

Java Programming Environment

Lab 0

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Overview

- Run a Java program
 - Install JDK
 - Write a Java code in text editor
 - Run a Java program
- Run a Java program in IntelliJ IDEA
 - Install IntelliJ IDEA
 - Write a code in IntelliJ IDEA
 - Configure run settings
 - Hello World!

Java Development Environment

- **JVM** (Java Virtual Machine) is a virtual machine which enables a computer to run Java programs
- **JRE** (Java Runtime Environment) is needed to run Java Programs
 - **JVM** + Java package classes (util, math, lang, etc.)
- **JDK** (Java Development Kit) is needed to develop Java Programs
 - **JRE** + development tools (javac, etc.)
- **Java SE** (Standard Edition) is an edition of **JDK**



Download JDK installer

- <https://www.oracle.com/technetwork/java/javase/downloads/jdk12-downloads-5295953.html>

Java SE Development Kit 12.0.2

You must accept the [Oracle Technology Network License Agreement](#) for Oracle Java SE to download this software.

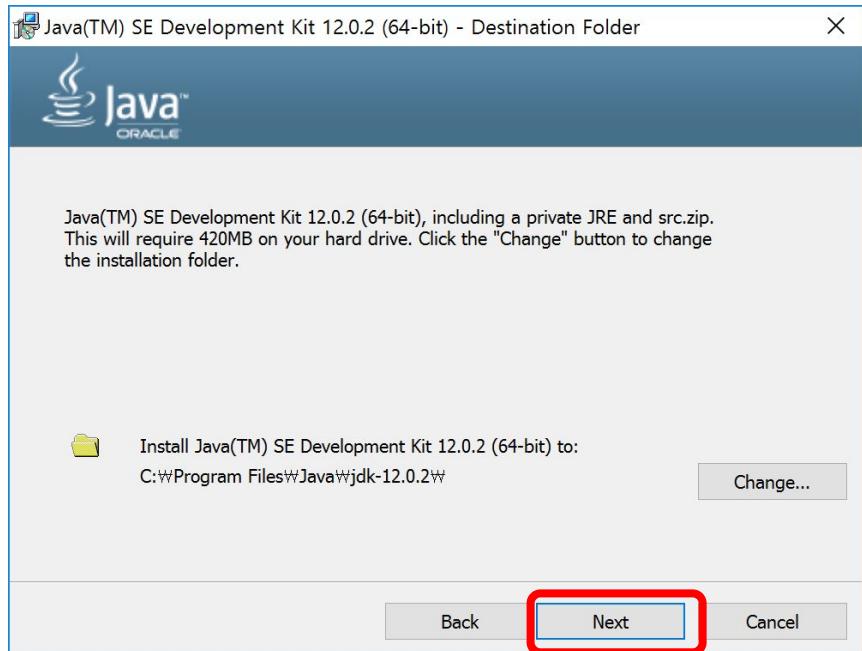
1 Select Accept License Agreement Decline License Agreement

Product / File Description	File Size	Download
Linux	155.14 MB	jdk-12.0.2_linux-x64_bin.deb
Linux	162.79 MB	jdk-12.0.2_linux-x64_bin.rpm
Linux	181.68 MB	jdk-12.0.2_linux-x64_bin.tar.gz
macOS	173.63 MB	jdk-12.0.2_osx-x64_bin.dmg
macOS	173.98 MB	jdk-12.0.2_osx-x64_bin.tar.gz
Windows	158.63 MB	jdk-12.0.2_windows-x64_bin.exe
Windows	179.57 MB	jdk-12.0.2_windows-x64_bin.zip

Select your OS

Install JDK

- Run JDK installer



Install JDK

- JDK is successfully installed

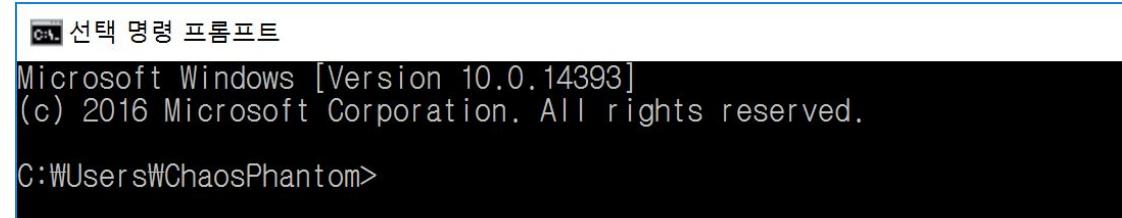


Add Java Path to the System

- Type  + “Command Prompt” or “명령 프롬프트”

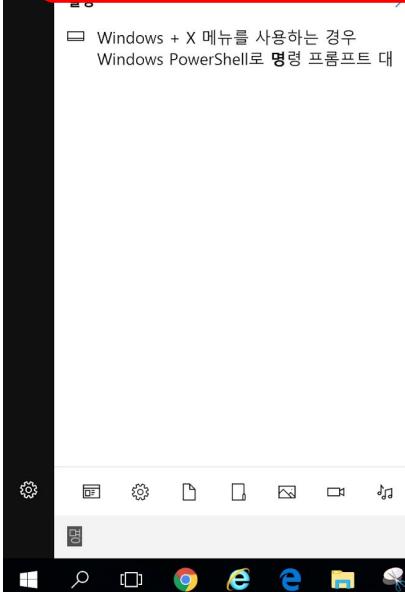


or “Command Prompt”



```
C:\선택 명령 프롬프트
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\ChaosPhantom>
```



Add Java Path to the System

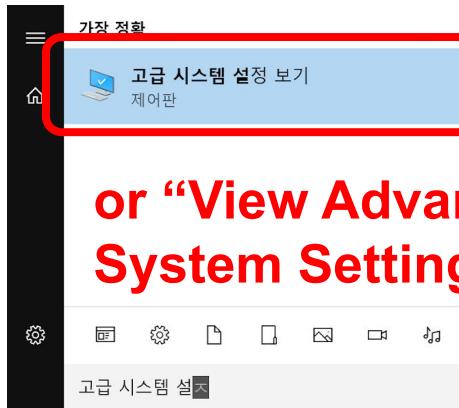
- Type “java -version” in Command Prompt (or 명령 프롬프트)
- Command Prompt doesn’t recognize Java because Java path is not added to the system

```
C:\> 명령 프롬프트
C:\Users\ChaosPhantom>java -version
'java'은(는) 내부 또는 외부 명령, 실행할 수 있는 프로그램, 또는
배치 파일이 아닙니다.
```

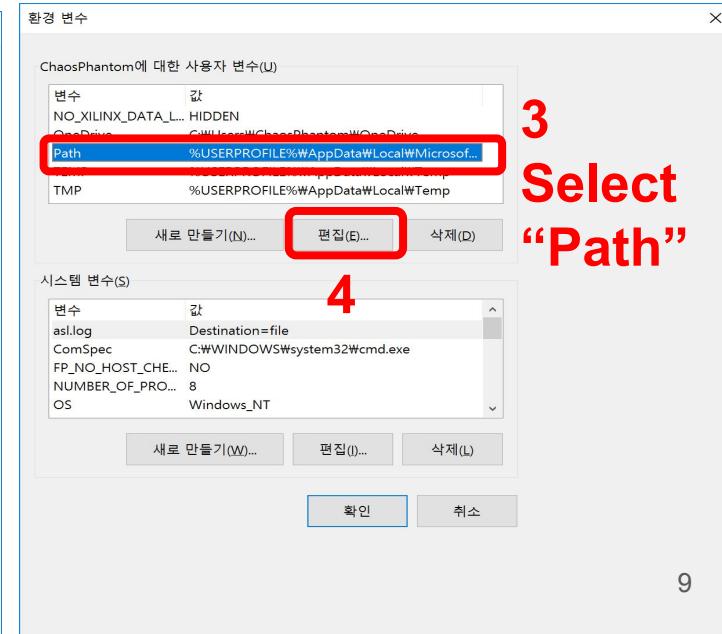
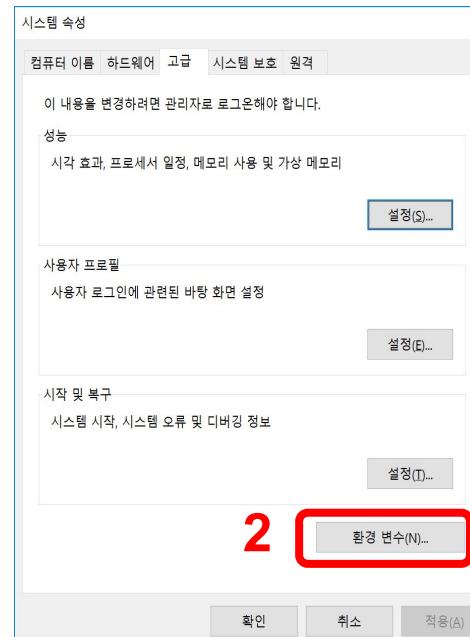
Add Java Path to the System

- Type  + View Advanced System Settings" or

“고급 시스템 설정 보기”



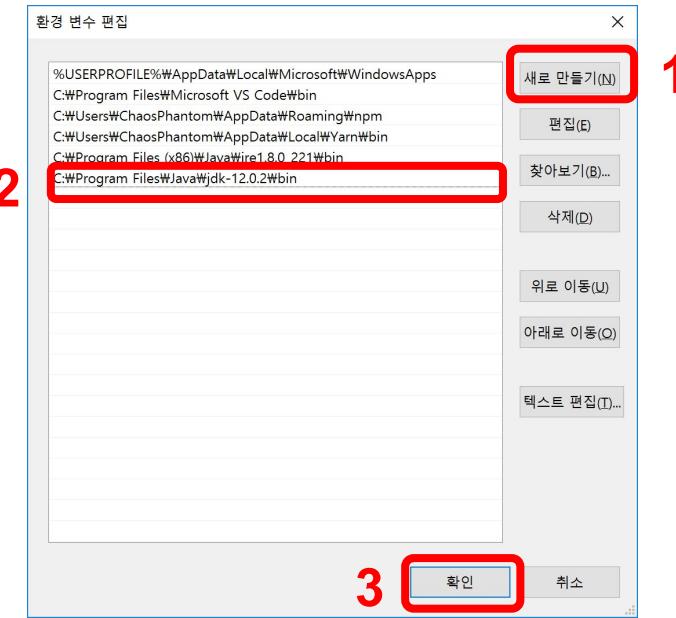
or “View Advanced System Settings”



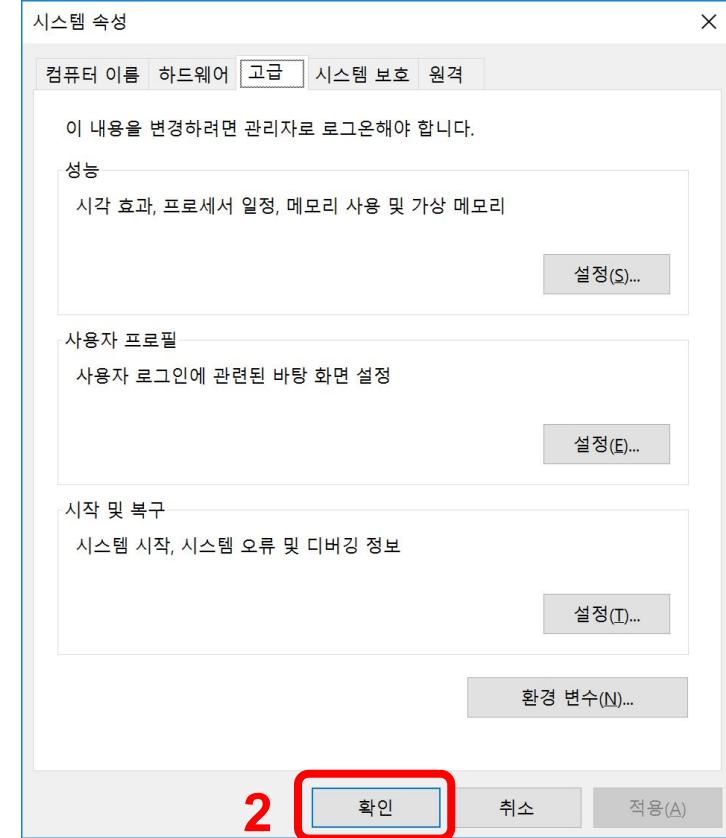
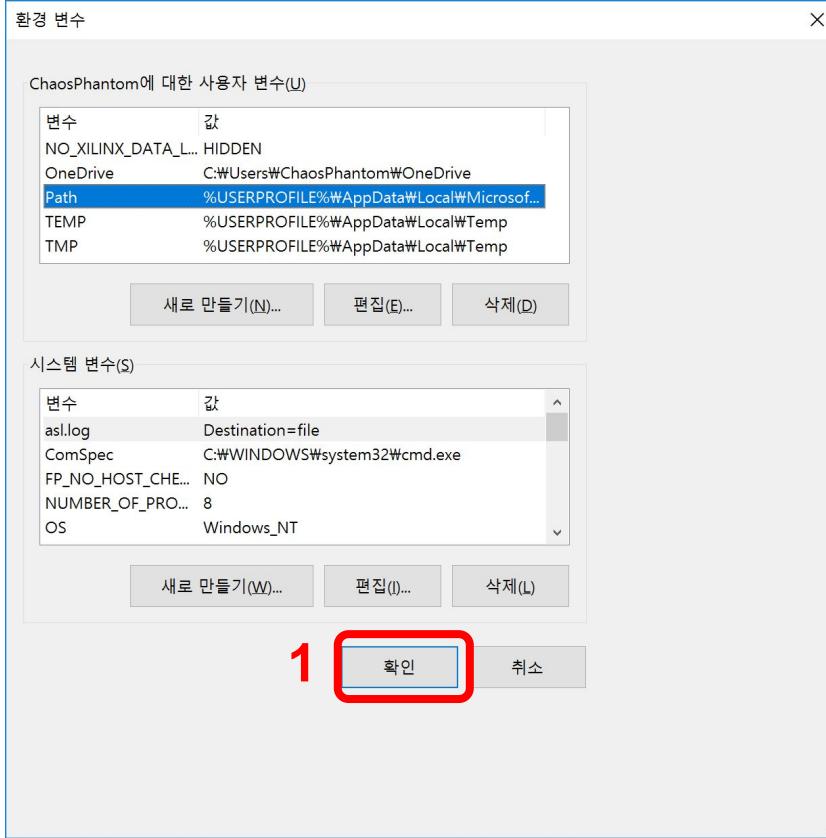


Add Java Path to the System

- Add “C:\Program Files\Java\jdk-12.0.2\bin”
(\ and # are the same character)



Add Java Path to the System



Add Java Path to the System

- Close and reopen Command Prompt (or 명령 프롬프트)
- Now the system recognize Java

 선택 명령 프롬프트

```
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.
```

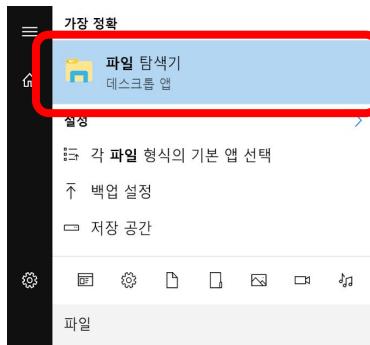
```
C:\Users\ChaosPhantom>java -version
java version "12.0.2" 2019-07-16
Java(TM) SE Runtime Environment (build 12.0.2+10)
Java HotSpot(TM) 64-Bit Server VM (build 12.0.2+10, mixed mode, sharing)
```

Write a Java Code

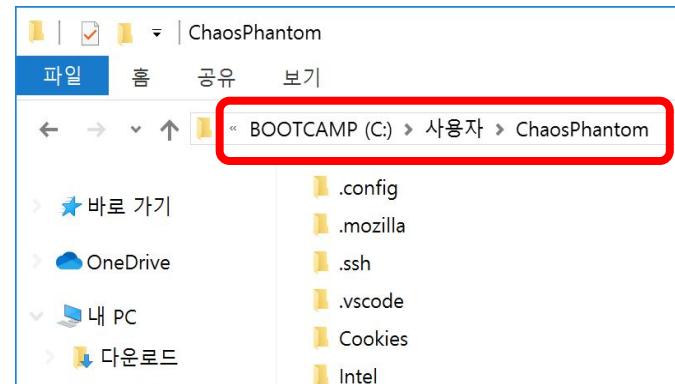
1. Type “File Explorer” or “파일 탐색기”
2. Go to

“C:\Users\<COMPUTER_ACCOUNT_NAME>”

or “C:\사용자\<컴퓨터 계정 이름>”

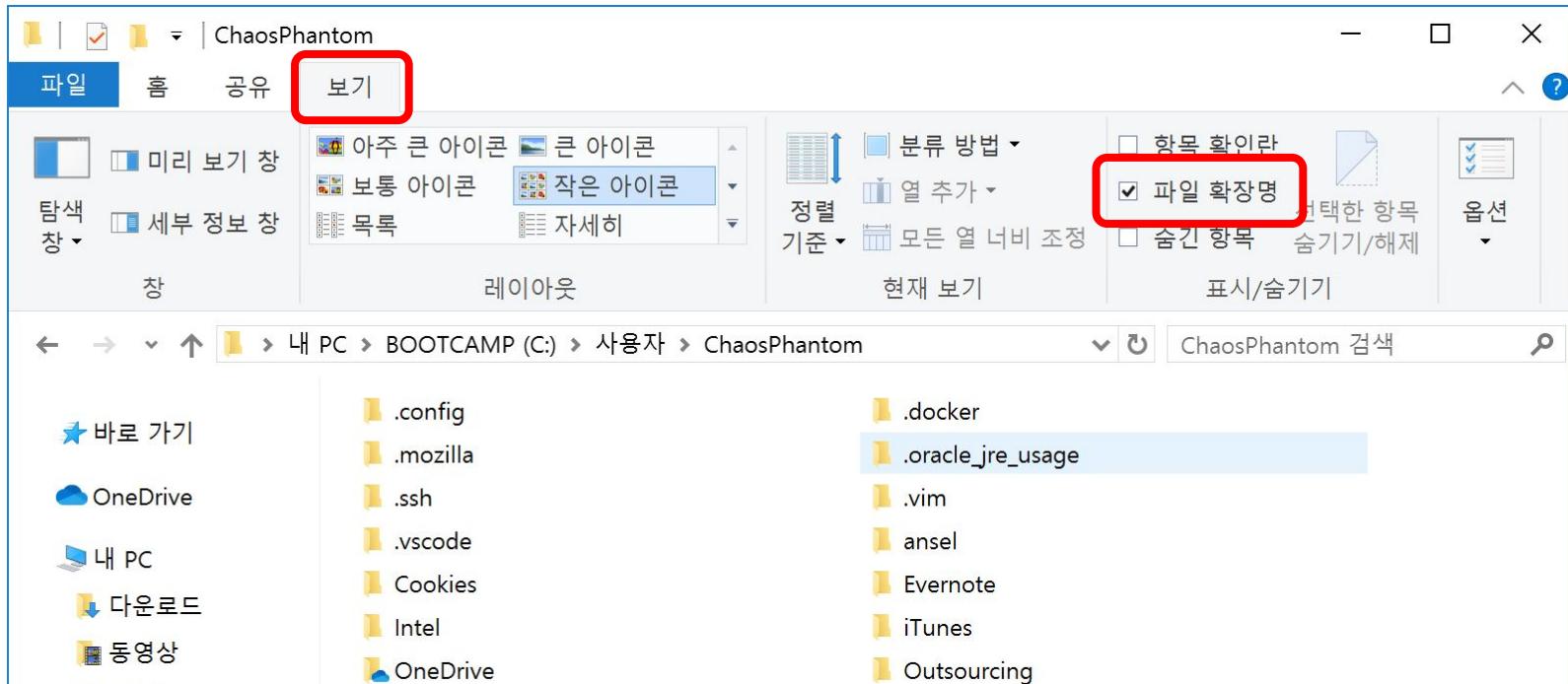


or “File Explorer”



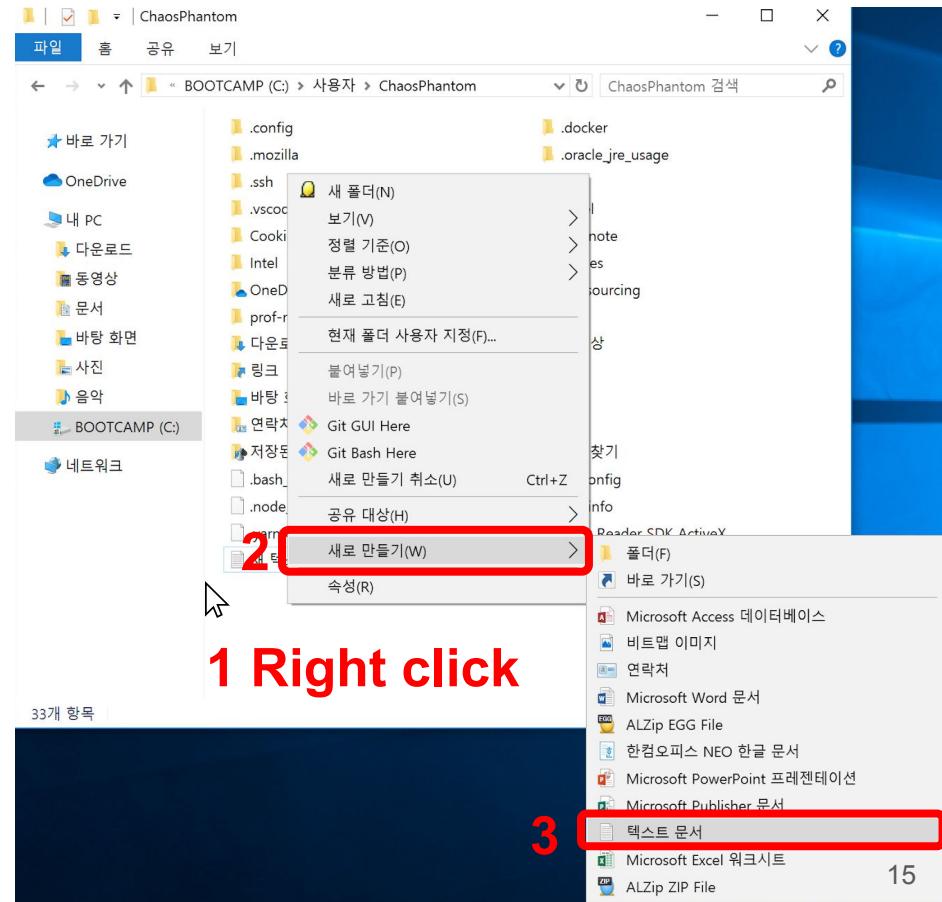
Write a Java Code

- Show file extensions



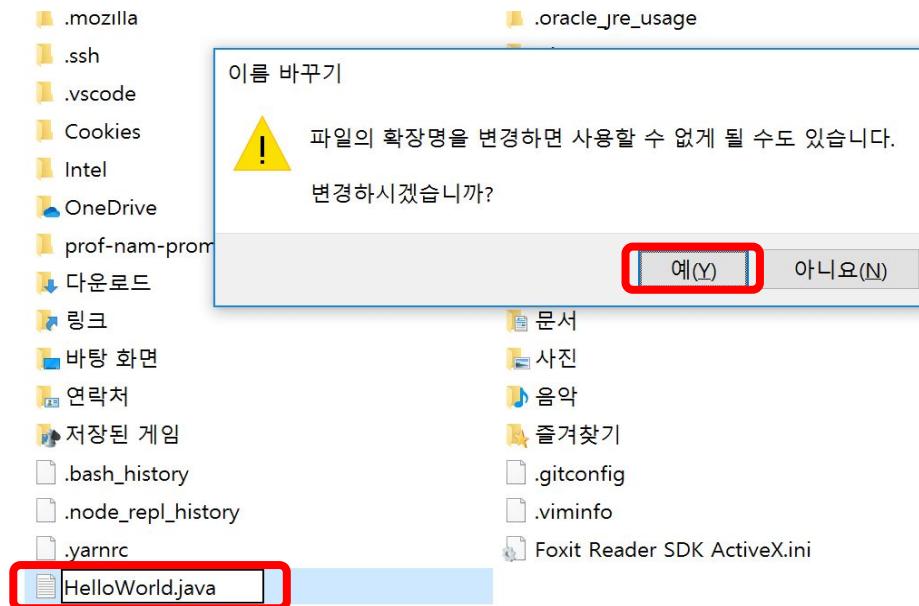
Write a Java Code

- Create a new text file



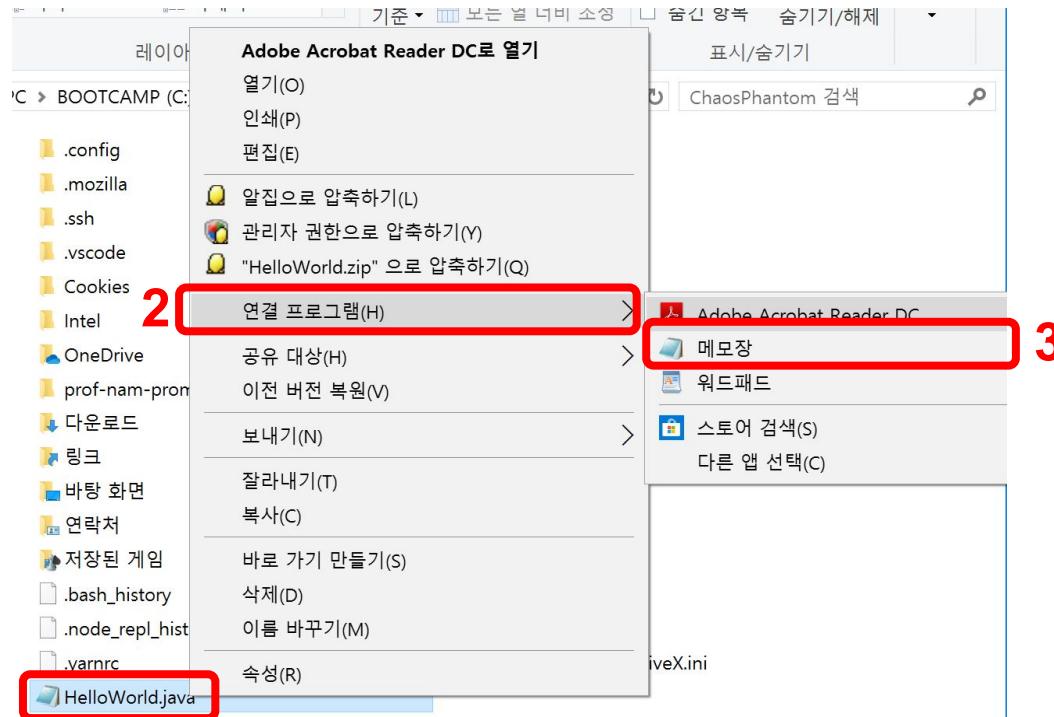
Write a Java Code

- Rename the text file “HelloWorld.java”
- Ensure that the extension is not “.txt”



Write a Java Code

- Open the Java file with text editor



Write a Java Code

- Write the code and save the file



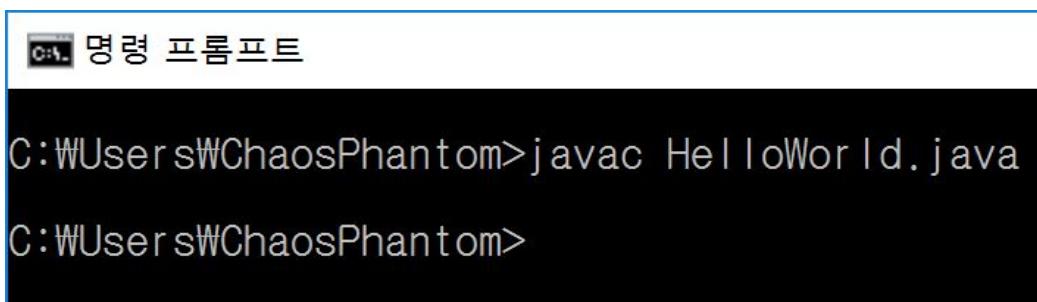
HelloWorld.java - 메모장

파일(F) 편집(E) 서식(O) 보기(V) 도움말(H)

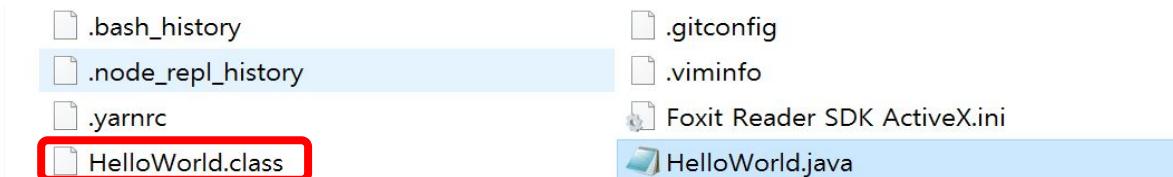
```
class HelloWorld {  
    public static void main(String[] args) {  
        System.out.println("Hello World!");  
    }  
}
```

Run a Java Program

- Type “javac HelloWorld.java” in Command Prompt and Java executable file “HelloWorld.class” is created



```
C:\Users\ChaosPhantom>javac HelloWorld.java  
C:\Users\ChaosPhantom>
```



Run a Java Program

- Type “java HelloWorld” to execute “HelloWorld.class” file
- You just ran your first Java program!



명령 프롬프트

```
C:\Users\ChaosPhantom>javac HelloWorld.java
C:\Users\ChaosPhantom>java HelloWorld
Hello World!
```

Introduction to IDE

- Writing Java code in text editor and compiling it manually is very exhausting and repetitive work especially in big and complex projects
- Instead, programmers use IDE to develop softwares

IDE (Integrated Development Environment)

- Software application that provides comprehensive facilities to computer programmers for software development
 - Code editor: autocomplete, syntax check, highlighting, etc.
 - Build automation tools: Automatic compile
 - Debuggers
- IDEs for Java Programming





IntelliJ IDEA

- We use IntelliJ IDEA for Java programming in this class
- One of the most popular Java IDE
- Developed by Jetbrains which develops other popular IDEs like Android Studio, Pycharm, etc.
- Already installed in the Software Practice Room (302-311-2)



Download IntelliJ IDEA

- <https://www.jetbrains.com/idea/download/#section=windows>

The screenshot shows the official IntelliJ IDEA download page. At the top, there's a navigation bar with links for Tools, Languages, Solutions, Support, Company, and Store, along with user and search icons. Below the navigation bar, there's a secondary navigation bar with links for IntelliJ IDEA, What's New, Features, Learn, Buy, and a prominent blue 'Download' button. On the left side, there's a large logo featuring the letters 'IJ' in a black hexagon with a white border, set against a background of overlapping colorful geometric shapes (pink, blue, orange, purple). Below the logo, text indicates the version: 'Version: 2019.2.1', build number 'Build: 192.6262.58', date 'August 21, 2019', and a link to 'Release notes'. In the center, the heading 'Download IntelliJ IDEA' is displayed above three tabs: 'Windows' (which is selected and highlighted in blue), 'macOS', and 'Linux'. To the right, two download options are shown: 'Ultimate' for web and enterprise development and 'Community' for JVM and Android development. Each option has its own 'DOWNLOAD' button with a dropdown menu icon. The 'Community' section also includes the text 'Free, open-source'.

Version: 2019.2.1
Build: 192.6262.58
August 21, 2019
[Release notes](#)

Windows macOS Linux

Ultimate
For web and enterprise development

Community
For JVM and Android development

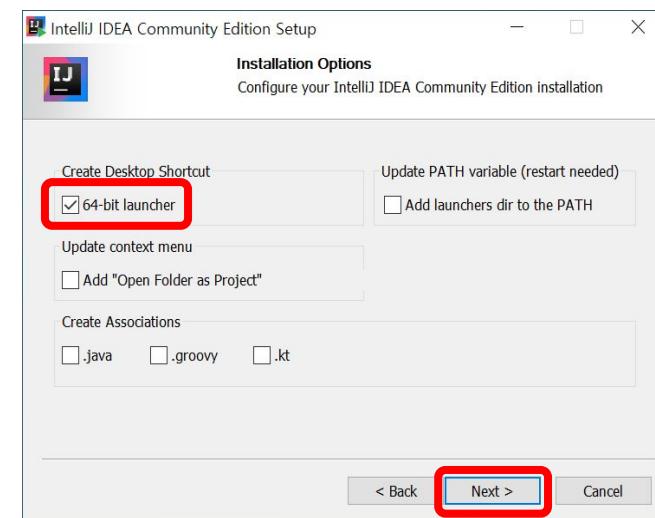
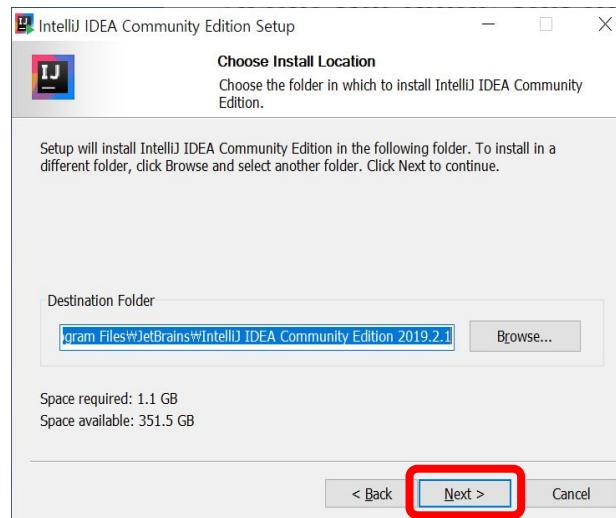
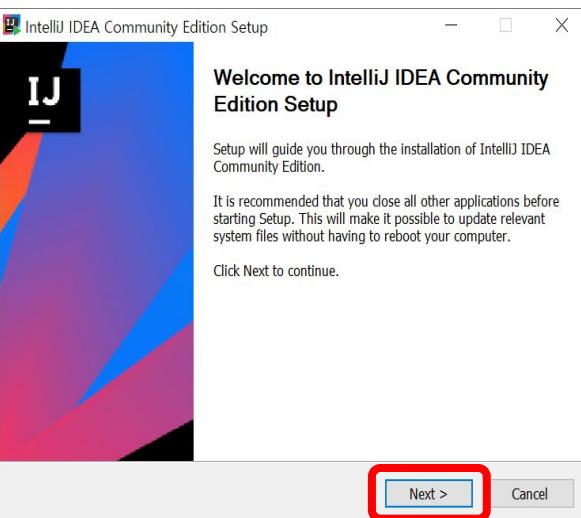
DOWNLOAD .EXE ▾
Free trial

DOWNLOAD .EXE ▾
Free, open-source



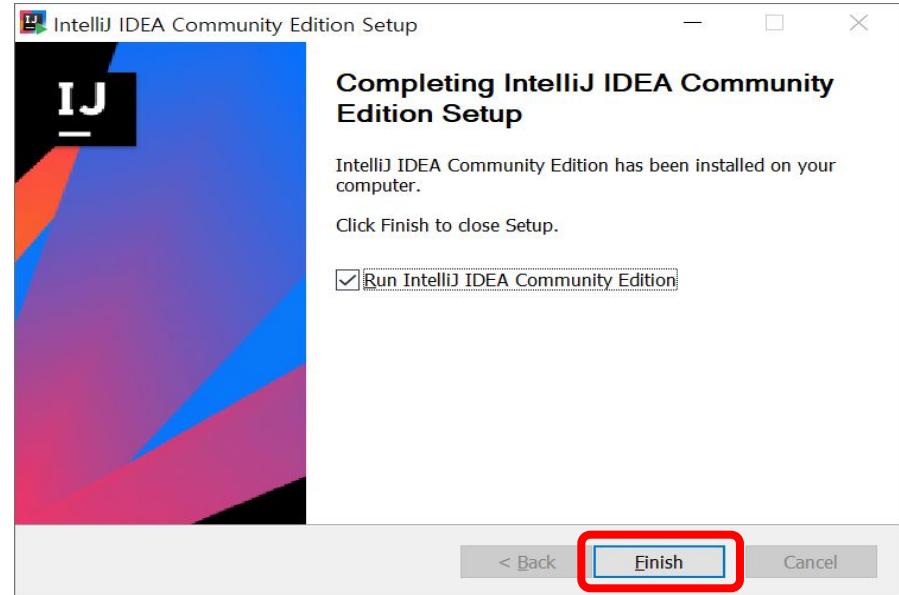
Install IntelliJ IDEA

- Execute the downloaded installer



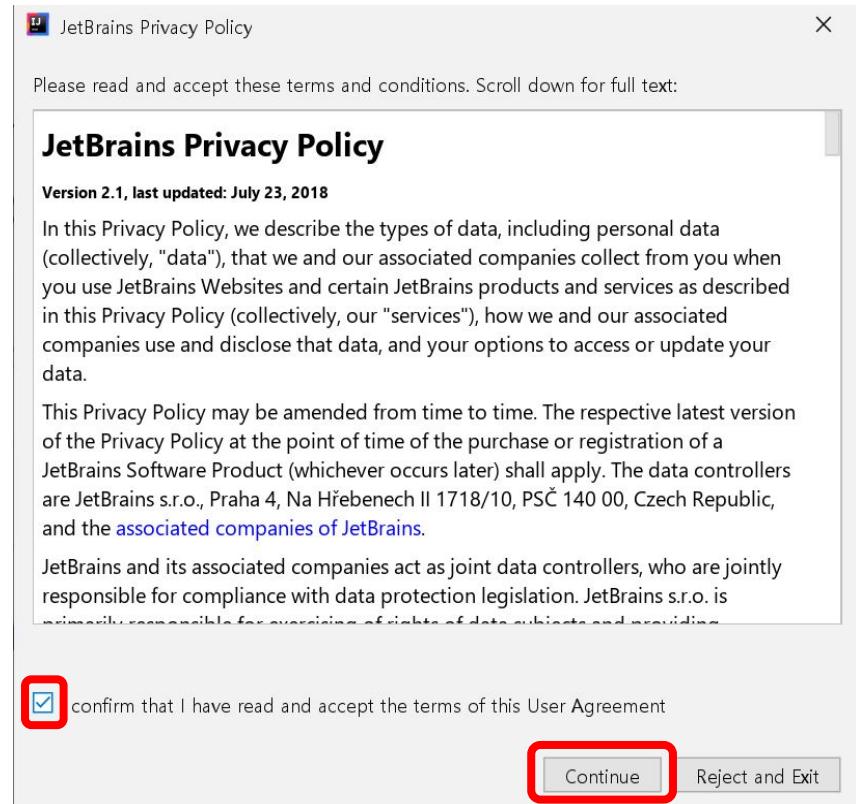
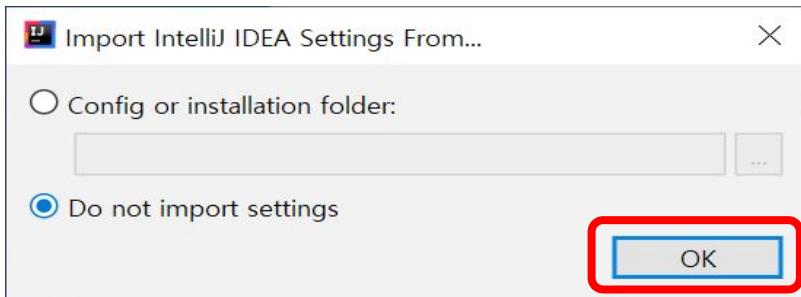
Install IntelliJ IDEA

- IntelliJ IDEA is Successfully installed

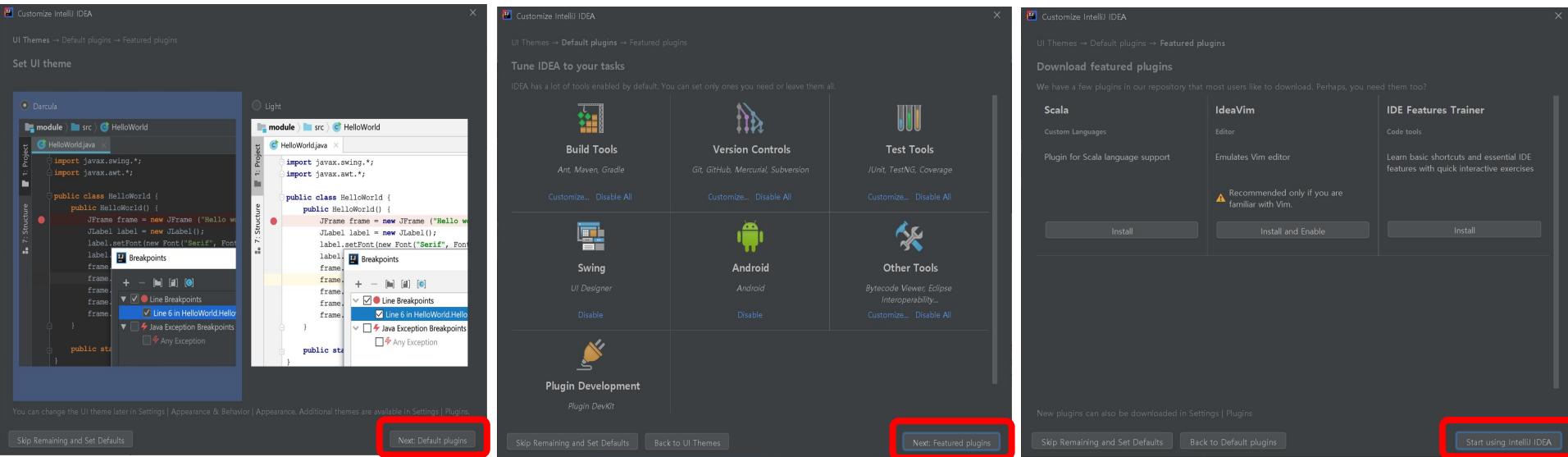


Configure IntelliJ IDEA Settings

- Run IntelliJ IDEA



Configure IntelliJ IDEA Settings

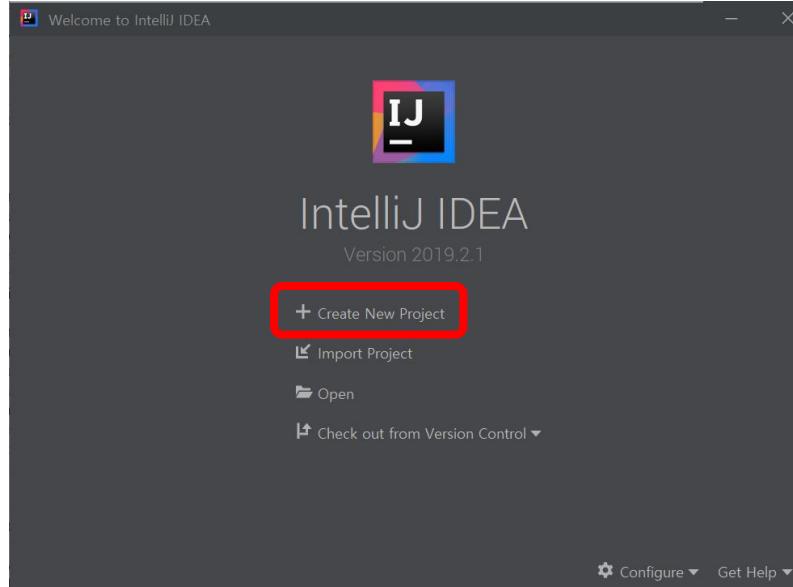


The image consists of three side-by-side screenshots of the 'Customize IntelliJ IDEA' configuration interface.

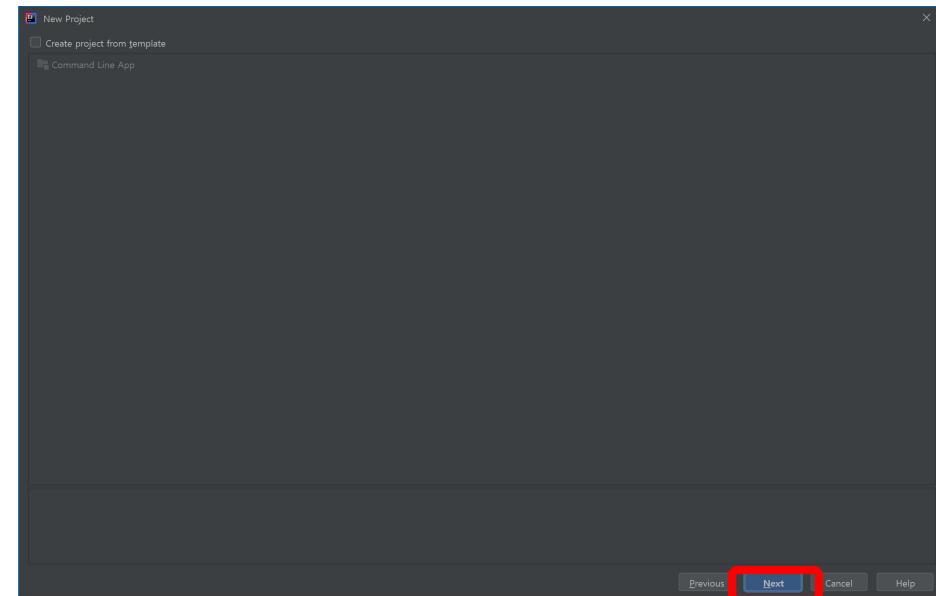
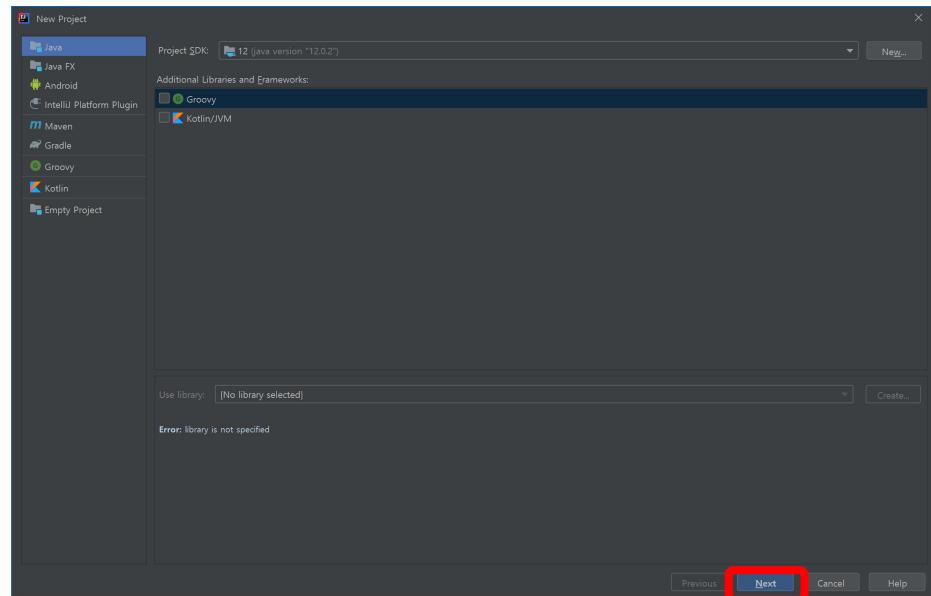
- Screenshot 1: Set UI theme**
Shows the 'UI Themes' section with 'Default plugins' selected. It displays two preview panes: 'Darcula' (dark blue theme) and 'Light' (light gray theme). The Darcula preview shows a Java code editor with breakpoints. A red box highlights the 'Next: Default plugins' button at the bottom.
- Screenshot 2: Tune IDEA to your tasks**
Shows the 'Tune IDEA to your tasks' section. It lists various tools: Build Tools (Ant, Maven, Gradle), Version Controls (Git, GitHub, Mercurial, Subversion), Test Tools (JUnit, TestNG, Coverage), Swing (UI Designer), Android, and Other Tools (Bytecode Viewer, Eclipse Interoperability...). Each tool has 'Customize...', 'Disable All', and 'Disable' buttons. A red box highlights the 'Next: Featured plugins' button at the bottom.
- Screenshot 3: Download featured plugins**
Shows the 'Download featured plugins' section. It lists Scala (Custom Languages), IdeaVim (Emulates Vim editor), and IDE Features Trainer (Editor). Each has an 'Install' or 'Install and Enable' button. A red box highlights the 'Start using IntelliJ IDEA' button at the bottom.

Run IntelliJ IDEA

- You see this window when run IntelliJ IDEA
- Let's create a new project

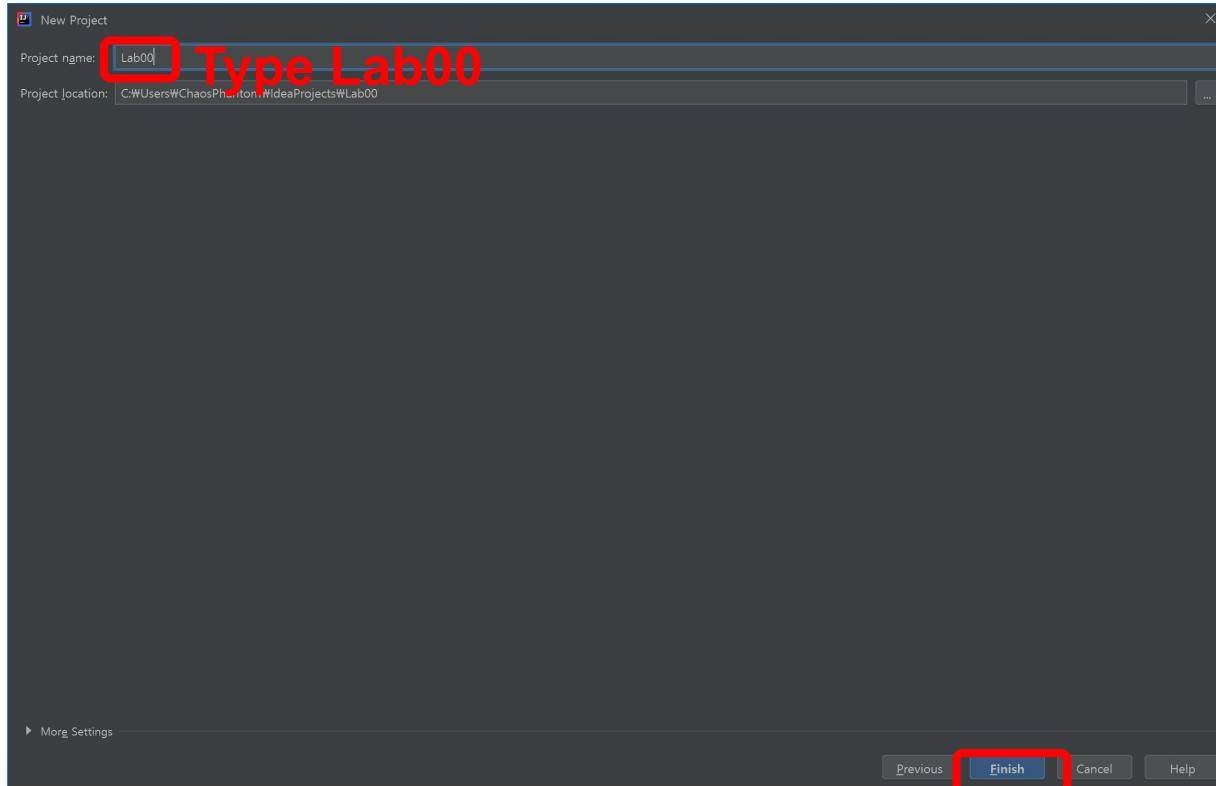


Create a New Project





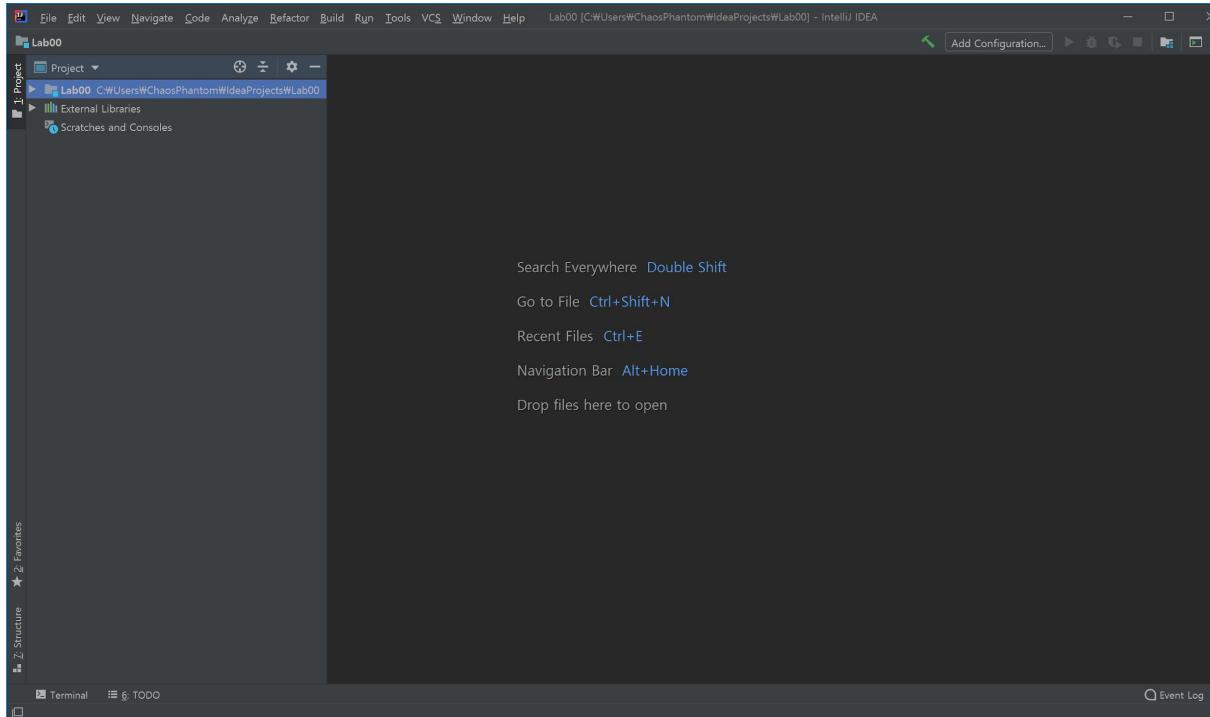
Create a New Project





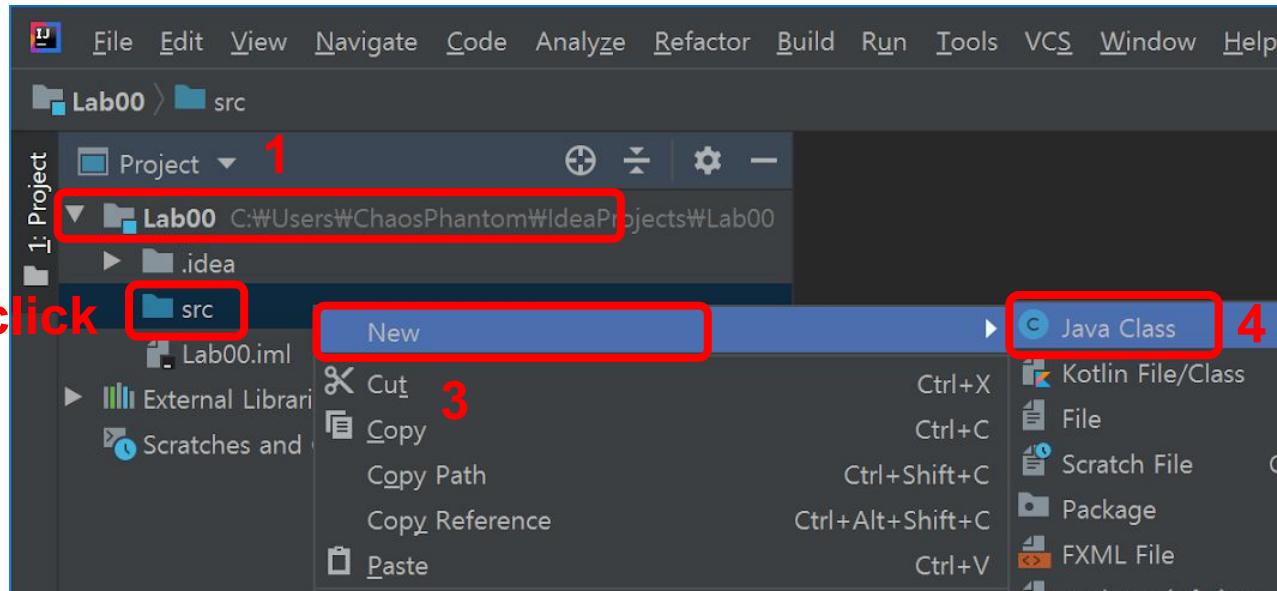
Create a New Project

- New project Lab00 is created



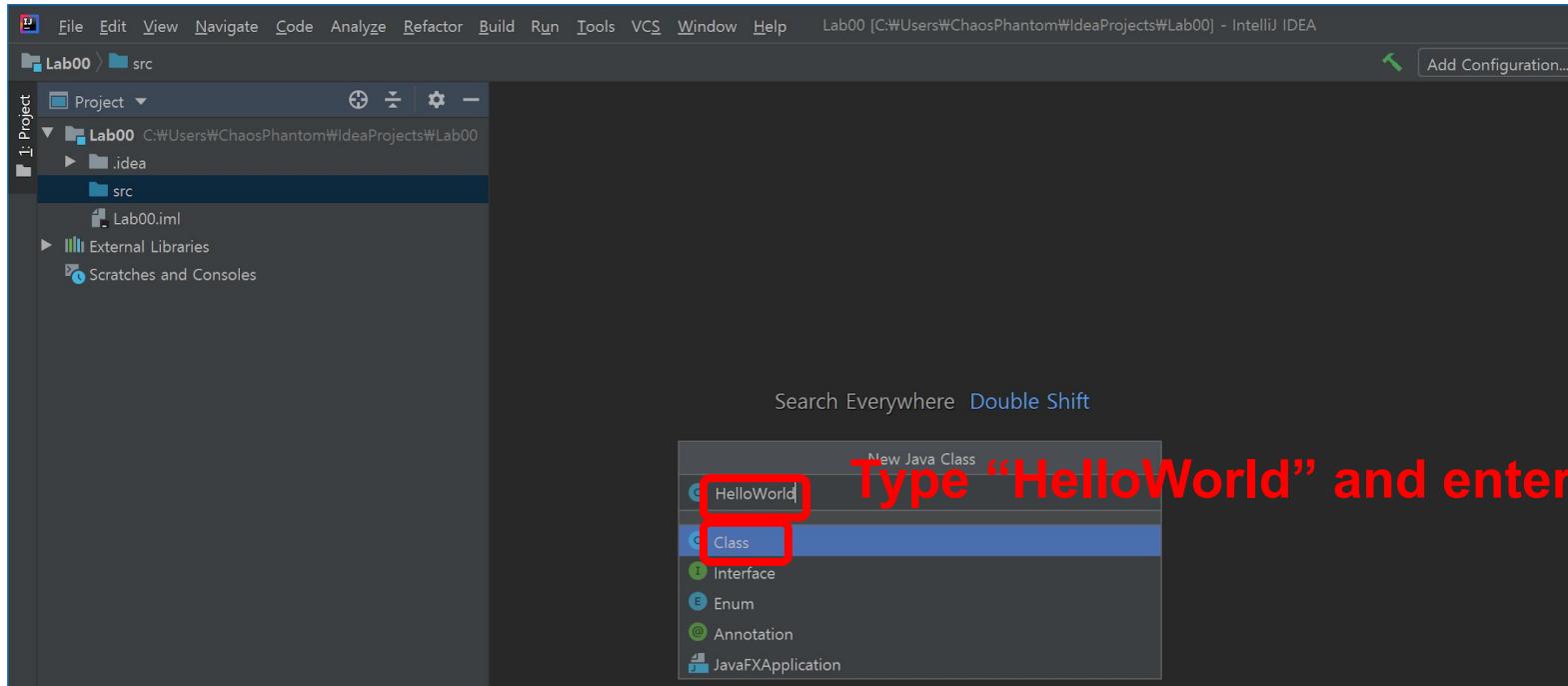
Create a Java Class File

- Create a new Java class file in “src” directory



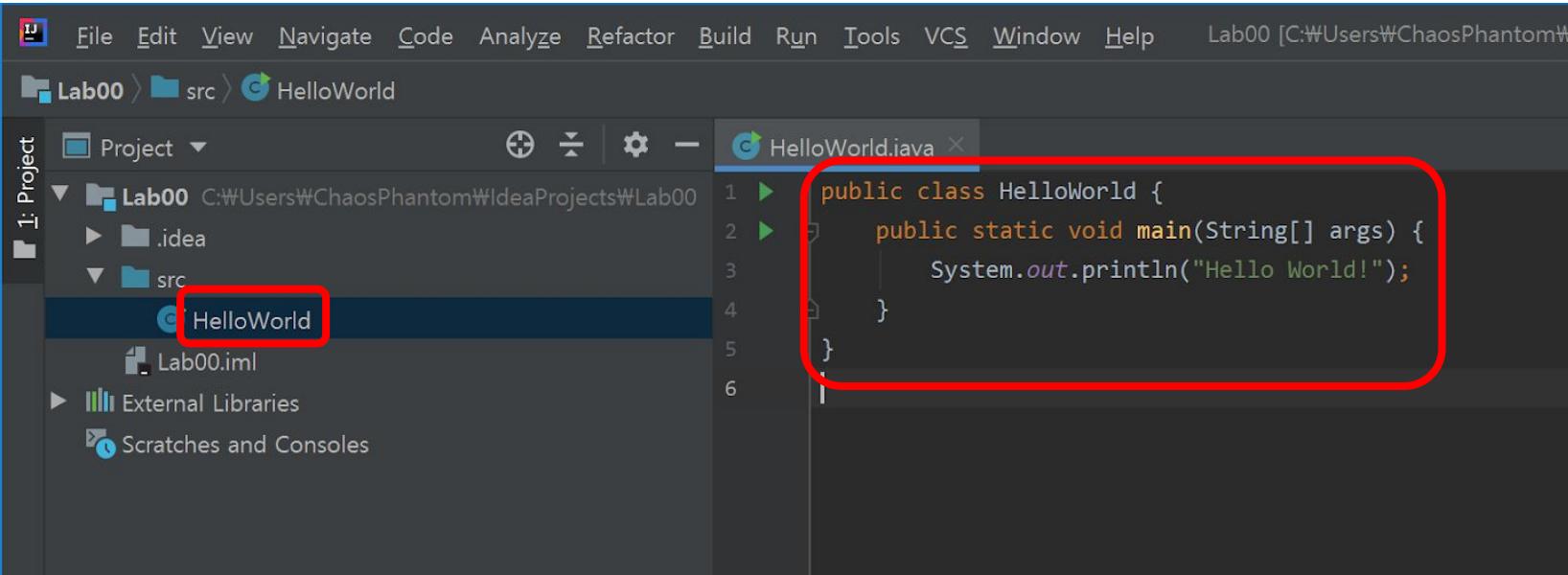
Create a Java Class File

- Create a new Java class “Main”



Write a Code

- Write a simple code which outputs “Hello World!”

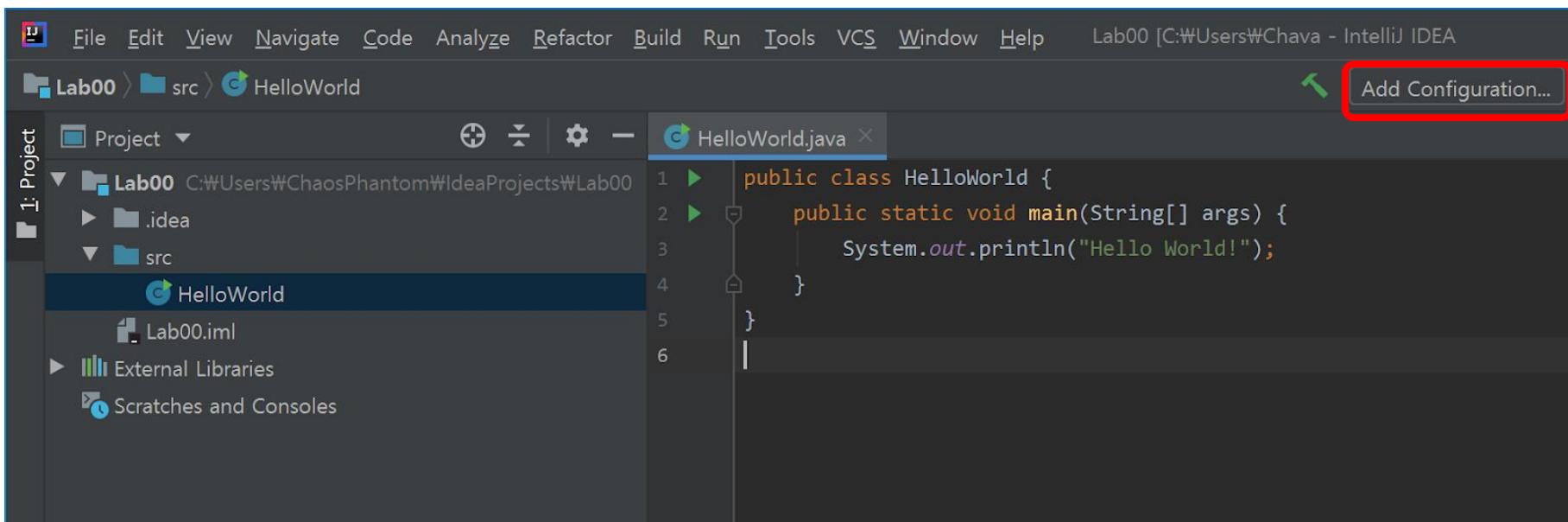


The screenshot shows the IntelliJ IDEA interface. The top navigation bar includes File, Edit, View, Navigate, Code, Analyze, Refactor, Build, Run, Tools, VCS, Window, Help, and the current project name Lab00 [C:\Users\ChaosPhantom\IdeaProjects\Lab00]. The left sidebar displays the Project structure with a 'Project' view, showing the 'Lab00' project with its .idea, src, and HelloWorld files. The 'src' folder is expanded, and the 'HelloWorld.java' file is selected and highlighted with a red box. The main editor window shows the following Java code:

```
public class HelloWorld {  
    public static void main(String[] args) {  
        System.out.println("Hello World!");  
    }  
}
```

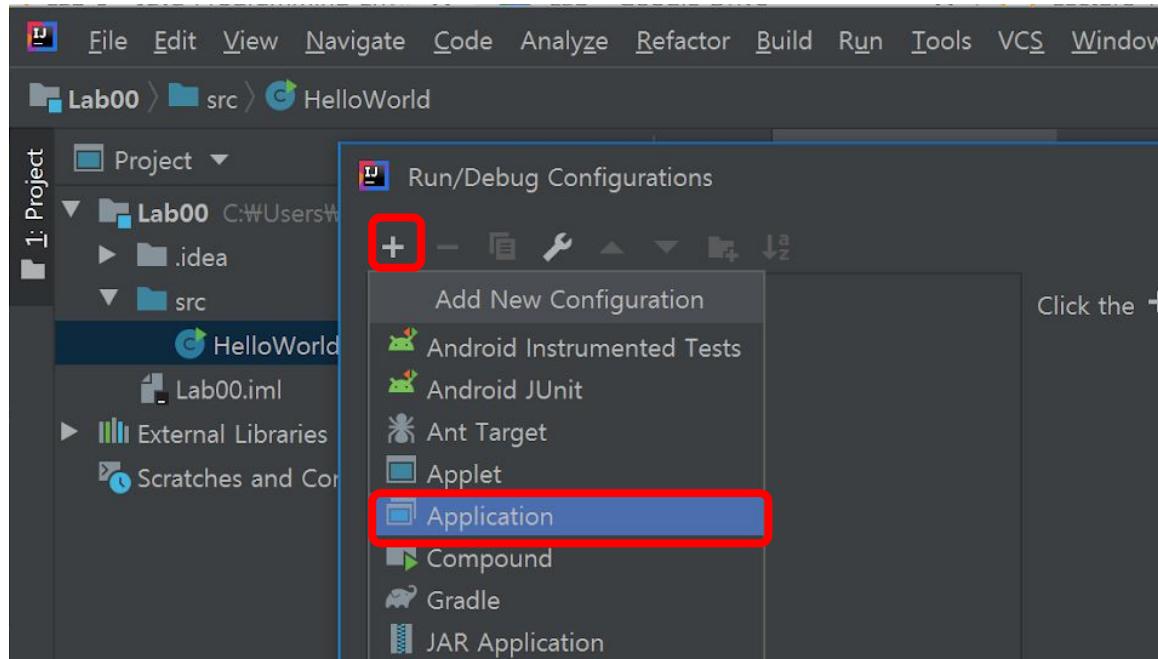
Run Configuration

- Create a new configuration to run Java application



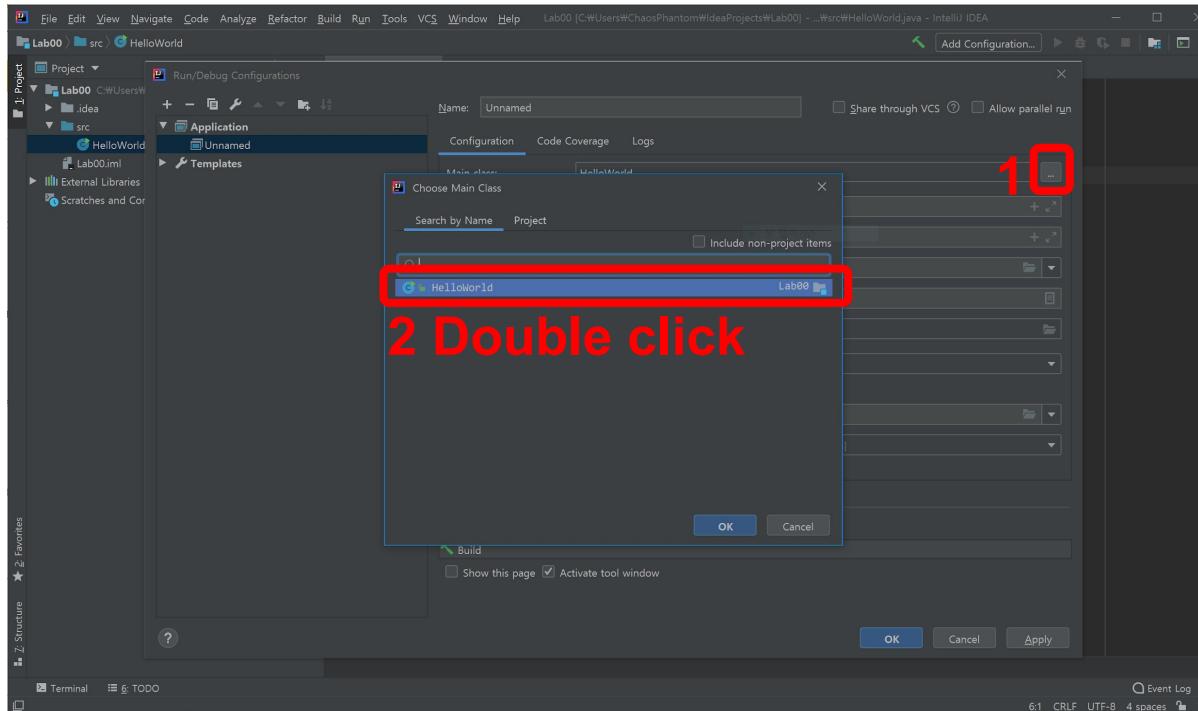
Run Configuration

- Create a new configuration to run Java application



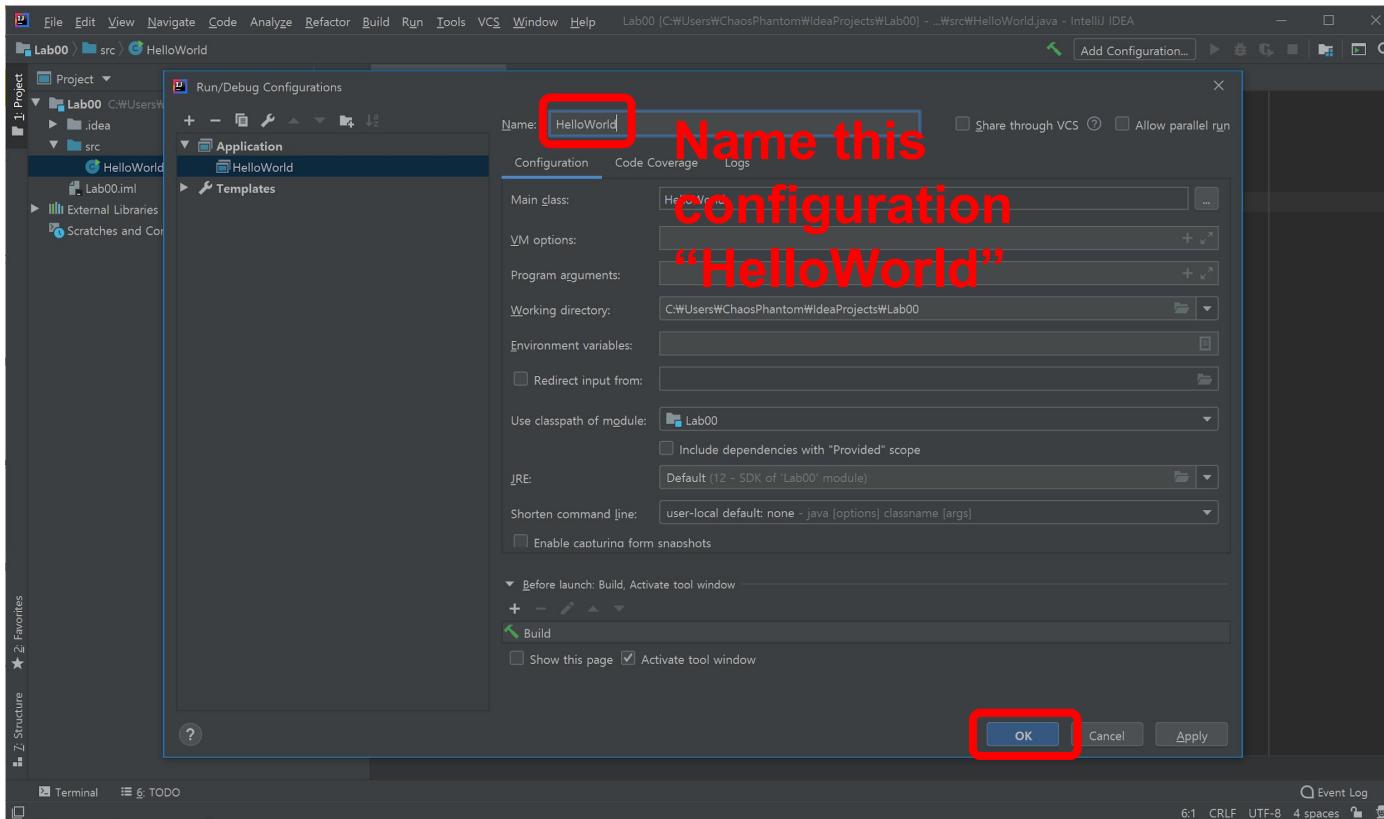
Choose the Main Class

- Choose which class to run



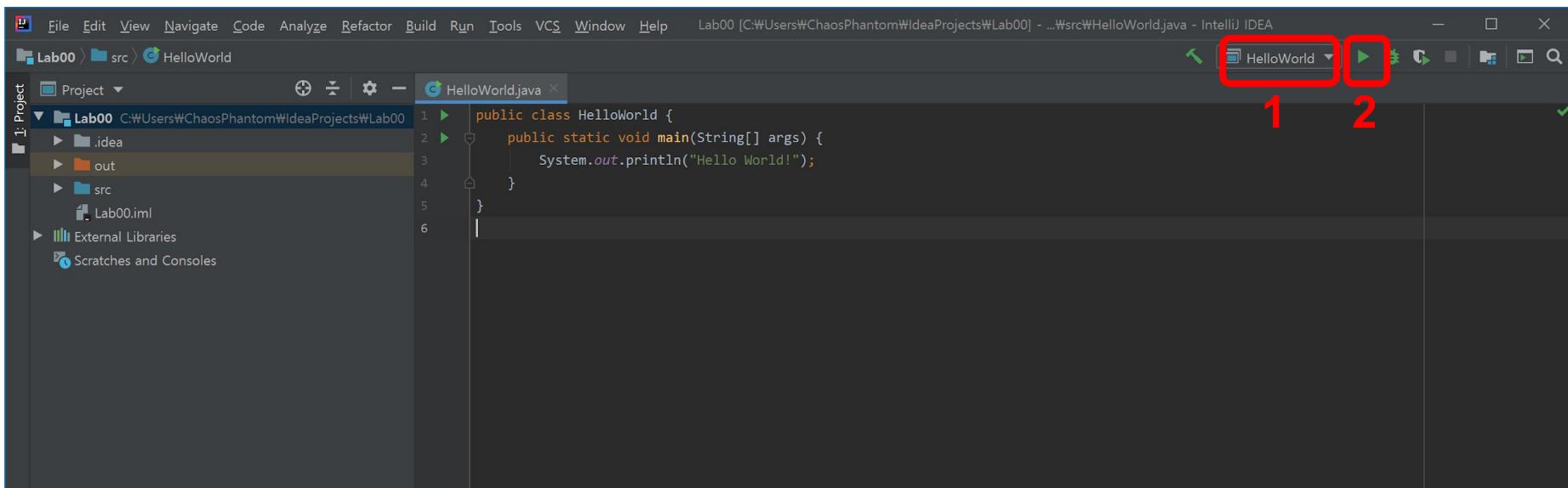


Run Configuration



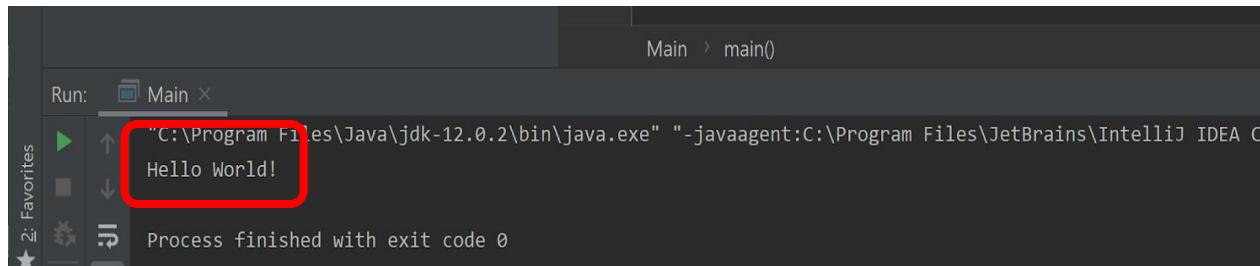
Run Java Application

- Run Java application



Hello World!

- IntelliJ IDEA automatically compile all “*.java” codes which are needed to run the main class (“Main” in this project).
- IntelliJ IDEA automatically runs the main class



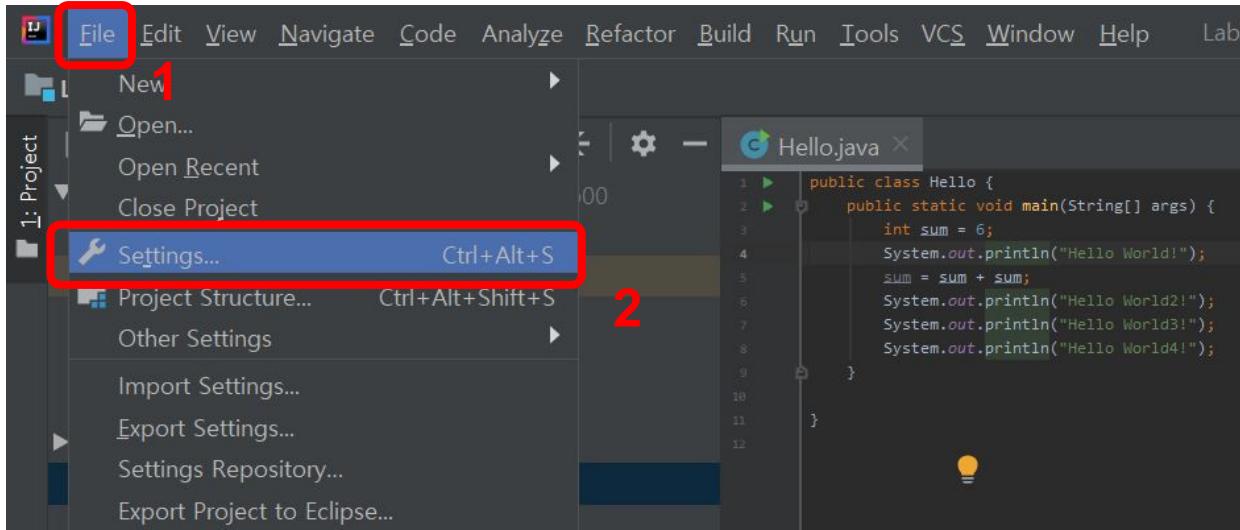
Additional features of IntelliJ IDEA

- Reason for using IDE
 - Convenient developing environment for the developer
 - Comprehensive facilities assisting the software development
- Will Introduce several specific and very useful built-in features of IntelliJ IDEA
 - Easier coding



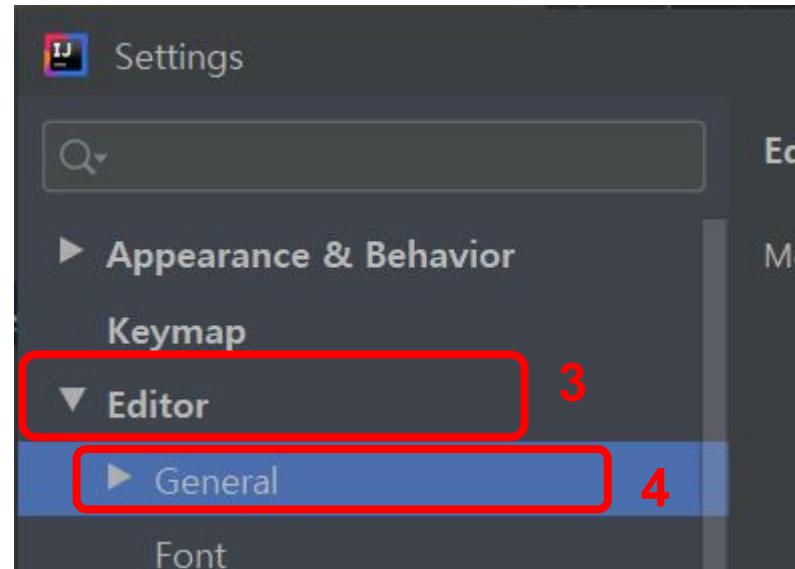
IDE font size change

- Code font size may be too small / large to read
- On the top bar menu, tap [File] -> [Settings]



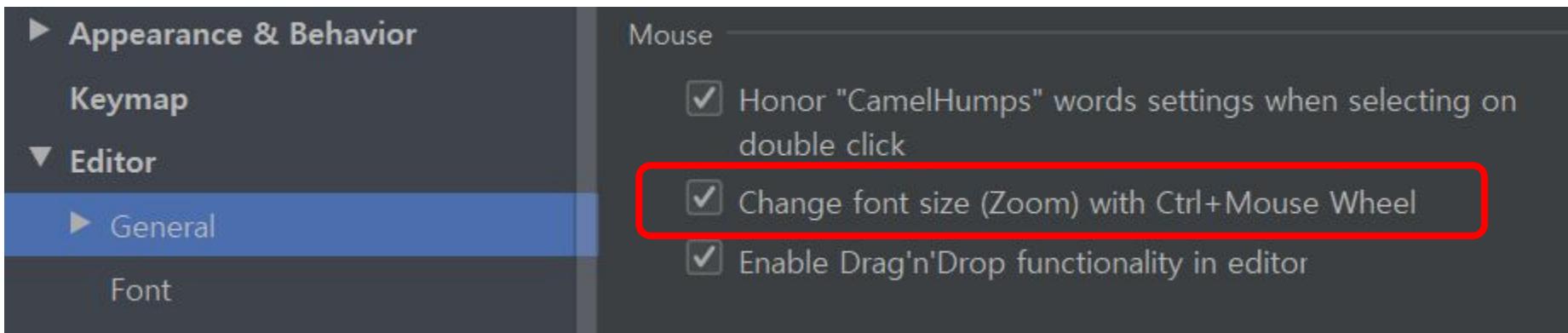
IDE font size change

- On the left bar of the Settings, tap [Editor] -> [General]



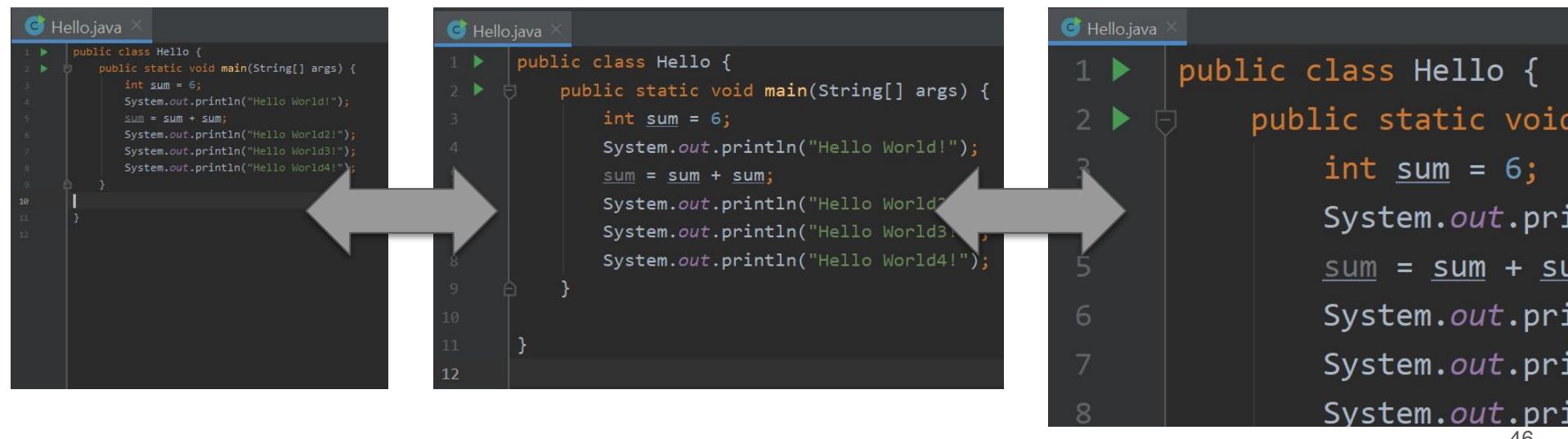
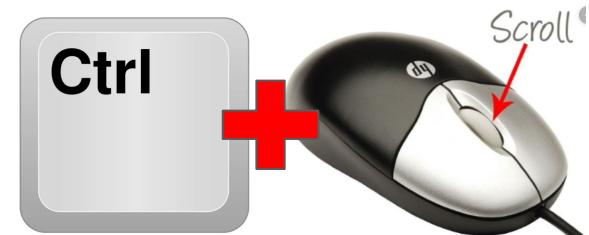
IDE font size change

- Check the box “Change font size(Zoom) with Ctrl + Mouse Wheel



IDE font size change

- Then font size is freely adjustable with [Ctrl + Mouse Wheel]



The figure consists of three side-by-side screenshots of a Java IDE (IntelliJ IDEA) showing the same code in three different font sizes. The code is as follows:

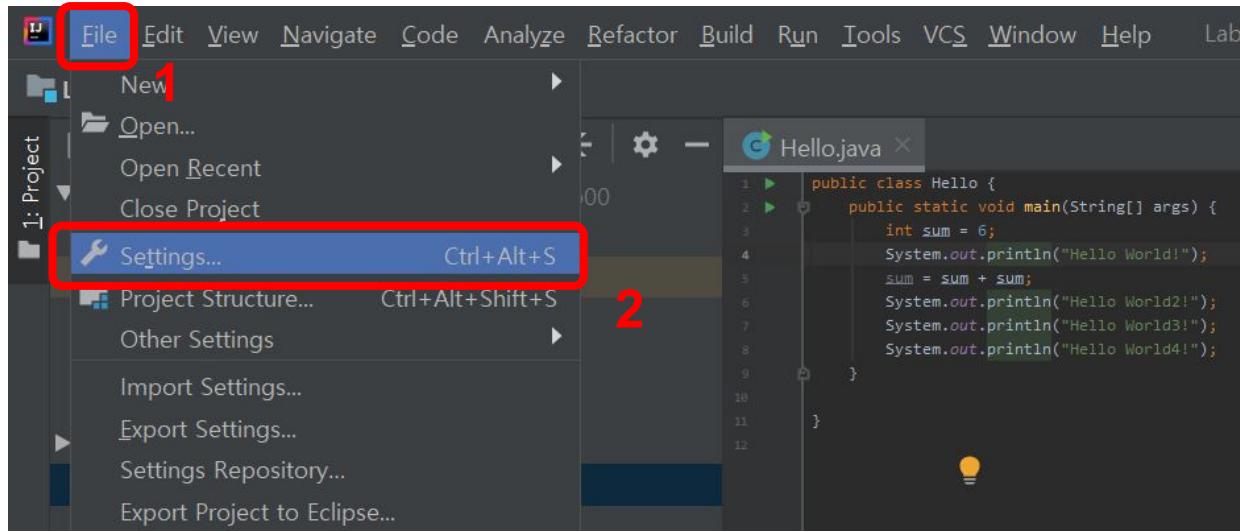
```
public class Hello {  
    public static void main(String[] args) {  
        int sum = 6;  
        System.out.println("Hello World!");  
        sum = sum + sum;  
        System.out.println("Hello World2!");  
        System.out.println("Hello World3!");  
        System.out.println("Hello World4!");  
    }  
}
```

The first screenshot shows the code in a small font. The second screenshot shows the code in a medium font. The third screenshot shows the code in a large font. A large grey double-headed arrow is positioned between the first and second screenshots, and another large grey double-headed arrow is positioned between the second and third screenshots, indicating the range of font sizes available.



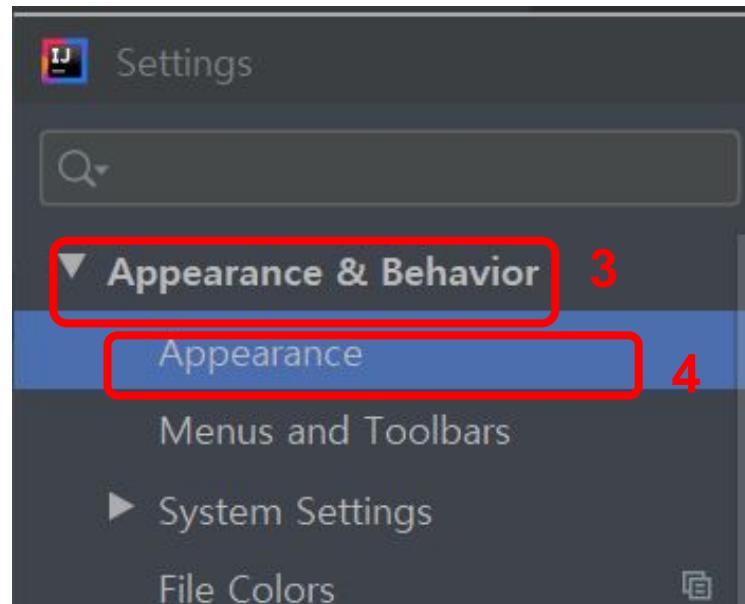
IDE theme change

- IDE theme may not suit your taste
- On the top bar menu, tap [File] -> [Settings]



IDE theme change

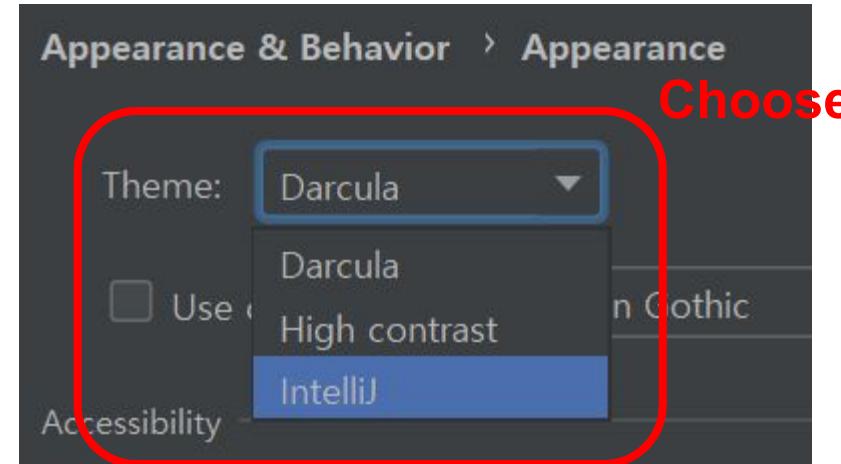
- On the left bar of the Settings, tap [Appearance]
-> [Appearance]





IDE theme change

- Select the theme you want in a “Theme” drop bar
 - Dracula : Black , IntelliJ : White, High contrast : for colorblind people.
 - Custom themes are also available through plugins



Code Autocomplete

- Writing the exact name for the functionality every time is TOO cumbersome
- When writing the code, Autocomplete the remaining part

```
public static void main(String[] args) {  
    int www = 6;  
    System.out.println("Hello World!");  
    www = www + www; Only written part of the name  
    System.out.prin  
}  
}  
  
    ⏮ printIn(int x) void  
    ⏮ print(boolean b) void  
    ⏮ print(char c) void  
    ⏮ print(int i) void  
    ⏮ print(long l) void  
    ⏮ print(float f) void  
    ⏮ print(double d) void  
    ⏮ print(String s) void
```

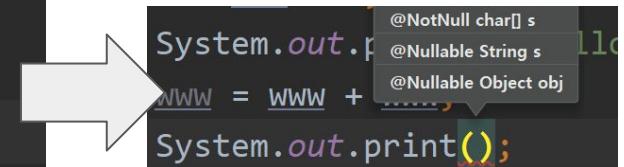
Suggests lots
of possible
names

Code Autocomplete

- Choose the name on drop bar with arrow key
- Press Tab or Enter to select it

```
public static void main(String[] args) {  
    int www = 6;  
    System.out.println("Hello World!");  
    WWW = WWW + www;  
    System.out.pr|  
}  
        m println(int x)          void  
        m print(boolean b)        void  
        m print(char c)          void  
        m print(int i)           void  
        m print(long l)          void
```

key to select

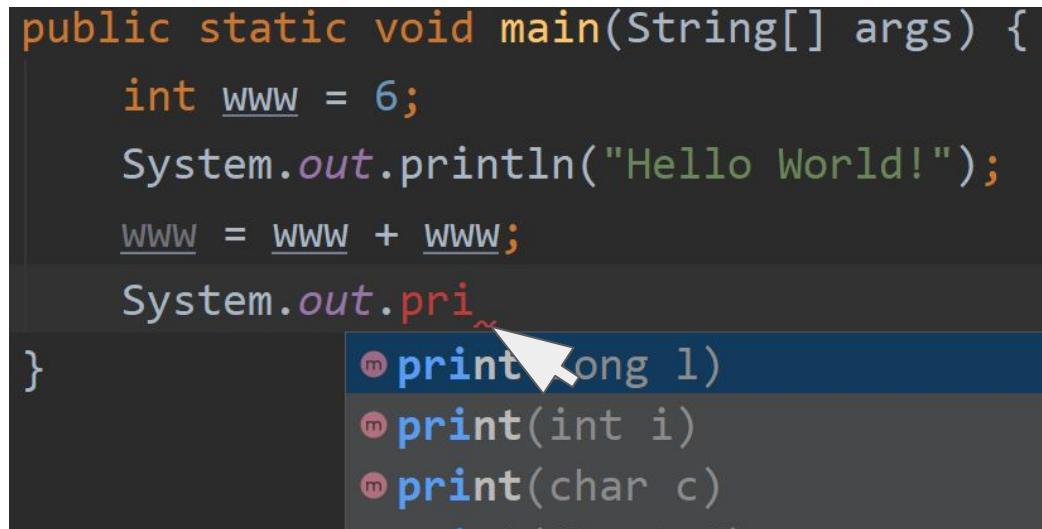


Enter / Tab to
Select it

Code Autocomplete

- Ctrl + space to explicitly call the autocomplete dropdown

```
public static void main(String[] args) {  
    int www = 6;  
    System.out.println("Hello World!");  
    www = www + www;  
    System.out.pri~  
}  
    ↗
```

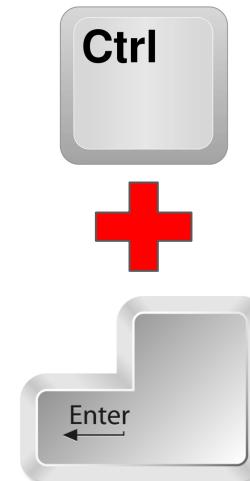


The screenshot shows a Java code editor with the following code:

```
public static void main(String[] args) {  
    int www = 6;  
    System.out.println("Hello World!");  
    www = www + www;  
    System.out.pri~  
}
```

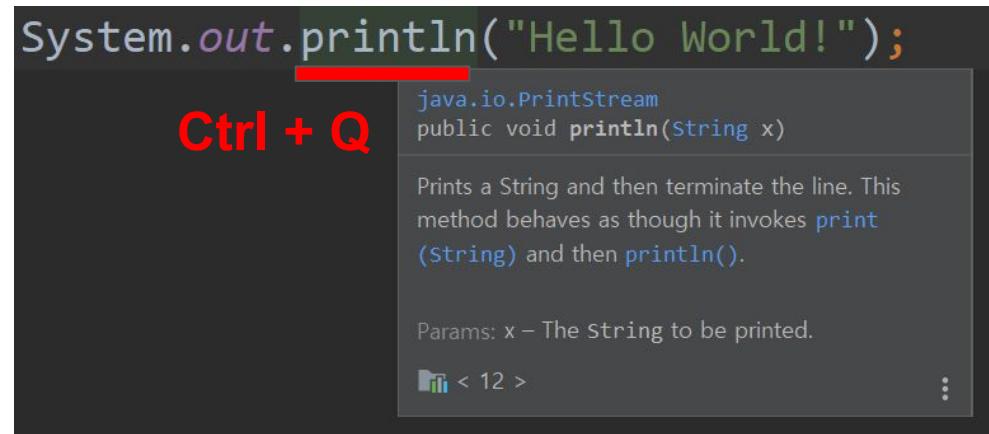
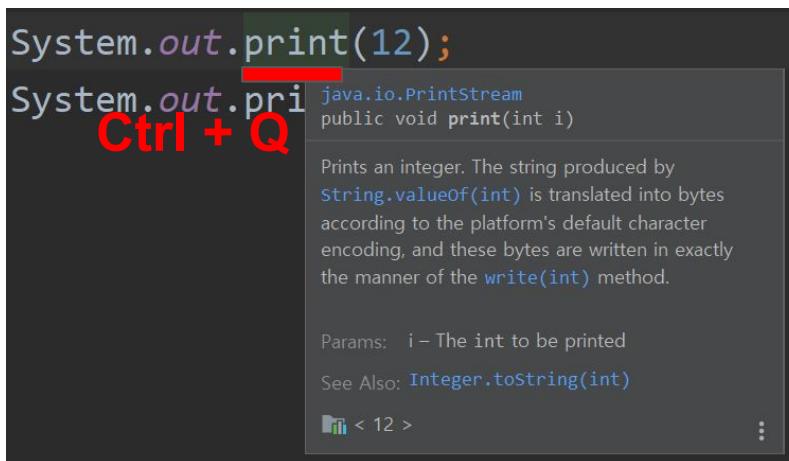
An arrow points to the word "pri" in the code, which has triggered an autocomplete dropdown. The dropdown contains three suggestions:

- print long l)
- print(int i)
- print(char c)



Quick Documentation search

- Ctrl + Q shows the Quick documentation of the function



Name Refactoring

- When we need to change a variable or function's name, we don't have to change all the code it is used manually

```
public static void main(String[] args) {  
    String s = "Hello World!";  
    System.out.println(s);  
    System.out.println(s + "1");  
    System.out.println(s + "2");  
    System.out.println(s + "3");  
    System.out.println(s + "4");  
    System.out.println(s + "5");  
    s = "It's over";  
    System.out.println(s + "1");  
}
```

Modify All
Manually?

Name Refactoring

- Shift + f6 on a name, and modify it to change all the same names used in the code

**Shift + F6
and change
only this**

```
public static void main(String[] args) {  
    String studen| "Hello World!";  
    System.out.println(studen);  
    System.out.println(studen + "1");  
    System.out.println(studen + "2");  
    System.out.println(studen + "3");  
    System.out.println(studen + "4");  
    System.out.println(studen + "5");  
    studen = "It's over";  
    System.out.println(studen + "1");  
}
```

**All of them
is changed
at once**



Java Language Syntax References

- For the next several weeks in the class, we will provide the introduction of basic java syntax
- The most widely used Java Syntax tutorials is in this link

<https://www.w3schools.com/java/default.asp>

- If you want additional learning or tutorial

w3schools.com

The screenshot shows the w3schools.com website with a focus on Java tutorials. The top navigation bar includes links for Home, HTML, CSS, and JAVASCRIPT. A green sidebar on the left lists various Java topics: Java Tutorial, Java HOME (which is highlighted), Java Intro, Java Get Started, Java Syntax, Java Comments, Java Variables, Java Data Types, Java Type Casting, Java Operators, Java Strings, Java Math, Java Booleans, Java If...Else, Java Switch, and Java While Loop. To the right of the sidebar, there's a large thumbnail image showing a collage of various Java-related applications and devices like mobile phones and tablets.

Java Language Syntax References

- The **full documentation** of Java is here,
<https://docs.oracle.com/en/java/javase/12/> but will not be helpful at all in a beginning stage.



The screenshot shows the Oracle Java Documentation homepage. At the top, there is a red header bar with the Oracle logo and a "Menu" icon. To the right of the header, there is a "Help Center" link. Below the header, the page has a navigation sidebar on the left and a main content area on the right. The sidebar contains links for "Home", "API Documentation", "Books", and "Related Resources". The main content area displays the title "JDK 12 Documentation" and a breadcrumb navigation path: "Home / Java / Java SE / 12".

Java Language Syntax References

- Or you could visit **API documentation** of previous version Java for more easier search of functionality.
 - <https://docs.oracle.com/javase/7/docs/api/>



The screenshot shows a web browser displaying the Java Platform Standard Edition 7 API Specification. The header bar includes links for Overview, Package, Class, Use, Tree, Deprecated, Index, and Help. Below the header, there are links for Prev, Next, Frames, and No Frames. The main content area features a large title: "Java™ Platform, Standard Edition 7 API Specification". On the left side, there is a sidebar with navigation links for All Classes and Packages, and specific package links for java.applet, java.awt, and java.awt.color.

Java Language Syntax References

- For example, if you want to search System.out.println



The screenshot shows the Java™ Platform, Standard Edition 7 API Specification documentation. On the left, there's a sidebar with links for "All Classes" and "Packages" (including java.applet, java.awt, and java.awt.color). The main content area has a navigation bar at the top with tabs: Overview (highlighted in orange), Package, Class, Use, Tree, Deprecated, Index (highlighted with a red box), and Help. Below the navigation bar, there are links for "Prev", "Next", "Frames", and "No Frames". The main title of the page is "Java™ Platform, Standard Edition 7 API Specification". A large red "Click" button is overlaid on the right side of the page.

Java Language Syntax References

- For example, if you want to search System.out.println

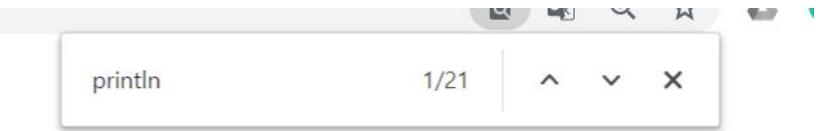


The screenshot shows a navigation bar with links: Overview, Package, Class, Use, Tree, Deprecated, Index (which is highlighted in orange), and Help. Below the navigation bar are links for Prev Letter, Next Letter, Frames, and No Frames. At the bottom, there is a horizontal menu of letters: A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, and _.

A red box highlights the letter 'P' in the bottom menu, and the word 'Click' is overlaid in large red text below it.

Java Language Syntax References

- For example, if you want to search System.out.println



**Ctrl + F and
Search**

printJobRequiresAttention(PrintJobEvent) - Method in class java.awt.print.PrintJobListener

Called to notify the client that an error has occurred.

println() - Method in class java.io.PrintStream

Terminates the current line by writing the line separator character.

println(boolean) - Method in class java.io.PrintStream

Prints a boolean and then terminate the line.

println(char) - Method in class java.io.PrintStream

Prints a character and then terminate the line.

println(int) - Method in class java.io.PrintStream