Number

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Learning Objection

- Number
    - Integer and Floating
- Arithmetic Computation
    - Arithmetic Expression
        - Addition: + x+y
        - Subtraction: - x-y
        - Multiplication: * x*y
        - Division: / x/y
        - Modulo: % x%y
        - Increase (++) / decrease operation (--)

Integer Number Type

- ➢Ranges of Values for Integer
  1. byte: -128 to 127
  2. short: -32,768 to 32,767
  3. int: -2,147,483,648 to 2,147,483,647
  4. long: -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807

- ➢ Example:
  - ❑ `int age = 10;`
  - ❑ `long countOfStar = 8764827384923849L;`

Floating Point Types

- float: 32 bits wide
    - approximately 7 decimal places of accuracy
    - range of values is approximately
        - 3.4 × 1038 to +3.4 × 1038.
- double: 64 bits wide
    - approximately 16 decimal places of accuracy
    - range of values is approximately
        - 1.8 × 10308 to +1.8 × 10308
- Example:
    - **float** pi = 3.14F;
    - **double** morePi = 3.14159265358979323846;

Arithmetic Expression

- Any expression involving numerical values is called arithmetic expression
  - Integer and Floating data type can use arithmetic expression
- Arithmetic operators (java use the same operator)
  - Addition: + x+y
  - Subtraction: - x-y
  - Multiplication: * x*y
  - Division: / x/y
    - Integer division: Get an integer quotient when both x and y are integers
    - 23/20 = 1, not 1.15
  - Modulo(remainder): % x%y
    - Returns the remainder of a division (7 % 3 = 1)

```
int a = 23;
int b = 20;
System.out.print(a/b);
```

Precedence in Expression

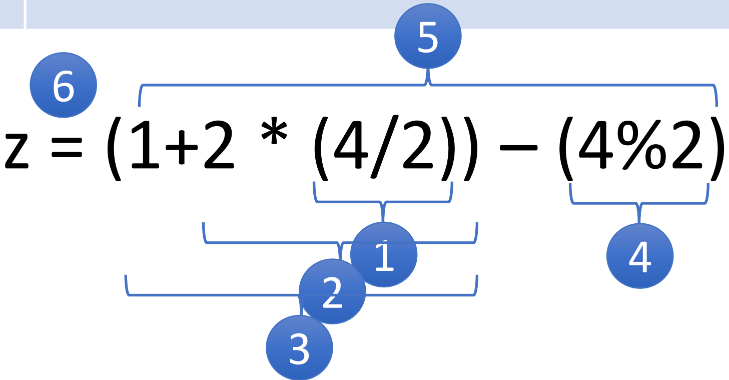
- How does you do the calculation?
  - Let x = 6, y= 3;
  - z= x + 3 / y
  - What is the answer (z value)?
- Can you change it to Java code?
  - int x = 6, y =3;
  - int z= x+3/y;
  - System.out.println(z);

1. 3/y -> 1
2. x+1 -> 7
3. z= 7

Precedence Rules

High Precedence

Operator	Operation	Order of evaluation (precedence)
( )	Subexpression	Subexpressions are evaluated first. If parentheses are nested, the innermost subexpression is evaluated first. If two or more pairs of parentheses are on the same level, then they are evaluated from left to right
* / %	Multiplication Division remainder	Evaluated second. If there are several operators of this type, they’re evaluated from left to right.
+ -	Addition subtraction	Evaluated next. If there are several operators of this type, they’re evaluated from left to right.
=	Assignment	Evaluated last.



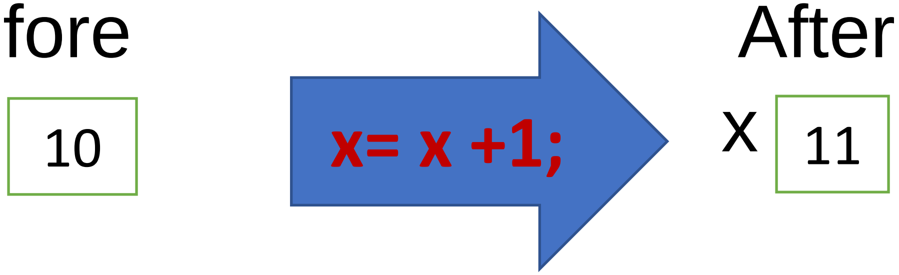
z = (1+2 * (4/2)) – (4%2)

Assignment Statements with Arithmetic

- Variables can be reassigned as many times as you want!

```
int x= 0; //assign 0 into x ← Assignment Statements
x = 7; // Assignment Statement
x = x + 1; // Assignment Statement
```

- When a variable changes, the old value is erased and a new one is written in.
  - ❑ Before
  - ❑ x



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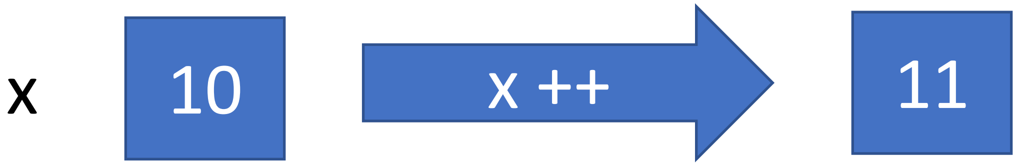
x= x +1;

After

x 11

Increase (++) / decrease operation (--)

- Increase one using ++
  - Example: x = x +1



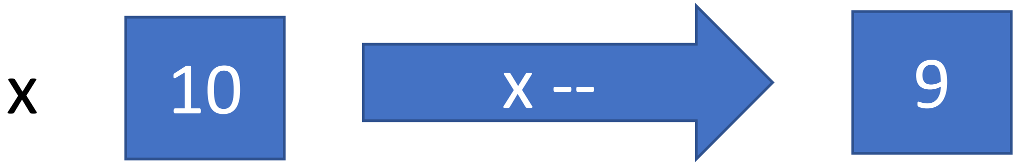
x

10

x ++

11

- Decrease one using --
  - Example: x = x - 1



x

10

x --

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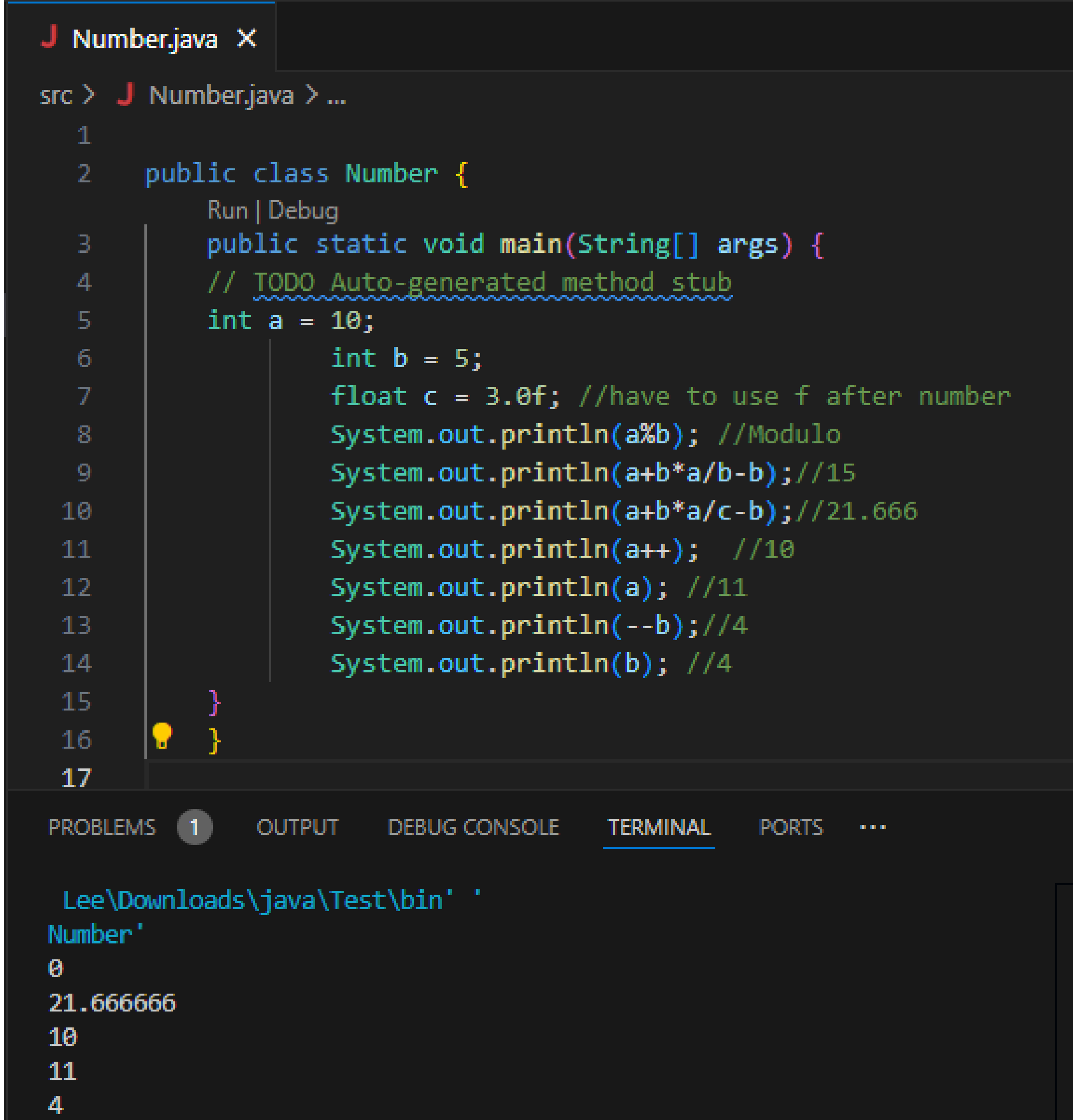
Practice

1. Make a new project (Reference: Create Project and Class File)
   - ❑Project name: Number
2. Create a new Class File
   - ❑Class name: Number
3. Coding:

```
public class Number {
    public static void main(String[] args) {
    // TODO Auto-generated method stub
    int a = 10;
        int b = 5;
        float c = 3.0f; //have to use f after number
        System.out.println(a%b); //Modulo
        System.out.println(a+b*a/b-b);//15
        System.out.println(a+b*a/c-b);//21.666
        System.out.println(a++);  //10
        System.out.println(a); //11
        System.out.println(--b);//4
        System.out.println(b); //4
    }
}
```

Practice – Code and Result

- Result



```java

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            System.out.println(a); //11
            System.out.println(--b);//4
            System.out.println(b); //4
    }
    }

```

```
 Lee\Downloads\java\Test\bin' '
Number'
0
21.666666
10
11
4
```

Summary

- Number
  - Integer and Floating
- Arithmetic Computation
  - Arithmetic Expression
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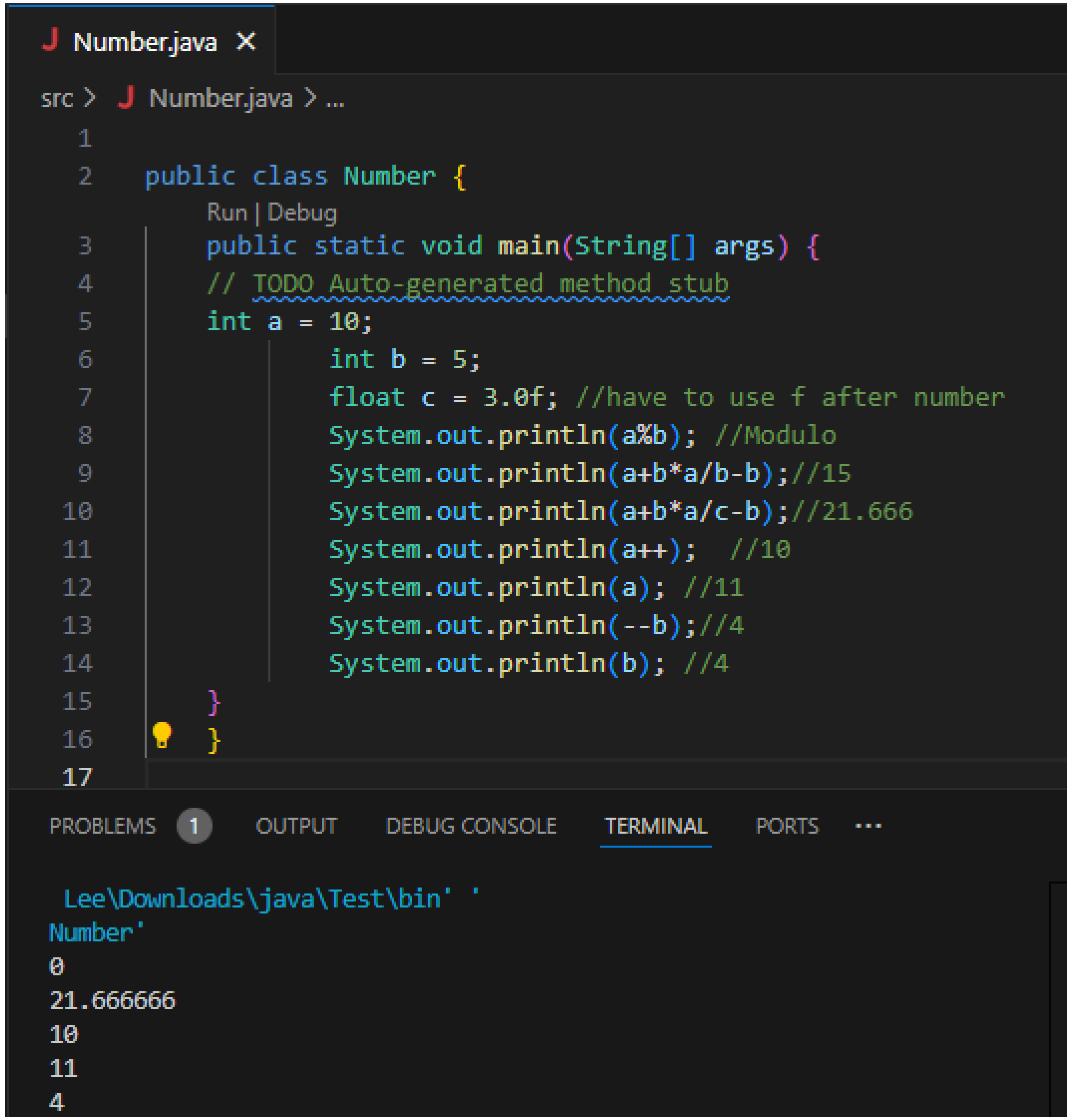

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            System.out.println(--b);//4
            System.out.println(b); //4
    }
}

```

```
 Lee\Downloads\java\Test\bin' '
Number'
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