데이터융합SW과
김규석 교수

JAVA

기본 프로그래밍 01

Objective

What is Programming?

- Procedural Programming(PP) vs Object-Oriented Programming(OOP)
- Features of Java

Development Environment

- Set up the development environment with JDK and Eclipse(IDE)
- Print “Hello World”
- Write comments on source code

Variable

- Declaration and Types of Variable
- Variable Type Casting

What is Programming?

Computer Programming(=Coding)

- The process of designing and building an executable computer program to accomplish a specific computing result or to perform a specific task

Q1 : What is a computer program?

Q2 : What does a computer consist of, then?

Q3 : How do we communicate with computers?

Source : https://en.wikipedia.org/wiki/Computer_programming

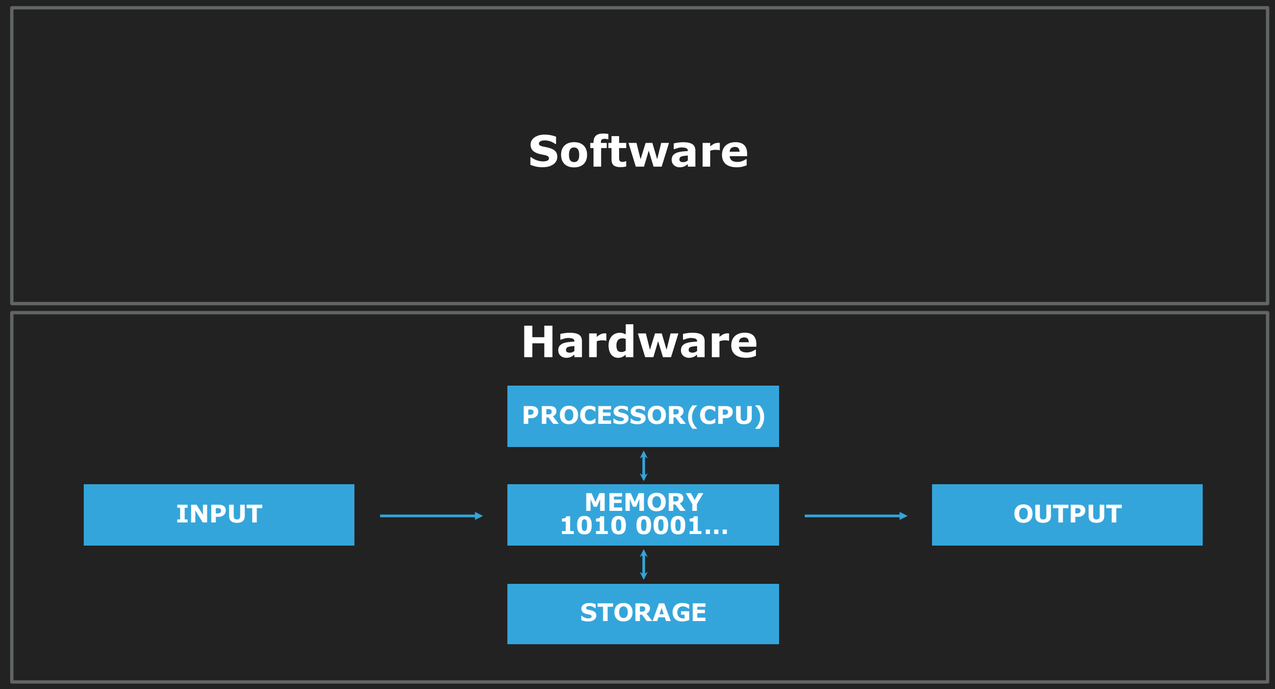
Answers to Q1 and Q2

Computer program

- A collection of instruction that can be executed by a computer to perform a specific task.

Hardware(HW) and Software(SW)

- Every computer is composed of two basic components: hardware and software

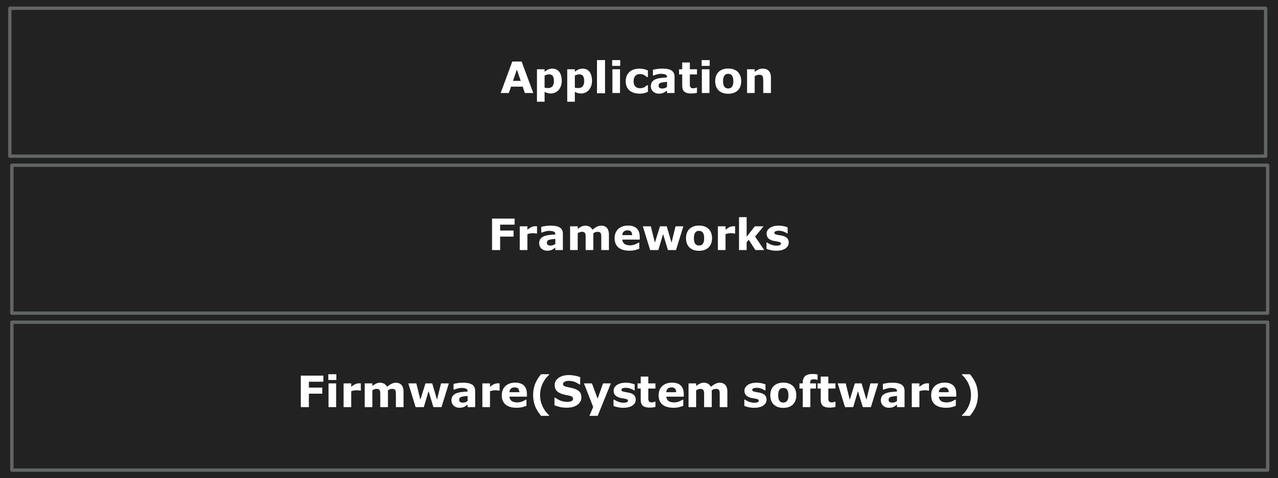


Source : https://en.wikipedia.org/wiki/Computer_program / https://www.wikilectures.eu/w/Computer_hardware_and_software

Answer to Q3

Software Category

- Application : a program designed to end-users
- Frameworks : a platform for developing software applications
- Firmware : a program to operate a device’s hardware



Bitwise Operator

Bitwise Operation

- Operates on a bit string, a bit array or a binary numeral at the level of its individual bits.

Q4* : Why are bits used for computer?

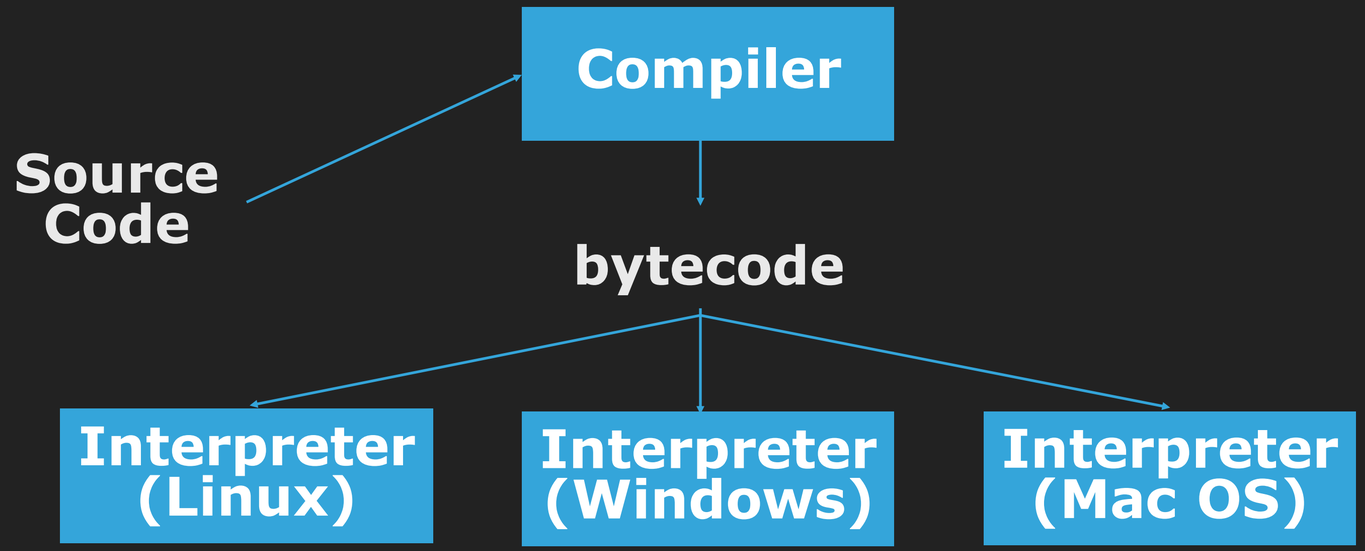
Q5* : What are units of measure for digital information used by computer?

Source : https://en.wikipedia.org/wiki/Bitwise_operation

Programming Process

Programming Process for Java

- Human composes source code
- Compiler translates code in human languages into one in programming lan



Q6* : What is bytecode?

Q7* : What's the role of JVM(Java Virtual Machine)?

Source：www2.hawaii.edu/~takebaya/ics111/process_of_programming/process_of_programming.html#:~:text=A compiler takes the program,to create an executable file.

Preparation of Development Environment(Cont'd)

Install JDK(Java Development Kit)

- A development environment for building applications and components using Java programming language.

1) Visit www.java.com
2) Download the file and install it

Click on it

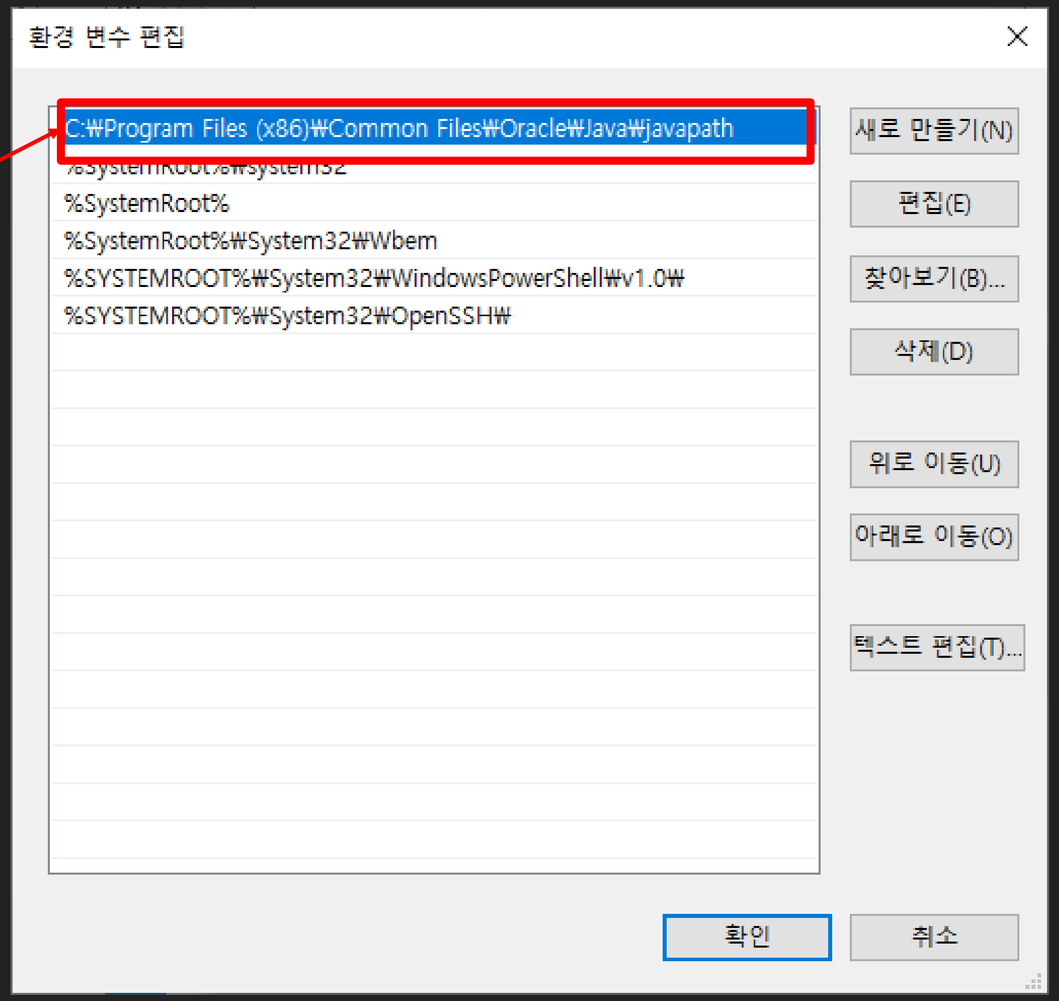
Source : https://en.wikipedia.org/wiki/Bitwise_operation

Preparation of Development Environment(Cont'd)

Install JDK(Java Development Kit)

3) After the installation,
the environment variables should include the path for Java

Path for Java installed



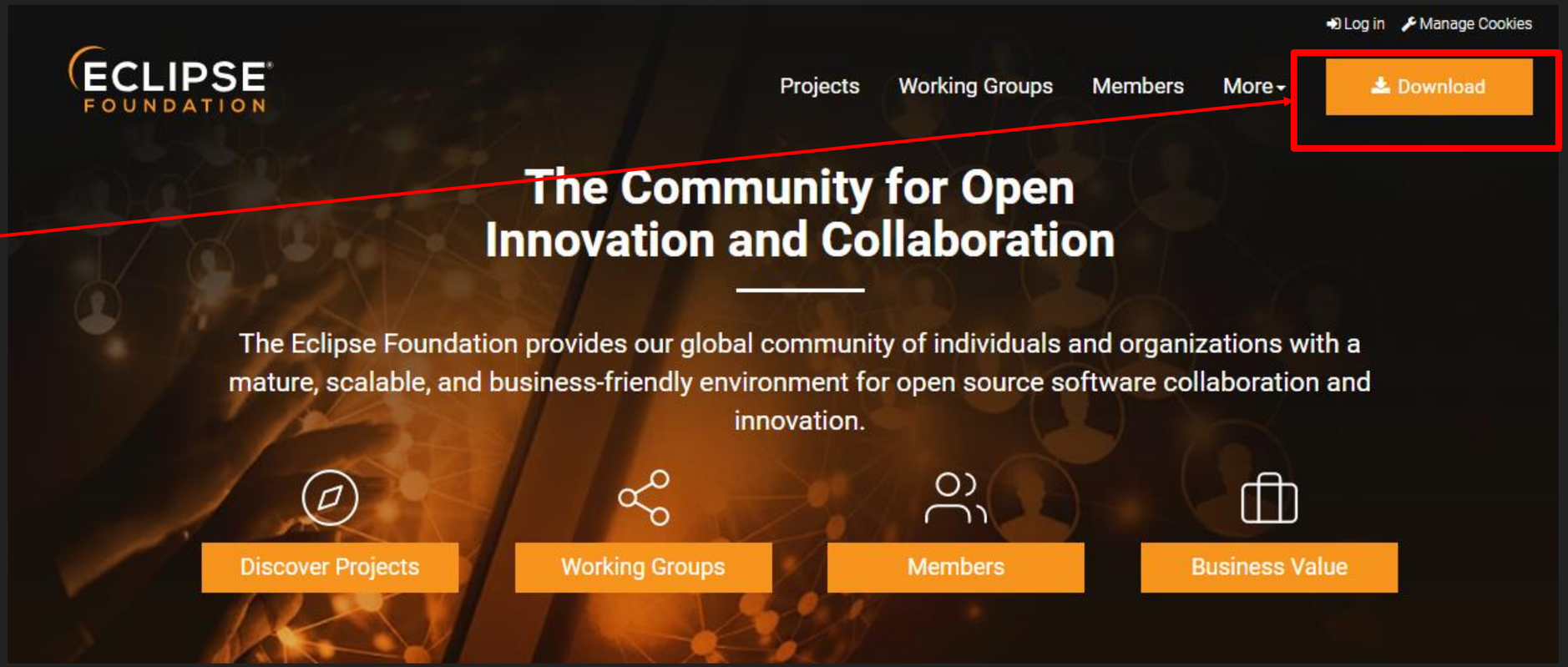
Preparation of Development Environment(Cont'd)

Install IDE(Integrated Development Environment)

- A software application that provides facilities for software development.

1) Visit www.eclipse.org
2) Download the file and install it

Click on it

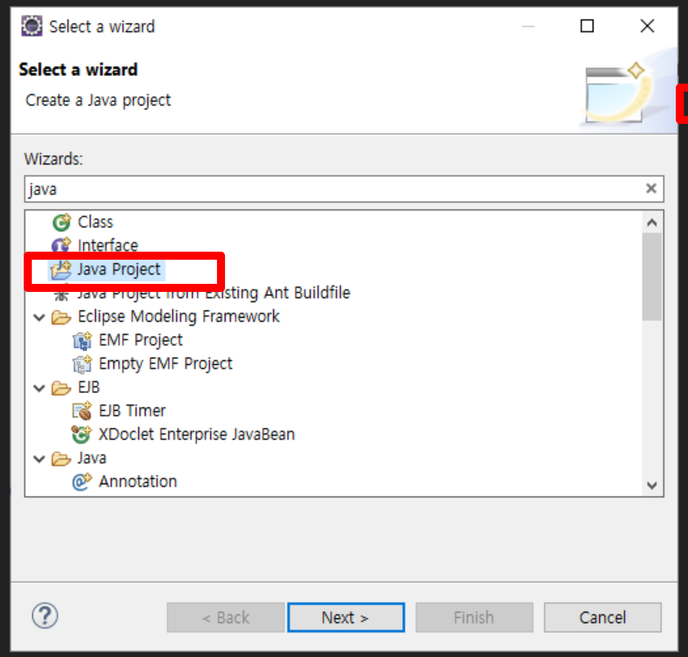


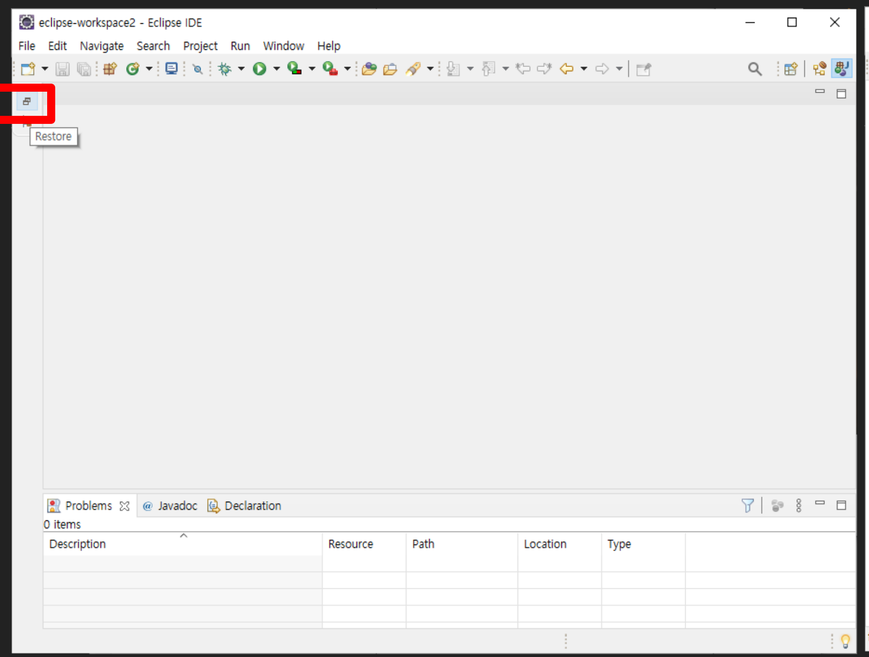
Source : www.eclipse.org

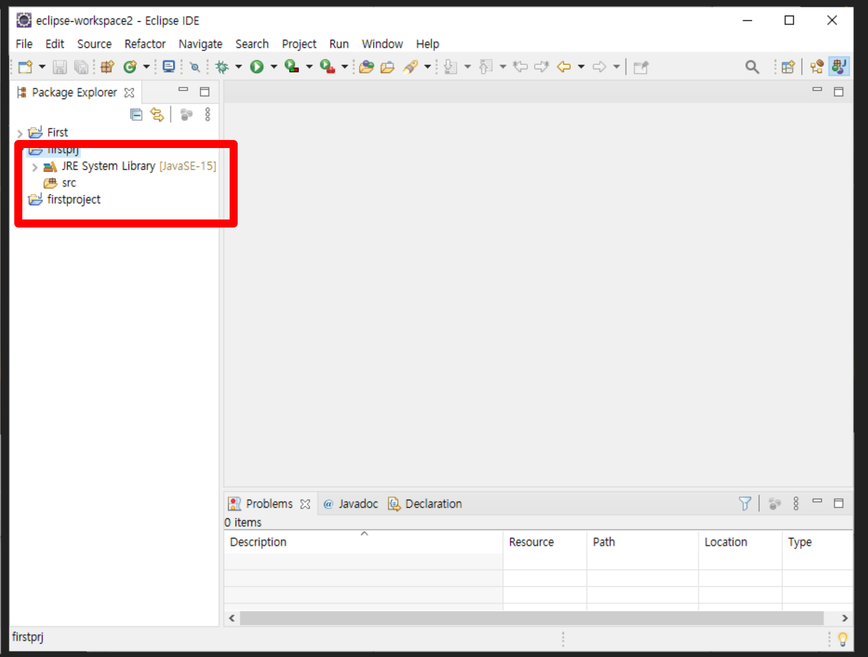
Beginning of Programming(Cont'd)

Create a Java Project

1) New > Other > Java Project
2) Input a Project Name > Next > Finish



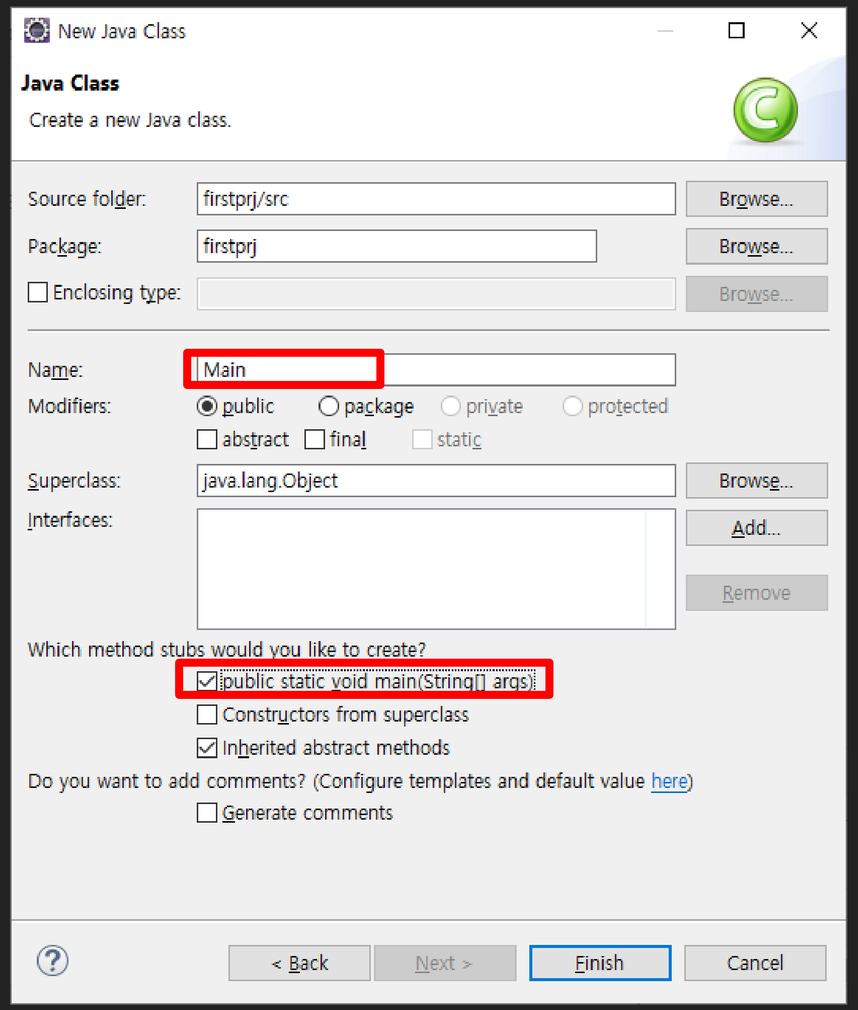


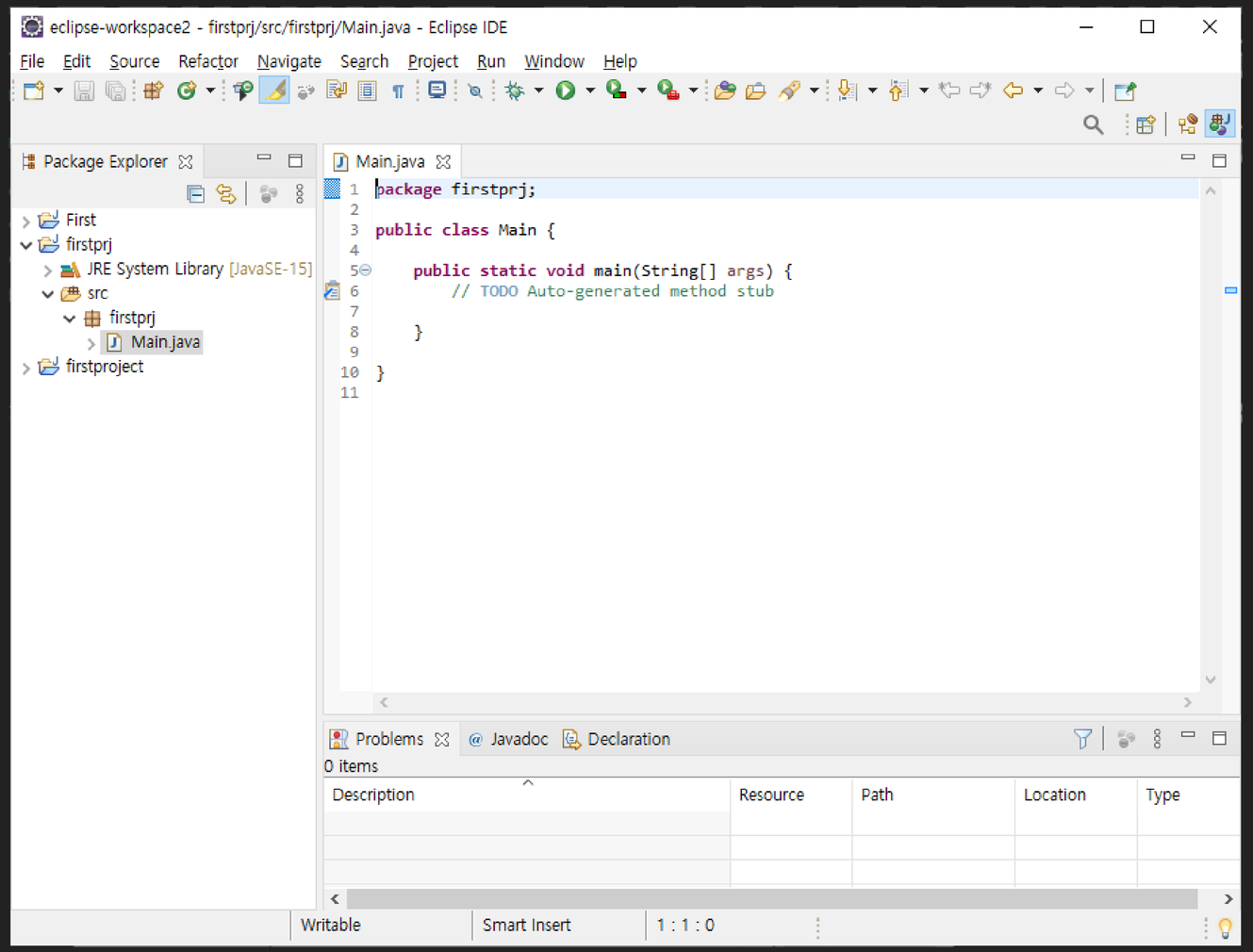


Beginning of Programming(Cont'd)

Create a Java Main Class

1) New > Other > Class
2) Input a Class Name > Check "public static void main" > Finish

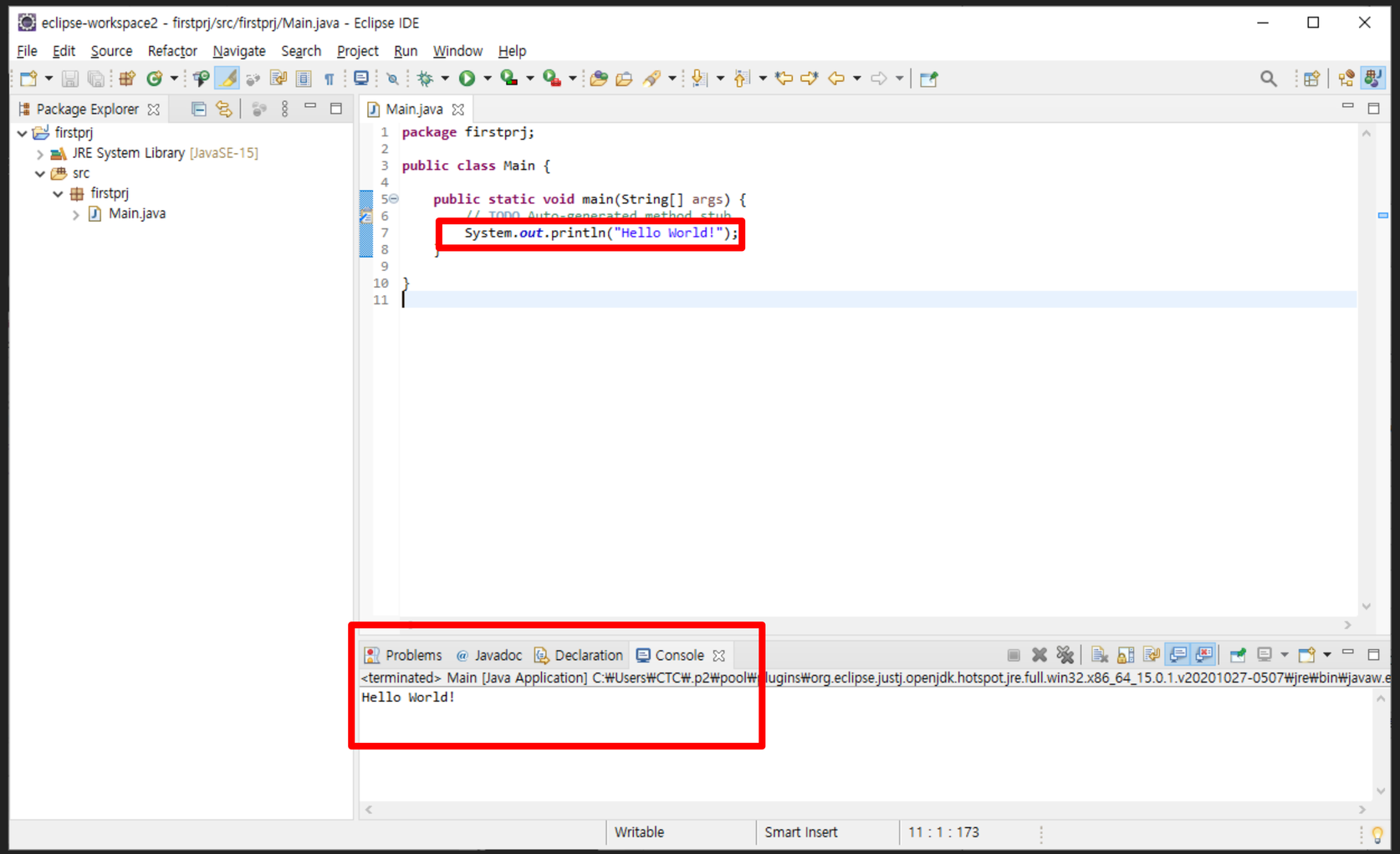




Beginning of Programming

Print “Hello World!”

1) Add a line, “System.out.println(“Hello World!”);”
2) Run > Run As > Java Application



Review Source Code(Cont'd)

Print "Hello World!"

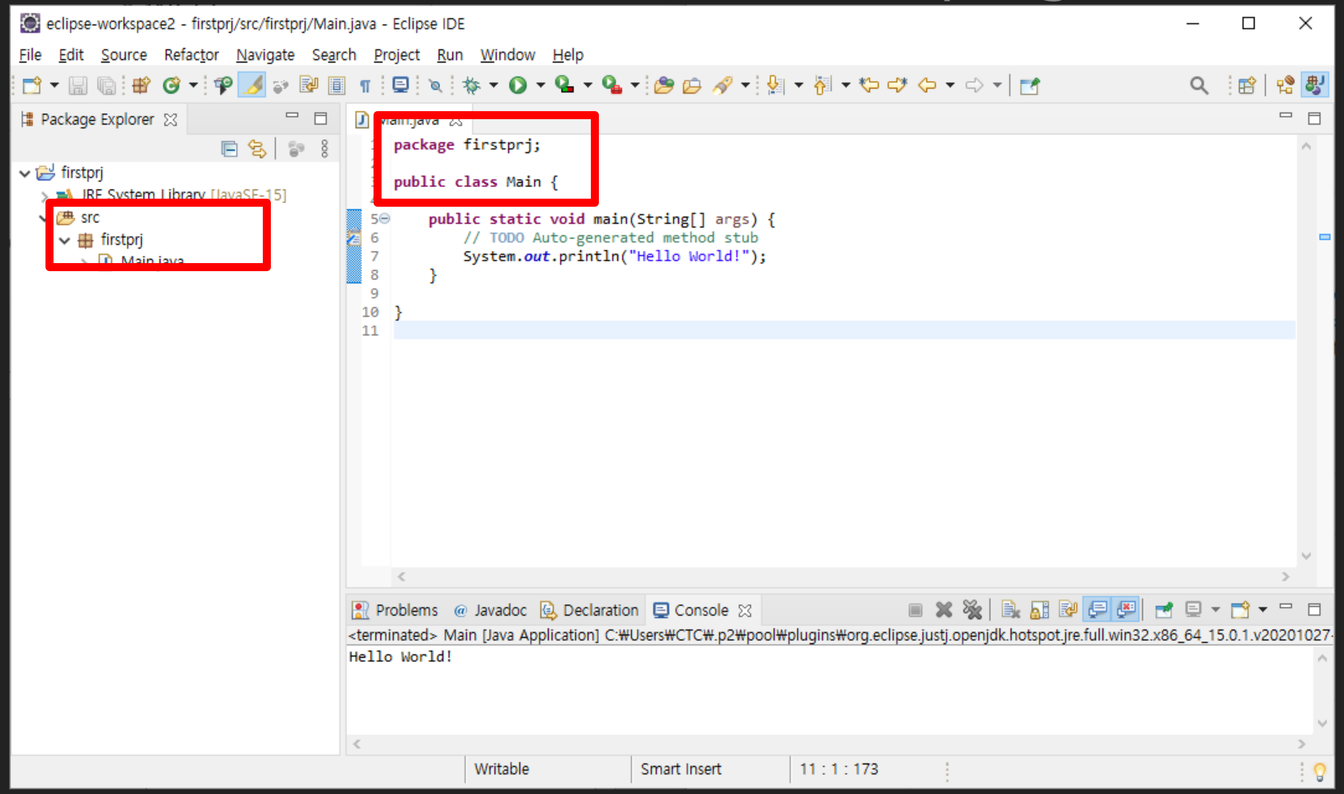
1) Project name that you entered
3) Class name you entered
5) Entry function → public static void main()
6) Single line comment
7) Call for function to print strings on the screen
8, 10) Brackets

```
1  package firstprj;
2
3  public class Main {
4
5      public static void main(String[] args) {
6          // TODO Auto-generated method stub
7          System.out.println("Hello World!");
8      }
9
10 }
```

Review Source Code(Cont'd)

1) Package Name

- "package" is a reserved word
- A semicolon is needed at the end of a program line

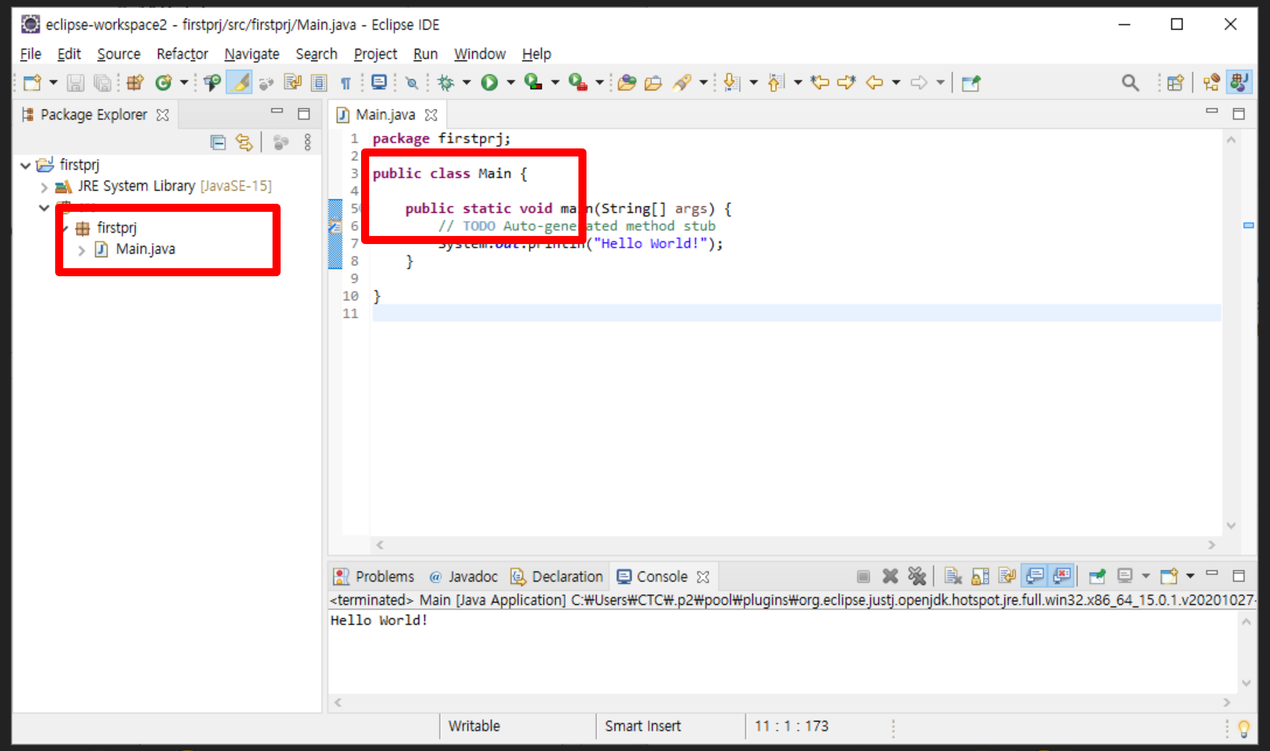


Q8* : Search for Java reserved words and List them up
P1 : Change the package name and run it again
P2 : Remove the semicolon and run it again

Review Source Code(Cont'd)

3) Class Name

- "public" is a controlling access modifier (cf. default, private, protected)
- "Main" is the class name



Q9* : Search for Java access modifiers and List them up
P3 : Remove the bracket and run it again
Q10* : Where's closed bracket to the line #3
P4 : Change the class name and run it again

Review Source Code(Cont'd)

5) Function

- "static" is a variable belonging to the class and initialized only once (cf. final)
- "main" is the name of the entry function.

```
1  package firstprj;
2
3  public class Main {
4
5      public static void main(String[] args) {
6          // TODO Auto-generated method stub
7          System.out.println("Hello World!");
8      }
9
10 }
```

Q11* : Search for Java attributes and List them up
P5 : Remove the bracket and run it again
Q12* : Where's closed bracket to the line #5

Review Source Code(Cont'd)

6) Comment

- Used to explain Java code and make it more readable

```
1  package firstprj;
2
3  public class Main {
4
5      public static void main(String[] args) {
6          // TODO Auto-generated method stub
7          /*
8           * multiline comment
9           */
10         System.out.println("Hello World!"); // single line comment
11     }
12
13 }
```

P6 : Practice and Get used to the comments

Review Source Code

7) Print Strings on the Screen

- Strings are surrounded by the double quotes

```
1  package firstprj;
2
3  public class Main {
4
5      public static void main(String[] args) {
6          // TODO Auto-generated method stub
7          System.out.println("Hello World!");
8      }
9
10 }
```

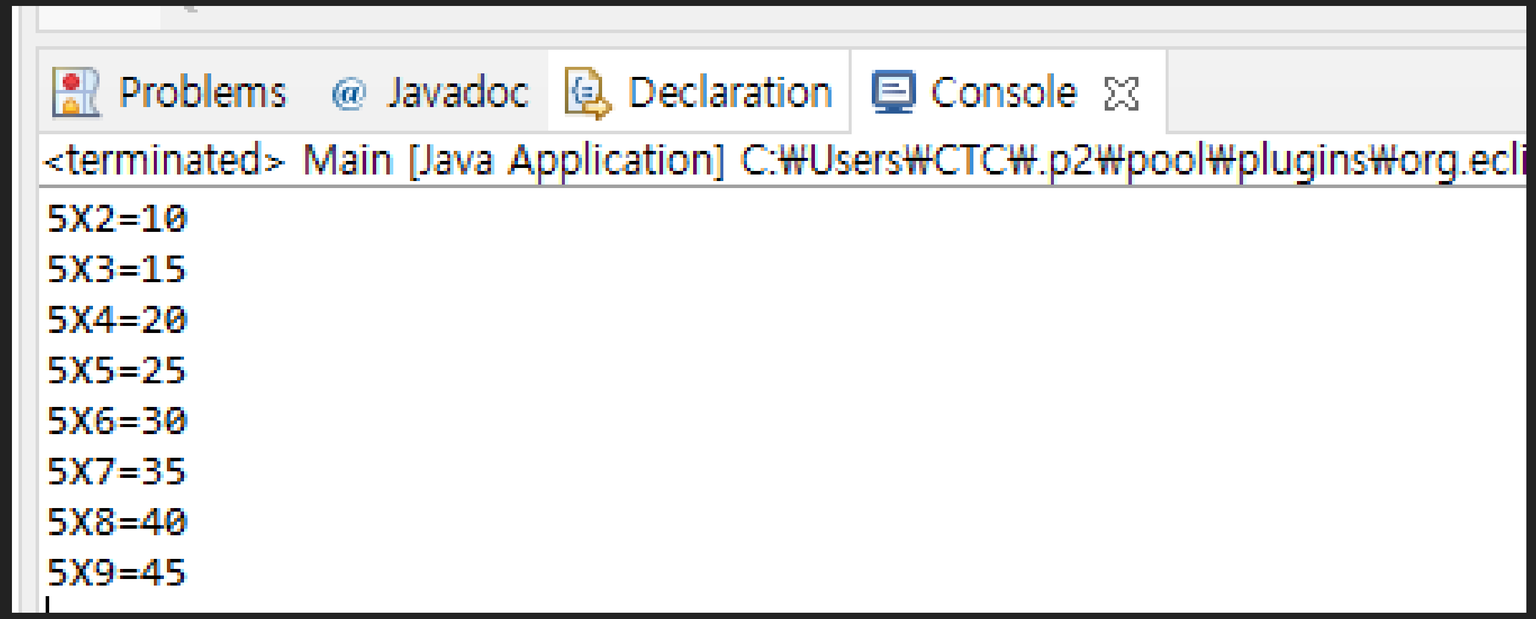
P7 : Print “Hello World!” three times in one line

P8 : Print “Hello World!” three times in three lines

P9

Print N times table

- Choose N and print the multiplication table N
- Attach the source code and the console window



Data Type and Variable(Cont'd)

Java Data Types

- Variables are containers for storing data values

- "main" is the name of the entry function.

Data Type	Size	Description
byte	1 byte	Numbers from -128 to 127
short	2 bytes	Numbers from -32,768 to 32,767
int	4 bytes	Numbers from -2,147,483,648 to 2,147,483,647
long	8 bytes	Numbers from -9,223,372,036,854,775,808 to 9,223,372,036,854,775,807
float	4 bytes	Fractional numbers, 6 to 7 decimal digits
double	8 bytes	Factional numbers, 15 decimal digits
boolean	1 bit	true or false values
char	2 bytes	A single character/letter or ASCII values

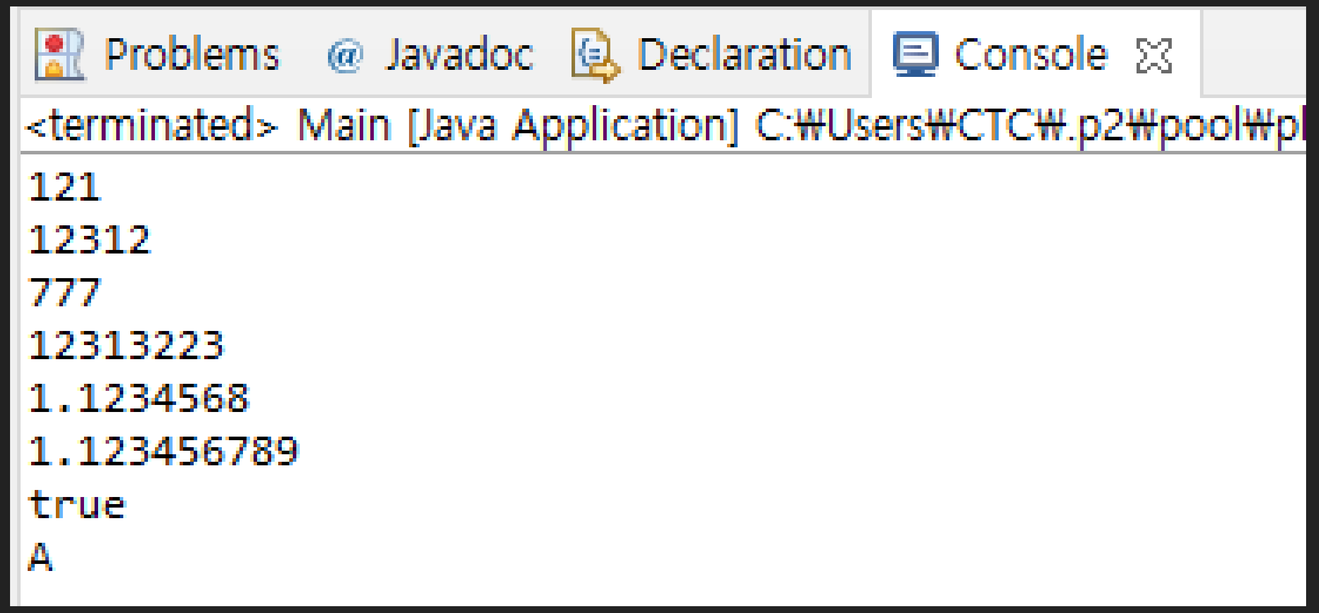
Source : https://www.w3schools.com/java/java_data_types.asp

Data Type and Variable(Cont'd)

Variable

- Variables can be initialized with a default value
- The variables can be automatically casted to String type and printed.

```
public static void main(String[] args) {
    byte bTemp = 121;
    short sTemp = 12312;
    int iTemp = 777;
    long lTemp = 12313223;
    float fTemp = 1.123456789f;
    double dTemp = 1.123456789;
    boolean boolTemp = true;
    char cTemp = 'A';
    System.out.println(bTemp);
    System.out.println(sTemp);
    System.out.println(iTemp);
    System.out.println(lTemp);
    System.out.println(fTemp);
    System.out.println(dTemp);
    System.out.println(boolTemp);
    System.out.println(cTemp);
}
```



Data Type and Variable

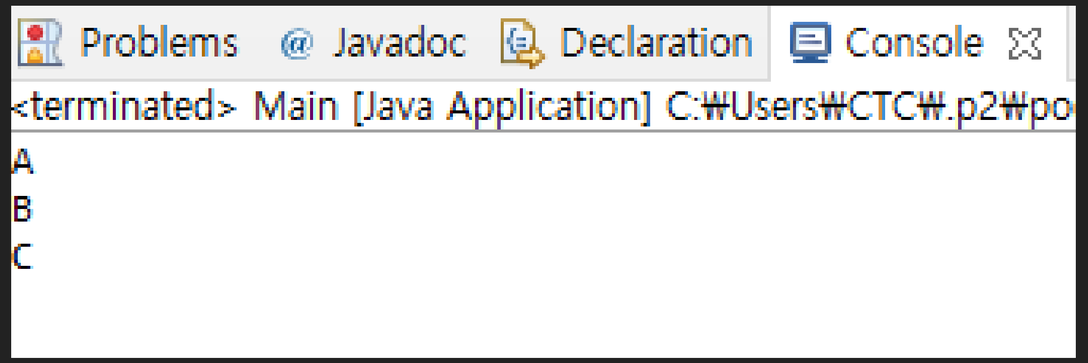
Variable

- Variables can be changed

```
public static void main(String[] args) {
    char cTemp = 'A';
    System.out.println(cTemp);

    cTemp = 'B';
    System.out.println(cTemp);

    cTemp = 'C';
    System.out.println(cTemp);
}
```



P10 : Practice this process with all the other data types

Data Type and Variable

Object Type Casting

- Converting the value of one data type to another data type

```
5      public static void main(String[] args) {
6          int iTemp = 1;
7          System.out.println(iTemp);
8
9          iTemp = (int)'2';
10         System.out.println(iTemp);
11     }
```

P11 : Practice this process with all the other data types

Operator(Cont’d)

Java Operators

- Operators are used to perform operations with variables and values

- The kinds of Java operators are as below:

1) Arithmetic operators

2) Assignment operators

3) Comparison operators

4) Logical operators

5) Bitwise operators

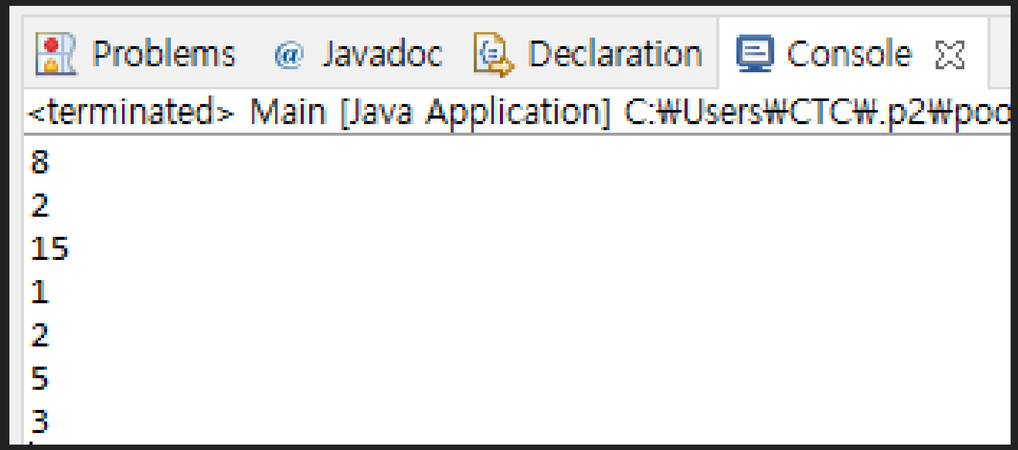
Operator(Cont'd)

Arithmetic Operators

Operator	Name	Description
+	Addition	Adds the two values
-	Subtraction	Subtracts one from another
*	Multiplication	Multiplies the two values
/	Division	**Divides one by another**
%	Modules	**Returns the division remainder**
++	Increment	**Increases the values of a variable by 1**
--	Decrement	**Decreases the values of a variable by 1**

Source : https://www.w3schools.com/java/java_operators.asp

```
5    public static void main(String[] args) {
6        int a = 5;
7        int b = 3;
8        System.out.println(a + b);
9        System.out.println(a - b);
10       System.out.println(a * b);
11       System.out.println(a / b);
12       System.out.println(a % b);
13       System.out.println(a++);
14       System.out.println(b--);
15   }
```



P12

Calculating Change

- User inputs the two numbers which are the paid money and the change

- Print the calculation of how many coins and bills are needed for the change

20000
13800

6200
10000 - 0
5000 – 1
1000 – 1
500 – 0
100 – 2
50 – 0
10 – 0

P13

Base 10 to Base 3 Converter

- User inputs a number of base 10

- Print the number of base 3 which is the same as the input number

10
101

Operator(Cont'd)

Assignment Operators

Operator	Example	Same As
=	x = 5	x = 5
+=	x += 3	x = x + 3
-=	x -= 3	x = x – 3
*=	x *= 3	x = x * 3
/=	x /= 3	x = x / 3
%=	x %= 3	x = x % 3
&=	x &= 3	x = x & 3
!=	x |= 3	x = x | 3
^=	x ^= 3	x = x ^ 3
>>=	x >>= 3	x = x >> 3
<<=	x <<= 3	x = x << 3

Source : https://www.w3schools.com/java/java_operators.asp

```
5   public static void main(String[] args)
6       int x = 7;
7       System.out.println(x);
8
9       x += 3;
10      System.out.println(x);
11      x -= 3;
12      System.out.println(x);
13      x *= 3;
14      System.out.println(x);
15      x /= 3;
16      System.out.println(x);
17      x %= 3;
18      System.out.println(x);
19      x = 10;
20      System.out.println(x);
21      x &= 3;
22      System.out.println(x);
23      x |= 3;
24      System.out.println(x);
25      x = 10;
26      System.out.println(x);
27      x ^= 3;
28      System.out.println(x);
29      x >>= 3;
30      System.out.println(x);
31      x <<= 3;
32      System.out.println(x);
```

Problems @ Javadoc Declaration Console

<terminated> Main [Java Application] C:₩Users₩CTC₩.p2₩poo

```
7
10
7
21
7
1
10
2
3
10
9
1
```

Operator(Cont'd)

Comparison Operators

Operator	Name
==	Equal to
!=	Not Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to

Source : https://www.w3schools.com/java/java_operators.asp

```
5      public static void main(String[] args) {
6          int x = 3;
7          int y = 3;
8          int z = 5;
9          System.out.println(x == y);
10         System.out.println(x != y);
11         System.out.println(x > y);
12         System.out.println(x < z);
13         System.out.println(x >= z);
14         System.out.println(y >= z);
15     }
```

Problems @ Javadoc Declaration Console

<terminated> Main [Java Application] C:₩Users₩CTC₩.p2₩pool

```
true
false
false
true
false
false
```

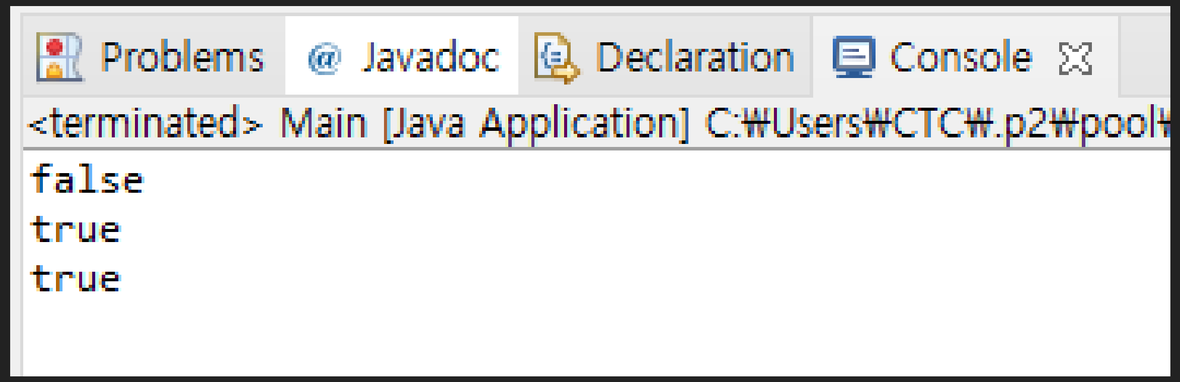
Operator

Logical Operators

Operator	Name	Description
&&	Logical and	Returns true if both statements are true
||	Logical or	Returns true if one of the statements is true
!	Logical not	Reverse the result, returns false if the result is true

Source : https://www.w3schools.com/java/java_operators.asp

```
5    public static void main(String[] args) {
6        int x = 10;
7        int y = 20;
8        System.out.println(x < 5 && y > 10);
9        System.out.println(x < 5 || y > 10);
10       System.out.println(!(x < 5 && y > 10));
11
12   }
```



Operator

Input Function

- In order to use the functions of “Scanner”, the related source code should be imported

- The function is depending on the variable data type

```
3  import java.util.Scanner;
4
5  public class Main {
6
7      public static void main(String[] args) {
8          Scanner scanner = new Scanner(System.in);
9          String name;
10         int age;
11
12         System.out.println("Please input name");
13         name = scanner.next();
14         System.out.println("name is " + name);
15
16         System.out.println("Please input age");
17         age = scanner.nextInt();
18         System.out.println("age is " + age);
19     }
20 }
```

Problems | Javadoc | Declaration | Console

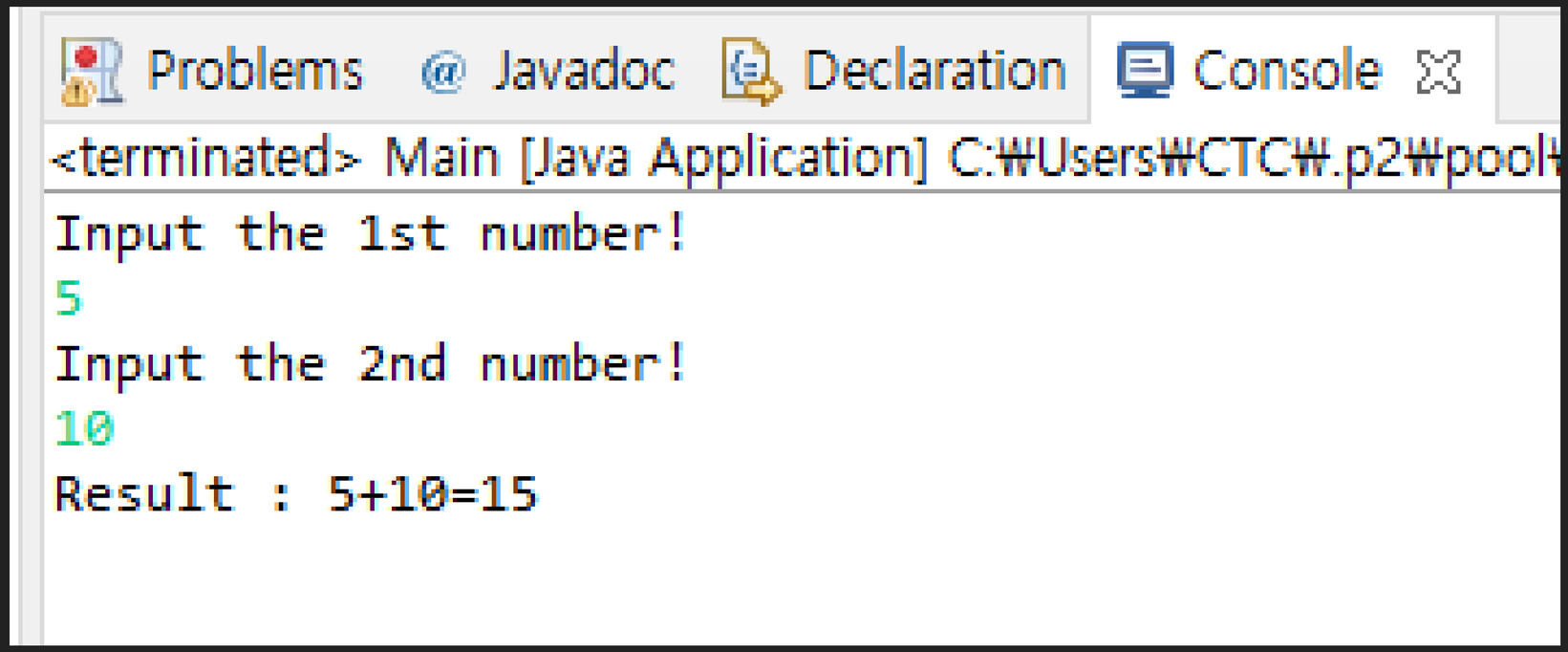
<terminated> Main [Java Application] C:₩Users₩CTC₩.p2₩poo

```
Please input name
mike
name is mike
Please input age
50
age is 50
```

P14

Compose a program with the conditions below

- User inputs the two numbers respectively
- The screen shows the plus calculation process and the result



Escape Character

Input Function

- In order to use the functions of “Scanner”, the related source code should be imported

- The function is depending on the variable data type

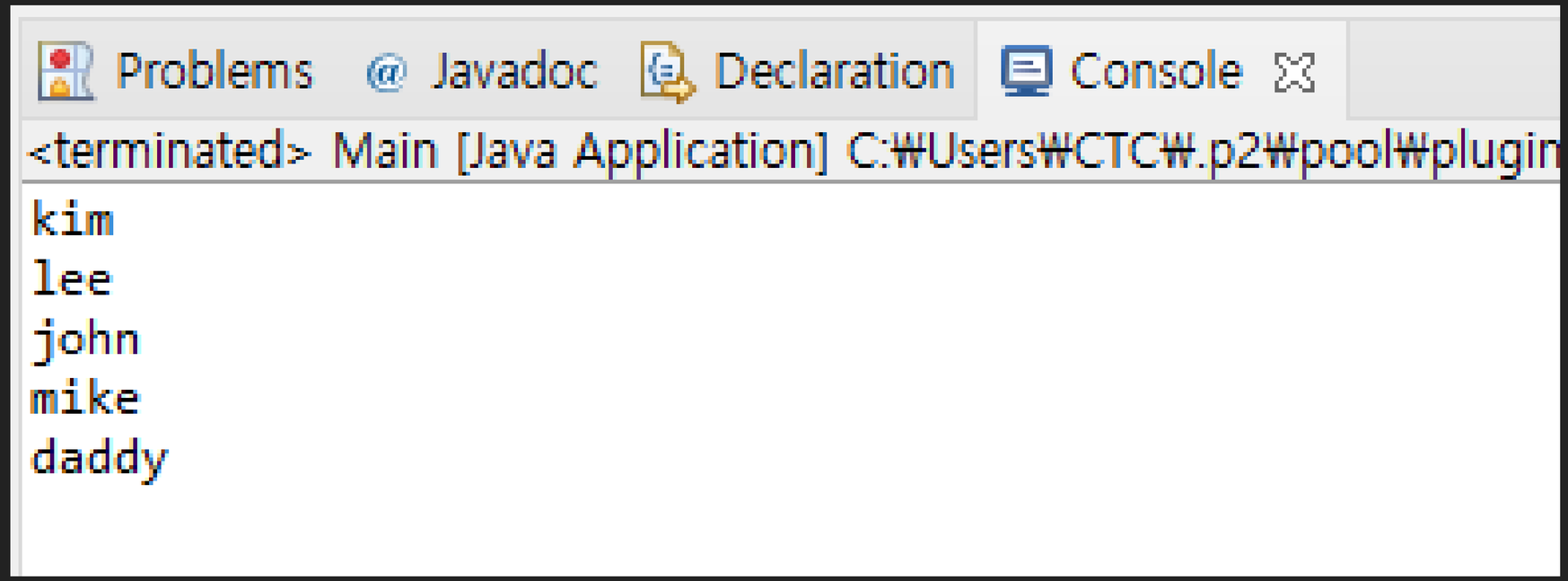
Escape Sequence	Description
\t	Insert a tab
\b	[illegible]
\n	Insert a newline
\r	[illegible]
\f	Insert a formfeed
\’	Insert a single quote
\”	Insert a double quote
\\	Insert a backslash

Source : https://docs.oracle.com/javase/tutorial/java/data/characters.html

P15

Compose a program with the conditions below

- Use the function, “System.out.print()” only once
- And print the 5 lines of words as below



P16

Compose a program with the conditions below

- Use the function, “System.out.print()” within 7 times
- And print the calendar as below