3;
	int d = 4;
	int x = a + b * c % d;
	System.out.println(x);
}
```

Operator Precedence

```
public static void main(String[] args) {
	int a = 1;
	int b = 2;
	int c = 3;
	int d = 4;
	int x = a + b * c % d;
	System.out.println(x);
}
```

```
3
```

Operator Precedence

```
public static void main(String[] args) {
	System.out.println(2 / 5 % 3);
	System.out.println(2 / (5 % 3));
	System.out.println(2 / 5 + 1);
}
```

Operator Precedence

```
public static void main(String[] args) {
	System.out.println(2 / 5 % 3);
	System.out.println(2 / (5 % 3));
	System.out.println(2 / 5 + 1);
}
```

```
0
1
1
```

Operator Precedence

```
public static void main(String[] args) {
	int i = 5;
	System.out.println(i);
	System.out.println(i++);
	System.out.println(i);
	System.out.println(++i);
}
```

Operator Precedence

```
public static void main(String[] args) {
	int i = 5;
	System.out.println(i);
	System.out.println(i++);
	System.out.println(i);
	System.out.println(++i);
}
```

```
5
5
6
7
```

Operator Precedence

```
public static void main(String[] args) {
	int i = 5;
	i ++;
	System.out.println(i);
}
```

```
6
```

Primitive Types

Operators: *Assignment* and *Arithmetic*