CS 259: Data Structures with Java
Hello World with the IntelliJ IDE

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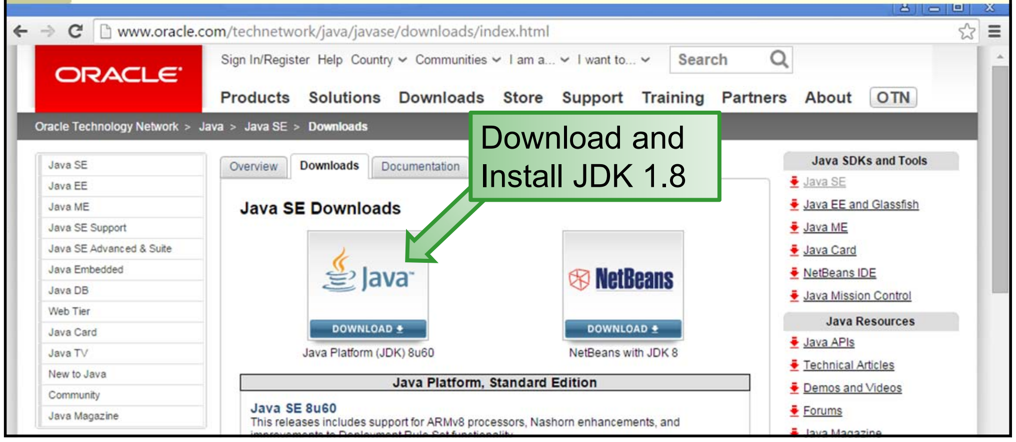
9/9/2016

Install Java Development Kit (JDK) 1.8

http://www.oracle.com/technetwork/java/javase/downloads/index.html

Most computers already have the ***Java Runtime Environment*** installed. However, to create Java programs, the ***Java Development Kit*** is required. Note: the JDK includes a copy of the matching version of the JRE.



Java Platform, Standard Edition

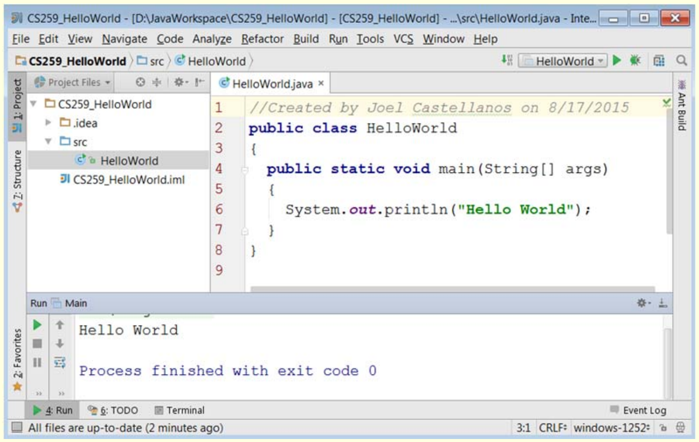
Java SE 8u60
This releases includes support for ARMv8 processors, Nashorn enhancements, and

IntelliJ IDE (Integrated Development Environment)

- https://www.jetbrains.com/idea/download/
- IntelliJ Community Edition (free) version 14.1.

Java is a ***Programming Language***.

IntelliJ is an ***Integrated Development Environment***.


CS259_HelloWorld - [D:\JavaWorkspace\CS259_HelloWorld] - [CS259_HelloWorld] - ...\src\HelloWorld.java - Inte...
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
CS259_HelloWorld src HelloWorld
HelloWorld
Project Files
CS259_HelloWorld
.idea
src
HelloWorld
CS259_HelloWorld.iml
HelloWorld.java
1: Project
7: Structure
2: Favorites
Ant Build
Run Main
4: Run
6: TODO
Terminal
Event Log
3:1 CRLF windows-1252

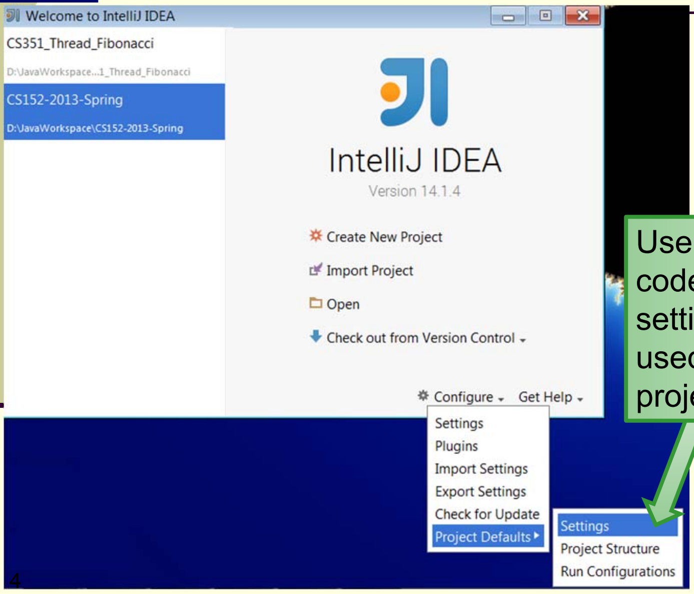
```java
//Created by Joel Castellanos on 8/17/2015
public class HelloWorld
{
  public static void main(String[] args)
  {
    System.out.println("Hello World");
  }
}
```

```
Hello World

Process finished with exit code 0
```

All files are up-to-date (2 minutes ago)

3

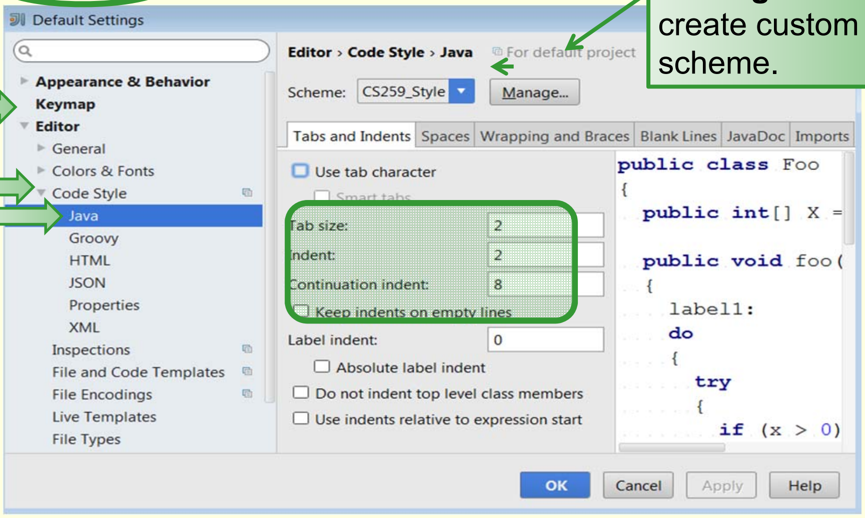
Project Default Settings (Code Style)



Use to change the code style and other settings that will be used for all new projects created.

4

Code Style: IntelliJ → File → Settings…



Scheme: CS259_Style

- [ ] Use tab character
- [ ] Smart tabs

Tab size: 2
Indent: 2
Continuation indent: 8
- [ ] Keep indents on empty lines

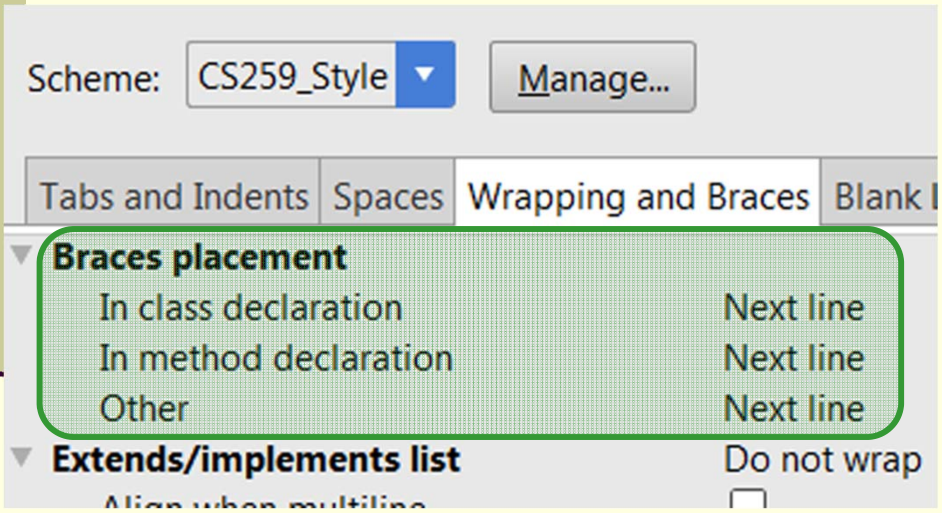
Label indent: 0
- [ ] Absolute label indent
- [ ] Do not indent top level class members
- [ ] Use indents relative to expression start

```
public class Foo
{
  public int[] X =

  public void foo(
  {
    label1:
    do
    {
      try
      {
        if (x > 0)
```

"**Manage…**" to create custom scheme.

5

Code Style: Braces



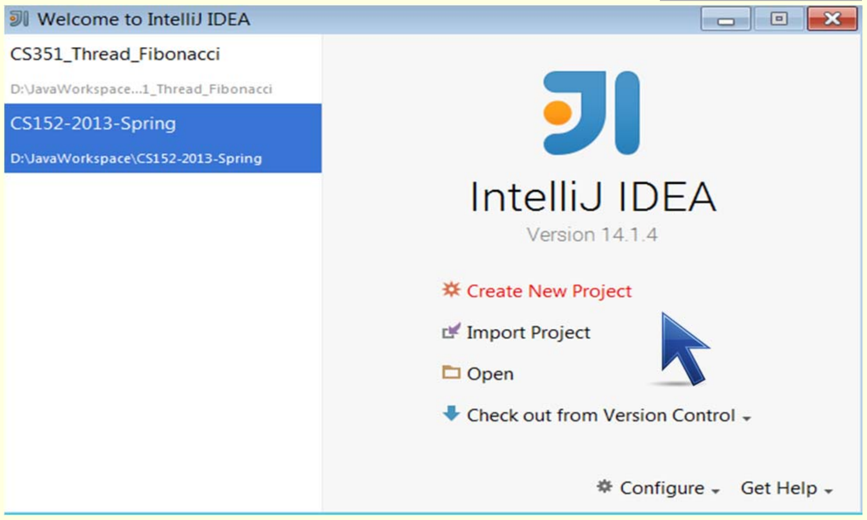
Scheme: CS259_Style

Braces placement

In class declaration	Next line
In method declaration	Next line
Other	Next line
Extends/implements list	Do not wrap
Align when multiline	☐

6

IntelliJ: Create New Project (1 of 5)



Welcome to IntelliJ IDEA

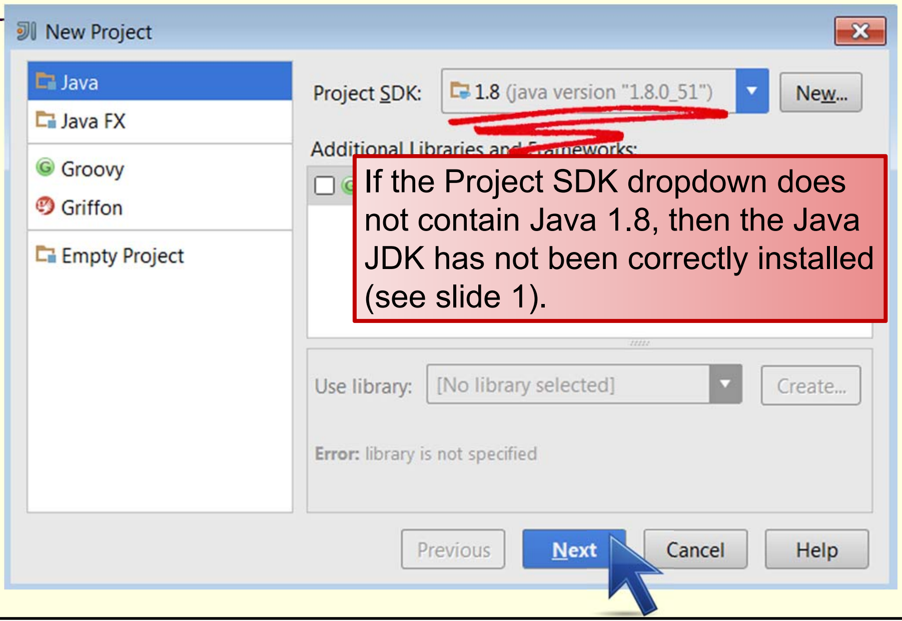
CS351_Thread_Fibonacci
D:\JavaWorkspace...1_Thread_Fibonacci

CS152-2013-Spring
D:\JavaWorkspace\CS152-2013-Spring

IntelliJ IDEA
Version 14.1.4

7

IntelliJ: Create New Project (2 of 5)



New Project

Project SDK: 1.8 (java version "1.8.0_51")

Additional Libraries and Frameworks:

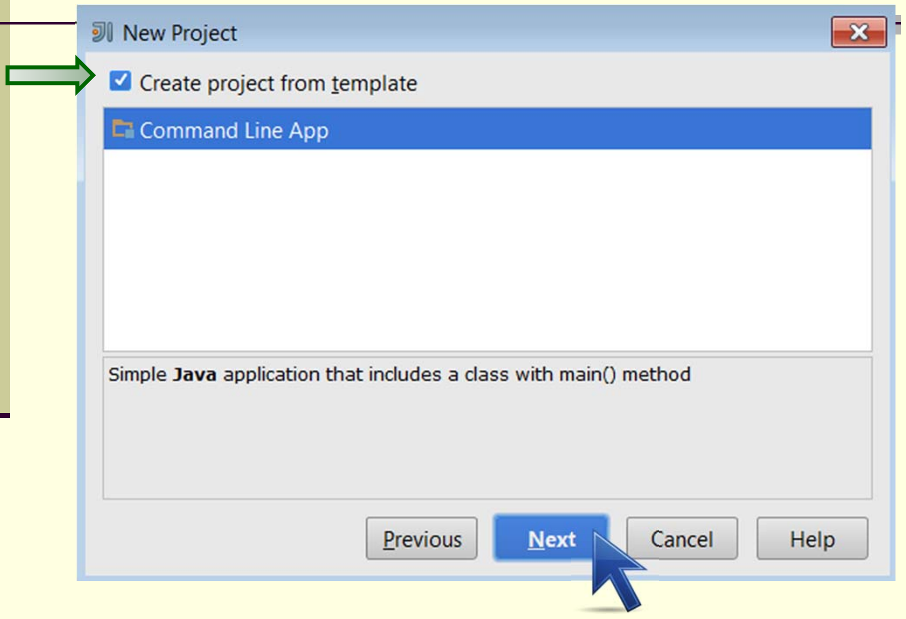
Use library: [No library selected]

Error: library is not specified

If the Project SDK dropdown does not contain Java 1.8, then the Java JDK has not been correctly installed (see slide 1).

8

IntelliJ: Create New Project (3 of 5)



New Project

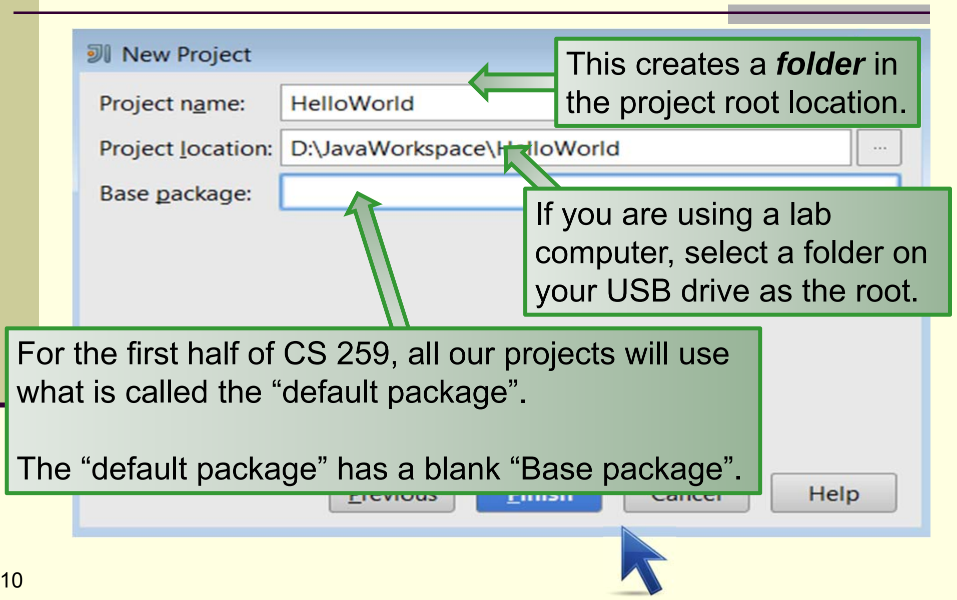
Create project from template: ✓

Command Line App

Simple **Java** application that includes a class with main() method

9

IntelliJ: Create New Project (4 of 5)



New Project

Project name: HelloWorld

Project location: D:\JavaWorkspace\HelloWorld

Base package:

This creates a ***folder*** in the project root location.

If you are using a lab computer, select a folder on your USB drive as the root.

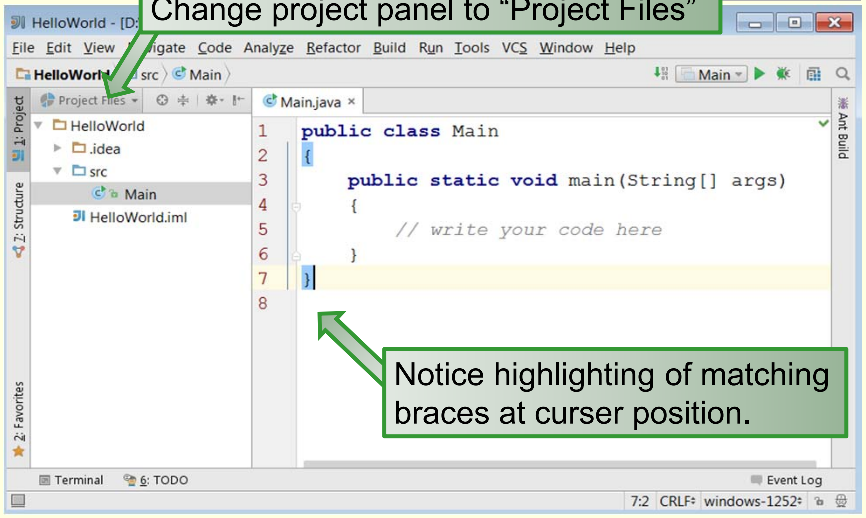
For the first half of CS 259, all our projects will use what is called the "default package".

The "default package" has a blank "Base package".

10

IntelliJ: Create New Project (5 of 5)

Change project panel to “Project Files”



```
public class Main
{
    public static void main(String[] args)
    {
        // write your code here
    }
}
```

Notice highlighting of matching braces at curser position.

Application: Add Inputs (Similar to Listing 1.1)

```
import java.util.Scanner;


public class Toy
{
  public static void main(String[] args)
  {
    System.out.println("Hello World");
    System.out.println("I want two numbers!");

    Scanner keyboard = new Scanner(System.in);
    int n1 = keyboard.nextInt();
    int n2 = keyboard.nextInt();

    System.out.println(n1+n2);
  }
}
```

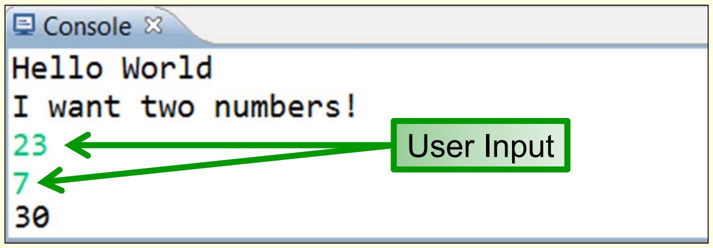
Filename ***MUST*** be **Toy.java**

From IntelliJ Project Files panel, Right-click filename and select:
Refactor → Rename

Compile, Run, and the Console

```
System.out.println("Hello World");
System.out.println("I want two numbers!");

Scanner keyboard = new Scanner(System.in);
int n1 = keyboard.nextInt(); //reads characters until ↵
int n2 = keyboard.nextInt();

System.out.println(n1+n2);
```

Compile and Run



```
Hello World
I want two numbers!
23
7
30
```

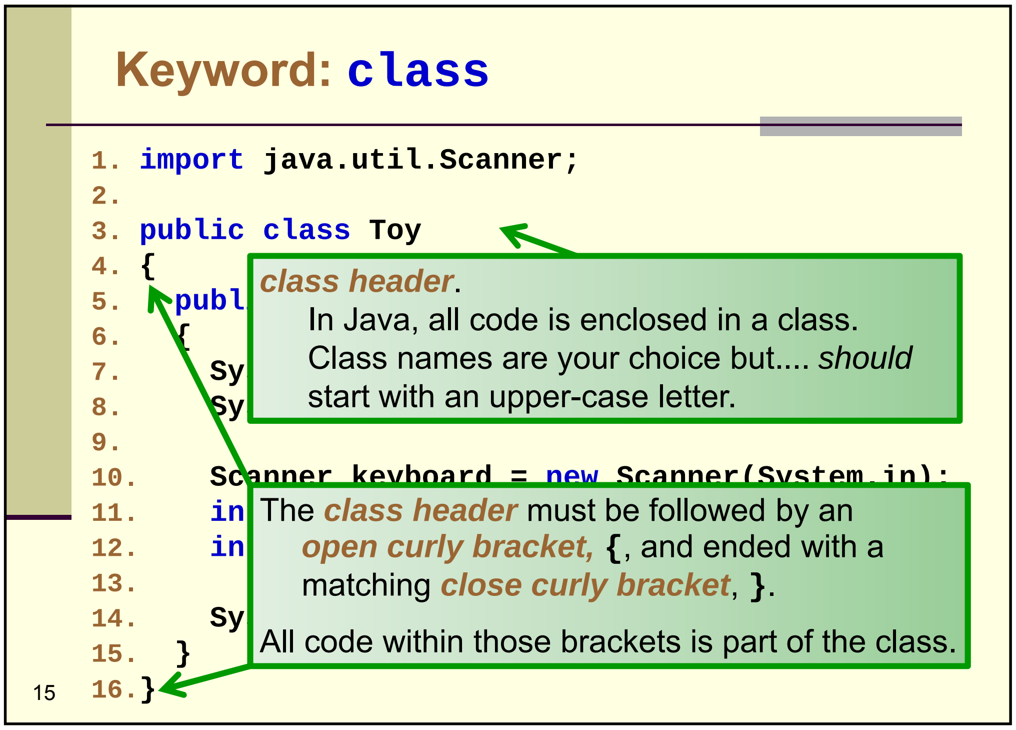
Keyword: `import`

```
import java.util.Scanner;






public class Toy_1_1
{
  public static void main(String[] args)
  {
    System.out.pri

```

Gets the **`Scanner`** class from the *package* (library) **`java.util`**.

All import statements are placed at the top of the source file.

Note: The Java programming language is *case-sensitive*.



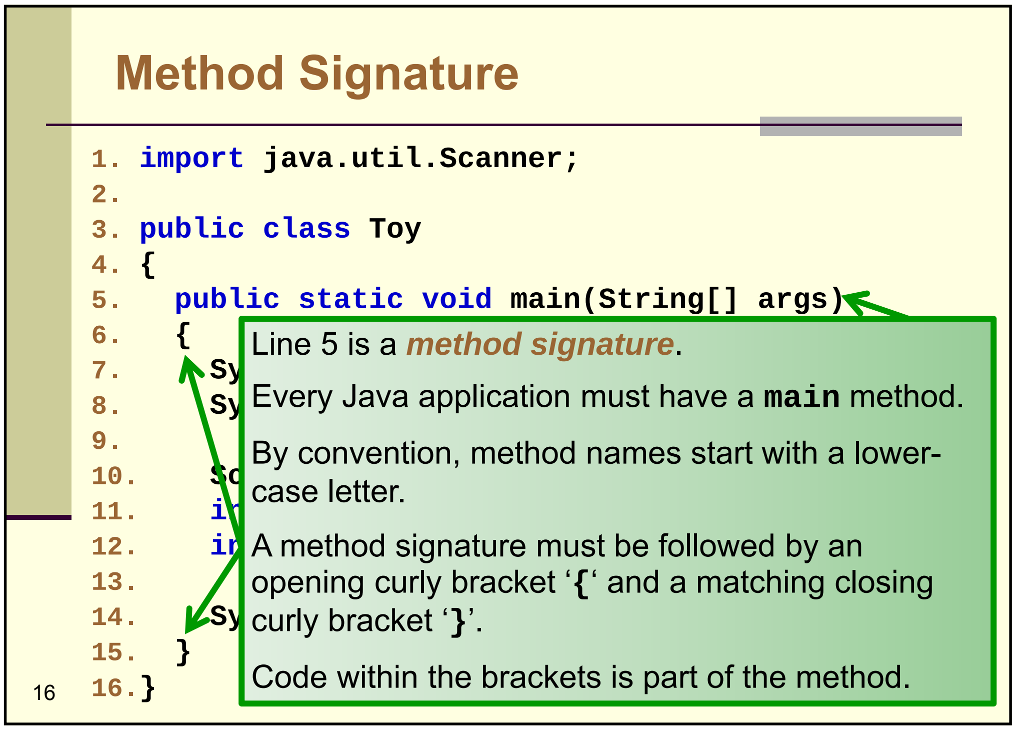
Keyword: `class`

```
1. import java.util.Scanner;
2.
3. public class Toy
4. {
5.   publ
6.   {
7.     Sy
8.     Sy
9.
10.    Scanner keyboard = new Scanner(System.in);
11.    in
12.    in
13.
14.    Sy
15.  }
16.}
```

class header.
In Java, all code is enclosed in a class.
Class names are your choice but.... *should* start with an upper-case letter.

The *class header* must be followed by an *open curly bracket,* **{**, and ended with a matching *close curly bracket*, **}**.

All code within those brackets is part of the class.



Method Signature

```
1. import java.util.Scanner;
2.
3. public class Toy
4. {
5.   public static void main(String[] args)
6.   {
7.     Sy
8.     Sy
9.
10.    Sc
11.    i
12.    in
13.
14.    Sy
15.  }
16.}
```

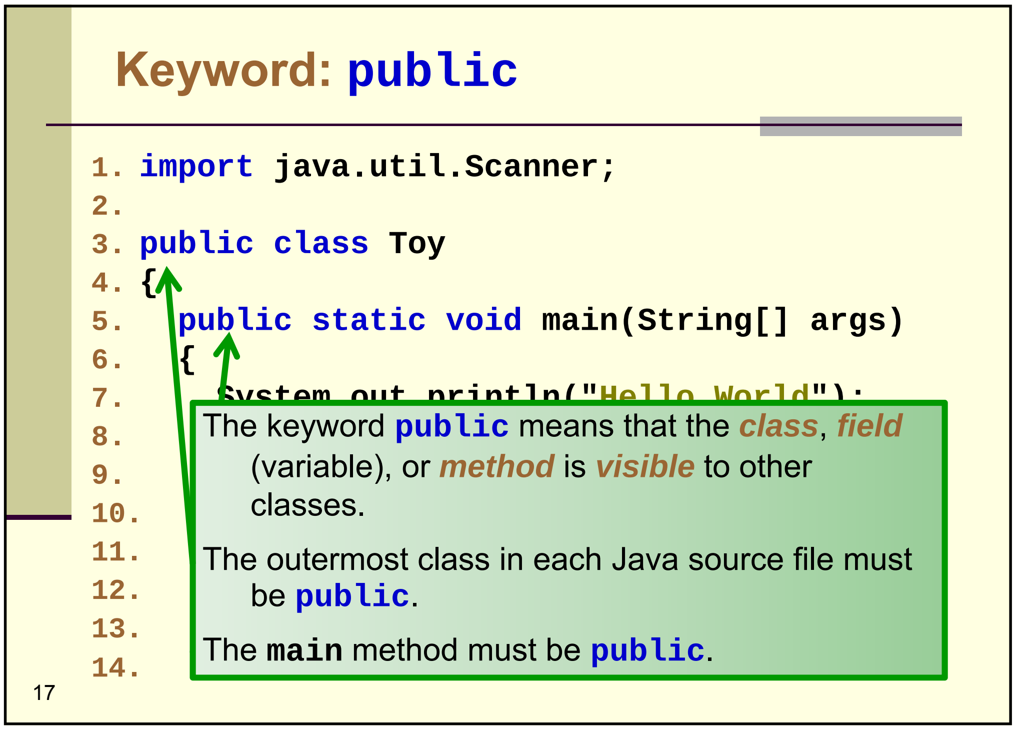
Line 5 is a *method signature*.

Every Java application must have a **`main`** method.

By convention, method names start with a lower-case letter.

A method signature must be followed by an opening curly bracket '**{**' and a matching closing curly bracket '**}**'.

Code within the brackets is part of the method.



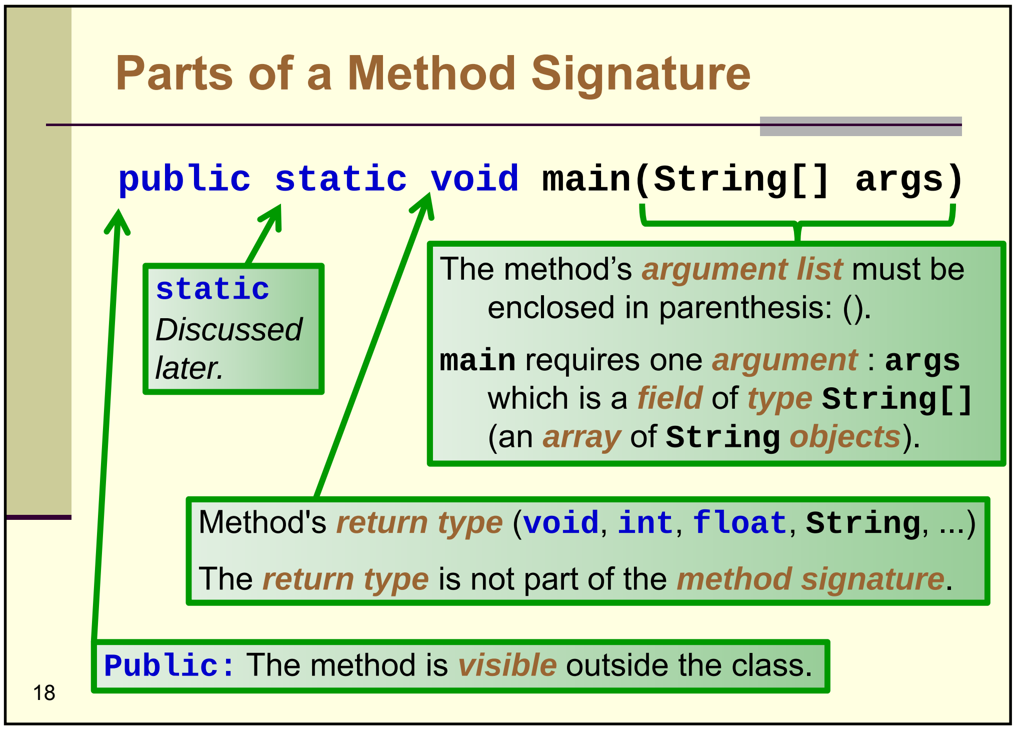
Keyword: public

```
import java.util.Scanner;

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

The keyword **public** means that the *class*, *field* (variable), or *method* is *visible* to other classes.

The outermost class in each Java source file must be **public**.

The **main** method must be **public**.



Parts of a Method Signature

```
public static void main(String[] args)
```

static *Discussed later.*

The method's *argument list* must be enclosed in parenthesis: ().

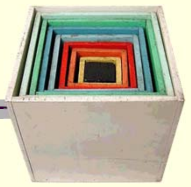
main requires one *argument* : **args** which is a *field* of *type* **String[]** (an *array* of **String** *objects*).

Method's *return type* (**void**, **int**, **float**, **String**, ...)

The *return type* is not part of the *method signature*.

Public: The method is *visible* outside the class.

Block Structure



```
public class Toy
{
  // Comment inside Toy.
  public static void main(String[] args)
  {
    // Comment inside main which is inside Toy.
    System.out.println("Hello World");
  }
}
```

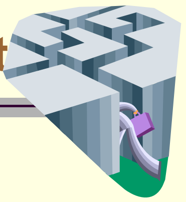
The *nesting* of curly brackets defines the block structure.

Good programming *style* requires block indentation.

In CS-259, we will use exactly two spaces per level.

19

Program Execution Entry Point



```
public class Toy
{
  public static void main(String[] args)
  {

```

When a Java program runs, code *execution* starts at **main**.

Every Java *application* must have **at least one** class with a **main** method.

It is ok for an application to have more than one class with **main**.

When a user runs a Java application, the user must specify which class contains the **main** he or she wants to use.

20

Method Calls

```
1. System.out.println("Hello World");
2. System.out.println("I want two numbers!");
```

Line 1 *Calls* the **`println`** *method* of the *object* **`System.out`** with the *argument* **`"Hello World"`**.

The **`println`** *method* takes a **`String`** *object* for an *argument* (input).

The **`println`** *method* displays its argument in the Java Console and then displays a newline character, **`'/n'`**.

Keyword new: Instantiating a Class

```
Scanner keyboard = new Scanner(System.in);
```

Declares a *field* (with the programmer defined name **`keyboard`**) to be of *type* **`Scanner`**.

The *type* **`Scanner`** is defined in **`import java.util.Scanner`**

argument list

Creates an *instance* of the **`Scanner`** class.

The = symbol *assigns* **`keyboard`** to the *memory address* of the newly created *instance* of **`Scanner`**.

Reading User Input from the Keyboard

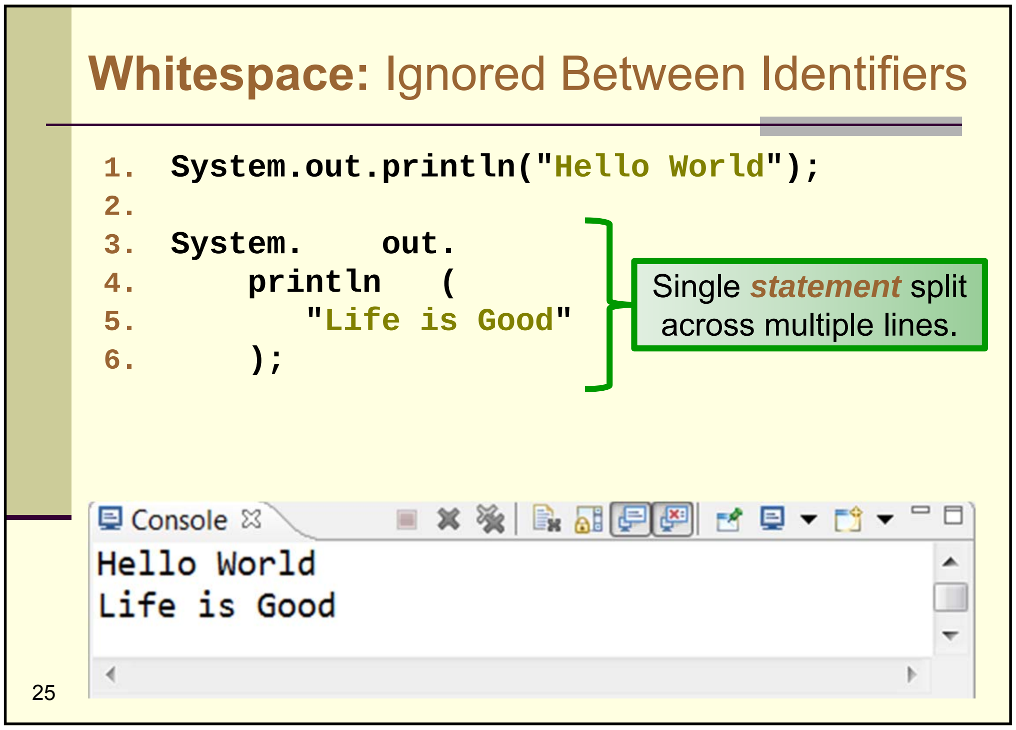
```
1. Scanner keyboard = new Scanner(System.in);
2. int n1 = keyboard.nextInt();
```

Line 2 does many things:

1) *Defines* **n1** to be a *field* of *type* **int**.
2) *Allocates* memory for **n1**.
3) *Calls* the **nextInt** *method* of the keyboard *instance* of **Scanner**. The **nextInt** *method*:
   i. *Reads* input from the keyboard.
   ii. *Echoes* the input to the *Console*.
   iii. *Tries to convert* the user input to an **int**.
   iv. *Returns* the converted input.
4) *Assigns* the returned **int** value to **n1**.

End of Statement $\boxed{;}$ Start of Block $\boxed{\{}$

```
import java.util.Scanner;

public class Toy
{
  public static void main(String[] args)
  {
    System.out.println("Hello World");
    System.out.println("I want 2 numbers!");

    Scanner keyboard = new Scanner(System.in);
    int n1 = keyboard.nextInt();
    int n2 = keyboard.nextInt();

    System.out.println(n1+n2);
  }
}
```

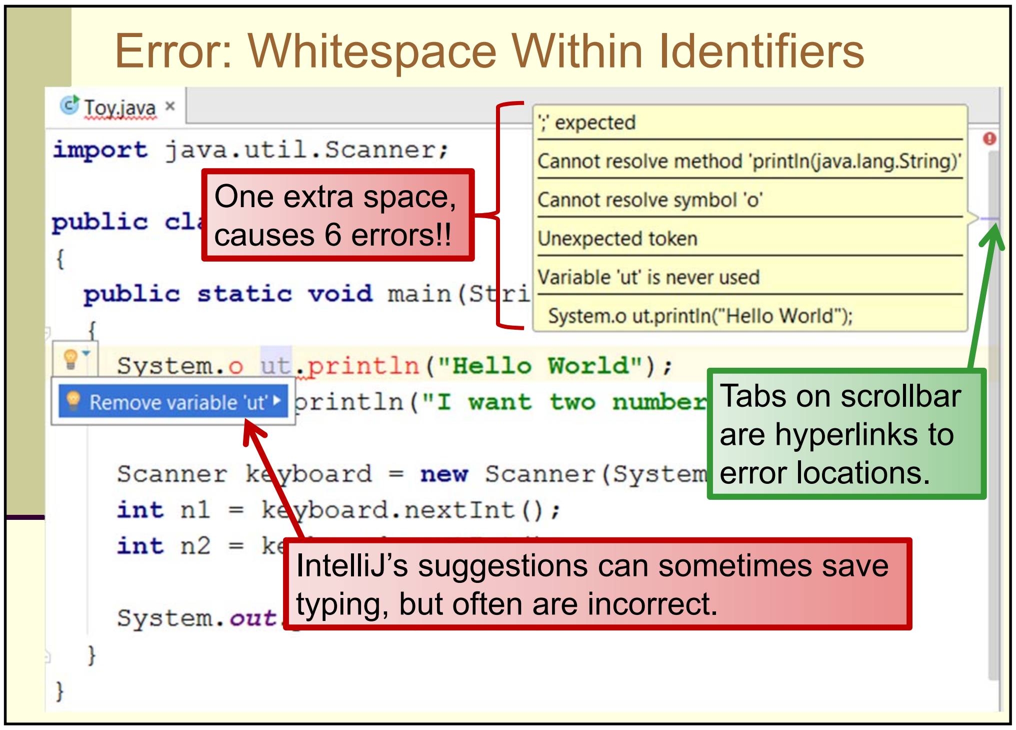


Whitespace: Ignored Between Identifiers

```
System.out.println("Hello World");

System.    out.
     println    (
         "Life is Good"
     );
```

Single *statement* split across multiple lines.

```
Hello World
Life is Good
```



Error: Whitespace Within Identifiers

```
import java.util.Scanner;

public cla
{
   public static void main(Stri
   {
      System.o ut.println("Hello World");
               println("I want two number

      Scanner keyboard = new Scanner(System
      int n1 = keyboard.nextInt();
      int n2 = ke

      System.out.
   }
}
```

```
';' expected
Cannot resolve method 'println(java.lang.String)'
Cannot resolve symbol 'o'
Unexpected token
Variable 'ut' is never used
 System.o ut.println("Hello World");
```

One extra space, causes 6 errors!!

Tabs on scrollbar are hyperlinks to error locations.

IntelliJ's suggestions can sometimes save typing, but often are incorrect.

Find and Fix the Syntax Error: #1

```java
import java.util.Scanner;

public class Toy
{
  public static void main(String[] args)
  {
    System.out.println("Input 2 numbers");

    Scanner in = new Scanner(System.in);
    int n1 = keyboard.nextInt();
    int n2 = keyboard.nextInt();

    System.out.println(n1+n2);
  }
}
```

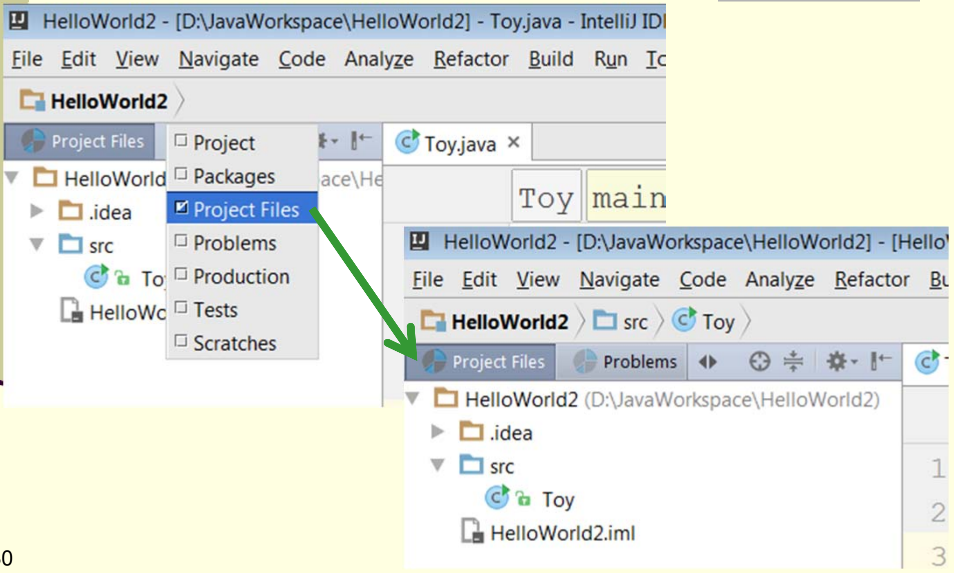
Find and Fix the Syntax Error: #2

```java
import java.util.Scanner;

public class Toy
{
  public static void main(String[] args)

    System.out.println("Input 2 numbers");

    Scanner bob = new Scanner(System.in);
    int n1 = bob.nextInt();
    int n2 = bob.nextInt();

    System.out.println(n1+n2);
  }
}
```

Find and Fix the Syntax Error: #3

```java
import java.util.Scanner;

public class Toy
{
  public static void main(String[] args);
  {
    System.out.println("Input 2 numbers");

    Scanner in = new Scanner(System.in);
    int n1 = in.nextInt();
    int n2 = in.nextInt();

    System.out.println(n1+n2);
  }
}
```

Setting IntelliJ to **Project Files** View


HelloWorld2 - [D:\JavaWorkspace\HelloWorld2] - Toy.java - IntelliJ IDI
File Edit View Navigate Code Analyze Refactor Build Run To
HelloWorld2
Project Files
Project
Packages
Project Files
Problems
Production
Tests
Scratches
Toy.java
HelloWorld
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src
To
HelloWo
Toy main
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File Edit View Navigate Code Analyze Refactor Bu
HelloWorld2 src Toy
Project Files Problems
HelloWorld2 (D:\JavaWorkspace\HelloWorld2)
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