CS2212 Introduction to Software Engineering

Javadoc



Javadoc CS22

Javadoc

- Documentation generator created by Sun Microsystems (now Oracle) for the Java language.
- Generates API documentation in HTML format from Java source code.
- De facto industry standard for documenting Java classes.
- Many Java IDEs (IntelliJ IDEA, NetBeans, Eclipse, etc.) have built in support for Javadoc.
- Document generation is controlled and configured using a speical syntax for Java comments in source files.

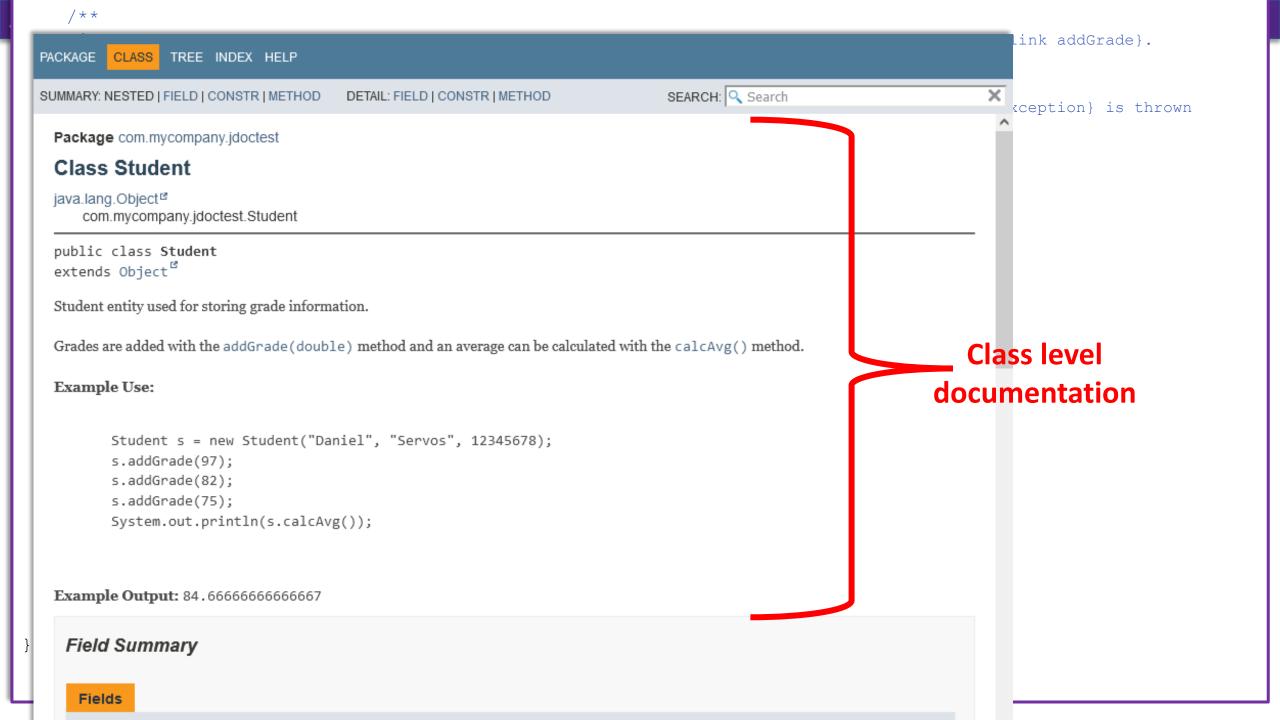
Javadoc Example

```
* Student entity used for storing grade information.
 * <br><br>>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br > \tag{br} >
 * <b>Example Use:</b>
 * 
 * {@code
         Student s = new Student("Daniel", "Servos", 12345678);
        s.addGrade(97);
        s.addGrade(82);
        s.addGrade(75);
         System.out.println(s.calcAvg());
 * 
 * <b>Example Output:</b> <code>84.6666666666666667</code><br>
 * @version 1.0.1b
 * @author Daniel Servos
 * @author Joe Bloggs
 * /
public class Student {
    /** The student's first name. */
    public String firstName;
```

Class level documentation

```
public class Student {
    /** The student's first name. */
   public String firstName;
                                                                                            Field level
    /** The student's last name. */
                                                                                         documentation
   public String lastName;
    /** The student number that was assigned to this student. */
   protected long studentNumber;
    /** A collection of final grades for this student's courses */
   private ArrayList<Double> grades;
    /**
                                                                                                  Method
     * Student constructor. Creates a new Student object.
                                                                                                    level
     * @param firstName the student's first name
                                                                                             documentation
     * @param lastName the student's last name
     * @param studentNumber the student number assigned to this student
   public Student(String firstName, String lastName, long studentNumber) {
        this.firstName = firstName;
        this.lastName = lastName;
        this.studentNumber = studentNumber;
        this.grades = new ArrayList();
    /**
     * Assign a final grade to this student.
     * Grades are used to calculate the student's overall average.
     * @param grade the grade, a value between 0 and 100 (inclusive), to assign to the student
     * @see calcAvg
    public void addGrade(double grade)
```

```
/ * *
 * Calculates the student's overall average based on their assigned grades. Add new grades with {@link addGrade}.
 * @return the student's average based on their currently assigned grades
 * @throws StudentGradeException if the student is not assigned any grades a {@link StudentGradeException} is thrown
 * @see addGrade
public double calcAvg() throws StudentGradeException{
    if(this.grades.size() <= 0)</pre>
        throw new StudentGradeException("No grades to compute average on!");
    double total = 0;
    for (double grade : this.grades)
        total += grade;
    return total / this.grades.size();
/**
 * Creates a string containing the student's full name.
 * @return the student's full name
 * @see String
public String getFullName() {
    return this.firstName + " " + this.lastName;
```



Field Summary

Fields

| Modifier and Type | Field | Description |
|---------------------|---------------|---|
| String [®] | firstName | The student's first name. |
| String® | lastName | The student's last name. |
| protected long | studentNumber | The student number that was assigned to this student. |

Field level documentation summary

Note: By default private fields are not documented, even if Javadoc comments are given in the source.

Constructor Summary

Constructors

Student(String[™] firstName, String[™] lastName, long studentNumber) Student constructor.

Method Summary

| All Methods | Instance Methods | Concrete Methods |
|-------------------|--------------------------|---|
| Modifier and Type | Method | Description |
| void | addGrade(double gr | rade) Assign a final grade to this student. |
| double | calcAvg() | Calculates the student's overall average based on their assigned grades.Add new grad with addGrade(double). |
| String® | <pre>getFullName()</pre> | Creates a string containing the student's full name. |

Constructor Summary

Constructors

Constructor Description

Student(String[™] firstName, String[™] lastName, long studentNumber) Student constructor.

Method Summary

| All Methods | Instance Methods | Concrete Methods | |
|--|---|--|---|
| Modifier and Ty | pe Method | Description | |
| void | addGrade(double | grade) Assign a final gr | ade to this student. |
| double | calcAvg() | Calculates the st with addGrade(| udent's overall average based on their assigned grades.Add new grade double). |
| String [®] | <pre>getFullName()</pre> | Creates a string | containing the student's full name. |
| Methods inherited from class java.lang.Object [™] | | | |
| clone [™] , equa | ls ^d , finalize ^d , get | Class [®] , hashCode [®] , n | otify [©] , notifyAll [©] , toString [©] , wait [©] , wait [©] |

Field Details

firstName

public String[™] firstName

The student's first name.

Method level documentation summary

Field Details

firstName

public String[™] firstName

The student's first name.

lastName

public String [™] lastName

The student's last name.

studentNumber

protected long studentNumber

The student number that was assigned to this student.

Constructor Details

Student

public Student(String firstName,
String lastName,
long studentNumber)

Student constructor. Creates a new Student object.

Parameters:

Detailed field level documentation

```
Ja
```

Student

```
public Student(String firstName,
String lastName,
long studentNumber)

Student constructor. Creates a new Student object.

Parameters:
firstName - the student's first name
lastName - the student's last name
studentNumber - the student number assigned to this student
```

Method Details

addGrade

```
public void addGrade(double grade)
```

Assign a final grade to this student. Grades are used to calculate the student's overall average.

Parameters:

grade - the grade, a value between o and 100 (inclusive), to assign to the student

See Also:

calcAvg()

calcAvg

Detailed method level documentation

See Also:

calcAvg()

calcAvg

Calculates the student's overall average based on their assigned grades. Add new grades with addGrade(double).

Returns:

the student's average based on their currently assigned grades

Throws:

com.mycompany.jdoctest.StudentGradeException - if the student is not assigned any grades a StudentGradeException is thrown

See Also:

addGrade(double)

getFullName

```
public String getFullName()
```

Creates a string containing the student's full name.

Returns:

the student's full name

See Also:

String♂

Javadoc CS2212

Javadoc Syntax

Normal Multiple Line Java Comment

```
/*
   This is a regular multi-line comment.
*/
```

Javadoc Multiple Line Comment

```
/*(*)

* This is a Javadoc comment.
*/
```

Javadoc Syntax

Normal One Line Java Comment

```
// This is a regular single line comment.
```

Javadoc One Line Comment

```
/** This is a Javadoc single line comment */
```

Javadoc Syntax

General Javadoc Comment Structure

Javadoc comment for methodName

```
/ * *
 * Short <b>one line</b> description.
 * 
 * Longer description. <i>If there were any, it would be
 * here.</i>
 * 
 * And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 * @param variable Description text text text.
  @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Javadoc CS2212

Javadoc Syntax

General Javadoc Comment Structure

Description of the method/class/field

```
* *
* Short <b>one line</b> description.
* 
* Longer description. <i>If there were any, it would be
* here.</i>
* 
 And even more explanations to follow in consecutive
* paragraphs separated by HTML paragraph breaks.
* @param variable Description text text text.
* @return Description text text text.
* /
```

public int methodName (...) {
 // method body with a return statement

Tags for the method/class/field

Javadoc Syntax

General Javadoc Comment Structure

Description can contain html.

This formatting will become part of the exported documentation.

```
* *
   Short <br/>b>one line</b> description.
   Longer description. <i>If there were any, it would be
   here.</i>
   And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 * @param variable Description text text text.
   @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Javadoc Syntax

General Javadoc Comment Structure

One line description of the method/class/field, etc.

```
* * *
 * Short <b>one line</b> description.
 * 
 * Longer description. <i>If there were any, it would be
 * here.</i>
 * 
 * And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 * @param variable Description text text text.
  @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Javadoc

Javadoc Syntax

General Javadoc Comment Structure

```
/ * *
 * Short <b>one line</b> description.
                                     Longer description if needed.
 * 
 * Longer description. <i>If there were any, it would be
 * here.</i>
 * 
  And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 *
  @param variable Description text text text.
  @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Javadoc CS2212

Javadoc Syntax

General Javadoc Comment Structure

```
paragraphs can be added if
/ * *
                                                needed.
 * Short <b>one line</b> description.
 * 
 * Longer description. <i>If there were any, it would be
 * here.</i>
 * 
 * And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 * @param variable Description text text text.
  @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Any number of additional

CS2212

Tags you can use depend on

Javadoc Syntax

General Javadoc Comment Structure

```
the item being documented
/ * *
                                         (class/method/field)
 * Short <b>one line</b> description.
 * 
 * Longer description. <i>If there were any, it would be
 * here.</i>
 * 
 * And even more explanations to follow in consecutive
 * paragraphs separated by HTML paragraph breaks.
 * @param variable Description text text text.
 * @return Description text text text.
 * /
public int methodName (...) {
    // method body with a return statement
```

Common Javadoc Block Tags

| Tag & Parameter | Usage | Applies to |
|-------------------------------|--|--|
| @author John Smith | Describes an author. | Class, Interface, Enum |
| @version version | Provides software version entry. Max one per Class or Interface. | Class, Interface, Enum |
| @since since-text | Describes when this functionality has first existed. | Class, Interface, Enum, Field, Method |
| @see reference | Provides a link to other element of documentation. | Class, Interface, Enum, Field, Method |
| @param name description | Describes a method parameter. | Method |
| @return description | Describes the return value. | Method |
| @throws classname description | Describes an exception that may be thrown from this method. | Method |
| @deprecated description | Describes an outdated method. | Class, Interface, Enum, Field, Method |
| @hidden | Hides a program element from the generated API documentation. | Enum, Field, Method |

Common Javadoc Inline Tags

| Tag & Parameter | Usage | Applies to |
|--------------------|--|--|
| {@link reference} | Link to other symbol. | Class, Interface, Enum, Field, Method |
| {@code literal} | Formats literal text in the code font. It is equivalent to <code>{@literal}</code> . | Class, Interface, Enum, Field, Method |
| {@literal literal} | Denotes literal text. The enclosed text is interpreted as not containing HTML markup or nested javadoc tags. | Class, Interface, Enum, Field, Method |

Inline tags can be used in the description part of Javadoc to insert links, code, ect.

Full List of Javadoc Tags

Found in Javadoc specification at:

https://docs.oracle.com/en/java/javase/13/docs/specs/javadoc/doc-comment-spec.html

```
/**
 * Student entity used for storing grade information.
 * <br><br>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br > 
 *
 * <b>Example Use:</b>
 * 
 * {@code
         Student s = new Student ("Daniel", "Servos", 12345678);
         s.addGrade(97);
         s.addGrade(82);
         s.addGrade(75);
         System.out.println(s.calcAvg());
 *
 * 
 *
 * <b>Example Output:</b> <code>84.666666666666666667</code><br/>br>
 * @version 1.0.1b
                                               Javadoc comment is directly above class
 * @author Daniel Servos
                                                  definition so this Javadoc comment
 * @author Joe Bloggs
                                                   documents the class as a whole.
public class Student {
    /** The student's first name. */
```

```
/ * *
 * Student entity used for storing grade information.
 * <br><br>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br>
 *
                                                   Adds links to part of documentation
 * <b>Example Use:</b>
 * 
                                                  about addGrade and clacAvg methods
  { @code
         Student s = new Student("Daniel", "Servos", 12345678);
         s.addGrade(97);
                                              The link inline tag inserts a link that points
         s.addGrade(82);
                                               to the documentation for the specified
         s.addGrade(75);
         System.out.println(s.calcAvg());
                                                package, class, or member referenced.
 * 
                                                  Syntax is package.class#member
 * <b>Example Output:</b> <code>84.666666666666666667</code><br/>br>
 * @version 1.0.1b
 * @author Daniel Servos
 * @author Joe Bloggs
 * /
public class Student {
    /** The student's first name. */
```

```
/ * *
 * Student entity used for storing grade information.
 * <br><br>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br > 
 *
 * <b>Example Use:</b>
 * 
   {@code
 *
         Student s = new Student("Daniel", "Servos", 12345678);
 *
         s.addGrade(97);
 *
         s.addGrade(82);
 *
         s.addGrade(75);
 *
         System.out.println(s.calcAvg());
 *
   <b>Example Output:</b> <code>84.6666666666666666667</code><br/>br>
 * @version 1.0.1b
                                                      Code inline tag displays text in code
 * @author Daniel Servos
                                                      font without interpreting the text as
 * @author Joe Bloggs
 * /
                                                     HTML markup or nested Javadoc tags.
public class Student {
    /** The student's first name. */
```

```
/**
 * Student entity used for storing grade information.
 * <br><br>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br > 
 *
 * <b>Example Use:</b>
 * 
  { @code
         Student s = new Student ("Daniel", "Servos", 12345678);
 *
         s.addGrade(97);
         s.addGrade(82);
 *
         s.addGrade(75);
 *
         System.out.println(s.calcAvg());
 *
 * 
 *
 * <b>Example Output:</b> <code>84.666666666666666667</code><br/>br>
                                     Version tag holds the current release number
 * @version 1.0.1b
                                      of the software that this code is part of. Adds
 * @author Daniel Servos
 * @author Joe Bloggs
                                      a "Version" subheading with the specified
 * /
                                     version-text value to the generated
public class Student {
                                   */ documents when the -version option is used.
    /** The student's first name.
```

```
/**
 * Student entity used for storing grade information.
 * <br><br>
 * Grades are added with the {@link addGrade} method and an average can
 * be calculated with the {@link calcAvg} method. <br > 
 *
 * <b>Example Use:</b>
 * 
 * {@code
         Student s = new Student ("Daniel", "Servos", 12345678);
         s.addGrade(97);
         s.addGrade(82);
 *
         s.addGrade(75);
         System.out.println(s.calcAvg());
 *
 *
 * 
 *
 * <b>Example Output:</b> <code>84.666666666666666667</code><br/>br>
                                    Author tags state who the author(s) of this
 * @version 1.0.1b
                                    piece of code are. Adds an "Author" entry
 * @author Daniel Servos
 * @author Joe Bloggs
                                    with the specified name text to the generated
                                    documents when the -author option is used.
public class Student {
    /** The student's first name. */
```

```
* <b>Example Output:</b> <code>84.6666666666666666667</code><br/>br>
                                         Javadoc comments above field definitions
 * @version 1.0.1b
                                         provide a description of the field.
 * @author Daniel Servos
 * @author Joe Bloggs
                                         By default, only public and protected
 * /
                                         fields/methods are included in the generated
public class Student {
   /** The student's first name. */
                                         documentation. Private fields and methods
   public String firstName;
                                         can be included with the -private option.
   /** The student's last name. */
   public String lastName;
   /** The student number that was assigned to this student. */
   protected long studentNumber;
   /** A collection of final grades for this student's courses */
   private ArrayList<Double> grades;
    /**
    * Student constructor. Creates a new Student object.
    * @param firstName the student's first name
    * @param lastName the student's last name
    * @param studentNumber the student number assigned to this student
```

// bre/

```
* *
 * Student constructor. Creates a new Student object.
 * @param firstName the student's first name
  @param lastName the student's last name
 * @param studentNumber the student number assigned to this student
public Student(String firstName, String lastName, long studentNumber) {
    this.firstName = firstName;
    this.lastName = lastName;
    this.studentNumber = studentNumber;
                                              Javadoc comments above method
    this.grades = new ArrayList();
                                              definitions provide documentation
                                              of that method.
/**
 * Assign a final grade to this student.
 * Grades are used to calculate the student's overall average.
 * @param grade the grade, a value between 0 and 100 (inclusive), to assign to the student
 * @see calcAvg
public void addGrade(double grade) {
    grades.add(grade);
```

```
/ * *
 * Student constructor. Creates a new Student object.
 * @param firstName the student's first name
 * @param lastName the student's last name
 * @param studentNumber the student number assigned to this student
 * /
public Student(String firstName, String lastName, long studentNumber) {
    this.firstName = firstName;
    this.lastName = lastName;
    this.studentNumber = studentNumber;
                                            A param tag is given for each parameter
    this.grades = new ArrayList();
                                            the method takes and provides a
                                            description of the parameter.
/**
 * Assign a final grade to this student.
 * Grades are used to calculate the student's overall average.
 * @param grade the grade, a value between 0 and 100 (inclusive), to assign to the student
 * @see calcAvg
public void addGrade(double grade) {
    grades.add(grade);
```

```
/ * *
 * Student constructor. Creates a new Student object.
 * @param firstName the student's first name
  @param lastName the student's last name
 * @param studentNumber the student number assigned to this student
 * /
public Student(String firstName, String lastName, long studentNumber) {
    this.firstName = firstName;
    this.lastName = lastName;
    this.studentNumber = studentNumber;
    this.grades = new ArrayList();
/**
 * Assign a final grade to this student.
 * Grades are used to calculate the student's overall average.
 * @param grade the grade, a value between 0 and 100 (inclusive), to assign to the student
                                        The see tag adds a "See Also" heading with a
* @see calcAvq
                                        link or text entry that points to the given
public void addGrade(double grade)
                                        reference. A documentation comment can
    grades.add(grade);
                                        contain any number of @see tags.
```

```
Calculates the student's overall average based on their assigned grades. Add new grades with {@link addGrade}.
   @return the student's average based on their currently assigned grades
   @throws StudentGradeException if the student is not assigned any gades a {@link StudentGradeException} is thrown
   @see addGrade
public double calcAvg() throws StudentGradeException{
    if(this.grades.size() <= 0)</pre>
         throw new StudentGradeException("No grades to compute average on!");
    double total = 0;
                                               Return tag documents what is returned by
    for (double grade : this.grades)
                                               this method. Should describe the type and
         total += grade;
                                               any constraints on the value returned.
    return total / this.grades.size();
/**
 * Creates a string containing the student's full name.
   @return the student's full name
   @see String
```

```
Calculates the student's overall average based on their assigned grades. Add new grades with {@link addGrade}.
   Greturn the student's average based on their currently assigned grades
   @throws StudentGradeException if the student is not assigned any grades a {@link StudentGradeException} is thrown
   @see addGrade
public double calcAvg() throws StudentGradeException{
    if(this.grades.size() <= 0)</pre>
         throw new StudentGradeException("No grades to compute average on!");
    double total = 0;
                                               Throws tag documents what kind of
    for (double grade : this.grades)
                                               exceptions can be thrown by this method.
         total += grade;
                                               Both an exception type and description of the
    return total / this.grades.size();
                                               exception should be provided.
/**
 * Creates a string containing the student's full name.
   @return the student's full name
   @see String
```

```
return total / this.grades.size();
/**
 * Creates a string containing the student's full name.
 * @return the student's full name
 * @see String
public String getFullName() {
    return this.firstName + " " + this.lastName;
```

Can create references to classes and other elements in the official Java API. This creates a link to the JDK API documentation.

- The Javadoc tool is provided as part of the JDK.
- You may have to set the path environment variable in your operating system correctly to use it via the command line.
- For example, if Javadoc is located at

C:\Program Files\Java\jdk-18.0.2.1\bin\javadoc.exe

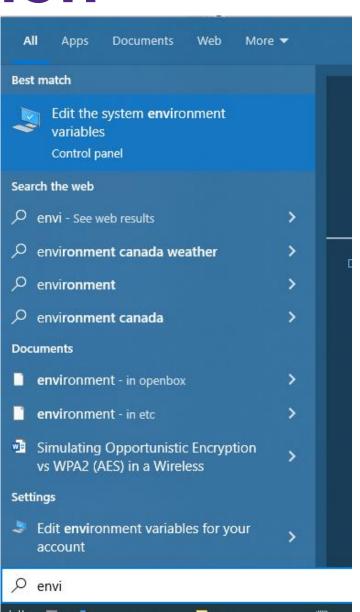
then the following folder must be part of your path:

C:\Program Files\Java\jdk-18.0.2.1\bin

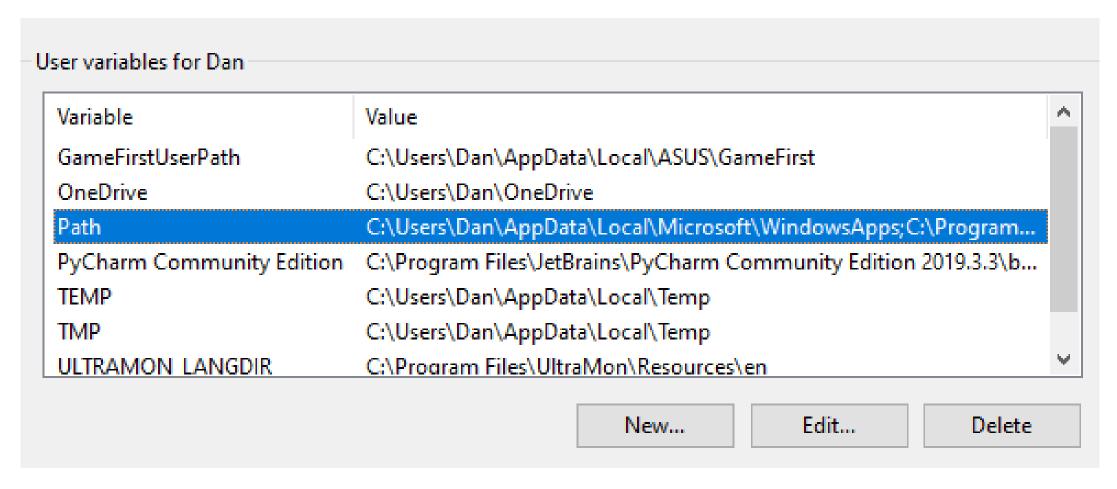
• On windows search for "environment" in the start menu and select "Edit the system environment" (shown to the right).

Click the "Environment Variables" button.

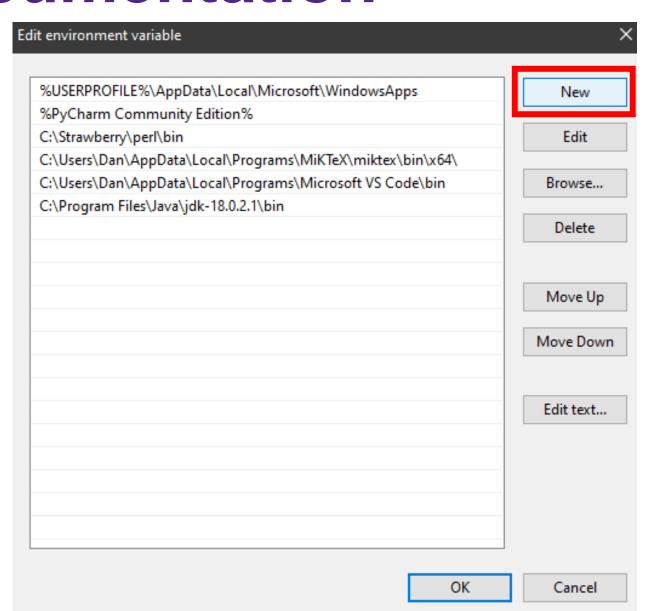
Environment Variables...



Select the Path variable under "User variables for..." and click "Edit...".



- Click the "New" button and enter in the full path to the directory that contains javadoc.exe
- This directory might be different depending on where you installed the JDK.
- Once entered, click "OK". Note that you will need to close and reopen any open command prompt windows for the changes to take effect.



• The command to generate the documentation is:

javadoc -d output_path package

A path to the directory that the documentation will be generated in. If this directory does not exist, it will be created.

The package to generate the documentation for. For example: com.mycompany.jdoctest

Your working directory must contain this package.

• Example 1:

javadoc -d doc com.mycompany.jdoctest

The documentation for the package com.mycompany.jdoctest will be generated and stored in the directory doc (this would be a subdirectory in the current working directory).

The current working directory must contain the package com.mycompany.jdoctest

• Example 2:

javadoc -d C:\Users\Dan\docs myclass.java

Only the documentation for the file myclass.java will be generated and stored in the directory C:\Users\Dan\docs.

The current working directory must contain the file myclass.java

Note: Normally you want to generate the documentation for a whole package and not just one class or file. However, this can be helpful for testing your Javadoc syntax.

Example Output:

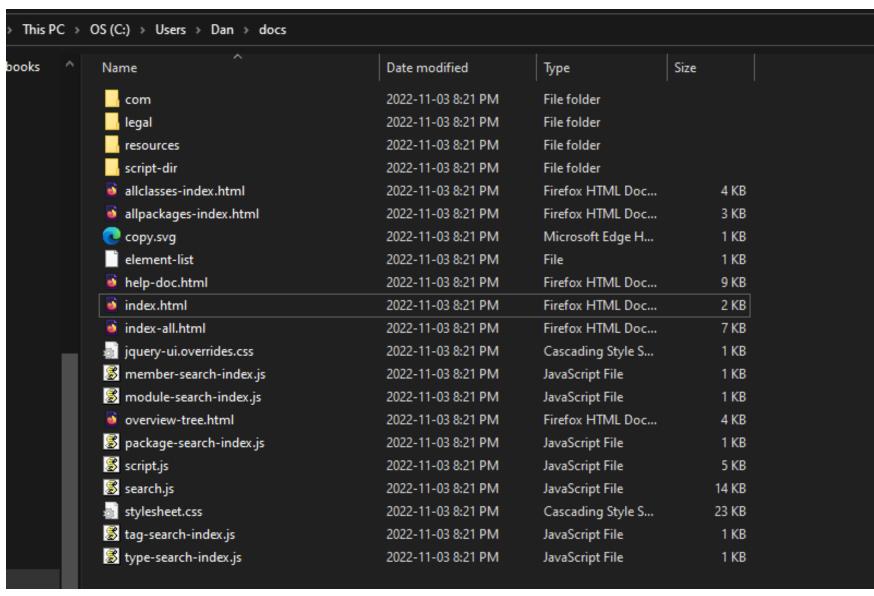
```
C:\Users\Dan\Documents\NetBeansProjects\jdoctest\src\main\java\com\mycompany\jdoctest>javadoc -d C:\Users\Dan\docs Student.java
Loading source file Student.java...
Constructing Javadoc information...
Creating destination directory: "C:\Users\Dan\docs\"
Building index for all the packages and classes...
Standard Doclet version 18.0.2.1+1-1
Building tree for all the packages and classes...
Generating C:\Users\Dan\docs\com\mycompany\jdoctest\Student.html...
Generating C:\Users\Dan\docs\com\mycompany\jdoctest\package-summary.html...
Generating C:\Users\Dan\docs\com\mycompany\jdoctest\package-tree.html...
Generating C:\Users\Dan\docs\overview-tree.html...
Building index for all classes...
Generating C:\Users\Dan\docs\allclasses-index.html...
Generating C:\Users\Dan\docs\allpackages-index.html...
Generating C:\Users\Dan\docs\index-all.html...
Generating C:\Users\Dan\docs\index.html...
Generating C:\Users\Dan\docs\help-doc.html...
```

If errors are shown in the output (that is not the case here), you likely have a syntax issue in your Javadoc comments. Resolve the errors and attempt to generate the documentation again.

Example Output:

A website will be created in your output directory that contains your documentation.

The main page is index.html.



Extra Javadoc Command Line Options

| Option | Description |
|---------------------------------|---|
| help | Display command-line options. |
| -private | Show private fields and methods in the generated documentation. |
| -author | Include author details in documentation from @author tag. |
| -footer <html-code></html-code> | Include the given html-code in the footer at the bottom of each page generated. |
| -header <html-code></html-code> | Include the given html-code in the header at the top of each page generated. |
| -version | Includes the version details in the documentation from the @version tag. |

Far more options are available. See javadoc --help for a full list.

More examples on running Javadoc can be found here:

https://docs.oracle.com/javase/8/docs/technotes/tools/windows/javadoc.html#CHDJBGFC

Most Java IDEs also have built-in tools for working with Javadoc.

NetBeans Example:

With NetBeans it is as easy as clicking "Generate Javadoc" in the Run menu.

