

# 軟體工程 Homework #4

## Part 1.

Define the context and modes of use of the system:

了解軟體和外在環境之間的關係，來決定如何提供系統功能，以及系統與外在環境的溝通，並且了解情境來決定系統的界線，以此來決定各系統所要實作的功能。

Context model 是一種架構模型，展示了環境中的不同系統，以區塊圖 (block diagram) 呈現。

Interaction model 是一種動態模型，展示了系統與環境是如何互動，以使用案例模型呈現。

Design the system architecture:

確認系統的主要構件，並且用 architectural pattern，如 layered model 或是 client-server model 來組織構件。

Identify the principal system objects:

想要確認系統中有那些構件通常會需要經驗和相關的領域知識，確認系統中存在之物件通常是一件連續性的事情，非正式的系統描述文件等等可以做為確認物件、物件屬性、物件的行為的起手點。

Develop design models:

設計模型展示了物件、物件類別、以及這些實體之間的關係，決定設計模型以及設計模型所要求的細節，是設計階段中最重要的步驟。

Subsystem models 顯示了將物件連貫成子系統的分群邏輯

Sequence models 顯示了物件互動的次序

State machine models 顯示了物件為了回應事件，會如何去改變自身狀態

Specify object interfaces:

物件的介面必須定義清楚，才能使得物件和其他構件可以並行設計，並且要注意不要將介面的過多細節透漏給物件或是一群物件，設計介面時也應該要避免將底層資料表示法暴露。

## Part 2.

Coupling:

是程式中的模組彼此相依程度的等級，等級越高表示模組之間干擾彼此或依存彼此的程度越高，其中又分 interface coupling 和 implementation coupling。

Cohesion:

模組內成員彼此之間的內部可靠度等級，一個高 cohesion 的類別，越能根據他的介面就了解該類別所負責的行為。

## Part 3.

Version management:

持續追蹤各軟體構件的不同版本，並且促進程式撰寫人員合作開發。

System integration:

定義構件的哪一些版本會產生對應的系統版本，並且利用這些資訊來自動建置系統。

Problem tracking:

使用者可以回報錯誤和問題，並且工程師可以看到處理問題的負責人和處理、解決時間。

Release management:

當系統釋出新版本時，會需要管理的事項包含：計畫新版本的功能、組織軟體版本。

## Part 4.

(a)

Refactor 重構，最主要的目的是要在不改變軟體可察覺行為的前提下使用

重構方法調整軟體結構，並且是一個持續性的事件，其中重構的方式包含：Rename、Extract method、Move method、Extract class 等等，並且同一種方式可以作用在不同結構上，產生不同層次的設計改善，比如 Rename Method、Rename Class、Rename Variables 等等。

Reengineering 重工，是指對既存軟體系統進行調查，並重新開發的過程，其目的是重新審視現有的系統，以便進一步利用新技術來改善系統或促進現存系統的再利用。

## (b)

### Maintenance to repair software faults

修改系統以修正系統的缺陷，使其達到需求，也稱 Corrective maintenance。

### Maintenance to adapt software to a different operating environment

修改系統使其可以在與原本作業系統不相同的作業系統上運作，也稱 Adaptive maintenance。

### Maintenance to add or to modify the system's functionality

修改系統使其可以滿足新需求，也稱 Perfective maintenance。

## (c)

Bad smells，程式裡的壞味道，通常指的是程式碼中一些導致邏輯隱晦不清，或者冗長且重複出現，又或者容易產生瑕疵等等的程式段落，例如：Duplicate code、Long methods、Switch (case) statements、Data clumping、Speculative generality。

Preventative maintenance 是一種預防 bad smells 的手段，可以透過 refactoring 來達成，由於重構是一種持續改善程式品質的流程，所以可以藉由重構來減緩修改程式所帶來的錯誤或瑕疵。

## Part 5.

### (a)

{partition of score: 0 ~ 59, <input: 0, expect output: 'F'>}

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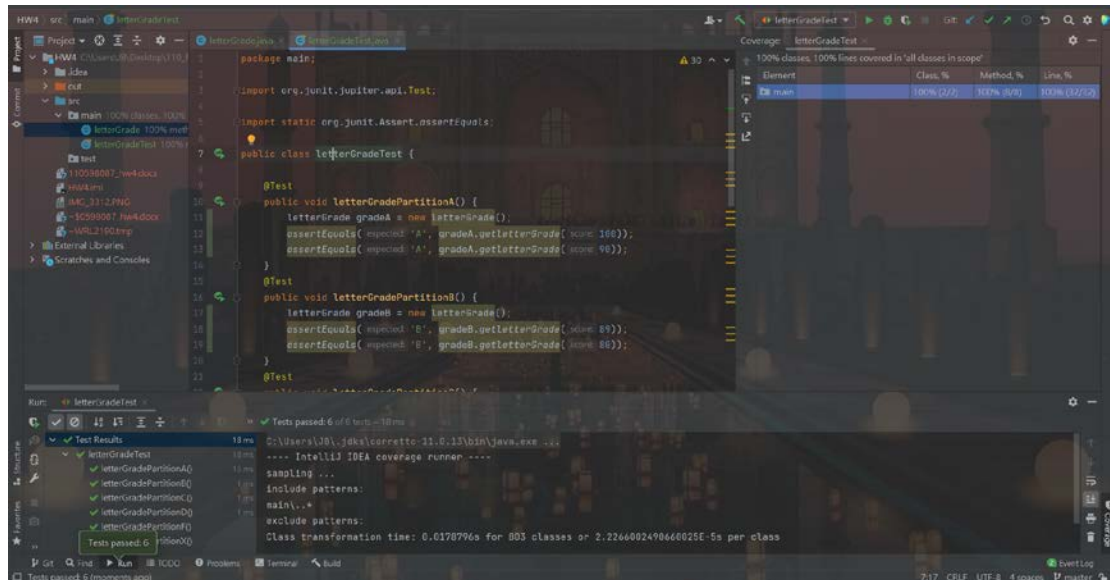
{partition of score: 60 ~ 69, <input: 60, expect output: 'D'>}  
{partition of score: 60 ~ 69, <input: 69, expect output: 'D'>}  
{partition of score: 70 ~ 79, <input: 70, expect output: 'C'>}  
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{partition of score: 80 ~ 89, <input: 80, expect output: 'B'>}  
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{partition of score: 90 ~ 100, <input: 90, expect output: 'A'>}  
{partition of score: 90 ~ 100, <input: 100, expect output: 'A'>}  
{partition of score: less than 0, <input: -1, expect output: 'X'>}  
{partition of score: greater than 100, <input: 101, expect output: 'X'>}

**(b)**

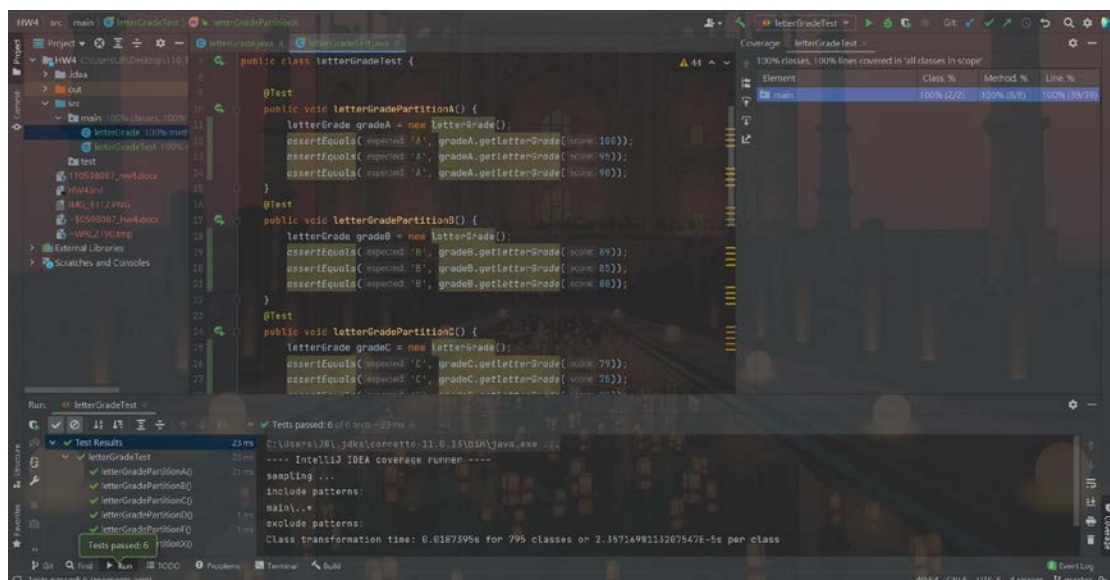
{boundary: 0 ~ 59, <input: 0, expect output: 'F'>}  
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{boundary: less than 0, <input: -1, expect output: 'X'>}  
{boundary: less than 0, <input: -10, expect output: 'X'>}  
{boundary: greater than 1000, <input: 101, expect output: 'X'>}  
{boundary: greater than 1000, <input: 110, expect output: 'X'>}

## Part 6.

(a)

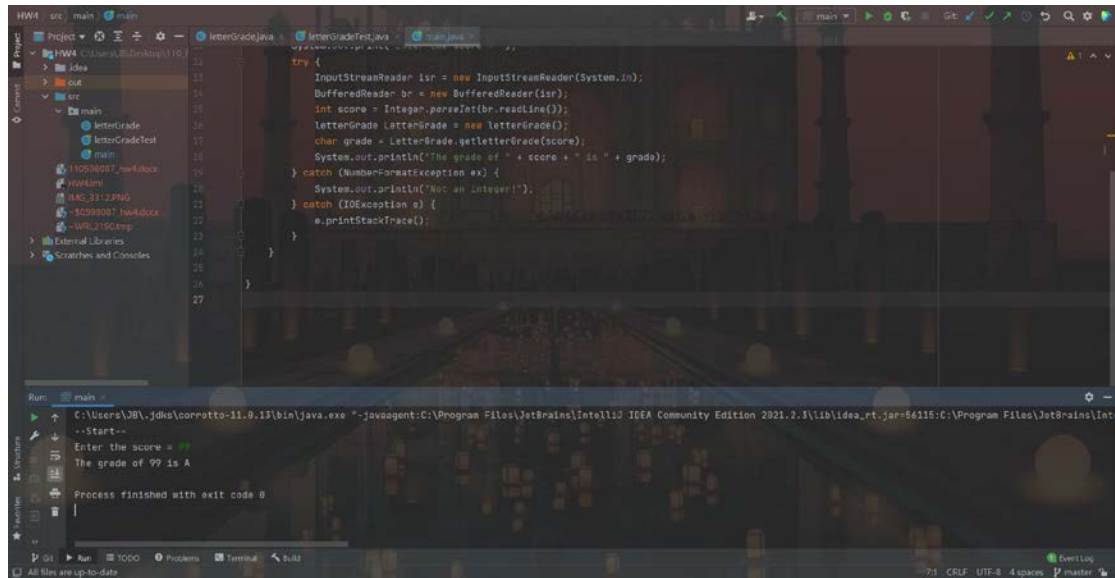


(b)



## Part 7.

(a)



The screenshot shows an IDE with a project named 'HW4'. The file explorer on the left shows the project structure: 'src' > 'main' > 'LetterGrade.java' and 'LetterGradeTest.java'. The main editor displays the code for 'LetterGrade.java'.

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The code in 'LetterGrade.java' is as follows:

```
try {  
    InputStreamReader isr = new InputStreamReader(System.in);  
    BufferedReader br = new BufferedReader(isr);  
    int score = Integer.parseInt(br.readLine());  
    LetterGrade letterGrade = new LetterGrade();  
    char grade = letterGrade.getLetterGrade(score);  
    System.out.println("The grade of " + score + " is " + grade);  
} catch (NumberFormatException ex) {  
    System.out.println("Not an Integer!");  
} catch (IOException e) {  
    e.printStackTrace();  
}
```

The Run window shows the execution of the program:

```
Run: main  
C:\Users\JBL\jdk\corretto-11.0.13\bin\java.exe -javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2021.2.3\lib\idea_rt.jar=56115:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2021.2.3\bin -Dfile.encoding=UTF-8  
--Start--  
Enter the score = 99  
The grade of 99 is A  
Process finished with exit code 0
```

No commits yet

Changes to be committed:

```
(use "git rm --cached <file>..." to unstage)
new file:   src/main/letterGrade.java
new file:   src/main/letterGradeTest.java
new file:   src/main/main.java
new file:   ../Project/SE_HW4/.idea/runConfigurations.xml
new file:   ../Project/SE_HW4/.idea/vcs.xml
```

Untracked files:

```
(use "git add <file>..." to include in what will be committed)
../Agile/
../Embedded/
../POSD/
../HW1/
../HW2/
../HW3/
.idea/
110598087_hw4.docx
HW4.iml
IMG_3312.PNG
out/
~$0598087_hw4.docx
~WRL2190.tmp
../Project/Gan_PEP.drawio.png
../Project/My First Board.jpg
../Project/PEP_ver1.314.docx
../Project/Revised_srs1.2.docx
../Project/SDD/
../Project/SETeam2/
../Project/SE_HW4/.idea/workspace.xml
"../Project/SE\346\234\237\344\270\255\345\240\261\345\221\212_V.pptx"
../teaching material/
../presentation/
```

JB@DESKTOP-NKV804M MINGW64 ~/Desktop/110\_first/SE/HW4 (master)

```
$ git commit -m "HW4 7(a)"
[master (root-commit) 2617e68] HW4 7(a)
5 files changed, 117 insertions(+)
create mode 100644 SE/HW4/src/main/letterGrade.java
create mode 100644 SE/HW4/src/main/letterGradeTest.java
create mode 100644 SE/HW4/src/main/main.java
create mode 100644 SE/Project/SE_HW4/.idea/runConfigurations.xml
create mode 100644 SE/Project/SE_HW4/.idea/vcs.xml
```

JB@DESKTOP-NKV804M MINGW64 ~/Desktop/110\_first/SE/HW4 (master)

```
$ git push http://140.124.181.35:3010/110598087/git_test.git
Enumerating objects: 14, done.
Counting objects: 100% (14/14), done.
Delta compression using up to 8 threads
Compressing objects: 100% (9/9), done.
Writing objects: 100% (14/14), 1.80 KiB | 230.00 KiB/s, done.
Total 14 (delta 0), reused 0 (delta 0), pack-reused 0
To http://140.124.181.35:3010/110598087/git_test.git
 * [new branch]      master -> master
```

 HW4 7(a)  
Jacob authored 55 minutes ago

2617e686

main.java 793 Bytes

EditWeb IDEReplaceDelete

```
1 package main;
2
3 import java.io.BufferedReader;
4 import java.io.IOException;
5 import java.io.InputStreamReader;
6
7 public class main {
8     public static void main(String[] args) {
9         System.out.print("Enter the score = ");
10        try {
11            InputStreamReader isr = new InputStreamReader(System.in);
12            BufferedReader br = new BufferedReader(isr);
13            int score = Integer.parseInt(br.readLine());
14            letterGrade letterGrade = new letterGrade();
15            char grade = letterGrade.getLetterGrade(score);
16            System.out.println("The grade of " + score + " is " + grade);
17        } catch (NumberFormatException ex) {
18            System.out.println("Not an integer!");
19        } catch (IOException e) {
20            e.printStackTrace();
21        }
22    }
23
24 }
```

(b)

```
public class LetterGradeTest {

    @Test
    public void letterGradePartitionA() {
        LetterGrade gradeA = new LetterGrade();
        assertEquals("expected: 'A', gradeA.getLetterGrade(score: 100));", gradeA.getLetterGrade(100));
        assertEquals("expected: 'A', gradeA.getLetterGrade(score: 95);", gradeA.getLetterGrade(95));
        assertEquals("expected: 'A', gradeA.getLetterGrade(score: 90);", gradeA.getLetterGrade(90));
    }

    @Test
    public void letterGradePartitionB() {
        LetterGrade gradeB = new LetterGrade();
        assertEquals("expected: 'B', gradeB.getLetterGrade(score: 89);", gradeB.getLetterGrade(89));
        assertEquals("expected: 'B', gradeB.getLetterGrade(score: 85);", gradeB.getLetterGrade(85));
        assertEquals("expected: 'B', gradeB.getLetterGrade(score: 80);", gradeB.getLetterGrade(80));
    }

    @Test
    public void letterGradePartitionC() {
        LetterGrade gradeC = new LetterGrade();
        assertEquals("expected: 'C', gradeC.getLetterGrade(score: 79);", gradeC.getLetterGrade(79));
        assertEquals("expected: 'C', gradeC.getLetterGrade(score: 75);", gradeC.getLetterGrade(75));
        assertEquals("expected: 'C', gradeC.getLetterGrade(score: 70);", gradeC.getLetterGrade(70));
    }

    @Test
    public void letterGradePartitionD() {
        LetterGrade gradeD = new LetterGrade();
        assertEquals("expected: 'D', gradeD.getLetterGrade(score: 69);", gradeD.getLetterGrade(69));
        assertEquals("expected: 'D', gradeD.getLetterGrade(score: 65);", gradeD.getLetterGrade(65));
        assertEquals("expected: 'D', gradeD.getLetterGrade(score: 60);", gradeD.getLetterGrade(60));
    }

    @Test
    public void letterGradePartitionF() {
        LetterGrade gradeF = new LetterGrade();
        assertEquals("expected: 'F', gradeF.getLetterGrade(score: 59);", gradeF.getLetterGrade(59));
        assertEquals("expected: 'F', gradeF.getLetterGrade(score: 38);", gradeF.getLetterGrade(38));
        assertEquals("expected: 'F', gradeF.getLetterGrade(score: 0);", gradeF.getLetterGrade(0));
    }

    @Test
    public void letterGradePartitionX() {
        LetterGrade gradeX = new LetterGrade();
        assertEquals("expected: 'X', gradeX.getLetterGrade(score: 101);", gradeX.getLetterGrade(101));
        assertEquals("expected: 'X', gradeX.getLetterGrade(score: 110);", gradeX.getLetterGrade(110));
        assertEquals("expected: 'X', gradeX.getLetterGrade(score: -1);", gradeX.getLetterGrade(-1));
        assertEquals("expected: 'X', gradeX.getLetterGrade(score: -10);", gradeX.getLetterGrade(-10));
    }
}
```

Jacob > git\_test > Repository

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HW4 7(a)

Jacob authored 2 hours ago

2617e686

letterGradeTest.java 1.75 KB

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```
1 package main;
2
3 import org.junit.jupiter.api.Test;
4
5 import static org.junit.Assert.assertEquals;
6
7 public class LetterGradeTest {
8
9     @Test
10     public void letterGradePartitionA() {
11         LetterGrade gradeA = new LetterGrade();
12         assertEquals("expected: 'A', gradeA.getLetterGrade(100);", gradeA.getLetterGrade(100));
13         assertEquals("expected: 'A', gradeA.getLetterGrade(95);", gradeA.getLetterGrade(95));
14         assertEquals("expected: 'A', gradeA.getLetterGrade(90);", gradeA.getLetterGrade(90));
15     }
16
17     @Test
18     public void letterGradePartitionB() {
19         LetterGrade gradeB = new LetterGrade();
20         assertEquals("expected: 'B', gradeB.getLetterGrade(89);", gradeB.getLetterGrade(89));
21         assertEquals("expected: 'B', gradeB.getLetterGrade(85);", gradeB.getLetterGrade(85));
22         assertEquals("expected: 'B', gradeB.getLetterGrade(80);", gradeB.getLetterGrade(80));
23     }
24 }
```