Meme Credit: https://dzone.com/articles/intellij-idea-vs-eclipse-which-is-better-for-begin

Lab 1: Getting Started

CS 2112 Fall 2021

August 30 / September 1, 2021

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Monday

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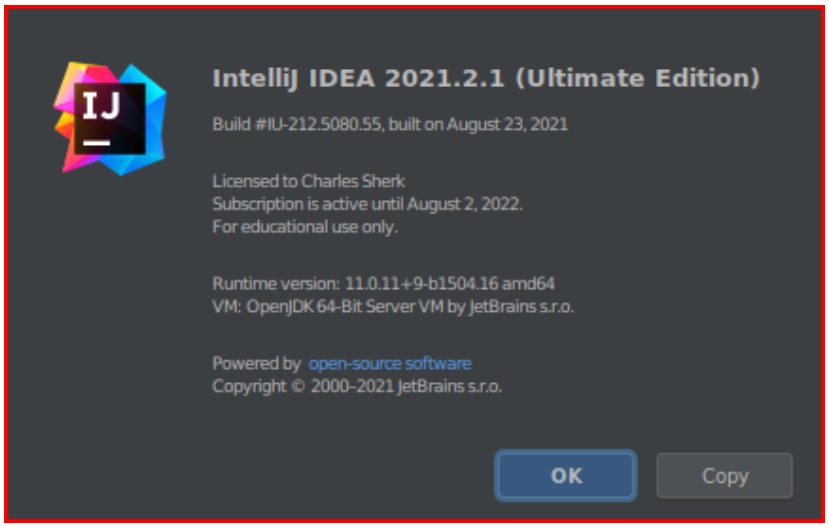
Lab Modalities

In-Person

- Attend in-person every week
- Masks required

Versions

We recommend IntelliJ 2021.2.1
(any relatively new version should be acceptable)



Community should be fine for our needs, but you can download Ultimate for free with your Cornell e-mail (see Ed).

We require Java 11.

Can I Use Another IDE?

Yes, but we will not be able to provide any technical support.
If something breaks, you're on your own.

Step 0 - Downloading IntelliJ

Go to

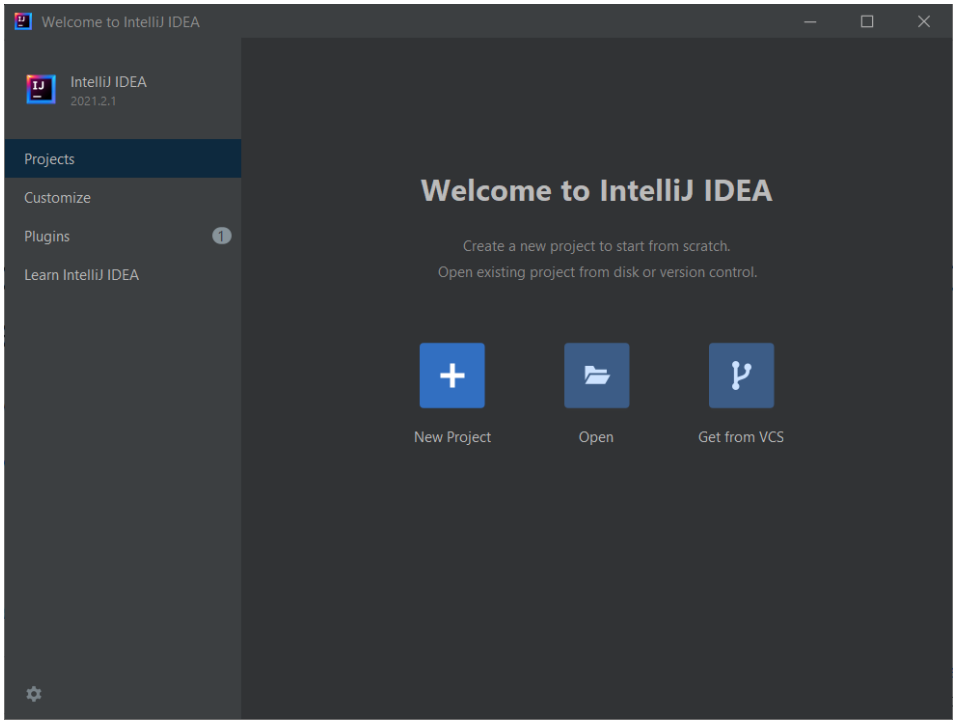
www.jetbrains.com/help/idea/installation-guide.html

Follow the directions for "Standalone Install" for your OS

Linux: snap package (classic) intellij-idea-ultimate

Step 1 - First IntelliJ Run

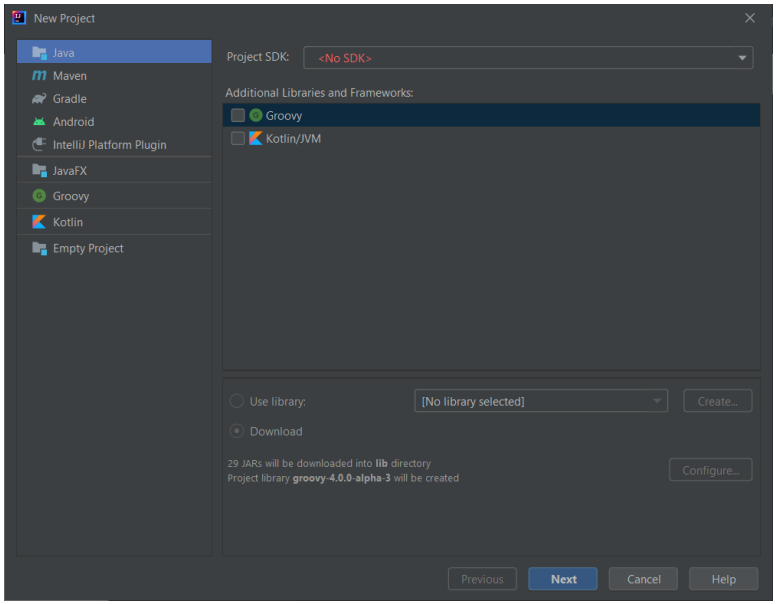
You should come to a screen like this:



Click ‘New Project’

Step 2 - Download a JDK

You should see this:

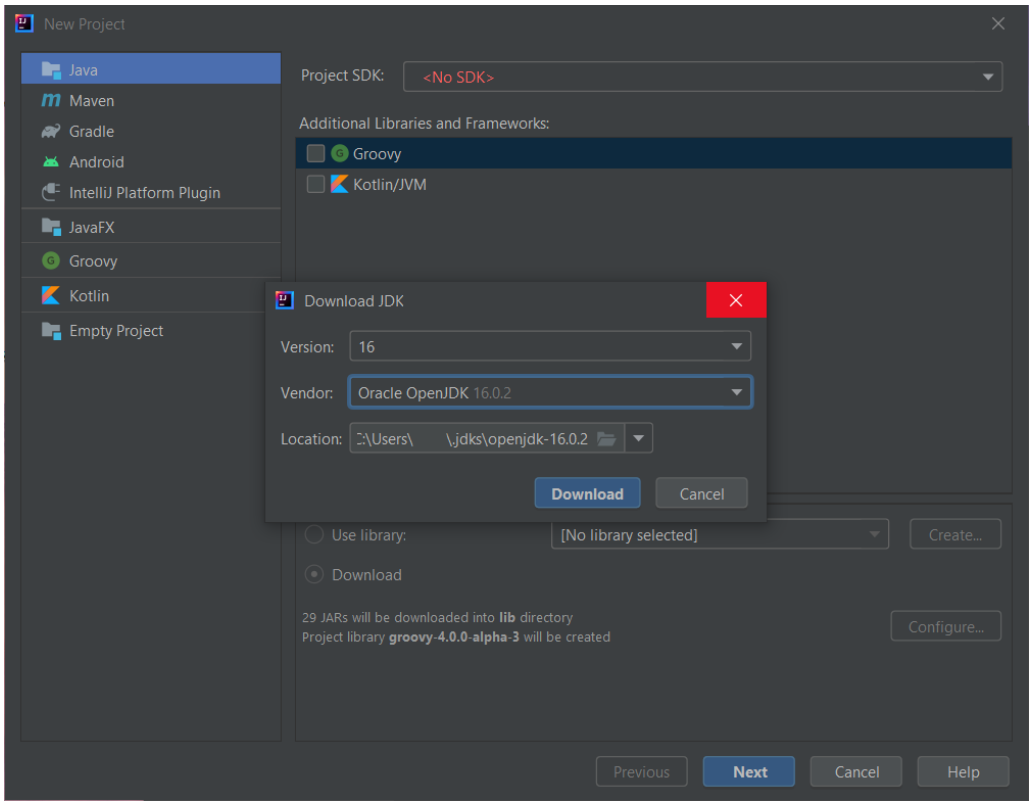


you might have a JDK already installed that's been detected

We're going to re-download a fresh one, though.

Step 2 - Download a JDK

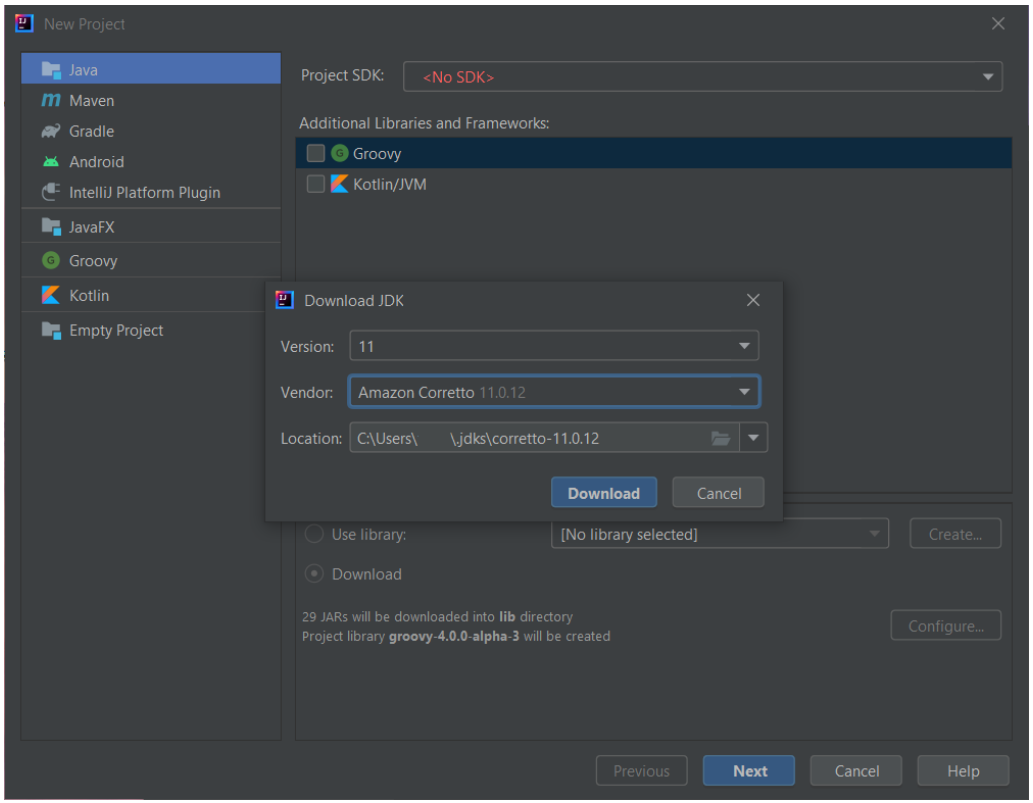
Click on the 'Project SDK' dialog box



Step 2 - Download a JDK

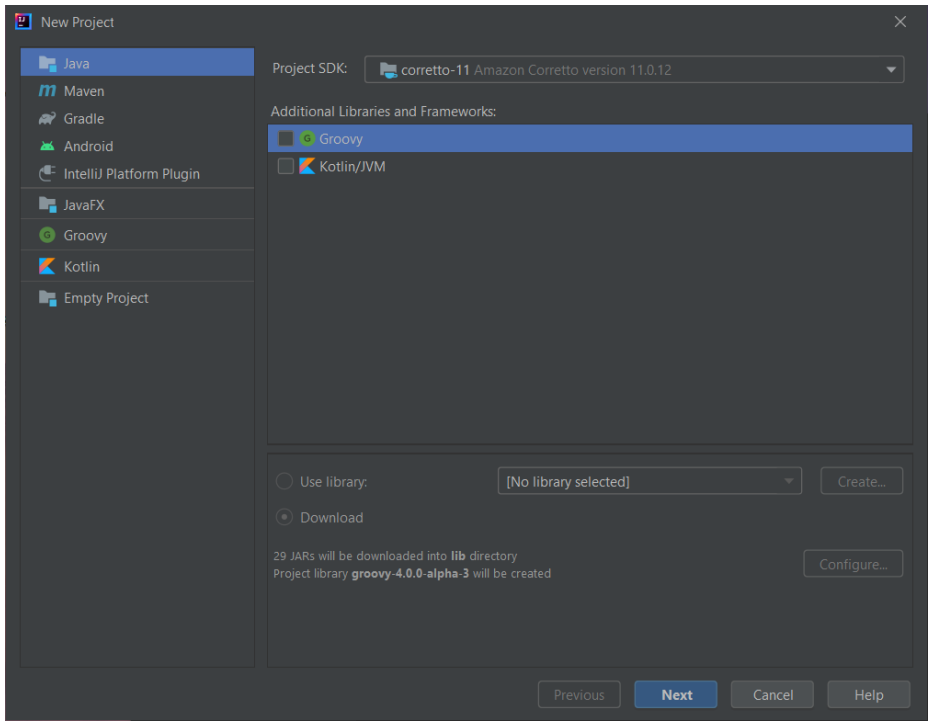
First select **Version 11**

Then, select **Amazon Corretto** as the distribution



Step 3 - Make A New Project

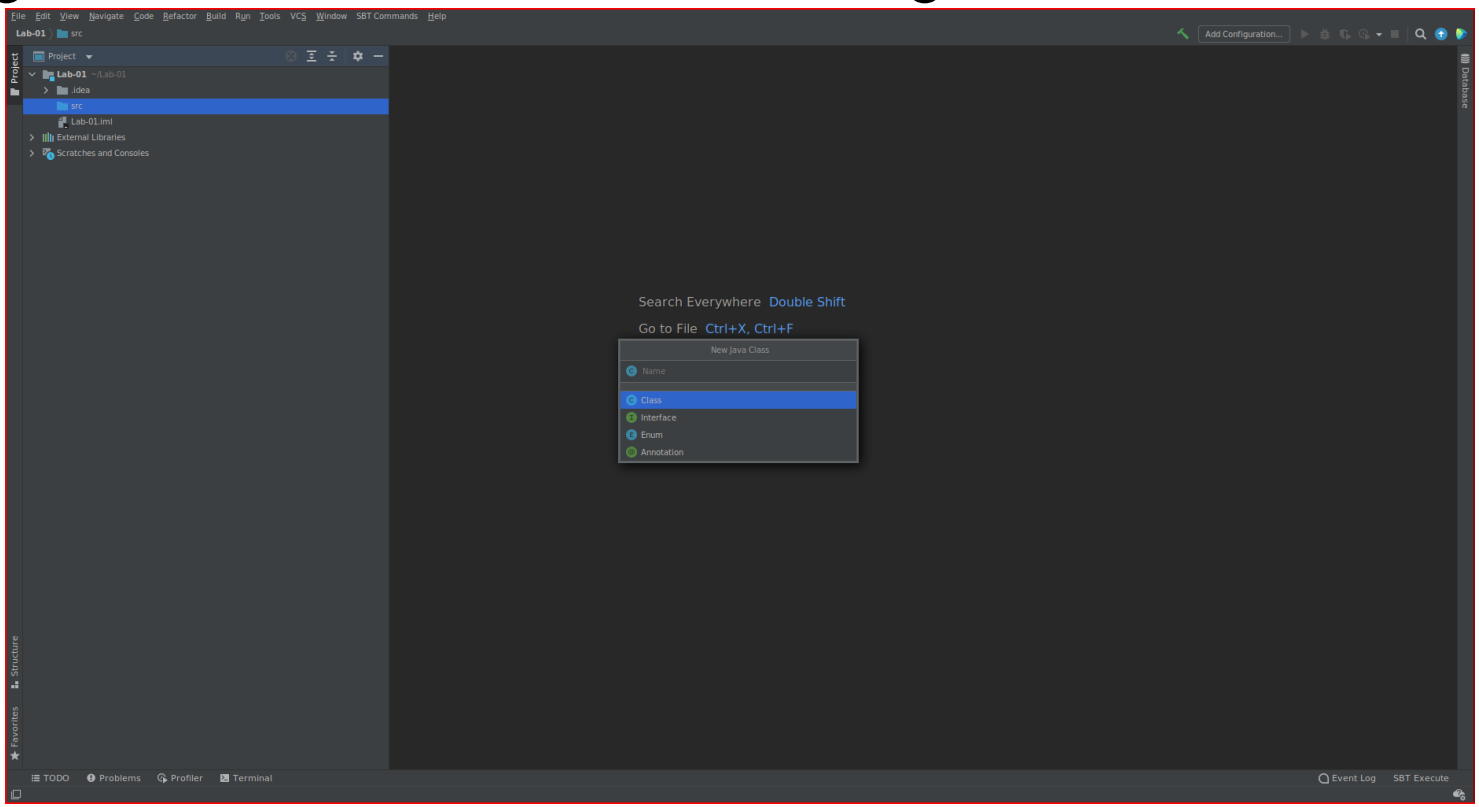
After you've downloaded the JDK, wait for it to auto-detect.
Make sure you've selected Corretto 11.



Click through the dialogs - we'll be creating a blank project.

Add a file

Right click on the blue src folder, and go to New -> Java Class



Name the class Main (or whatever you like)

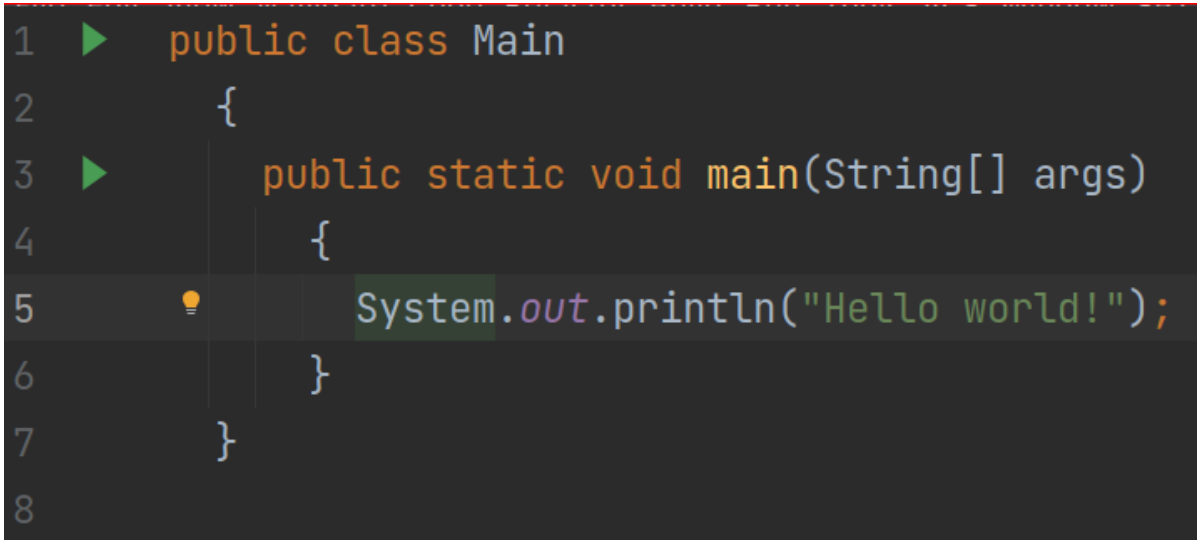
Hello World

Feel the power of IntelliJ by typing "psvm<TAB>" to autocomplete a boilerplate main method.

```
1 public static void main(String[] args) {
2     System.out.println("Hello World");
3 }
```

Running your code

Click one of the green triangles on the sidebar



After the first run, you can also use the Run/Debug toolbar on the top right

Coding Exercise

There is a 4-digit number which, when the order of its digits is reversed, yields a number 4 times greater.
Write a program to find and print out this number.

Useful Features Of IntelliJ

- **Auto-save**
- Autocomplete
- Autoindent
- Compile & Run
- Refactoring
- Autoformat (Ctrl + Alt + L/Opt + Cmd + L)
  - We suggest turning on autoformat on (auto)save
  - Autosave should be enabled by default, but you can also save manually with Ctrl + S or Cmd + S
  - File > Settings > Tools > Actions on Save > Check "Reformat Code" > Select "Changed lines" instead of "Whole file"
  - If your group members don't have the same format, you will get terrible merge conflicts
- Javadoc
- Comments

I/O Handout

A detailed reference on I/O can be found in the I/O handout on the course webpage:
https://courses.cs.cornell.edu/cs2112/2021fa/handouts/IO.pdf

Paths

A path represents the location of a file, typically on your computer.

eg: `C:\Users\Andrew\Documents\CS 2112\Lab 1.tex`

Types of Paths

There are two types of paths: absolute and relative.

Absolute Paths

- Starting at root, full path of file
- Usually only works on your machine
- eg:

  `C:\Users\Andrew\Documents\CS 2112\Lab 1.tex`

Relative Paths

- Relative to current directory
- In Eclipse, project folder
- Typically used when programming
- eg:

  `Documents\CS 2112\Lab 1.tex`

  (if we're in the `Andrew` directory)

Using Paths in Java

You can call `Paths.get(...)` with a relative path to acquire a `Path` object, which represents the location of a file.

```
1 Path p = Paths.get("res", "map1.xml");
```

The above code returns a reference to the relative path `res/map1.xml`.

Note you can seperate directories as separate arguments, or pass an entire relative path in.

Files

Once you have a path to a file, Java provides many methods that allow you to operate on it, listed under the `Files` class.

eg: `exists(Path p)`, `isReadable(Path p)`, `createFile(Path p)`, `delete(Path p)`, `isWritable(Path p)`, `size(Path p)`, and more.

Check the official documentation for more:
https://docs.oracle.com/en/java/javase/11/docs/api/java.base/java/nio/file/Files.html

Streams

A **stream** is a sequence of data being processed (read / written) from beginning to end.
Input streams are data coming into a program (for example, reading from a file).
Output streams are data leaving a program (for example, writing to a file).

Types of Streams

- Byte Stream
- Character Stream
- Raw Stream
- Blocking Stream
- Buffered Stream
- NIO Stream
- Object Stream
- etc.

Basic Streams

Reads one byte at a time.

```
1 InputStream is = Files.newInputStream(p);
2 is.read(); // Gets the next byte in the file
```

We can use a **Buffered Stream** to get more than one byte at a time, for convenience.
Remember to always **close** a stream when finished working with it.

Buffered Readers

```
1  InputStream is = Files.newInputStream(p);
2  BufferedReader br = new BufferedReader(is);
3  ^^I^^I// or
4  BufferedReader br = Files.newBufferedReader(p);
5
6  // read whole line (or null if empty)
7  String s = br.readLine();
8  br.close(); // close stream
```

Buffered Writers

```
1 BufferedWriter bw = Files.newBufferedWriter(p);
2 // Overwrites p if exists, creates if not
3
4 bw.write("..."); // No newline
5 bw.close(); // Don't forget
```

Use a `PrintWriter` to write non-String objects and get additional methods.

```
1 PrintWriter pw =
2     new PrintWriter(Files.newBufferedWriter(p));
3 pw.println(6); // Includes newline
```

Standard Streams

Your OS provides every program with three "standard" I/O streams. These streams have defaults, but can be changed per program. For example, a user may want to redirect standard error into a log file instead of showing it in the console.

Standard Input: What the user types into your program, typically in the console.

Standard Output: What your program shows to the user, typically in the console.

Standard Error: Error messages from your program, typically in red in the console.

Standard Streams in Java

Java exposes each of the standard streams to the programmer as fields in the `System` class: `System.in`, `System.out`, and `System.err`.

Standard input is an `InputStream`, and the other two are `PrintWriter`.

Thus, `System.out.println("")` is calling the `println("")` method on a `PrintWriter` that just happens to be standard output.

Character Encoding

Character encoding defines how characters we recognize get stored to disk as individual bytes.

For this class, use Unicode **UTF-8**.

I/O Exercise

Write a program to read user input from the console and print back the user input.
Feel free to reference the IO handout:
https://courses.cs.cornell.edu/cs2112/2021fa/handouts/IO.pdf

- Create a class with a main method
- Accept user input and echo it back

I/O Challenge Exercise

Find out what words are shared by two files, and return the number of unique words in common. Output the words you find to a different file.

```
1 long wordsInCommon(File file1, File file2) {
2     // TODO implement
3 }
```