GIA DINH
UNIVERSITY

Chapter 1

Java Fundamentals

Objectives

- *Java introduction*
- *First program*
- *Variable declaration syntax*
- *Primitive data type*
- *Identification of the operators*
- *Describe decision statements: if … else ; switch … case*
- *Explain iterations: for, while, do…while*

NTS SAMPLE

Java Introduction

HISTORY

- 1991: Sun MicroSystem developed to create embedded software
- 1996: first release of Java
- Java:
  - Programming language
  - Development environment
  - Deployment environment

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Java application

- Desktop application
  - Java application (standalone)
  - Applet
- Server application:
  - JSP
  - Servlets
- Mobile application

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First Program

FIRST PROGRAM

```
package firstPackage;

class FirstClass {
    public static void main(String[] args) {
        System.out.println("This is the first class!");
    }
}
```

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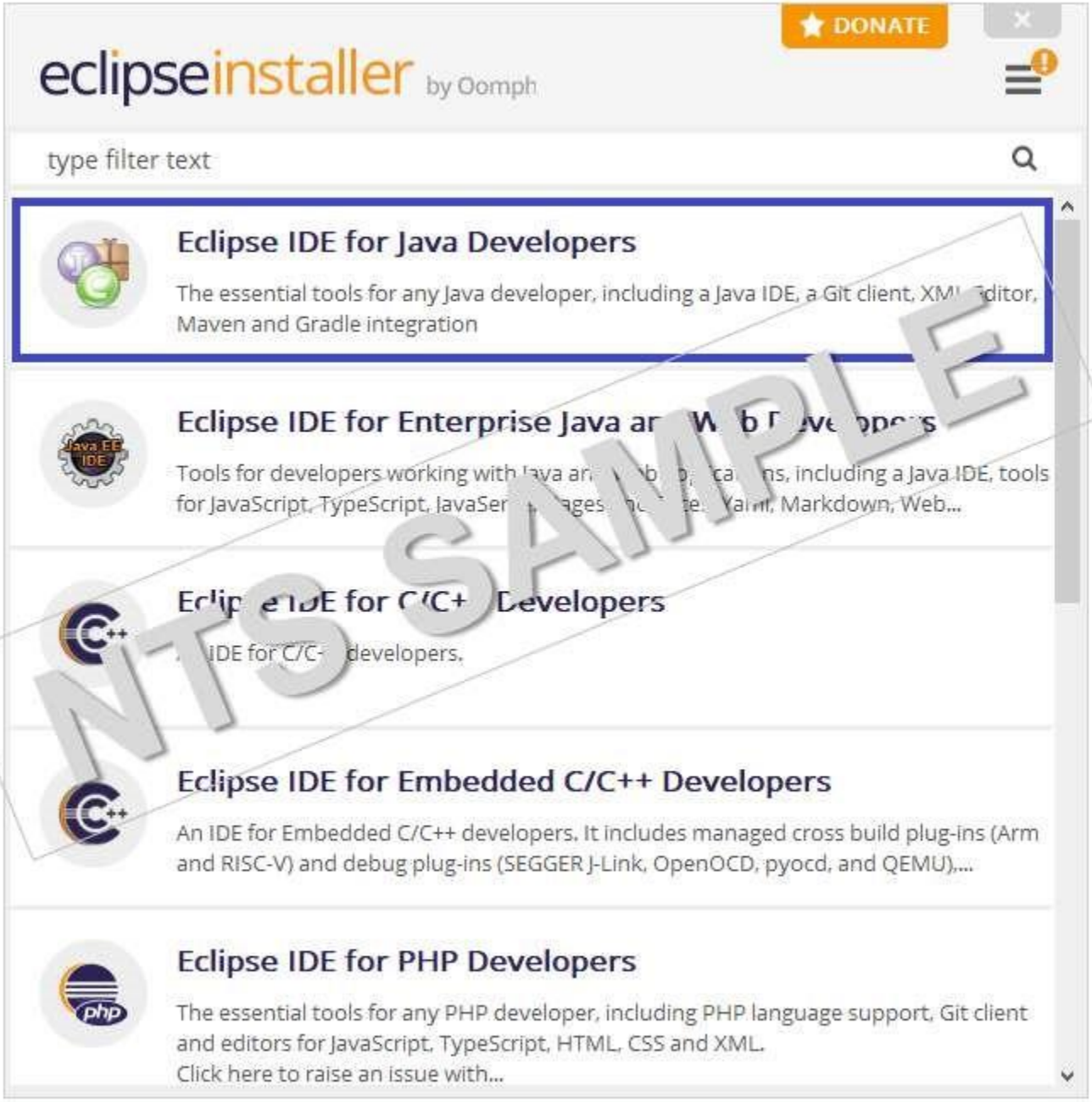
Installation


eclipse
2023-03


DONATE
eclipseinstaller by Oomph
type filter text
Eclipse IDE for Java Developers
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration
Eclipse IDE for Enterprise Java and Web Developers
Tools for developers working with Java and Web applications, including a Java IDE, tools for JavaScript, TypeScript, JavaScript frameworks, YAML, Markdown, Web...
Eclipse IDE for C/C++ Developers
An IDE for C/C++ developers.
Eclipse IDE for Embedded C/C++ Developers
An IDE for Embedded C/C++ developers. It includes managed cross build plug-ins (Arm and RISC-V) and debug plug-ins (SEGGER J-Link, OpenOCD, pyocd, and QEMU),...
Eclipse IDE for PHP Developers
The essential tools for any PHP developer, including PHP language support, Git client and editors for JavaScript, TypeScript, HTML, CSS and XML.
Click here to raise an issue with...

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DONATE
eclipseinstaller by Oomph
Eclipse IDE for Java Developers
details
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration.
Java 17+ VM
Installation Folder
create start menu entry
create desktop shortcut
INSTALL
BACK

NTS SAMPLE


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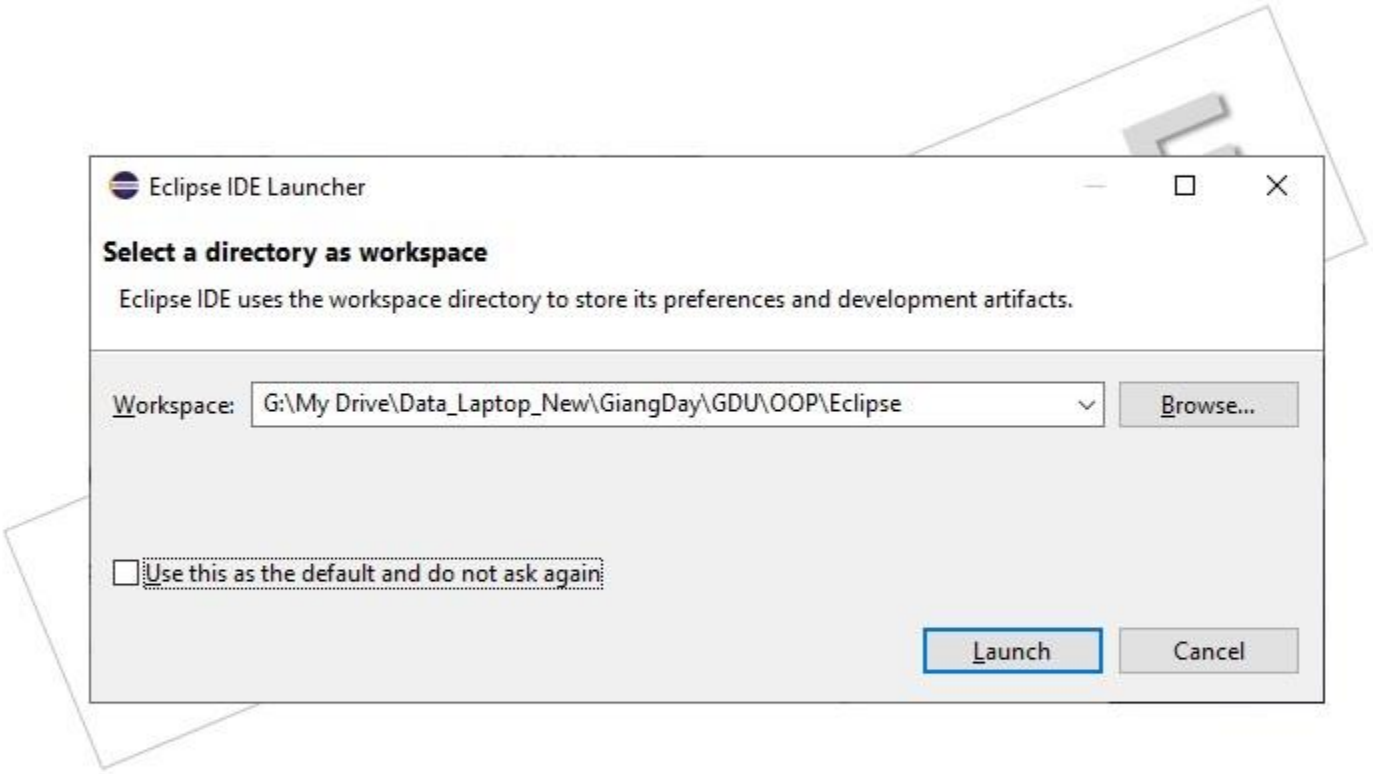
Eclipse IDE for Java Developers
details
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration.
Java 17+ VM
Installation Folder
create desktop shortcut
INSTALLING
Cancel Installation
BACK

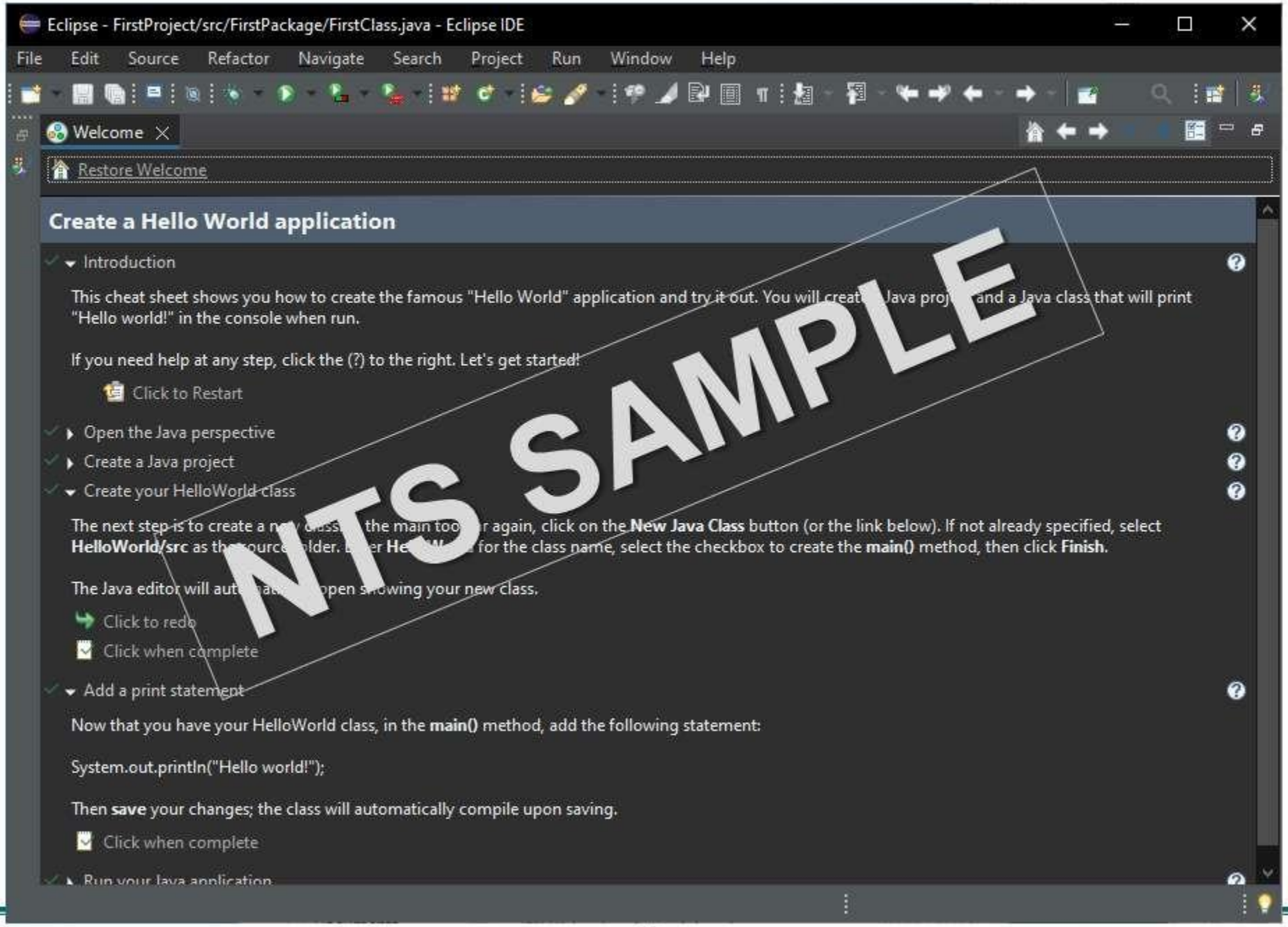
NTS SAMPLE


eclipseinstaller by Oomph
Eclipse IDE for Java Developers
details
The essential tools for any Java developer, including a Java IDE, a Git client, XML Editor, Maven and Gradle integration.
Java 17+ VM
Installation Folder
create start menu entry
create desktop shortcut
LAUNCH
show readme file
open in system explorer
keep installer
BACK

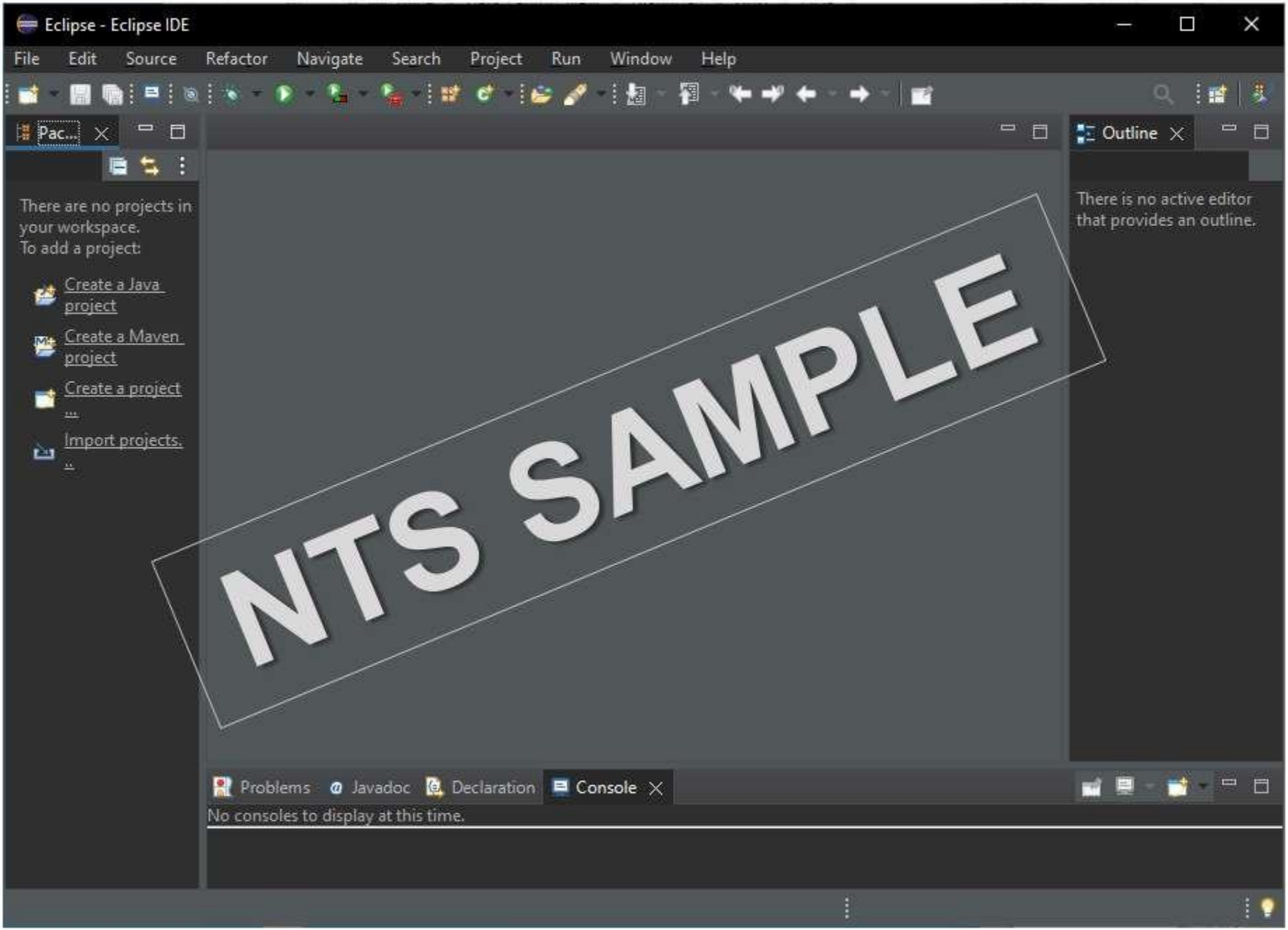
NTS SAMPLE

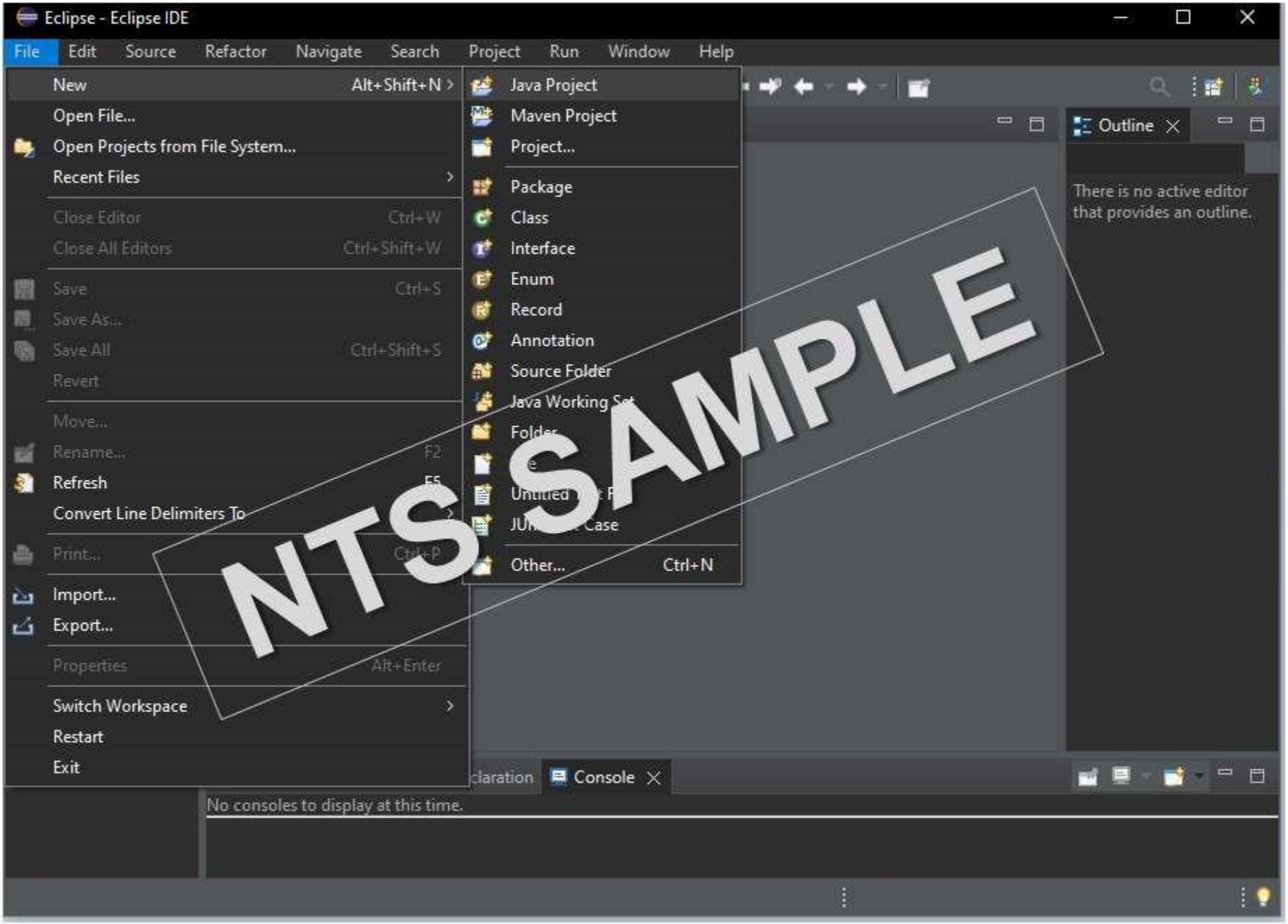

eclipse
2023-03


Eclipse IDE Launcher
Select a directory as workspace
Eclipse IDE uses the workspace directory to store its preferences and development artifacts.
Workspace:
G:\My Drive\Data_Laptop_New\GiangDay\GDU\OOP\Eclipse
Browse...
Use this as the default and do not ask again
Launch
Cancel


Eclipse - FirstProject/src/FirstPackage/FirstClass.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Welcome
Restore Welcome
Create a Hello World application
Introduction
This cheat sheet shows you how to create the famous "Hello World" application and try it out. You will creat Java proj and a Java class that will print "Hello world!" in the console when run.
If you need help at any step, click the (?) to the right. Let's get started!
Click to Restart
Open the Java perspective
Create a Java project
Create your HelloWorld class
The next step is to create a n the main too r again, click on the New Java Class button (or the link below). If not already specified, select HelloWorld/src as th ource lder. er He for the class name, select the checkbox to create the main() method, then click Finish.
The Java editor will aut at pen showing your new class.
Click to redo
Click when complete
Add a print statement
Now that you have your HelloWorld class, in the main() method, add the following statement:
System.out.println("Hello world!");
Then save your changes; the class will automatically compile upon saving.
Click when complete
Run your Java application

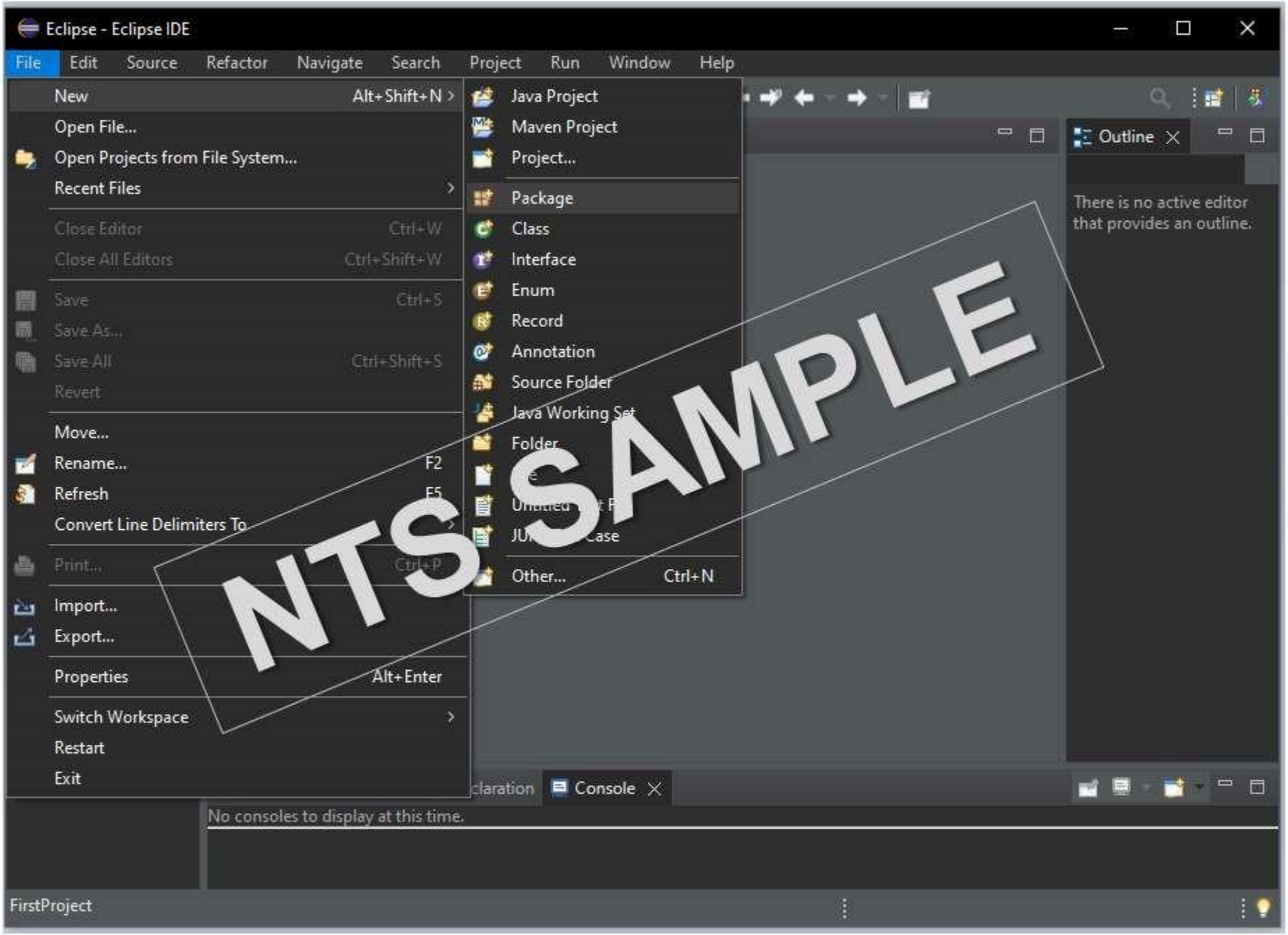
NTS SAMPLE

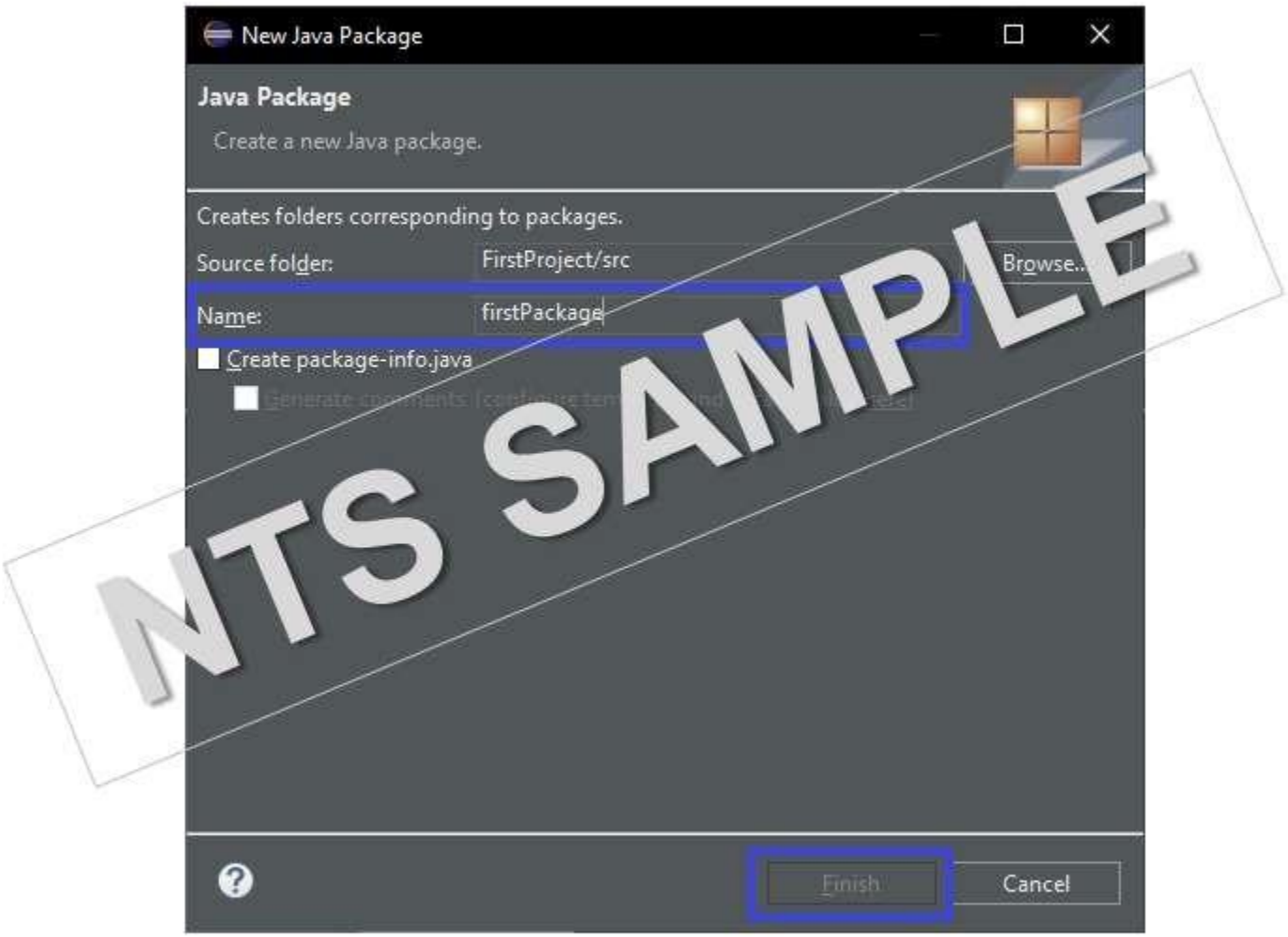

Eclipse - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Pac...
There are no projects in your workspace.
To add a project:
Create a Java project
Create a Maven project
Create a project ...
Import projects...
Outline
There is no active editor that provides an outline.
NTS SAMPLE
Problems Javadoc Declaration Console
No consoles to display at this time.

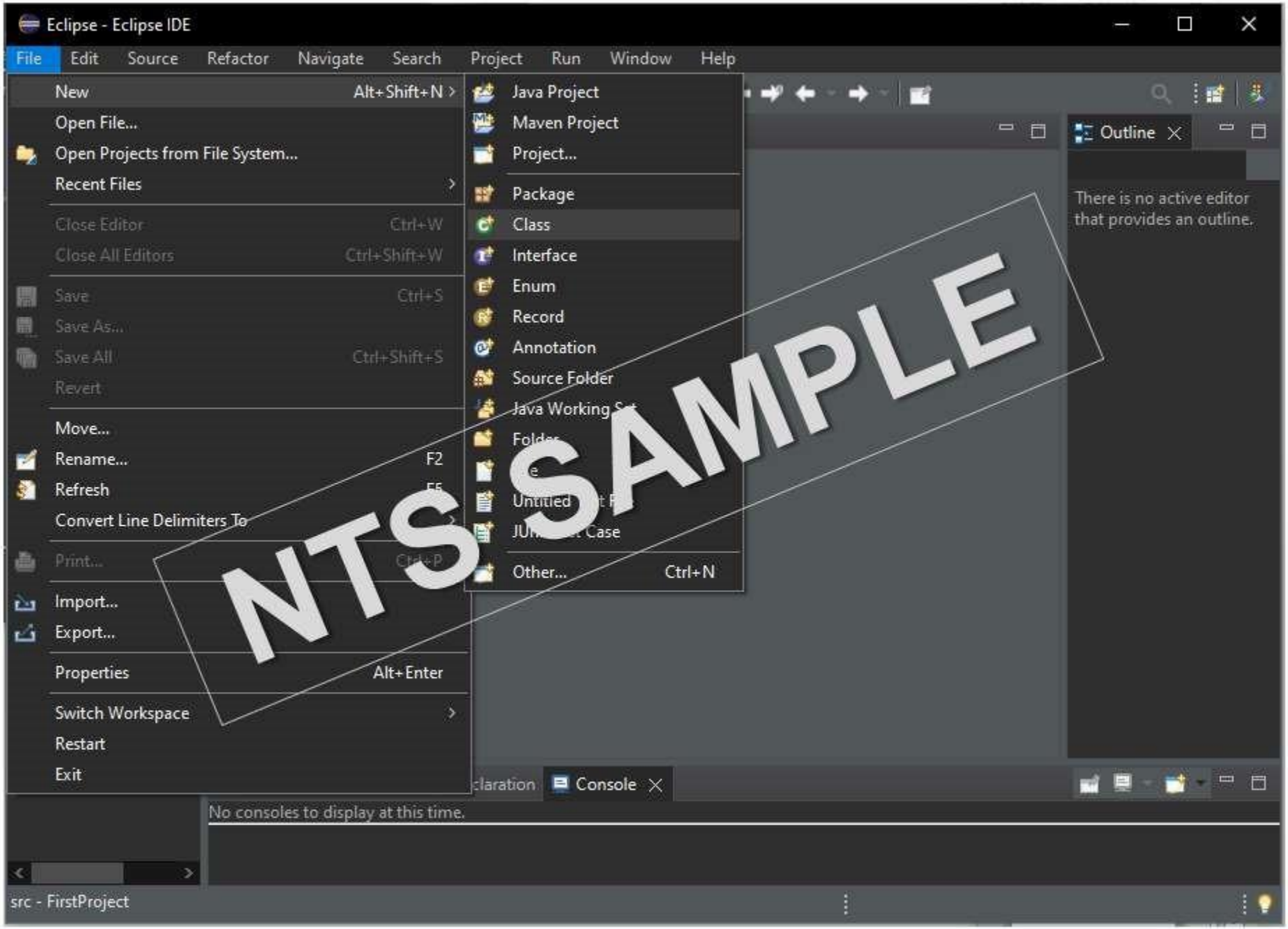

Eclipse - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
New Alt+Shift+N
Open File...
Open Projects from File System...
Recent Files
Close Editor Ctrl+W
Close All Editors Ctrl+Shift+W
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To
Print... Ctrl+P
Import...
Export...
Properties Alt+Enter
Switch Workspace
Restart
Exit
Java Project
Maven Project
Project...
Package
Class
Interface
Enum
Record
Annotation
Source Folder
Java Working Set
Folder
Untitled
Case
Other... Ctrl+N
Outline
There is no active editor that provides an outline.
Console
No consoles to display at this time.
NTS SAMPLE

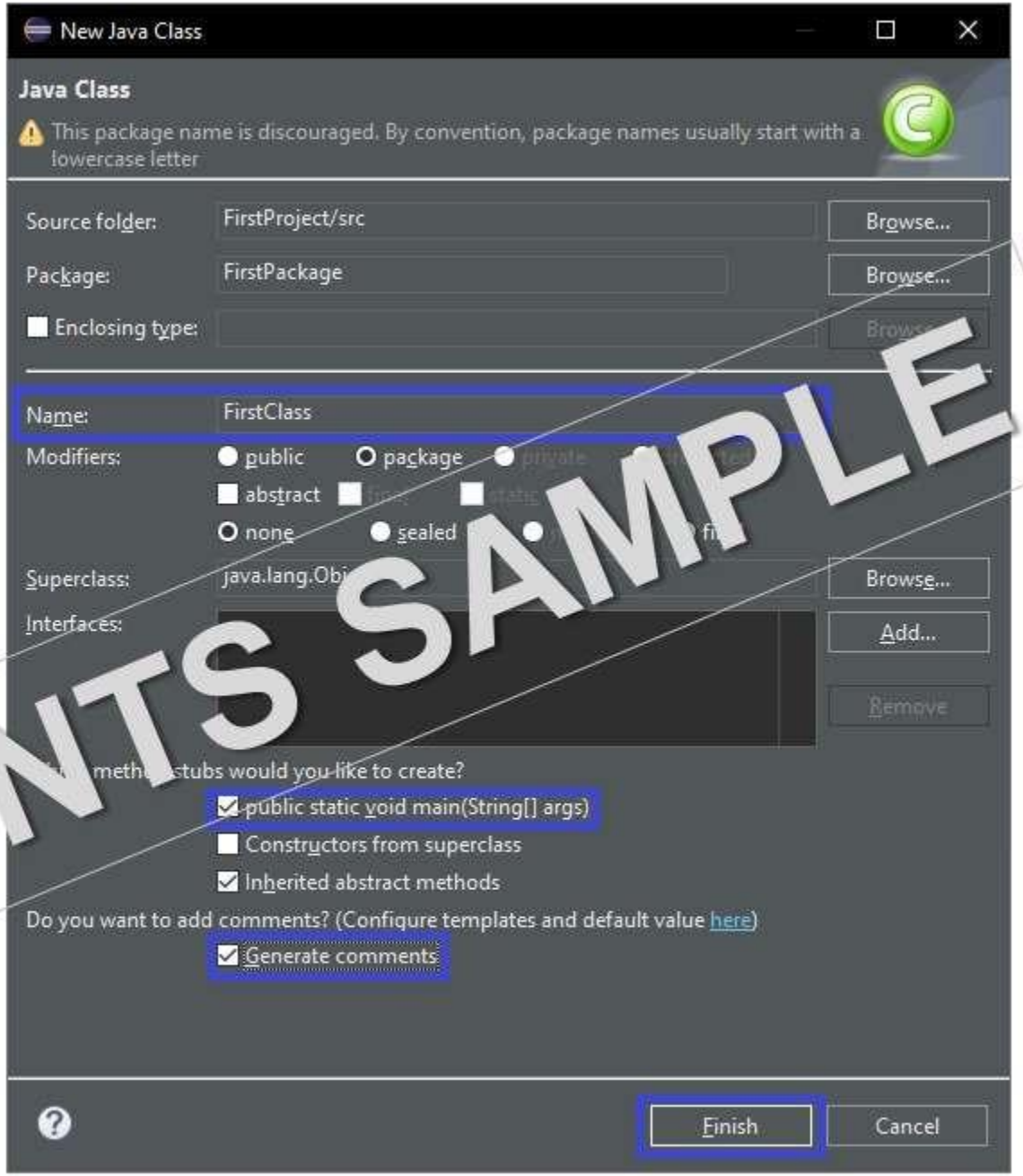

New Java Project
Create a Java Project
Create a Java project in the workspace or in an external location.
Project name: firstProject
Use default location
Location: C:\Users\Administrator\eclipse-workspace\firstProject
Browse...
JRE
Use an execution environment JRE: JavaSE-17
Use a project specific JRE: jre1.8.0_
Use default JRE (currently 'jre1.8.0_233')
Configure JREs...
Project layout
Configure default...
Add project to working sets
New...
Working sets:
Select...
The default compiler compliance level for the current workspace is 1.8. The new project will use a project specific compiler compliance level of 1.7.
< Back
Next >
Finish
Cancel

NTS SAMPLE

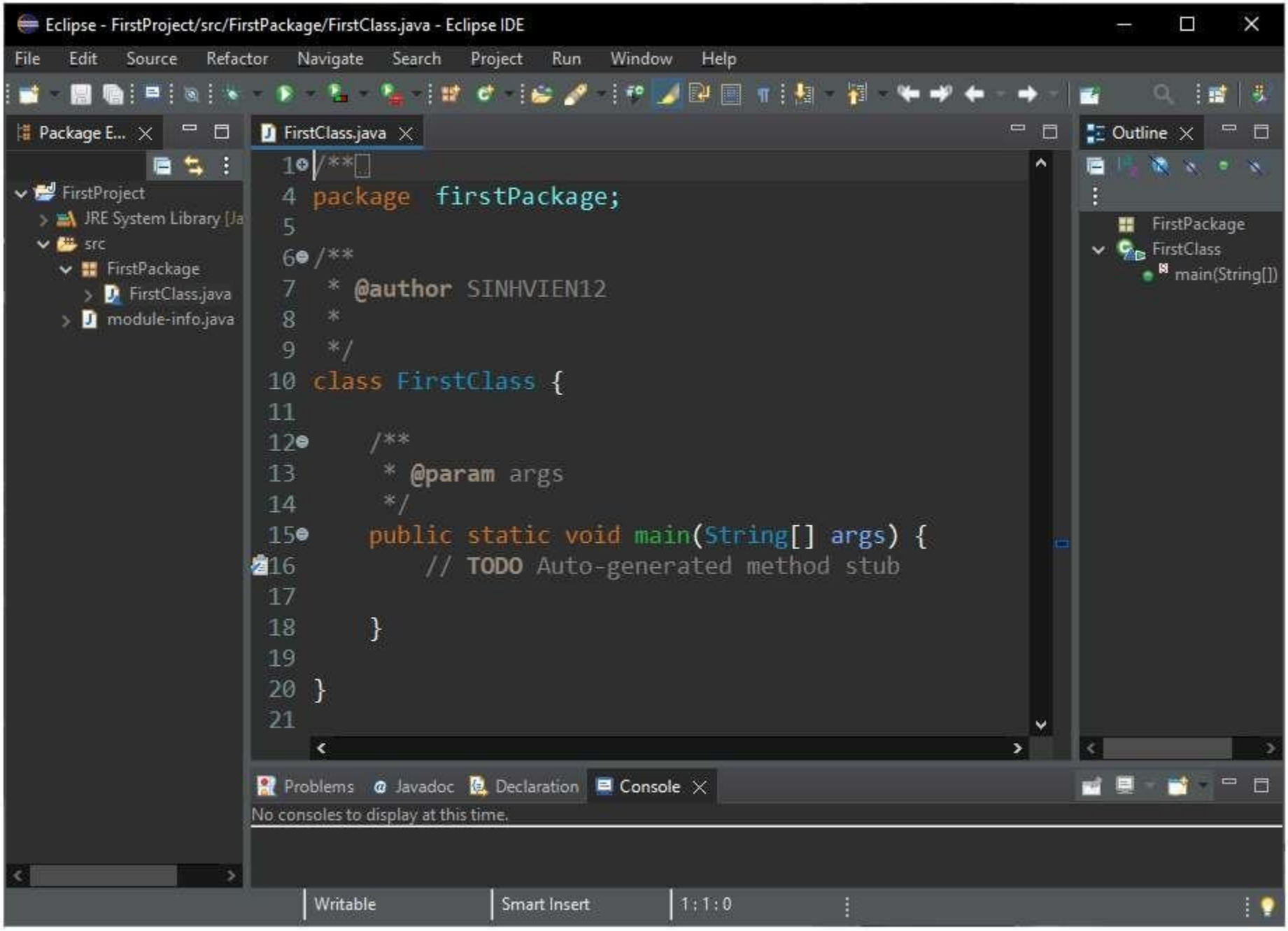

Eclipse - Eclipse IDE
File
Edit
Source
Refactor
Navigate
Search
Project
Run
Window
Help
New Alt+Shift+N
Open File...
Open Projects from File System...
Recent Files
Close Editor Ctrl+W
Close All Editors Ctrl+Shift+W
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To
Print... Ctrl+P
Import...
Export...
Properties Alt+Enter
Switch Workspace
Restart
Exit
Java Project
Maven Project
Project...
Package
Class
Interface
Enum
Record
Annotation
Source Folder
Java Working Set
Folder
Other... Ctrl+N
Outline
There is no active editor that provides an outline.
Console
No consoles to display at this time.
FirstProject
NTS SAMPLE

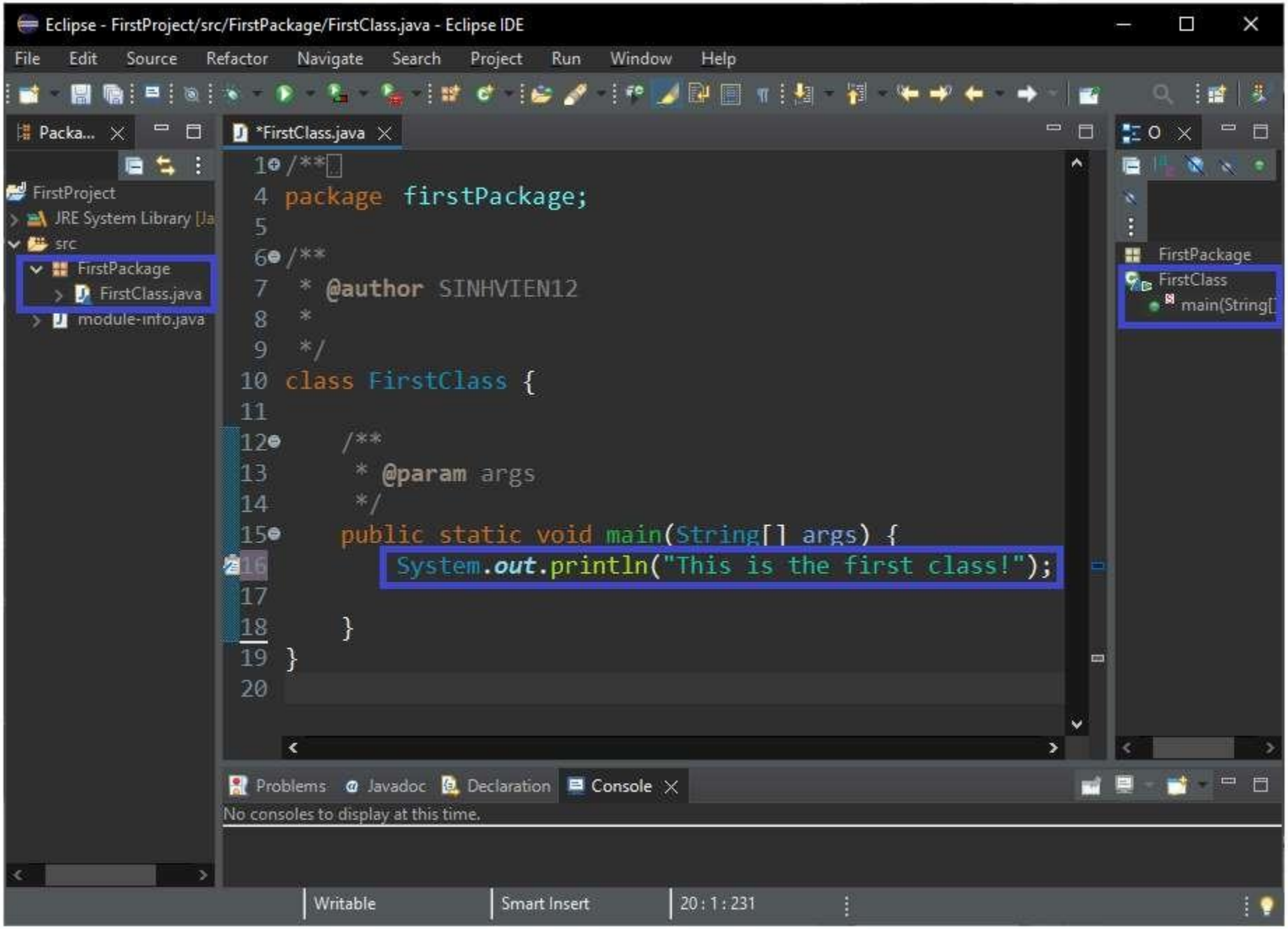

New Java Package
Java Package
Create a new Java package.
Creates folders corresponding to packages.
Source folder:
FirstProject/src
Browse...
Name:
firstPackage
Create package-info.java
Finish
Cancel
NTS SAMPLE

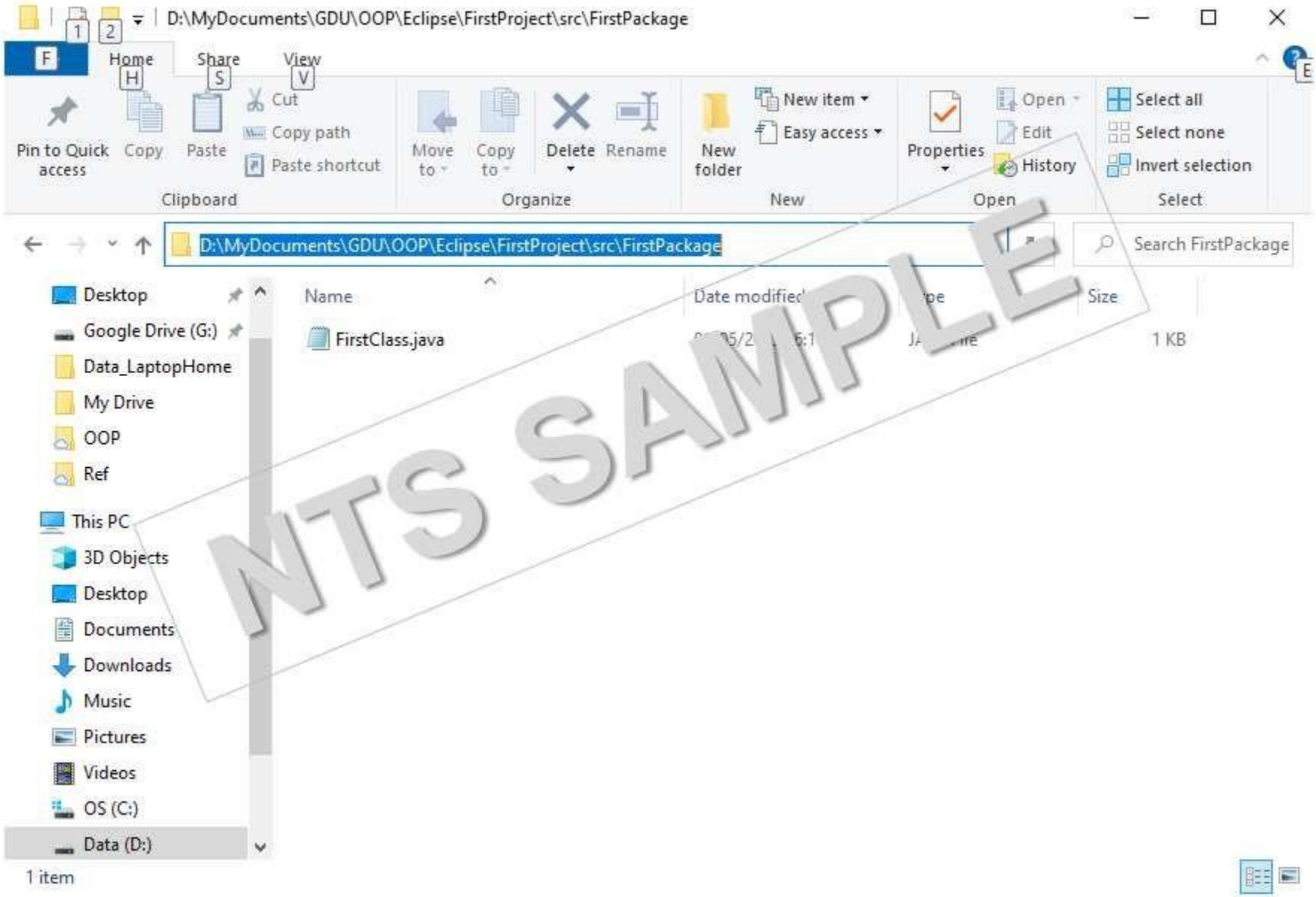

Eclipse - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
New Alt+Shift+N
Open File...
Open Projects from File System...
Recent Files
Close Editor Ctrl+W
Close All Editors Ctrl+Shift+W
Save Ctrl+S
Save As...
Save All Ctrl+Shift+S
Revert
Move...
Rename... F2
Refresh F5
Convert Line Delimiters To
Print... Ctrl+P
Import...
Export...
Properties Alt+Enter
Switch Workspace
Restart
Exit
Java Project
Maven Project
Project...
Package
Class
Interface
Enum
Record
Annotation
Source Folder
Folder
Other... Ctrl+N
Outline
There is no active editor that provides an outline.
Console
No consoles to display at this time.
src - FirstProject
NTS SAMPLE


New Java Class
Java Class
This package name is discouraged. By convention, package names usually start with a lowercase letter
Source folder:
FirstProject/src
Browse...
Package:
FirstPackage
Browse...
Enclosing type:
Name:
FirstClass
Modifiers:
public
package
abstract
none
sealed
Superclass:
java.lang.Obi
Browse...
Interfaces:
Add...
Remove
stubs would you like to create?
public static void main(String[] args)
Constructors from superclass
Inherited abstract methods
Do you want to add comments? (Configure templates and default value here)
Generate comments
Finish
Cancel

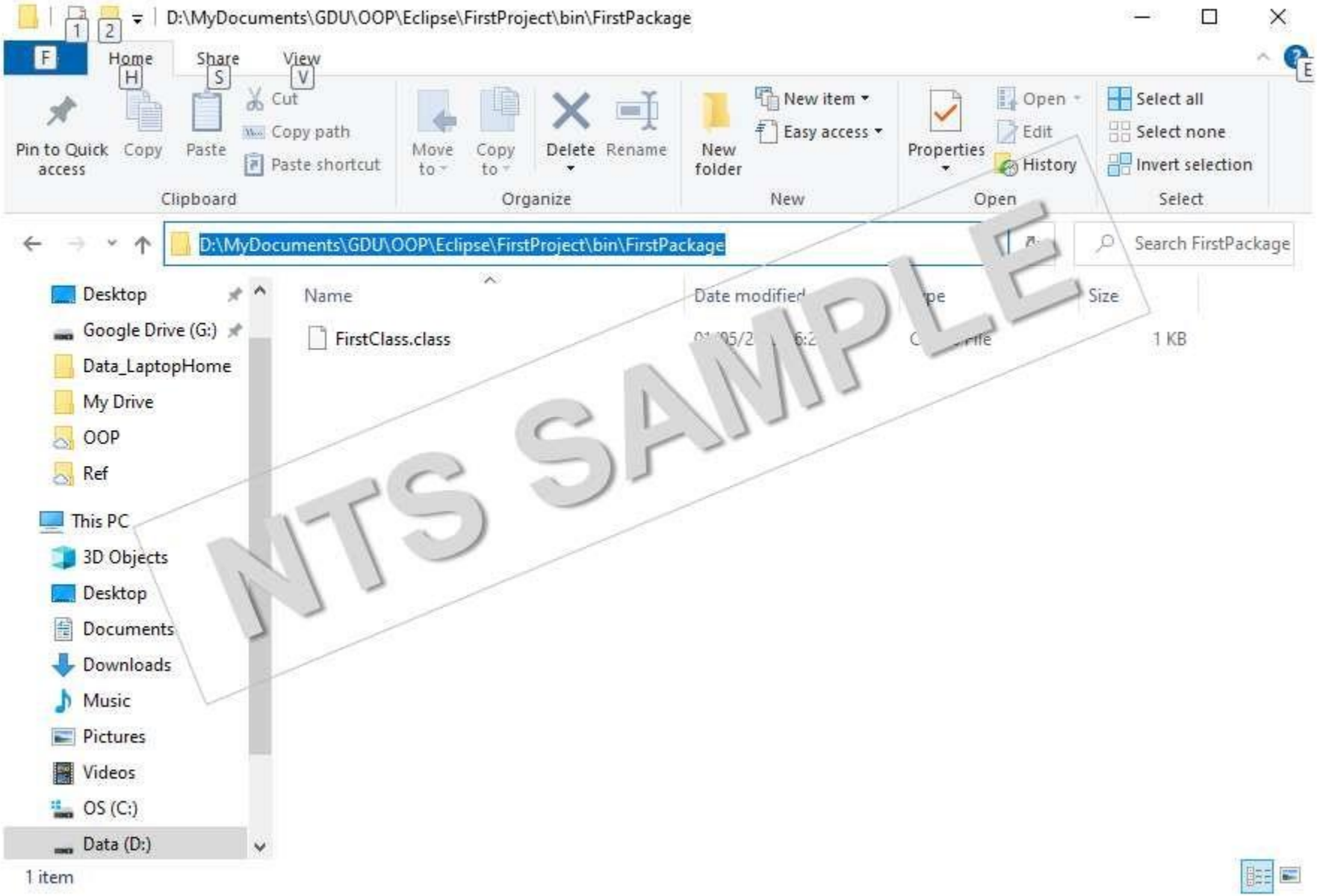
NTS SAMPLE


Eclipse - FirstProject/src/FirstPackage/FirstClass.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Package E...
FirstProject
JRE System Library [Ja
src
FirstPackage
FirstClass.java
module-info.java
FirstClass.java
1 /**
4 package firstPackage;
5
6 /**
7 * @author SINHVIEN12
8 *
9 */
10 class FirstClass {
11
12 /**
13 * @param args
14 */
15 public static void main(String[] args) {
16 // TODO Auto-generated method stub
17
18 }
19
20 }
21
Outline
FirstPackage
FirstClass
main(String[])
Problems Javadoc Declaration Console
No consoles to display at this time.
Writable Smart Insert 1 : 1 : 0

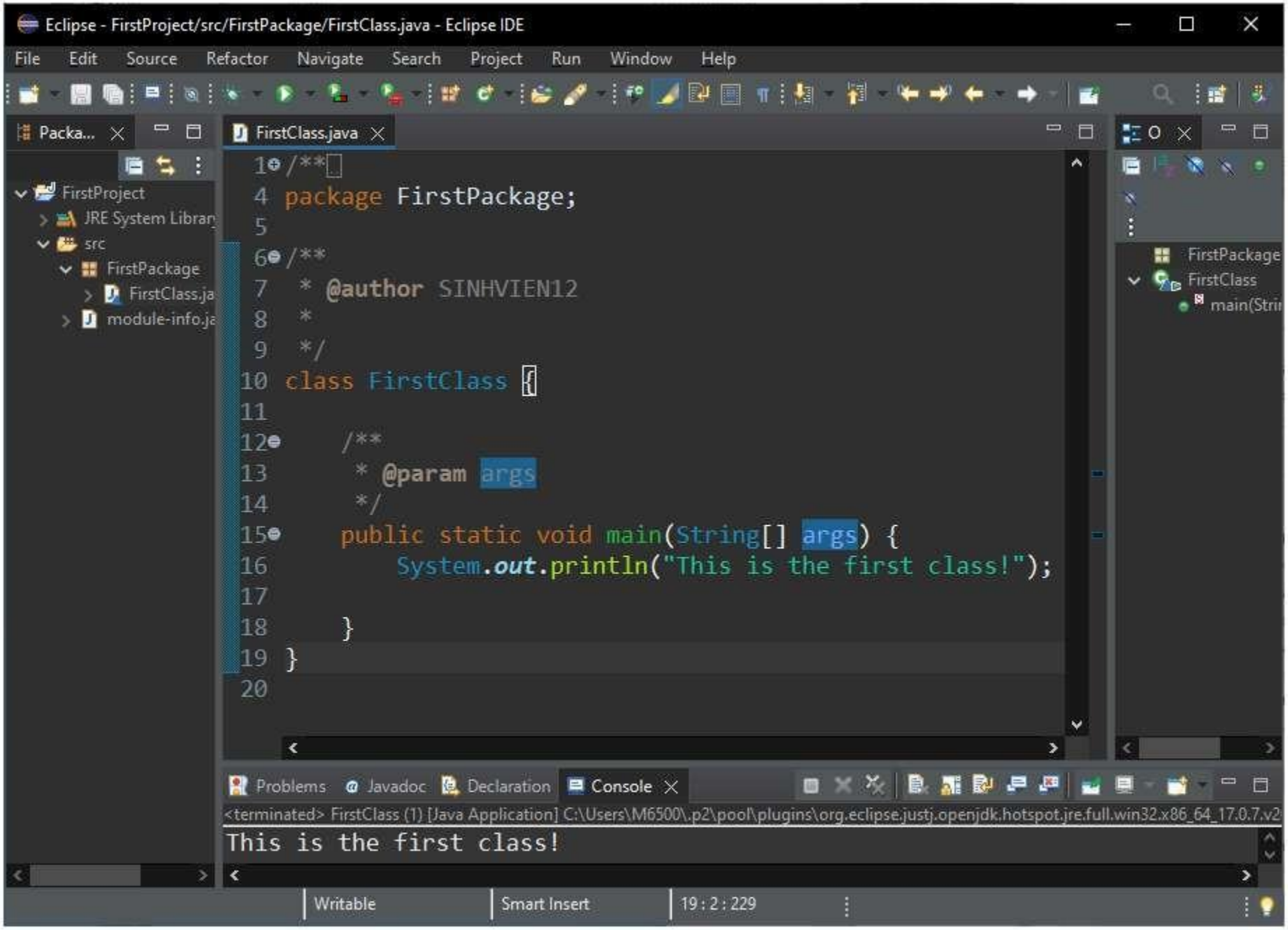

Eclipse - FirstProject/src/FirstPackage/FirstClass.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Packa...
FirstProject
JRE System Library [Ja
src
FirstPackage
FirstClass.java
module-info.java
*FirstClass.java
1 /**
4 package firstPackage;
5
6 /**
7 * @author SINHVIEN12
8 *
9 */
10 class FirstClass {
11
12 /**
13 * @param args
14 */
15 public static void main(String[] args) {
16 System.out.println("This is the first class!");
17
18 }
19 }
20
FirstPackage
FirstClass
main(String[
Problems Javadoc Declaration Console
No consoles to display at this time.
Writable
Smart Insert
20 : 1 : 231


D:\MyDocuments\GDU\OOP\Eclipse\FirstProject\src\FirstPackage
Home
Share
View
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organize
New folder
New item
Easy access
New
Properties
Open
Edit
History
Open
Select all
Select none
Invert selection
Select
D:\MyDocuments\GDU\OOP\Eclipse\FirstProject\src\FirstPackage
Search FirstPackage
Desktop
Google Drive (G:)
Data_LaptopHome
My Drive
OOP
Ref
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
OS (C:)
Data (D:)
Name
Date modified
Size
FirstClass.java
1 KB
1 item

NTS SAMPLE


D:\MyDocuments\GDU\OOP\Eclipse\FirstProject\bin\FirstPackage
Home
Share
View
Pin to Quick access
Copy
Paste
Cut
Copy path
Paste shortcut
Clipboard
Move to
Copy to
Delete
Rename
Organize
New folder
New item
Easy access
New
Properties
Open
Edit
History
Open
Select all
Select none
Invert selection
Select
D:\MyDocuments\GDU\OOP\Eclipse\FirstProject\bin\FirstPackage
Search FirstPackage
Desktop
Google Drive (G:)
Data_LaptopHome
My Drive
OOP
Ref
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
OS (C:)
Data (D:)
Name
Date modified
Size
FirstClass.class
1 KB
1 item

NTS SAMPLE


Eclipse - FirstProject/src/FirstPackage/FirstClass.java - Eclipse IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Packa...
FirstProject
JRE System Library
src
FirstPackage
FirstClass.ja
module-info.ja
FirstClass.java
1 /**
4 package FirstPackage;
5
6 /**
7 * @author SINHVIEN12
8 *
9 */
10 class FirstClass {
11
12 /**
13 * @param args
14 */
15 public static void main(String[] args) {
16 System.out.println("This is the first class!");
17
18 }
19 }
20
FirstPackage
FirstClass
main(Stri
Problems Javadoc Declaration Console
<terminated> FirstClass (1) [Java Application] C:\Users\M6500\.p2\pool\plugins\org.eclipse.justj.openjdk.hotspot.jre.full.win32.x86_64_17.0.7.v2
This is the first class!
Writable
Smart Insert
19 : 2 : 229

Variables and Operators

VARIABLES

- Syntax: **datatype** variable_name;
- Ex: int a,b,c;
- Declaring literal: initialize value
  - int a=14, b=0x14, c=014;
  - float a=4, b=4.5F,c=4.0000045f
  - double a=4.45, d=45E-2,e=45e+2;
  - boolean a=true,b=false; //a=1 → error
  - char a='c', b='$', c='_', d=' '; //a='kl' →error
  - final double Pi=3.14; //final: constant
  - null → special keyword

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Data type

- Primitive: Like C++
- Reference

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Data type: Primitive

Data type	Type	Storage	Example

Integer	**byte**
	short
	int
	long
		1 byte
		2 bytes
		4 bytes
		8 bytes
			byte b=127; // -128 ÷ 127
			short b=32,767; // -32,768 ÷ 32,767
			int i=2,147,483,647;
			long l=9,223,372,036,854,775,807;

Floating point	**float** **double**	4 bytes 8 bytes	float a =3.14f;// $\pm 3.4 \times 10^{38}$ double d=123e-4;// $\pm 1.79 \times 10^{308}$
Character	**char**		char a='c';
Boolean	**boolean**		boolean a=true;

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- ***Note:***

System.***out***.println(2.0-1.1); //0.8999999999999999

Data type: Reference

- Reference data type:
  - Object
  - Array
- Reference data type is an address of an object or an array
- Ex:

```
byte i;
byte [] a = new byte [10];
for(i=0;i<10;i++)
        a[i]=i;

System.out.print("Array a[]: ");
for(i=0;i<10;i++)
        System.out.print(" " + a[i]);
```

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Array - String

- Ex: short [][] b = new short[10][10]
- String st1 = new String("This is a string");
- String st2 = new String();

  st2 = "This is a string, too";
- Methods:
  - int length(): to find the length of string
  - char charAt(index): to get the character value at the specified index
  - concat(), compareTo(), replace(), substring(), trim()…
- String [ ] st = **new** String[2];

  st[0] = "Duong Dong Nam";

  st[1] = "Vo Ngan Quynh";

  for(String s:st)

  System.*out*.println(s);

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Formatted output

- Function ≠ Method
- Method output
  - **print ()**. Ex: System.out.print("Hello world");
  - **println()**. Ex: System.out.println("Hello world");
  - **format()**. Ex: System.out.format("%d ", soNguyen);
- Ex: See next page…

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Example

```
public static void main(String[] args) {
    int a=5;
    System.out.println("Value: "+a);
    System.out.format("Value: %d", a);
    System.out.format("\nValue: %d", -a);
    System.out.format("\nValue: %1.2f", 14.126);
}
```

Results:

```
Value: 5
Value: 5
Value: -5
Value: 14.13
```

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Operator

- Basic operator: like C++
  - Arithmetic Operator: + - * / %
  - Relational Operator: == != <= >= < >
  - Logical Operator: ! && ||
  - Bitwise Operator: ~ *(not)*, & *(and)*, | *(or)*, ^ *(xor)*
  - Increment / Decrement: ++ --

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Operator

- Special operator:
  - Left shift operator: multiply by 2
    - Symbol: <<
    - Ex: int a=3,b=a<<2; // b=12
  - Right shift operator: divide by 2
    - Symbol: >>
    - Ex: int a=36,b=a>>3; // b=4
  - Ex: See next page

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Example

```
public static void main(String[] args) {
        byte a,b;
        a=4<<2;
        b=9>>2;

        System.out.println(" Left shift 2 bits: "+a);
        System.out.println(" Right shift 2 bits: "+b);
}
```

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Operator precedence

- Like C++
- Ex: a+b*c-d/3.2+2*e

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Type casting

- Implicit: automatic conversion
  - Ex:

```
int a=3;
float b;
b=a;
```

- Explicit:

```
public static void main(String[] args) {
    float a,b,c;
    a= 3/2;
    b=(float) 3/2;
    c=(float) (3/2);
    System.out.println("3/2= "+a);
    System.out.println("(float)3/2= "+b);
    System.out.println("(float)(3/2)= "+c);
}
```

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Decision Marking And Iterations

if-else

```
public static void main(String[] args) {
        int a;
            a=11;
        if (a%2==0)
            System.out.println(a + " is an even number");
        else
            System.out.println(a + " is an odd number");
    }
```

switch - case

```
public static void main(String[] args) {
 int a=4;
 switch (a){
      case 2:
           System.out.println("Monday");
           break;
      case 3:
           System.out.println("Tuesday");
            break;
      case 4:
           System.out.println("Wednesday");
           break;
      case 5:
           System.out.println("Thursday");
           break;
      case 6:
           System.out.println("Friday");
           break;
      case 7:
           System.out.println("Saturday");
           break;
      case 8:
           System.out.println("Sunday");
           break;
      default:
           System.out.println("That's  not weekday");
   }
}
```

for loop

```
public static void main(String[] args) {
        int n=10,S;
        S=0;
        for(byte i=1;i<=n;i++)
                        S+=i;
        System.out.print("Sum: "+S);
    }
```

while loop

```
public static void main(String[] args) {
        int n=10,S,i;
        S=0;
        i=2;
        while (i<=n){
                if(i%2==0)
                        S+=i;
                i+=2;
        }
        System.out.print("Sum: "+S);
  }
```

do … while loop

```
package FirstPackage;
import java.util.*;
public class Example_doWhile {
        public static void main(String[] args) {
            Scanner input= new Scanner(System.in);
            int n;
            do {
                System.out.print("Input a positive integer n: ");
                n=input.nextInt();
            } while (n<=0);
            System.out.println("n = "+n);

        }
}
```

Jump statement: break

```
public static void main(String[] args) {
        byte n=10,S=0;
        for(byte i=1;i<=n;i++){
                if (i==5)
                        break;
                S+=i;
        }
        System.out.print("Sum: "+S);
}
```

Jump statement: continue

```
public static void main(String[] args) {
        byte n=10,S=0,i;
        for(i=1;i<=n;i++){
                if (i%2==0)
                        continue;
                S+=i;
        }
        System.out.print("Sum: "+S);
}
```

Label statement: break

```
public static void main(String[] args) {
        byte i,j;

        exitLoop:
            for(i=0;i<=2;i++)
                for(j=0;j<=3;j++){
                        if (j==1)
                                break exitLoop;
                        System.out.println("Inner loop i="+i+" j="+j);
                }
        System.out.print("Extern loop");
}
```

Results:

```
Inner loop i=0 j=0
Extern loop
```

Label statement: continue

```
public static void main(String[] args) {
        byte i,j;

        continueLoop:
            for(i=0;i<=2;i++)
                for(j=0;j<=3;j++){
                        if (j==1)
                                continue continueLoop;
                        System.out.println("Inner loop i="+i+" j="+j);
                }
        System.out.print("Extern loop");
}
```

Results:

```
Inner loop i=0 j=0
Inner loop i=1 j=0
Inner loop i=2 j=0
Extern loop
```

Review

- Java introduction
- First program
- Variable declaration syntax
- Primitive data type
- Identification of the operators
- Describe decision statements: if … else ; switch … case
- Explain iterations: for, while, do…while

NTS SAMPLE

Q&A