

# Lecture 0 - Course Introduction

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CSC-1004: Computational Laboratory Using Java  
Course Page: [\[Click\]](#)

# Course Introduction

This course is a computational lab course to strengthen programming skills. As a laboratory course, CSC-1004 will be delivered in the format of finishing projects.

**Self-learning and debugging skills** are especially important for succeeding in this course.

Each student is expected to implement **individually**:

- Two medium-sized Java projects (around 2000 lines of code).
- A smaller Python project (around 500 lines of code).



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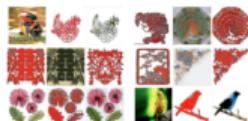
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# Course Introduction

**Goals:** To strengthen programming skills:

- *Prepare for other CS Courses.* E.g., Data Structure, Machine Learning, etc.
- *Collect Project Experience.* E.g., the project could appear on your resume or CV for finding an internship.

## OTHER PROJECTS



### 1. Paper-cutting Artwork Generation based on unpaired-training GAN. 2019

Traditional way to produce 2D paper-cutting artworks is quite time-consuming and labor-intensive. Therefore, in this project, we design a new deep learning framework based on CycleGAN, which is trained in an unpaired manner, to automatically synthesize high-quality artistic paper-cuttings from scratch.



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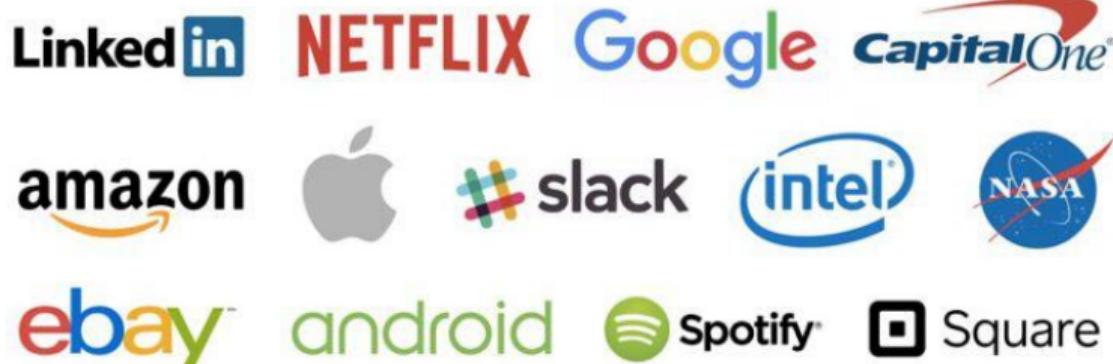
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# Course Introduction

*"Why we need to learn Java programming"*

Java has been one of the *most popular programming languages for many years*. It's used in a variety of applications, from web development to mobile apps (especially Android), desktop applications, and large-scale enterprise systems.

MAJOR COMPANIES  
THAT USE

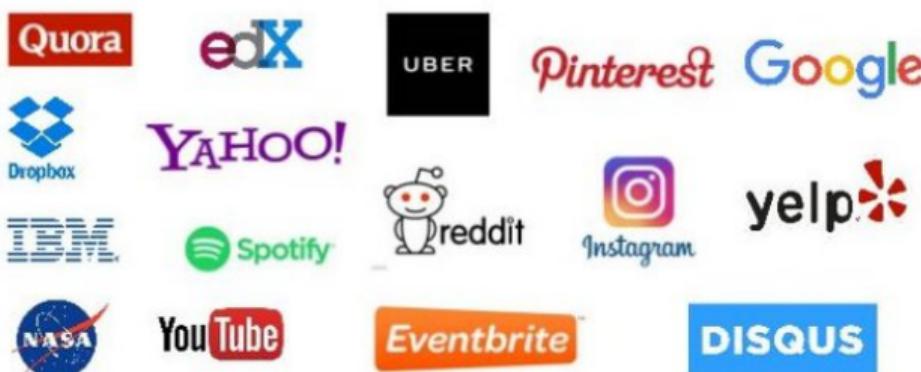


# Course Introduction

*"Why we need to learn Python programming"*

There's a **strong market demand** for Python developers in various domains, such as web development, data science, artificial intelligence, and more. Python skills are often sought after by employers.

## COMPANIES USING PYTHON



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# Course Introduction

Java	Python
<ul style="list-style-type: none"><li>• Statically typed</li><li>• Compiled</li><li>• Platform-independent</li><li>• Bigger community</li><li>• More libraries and documentation</li><li>• Larger legacy systems</li><li>• Mainly used for web, mobile, enterprise-level apps</li><li>• Limited string related functions</li><li>• Learning curve is more complex</li><li>• Usually faster than Python</li><li>• Slower development process requiring more lines of code</li></ul>	<ul style="list-style-type: none"><li>• Dynamically typed</li><li>• Interpreted</li><li>• Dependent on a platform</li><li>• Smaller yet fast-growing community</li><li>• Fewer libraries and documentation</li><li>• Fewer legacy problems</li><li>• Mainly used for data science, AI, and ML</li><li>• Lots of string related functions</li><li>• Easier to learn and use</li><li>• Fast but usually slower than Java</li><li>• Faster development process, involves writing fewer lines of code</li></ul>

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# Course Introduction

Jobs that need Java and Python programming skills:

- **Software Engineer.** Proficiency in languages like C/C++, Java and Python.  
(Database, Data Structures, and Web ...) [Salary](#):
  - China: CNY 200,000 to CNY 400,000 per year.
  - Europe: EUR 50,000 - EUR 70,000 per year.
  - USA: USD 80,000 - USD 120,000 per year.
- **Data Analysts.** Knowledge of languages like Python and R (a language for statistical computing). [Salary](#):
  - China: CNY 60,000 to CNY 200,000 per year.
  - Europe: EUR 40,000 to EUR 70,000 per year.
  - USA: USD 60,000 to USD 90,000 per year.



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# Course Introduction

Jobs that need Java and Python programming skills:

- **Applied Scientist.** Strong working knowledge of programming languages such as C/C++, Java, or Python. Practical machine learning experience. [Salary](#):
  - China: CNY 200,000 to CNY 500,000 per year.
  - Europe: EUR 50,000 - EUR 80,000 per year.
  - USA: USD 80,000 - USD 150,000 per year.
- **Research Scientist.** Strong working knowledge of programming languages such as Python, Java, R or Matlab. Statistical and Mathematical Modeling. Databases,. etc. [Salary](#):
  - China: CNY 180,000 to CNY 500,000 per year.
  - Europe: EUR 50,000 - EUR 80,000 per year.
  - USA: USD 70,000 - USD 120,000 per year.



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## CSC 1003 v.s., CSC 1004

- **Goal:** Basic knowledge of computer science and Java programming.
- **Approach:** Remember conceptions, implement features and pass exams.
- **Evaluation:** assignments and exams.
- **Goal:** Build a project (something useful) with your knowledge.
- **Approach:** Practical training that makes you a qualified programmer.
- **Evaluation:** Let's coding!



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## Scoring Schema:

- *Java Projects (60% in total, each 30%).* Basic functions and videos.
- *Python Project (30%).* Basic functions and videos.
- *Advanced Features (10%).* Implement two advanced features (see intro later).



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# Course Introduction

**1. Java Chat Zoom** (Check [this page](#).) You are expected to write a chat room with Java. The main features include:

1. Java Class and Inheritance.
2. Java Multi-Threading.
3. Java Socket Programming.



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# Course Introduction

- 2. Java Game** (Check [this page](#).) You are expected to write a game named Gomoku ("Five In A Row") with Java. The basic features include:
1. Java Class and Inheritance.
  2. Java Graphical User Interface (GUI).



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3. **Python Games** (Check [this page](#).) You are expected to write a game with Python.

The basic features include:

1. Python Package Usage.
2. Python Class and Inheritance.
3. Python Graphical User Interface (GUI).



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# What to Expect

## What to Expect:

- *Lecture and TAs will introduce the core techniques for programming the project.*
- *Lecture and TAs will introduce general requirements, leaving some space for including additional designs.*
- ***Every student must individually finish a project without forming any team.***
- *Students must learn how to design the projects and debug the codes by themselves.*

Self-learning skills are extremely important for success in CSC 1004.



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# Lectures and Tutorials

## Lectures:

- *Introduce the programming skills to complete the basic features in your project.*
- *Introduce some advanced Java/python knowledge to improve your project.*

The lecture covers the main idea, how to utilize these ideas in your project is your work.

## Tutorials:

- *Go over the code of some example projects with you.*
- *The code of these example projects can be shared at your request.*
- *Question answering.*

TAs will not debug for you or write any code for you.



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# Java IDEs

Popular **Integrated Development Environment (IDE)** for Java includes:

- *Eclipse* (*Not Recommended!*). ([Official Site](#)) It is a Java-based open-source platform that enables us to create highly customized IDEs from Eclipse members' plug-in components.



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# Java IDEs

Popular Integrated Development Environment (IDE) for Java includes:

- *Eclipse* (*Not Recommended!*). ([Official Site](#))
- *NetBeans* (*Not Recommended!*). ([Official Site](#)) NetBeans is a Java-based IDE and basic application platform framework. Besides Java, JavaScript and JavaFX, NetBeans supports PHP, C/C++, Groovy, and HTML5 languages.



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# Java IDEs

Popular **Integrated Development Environment (IDE)** for Java includes:

- *Eclipse* (*Not Recommended!*). ([Official Site](#))
- *NetBeans* (*Not Recommended!*). ([Official Site](#))
- *IntelliJ IDEA* (*Recommended!*). ([Official Site](#)) It is a free and open-source commercial Java IDE. It has several features to make programming easier, like code completion, **debugging**, XML editing support, code refactoring, code checks, unit testing, etc.



**IntelliJ IDEA**

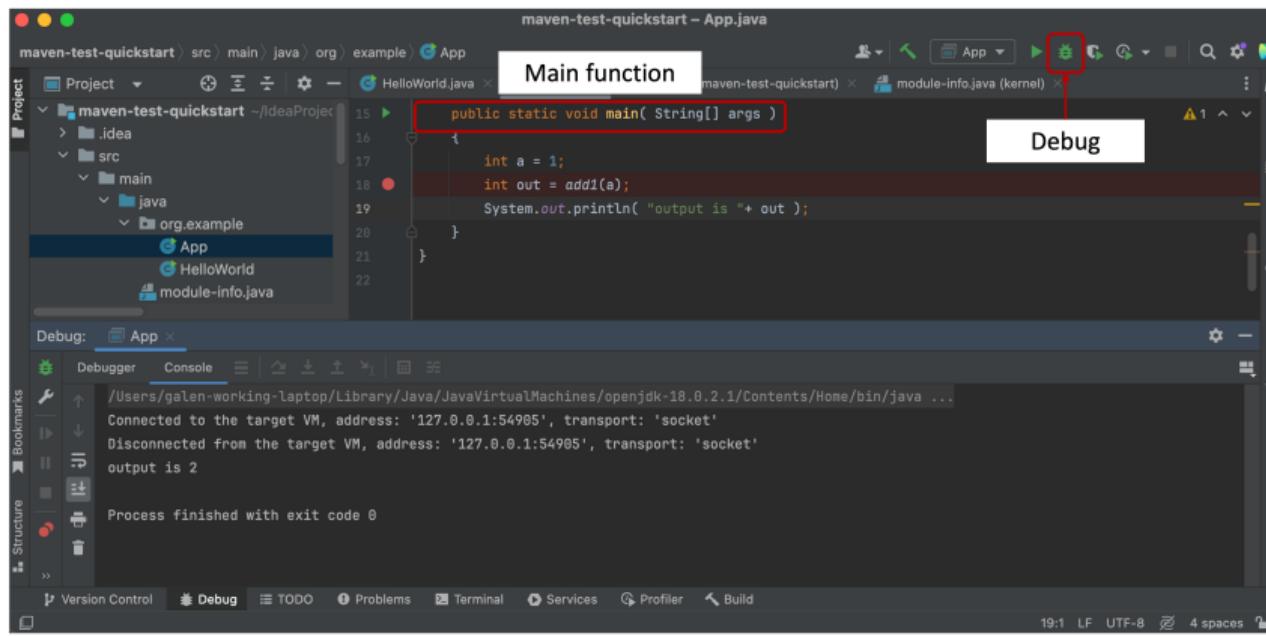


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# Debugging with IntelliJ IDEA.

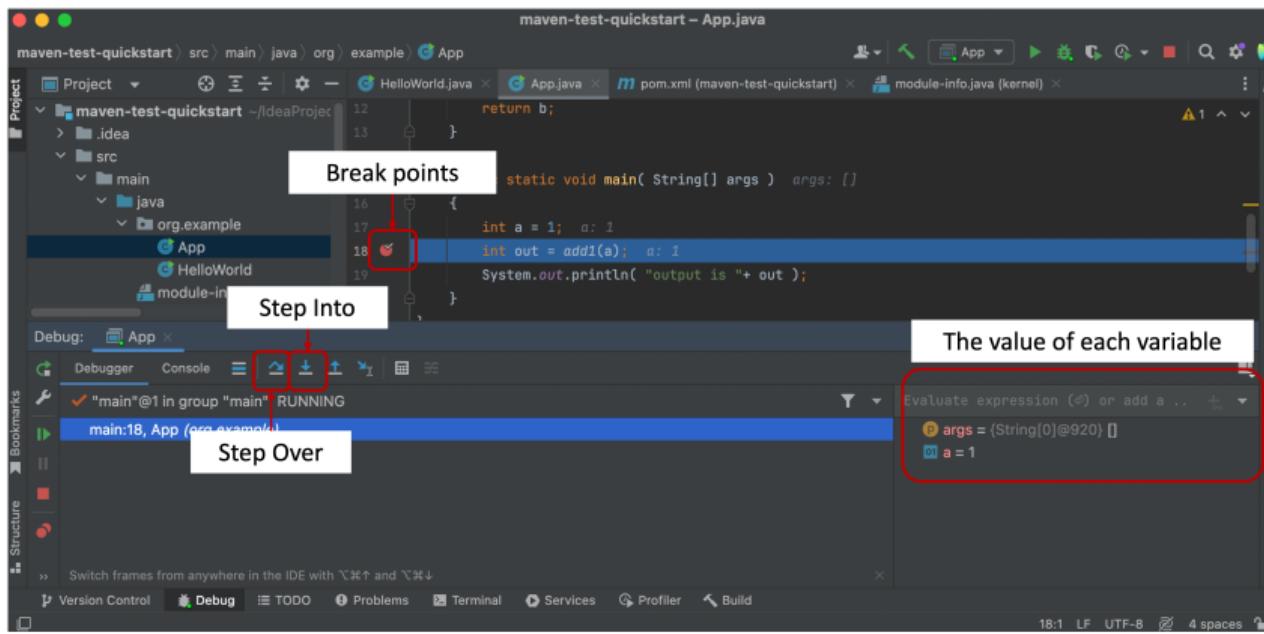
- Download the **Ultimate** version of [IntelliJ IDEA](#) (register with your school's email). Find the main file and open the debug mode.



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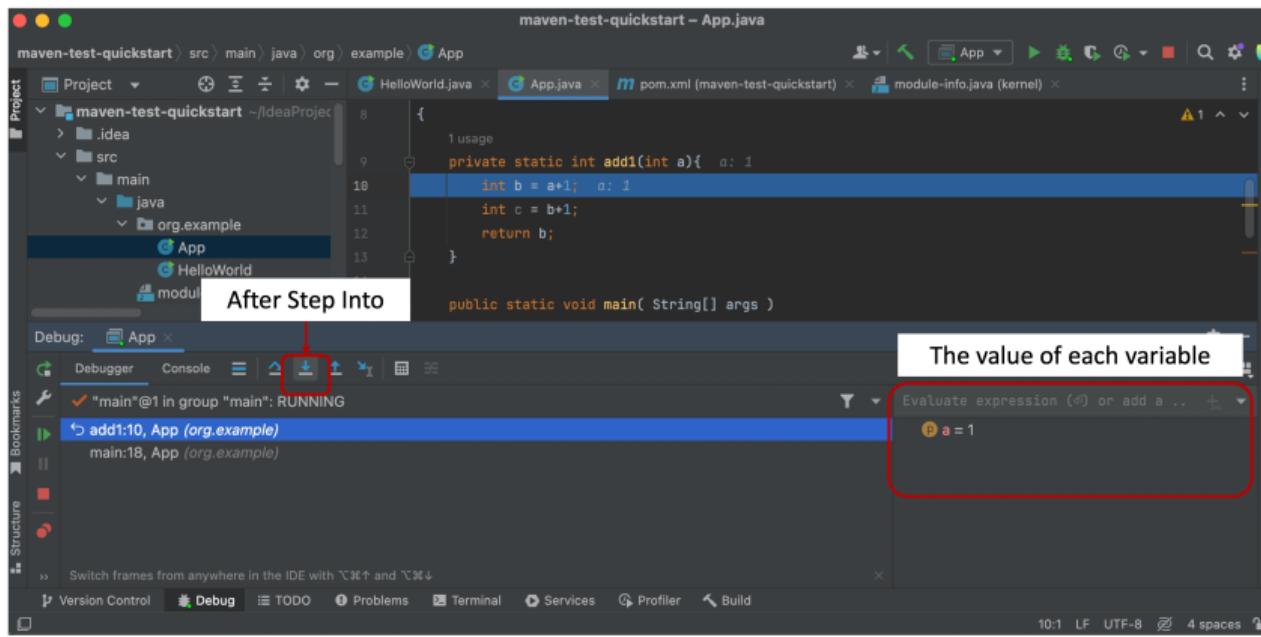
# Debugging with IntelliJ IDEA.

- **Breakpoints** allows stopping program execution at a certain point. Breakpoints are set by hovering the mouse over the gutter area and clicking on it.



# Debugging with IntelliJ IDEA

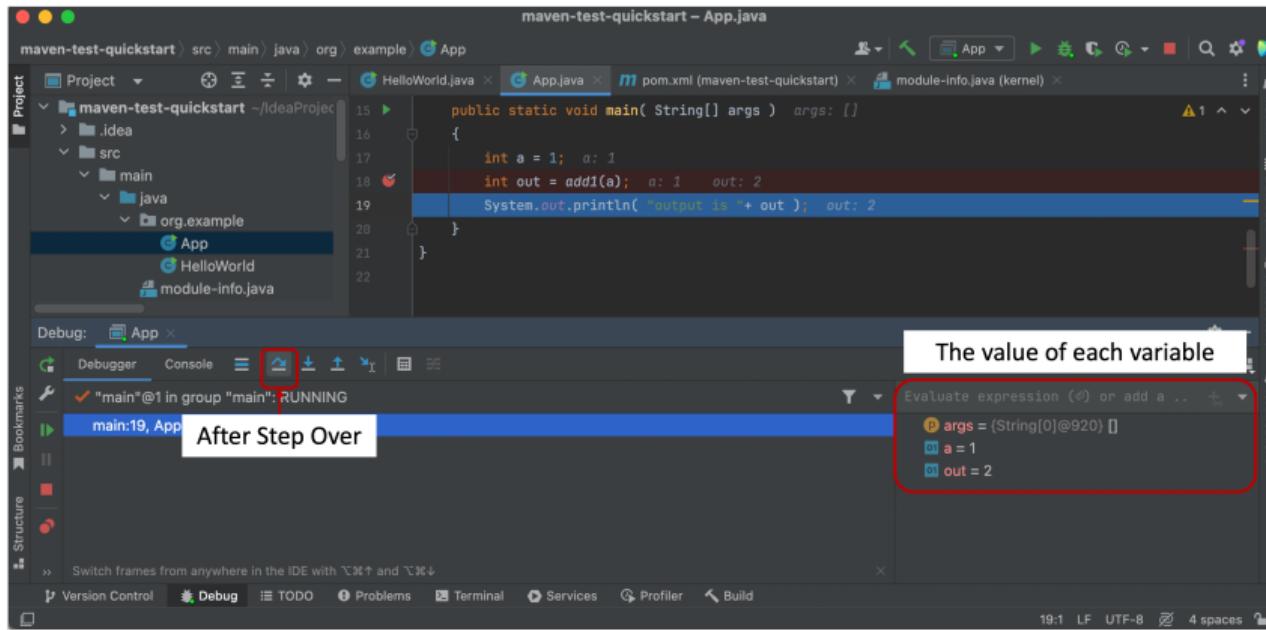
- **Step into.** While debugging, if a function is encountered and a step into action is selected, the debugger will stop program execution at each point of that function.



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# Debugging with IntelliJ IDEA.

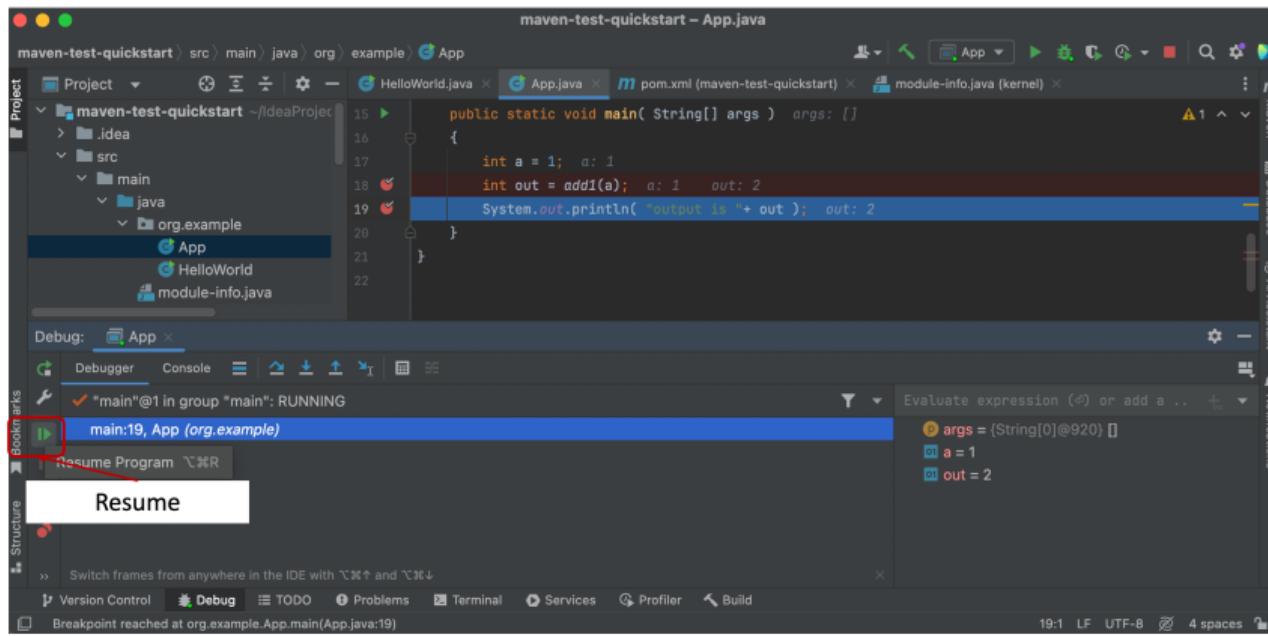
- **Step over.** The Step over action does not enter into function instead, it will jump to the next line of code.



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# Debugging with IntelliJ IDEA.

- *Resume Program*. The Resume Program action will continue the execution of the program by ignoring the breakpoint.



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# Java Project Management Tools

**Maven** is a powerful project management tool that is based on POM (project object model). It is used for project build, dependency, and documentation.

The main functions include:

- *Adding a set of Jars in each project.*
- *Creating the right project structure.*
- *Building and Deploying the project.*



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# Java Project Management Tools: Maven

## Create a Maven Project with IntelliJ IDEA

1. *Make sure you have downloaded the **Ultimate** version of [IntelliJ IDEA](#) (see above).*

IntelliJ IDEA supports a fully-functional integration with Maven that helps you automate your building process. You can easily create a new Maven project, open and sync an existing one, add a Maven support to any existing IntelliJ IDEA project, configure and manage a multi-module project.



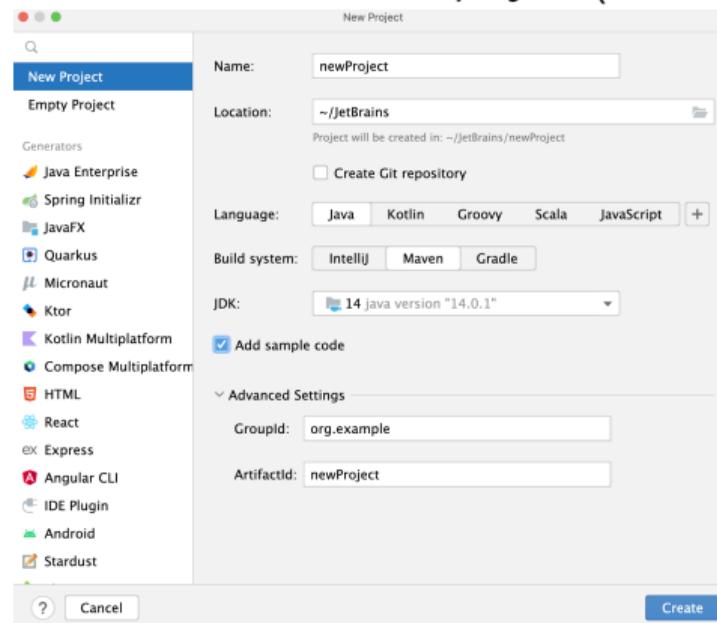
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# Java Project Management Tools: Maven

## Create a Maven Project with IntelliJ IDEA

1. Make sure you have downloaded the **Ultimate** version of [IntelliJ IDEA](#) (see above).
2. Create a new Maven project (check [this page](#) for the detailed step).



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# Java Project Management Tools: Maven

## Create a Maven Project with IntelliJ IDEA

1. *Make sure you have downloaded the **Ultimate** version of [IntelliJ IDEA](#) (see above).*
2. *Create a new Maven project (check [this page](#) for the detailed step).*
3. *(optional) Change the Maven Repository.*

A maven repository is a **directory of packaged JAR file** with pom.xml file.

Maven searches for dependencies in the repositories (check [this page](#) for the detailed step).



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# Maven *pom.xml* file.

**POM** is an acronym for *Project Object Model*. The pom.xml file contains information of project and configuration information for the maven to build the project.

## 1. Elements of maven pom.xml file.

Element	Description
project	It is the root element of pom.xml file.
modelVersion	It specifies the modelVersion. It should be set to 4.0.0.
groupId	It specifies the id for the project group.
artifactId	It specifies the id for the artifact (project). An artifact is something that is either produced or used by a project.
version	It is the sub element of project. It specifies the version of the artifact under given group.



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# Maven *pom.xml* file.

**POM** is an acronym for *Project Object Model*. The pom.xml file contains information of project and configuration information for the maven to build the project.

## 1. Elements of maven pom.xml file.

Element	Description
packaging	defines packaging type such as jar, war etc.
name	defines name of the maven project.
url	defines url of the project.
dependencies	defines dependencies for this project.
dependency	defines a dependency. It is used inside dependencies.
scope	defines scope for this maven project. It can be compile, provided, runtime, test and system.



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# An Example of *pom.xml* file.

```
<project xmlns="http://maven.apache.org/POM/4.0.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://maven.apache.org/POM/4.0.0
  http://maven.apache.org/xsd/maven-4.0.0.xsd">

  <modelVersion>4.0.0</modelVersion>

  <groupId>com.javatpoint.application1</groupId>
  <artifactId>my-application1</artifactId>
  <version>1.0</version>
  <packaging>jar</packaging>

  <name>Maven Quick Start Archetype</name>
  <url>http://maven.apache.org</url>
```

```
<dependencies>
  <dependency>
    <groupId>junit</groupId>
    <artifactId>junit</artifactId>
    <version>4.8.2</version>
    <scope>test</scope>
  </dependency>
</dependencies>

</project>
```



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# Question and Answering (Q&A)



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