Name:_____**Registration-Nb.:**_____

1 Test Basics

1.1 What is the goal of Software Tests?

- Finding defects
- High test coverage
- Statements concerning software quality

1.2 Describe three software quality criteria and describe which tests could be used to check them!

Examples

• Functionality - Suitability	Functional System Test
• Functionality - Interoperability	System Integration Test
• Security	NFR Test – Security Test
• Reliability	NFR Test
• Recoverability	NFR Test – Recoverability Test
• Usability	User Acceptance Test
• Operability	Operability Test
• Time Behaviour	NFR Test – Performance Test
• Resource Behaviour	NFR Test – Load Test

1.3 Why is prioritization important in testing?

- To focus on critical areas in the beginning
- To face possible time problems – to ensure that ever you stop testing, you have done the best testing in the time
- To fix the most important defects first

1.4 Explain "White Box Testing", "Black Box Testing", and "Gray Box Testing"

- White Box Test
  Testing with knowledge of the internals of the program
- Black Box Test
  Testing external behaviour of a program based on specification / requirements
- Gray Box Test
  Testing external behaviour like Black Box Testing but using a Test Strategy based partly on internals of a software

1.5 What is the difference between a „Test Case“ and a „Test Scenario“?

- Test Case
  Sequence of steps consisting of actions to be performed on the system under test that originates typically out of an Use Case
- Test Scenario (*Synonym: Test Case Chain, Test Suite*)
  Collection of logically related test cases – arises typically from a Business Scenario (Business Use Case)

1.6 What is the meaning of “severity level” and “priority” in defect management?

- Severity Level
  says how serious a defect is, where a very high severity level could mean data loss, not usable and very low severity level could mean disfigurement
- Priority
  describes how urgent a defect must be fixed. A very high priority could mean that fastest fixing is necessary and very low could mean a subordinated handling is sufficient

2 Test Strategy

2.1 What is the goal of the Test Strategy Phase?

Goal of the Test Strategy Phase is the development of a proposed resolution and getting a decision of management concerning proceeding in testing. Contents of the proposal should be:

- Test Basics
  Agreement of arrangement of acceptance
- Test Strategy
  Roles and responsibilities
- Time schedule (has to be consistent with overall project)

2.2 Discuss the advantages and disadvantages concerning the assignment of the responsibility concerning test to

a. the Software vendor

+ Knows specification very well
+ Could combine coding with testing (Test Driven Design)
– Conflict of interests, focus is software development, not testing
– Onesided perspective

b. the customer

+ Knows specification best
+ Access to domain experts who know the subject very well
– Not a test expert
– Possible time problem, as the main activity is typically "daily business"

c. Test specialists

+ Independent test experts
+ Additional neutral point of view
– Typically not experts in the subject
– Main interest could be to be contracted instead of finishing testing as soon as possible

2.3 Describe possibilities to improve the test process!

Suggestions:

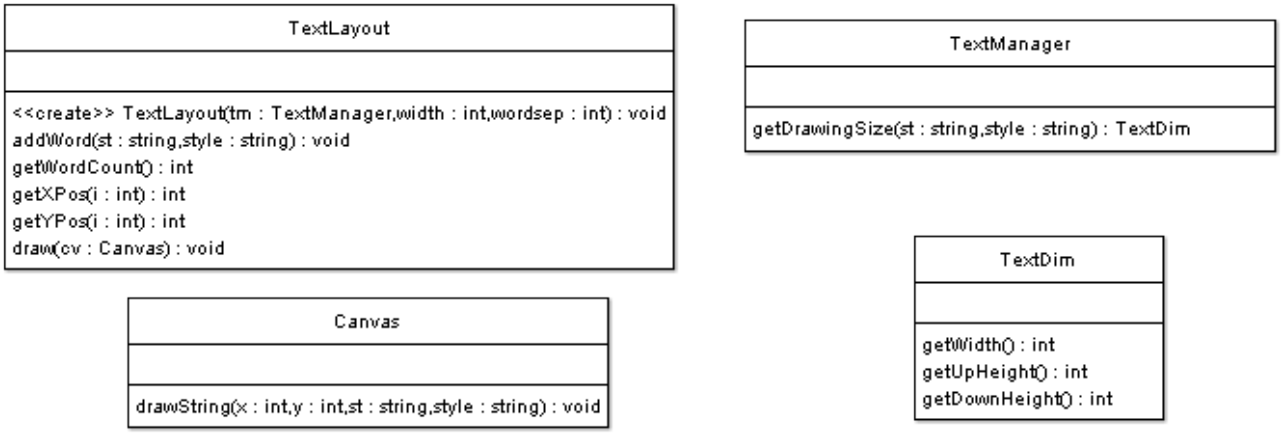
- Developing of a test plan with milestones with target-performance comparison
- Discussion and decision with the Test Team how to ensure and improve quality of work like Test Cases, Test Data, and Test Scenarios
  - Supporting of quality increasing techniques
- Checklists concerning Quality Criteria concerning Test Cases, Test reports etc.
- Learning sessions in test team
- Establishing of Test Tandems
  - during Test Design, esp. Test Case Creation – one writing, one observing
  - during Test Execution
- Reviews of people concerned
- Planning and doing of rework – overwork
- Establish a living "quality handbook"
- Organization of regular lessons learned workshops

3. Text layout

In this problem, you will write junit test cases for class `TextLayout` which takes a sequence of words and their display styles, and computes their positions in a drawing area. You can download `TextLayout.java` and a skeleton for `TextLayoutTest.java` from `http://garnet.cpe.ku.ac.th/~jtf/219343/`. This implementation of TextLayout contain some defect, and it will be great if your test case can reveal it.

You should send your solutions to problems 3.1 and 3.2 to jittat@gmail.com. Because they will have the same file name, you can rename the solution to problem 3.1 to `TextLayoutTest31.java`.

The following diagram shows relevant classes.

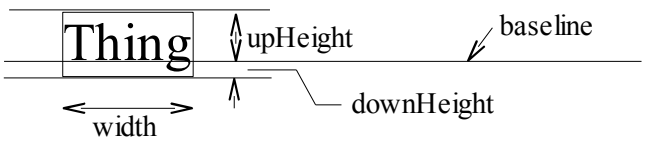


An object of class TextLayout is created with the following arguments: an object of class TextManager `tm`, drawing area `width`, and the space between words `wordsep`.

From the interface of `TextLayout`, you can see that it takes each word and its style incrementally (method `addWord`). An example of using this method is shown below.

```
TextLayout to = new TextLayout(tm,100,5);
to.addWord("Hello", "Normal");
to.addWord("World", "Bold");
```

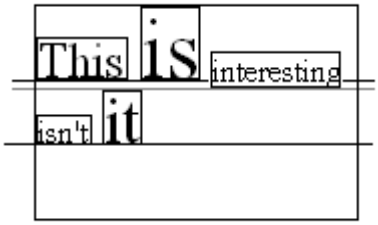
To get an information for computing layouts, `TextLayout` would call a method `getDrawingSize` from `TextManager`, passing `st` and `style` as parameters, to compute the dimension of that word; this method returns an object of `TextDim`. The dimension of a word is show below.



We now describe how class `TextLayout` find positions for words in the texts. The texts are divided into lines. Words on the same line are vertically aligned so that they are on the same baseline. `TextLayout` tries to fit as many words as possible in the same line, but make sure that the there is a space of `wordsep` between every pair of words. The upHeight (downHeight) of a line is the

maximum upHeight (downHeight) of words on that line.

After `TextLayout` receives each word, it recomputes the position of every word. The interface to layout information are methods `getWordCount`, which returns the number of words received so far; `getXPos`, and `getYPos`, which take the index to words (starting at 0) and return its x and y positions. The co-ordinate of the upper-left corner of the drawing area is (0,0). A sample layout is show below.



Note: The width of the containing box is specified as `width`, and the size of spaces between words is specified as `wordsep` in the constructor. All words in a single line share the same baseline. The top of each line (at upheight) matches the bottom (at downheight) of the previous line; see the word "it" in the picture.

3.1 Testing TextLayout, mocking TextManager

Since we want to test TextLayout for any possible TextManager, we decide that we will mock TextManager. (Note that TextManager is an interface.)

Write two interesting test cases for TextLayout (in class TextLayoutTest).

The following is a skeleton of `TextLayoutTest.java`.

```
import org.junit.Test;
import static org.junit.Assert.*;
import static org.easymock.EasyMock.*;

class TextDim {
    private int width, upheight, downheight;
    public TextDim(int w, int uh, int dh) {
           width = w;
           upheight = uh;
           downheight = dh;
    }
    public int getWidth() { return width; }
    public int getUpHeight() { return upheight; }
    public int getDownHeight() { return downheight; }
}

interface TextManager {
    TextDim getDrawingSize(String st, String style);
}

interface Canvas { // this Canvas interface will be used in problem 3.2
    void drawString(int x, int y, String st, String style);
}

public class TextLayoutTest {
    ....  // your tasks.
}
```

You must mock `TextManager` using EasyMock framework. Since `TextLayout` can call method `getDrawingSize` for each word many times, when programming your mock you must specify this behavior. You can do so by calling method `atLeastOnce` after calling `expect` as shown in an example below.

```
TextManager tm = createMock(TextManager.class);
expect(tm.getDrawingSize("Hello", "Normal"))
    .andReturn(new TextDim(20,10,0)).atLeastOnce();
expect(tm.getDrawingSize("World", "Bold"))
    .andReturn(new TextDim(25,12,0)).atLeastOnce();
```

You can use `getWordCount`, `getXPos`, and `getYPos` to verify that `TextLayout` works correctly.

Note: your test case shouldn't be too trivial or too complicated. You might want to read problem 3.2 before you continue.

3.2 Testing TextLayout, mocking both TextManager and Canvas

We want our testing paradigm to move to interaction-based testing. So, we decide to drop three state-checking methods `getWordCount`, `getXPos`, and `getYPos` from `TextLayout`. We still want to test the class, but to verify its correctness, we need to look at its interaction with class `Canvas`, which interacts with TextLayout through method `draw`. If you call method draw, passing in the `Canvas`, TextLayout would use method `drawString` of `Canvas` to draw each word, from the first to the last one.

Modify the test case in problem 3.1, so that it also mocks `Canvas` and the correctness of TextLayout is verified through its interaction with the mocked canvas.