Introduction to Software Engineering

Assignment 10

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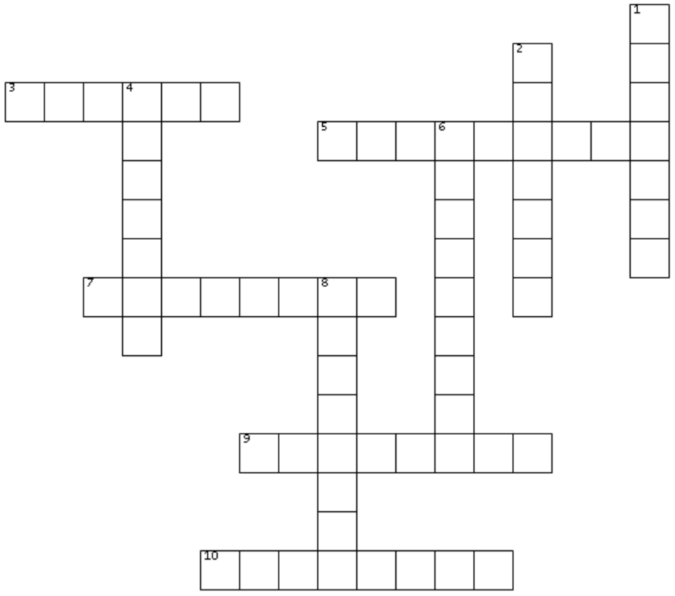
1 Crossword puzzle for design patterns

Test yourself by doing this from memory. Do not look at the lecture slides!



ACROSS

3. Provides a uniform interface to a subsystem's set of interfaces to simplify the use of the subsystem.
5. Allows clients to treat both individual objects and composites of objects uniformly.
7. Promotes loose coupling by preventing objects from explicitly referencing each other.
9. Algorithms can vary independent of the clients that use them.
10. Allows sequential access to the elements of a compound object without revealing its underlying representation.

DOWN

1. Capture and externalize an object's internal state without violating its encapsulation, so that the object can later be restored to that state.
2. Allows to define a new operation without modifying the classes of the elements it operates on.
4. Converts a class's interface to another interface clients expect.
6. Determines the types of objects to be created using a typical instance and creates new objects by copying this instance.

8. Defines a 1-to-n dependency between objects, such that changing the object's state results in all dependent oLbjects being notified.

Solution

1. Memento
2. Visitorz
3. Facade
4. Adapter
5. Composite
6. Prototype
7. Mediator
8. Observer
9. Strategy
10. Iterator

2 JUnit 5

Given the following method signature with the corresponding JavaDoc comment of a method that returns an element at a specific location in a sorted list:

```java
public class SortedIntegerList {
  /**
   * Returns the element at the given position in the list.
   *
   * @param position
   * the position of the list element to be returned.
   * @return the element at the given position in the list.
   *
   * @throws IndexOutOfBoundsException
   * the exception is thrown if the given position
   * is outside the bounds of the list.
   */
  public int getElement(int position) throws IndexOutOfBoundsException;
}
```

Complete the JUnit test class below. The class should provide useful test cases for equivalence classes and boundary values. Hint: The list contains 100 elements. Indices run from 0 to 99. The constructor initializes the list with the integers 0 to 99 in ascending order. Find out how to check for exceptions in JUnit 5 **on the Internet**.

```java
//imports
public class ListTest {
  static SortedIntegerList list;

  @BeforeAll
  public static void setup() {
    //allocate list with 100 elements with values 0..99
    list = new SortedIntegerList(100);
  }
```

Solution

The test for the interior indices

```java
@Test
public void testValidIndices() {
    assertEquals(42, list.getElement(42), "The 42-th element should be 42");
}
```

The test for the upper boundary

```java
@Test
public void testLowerBoundaryIndices() {
    // Lower boundary
    assertEquals(0, list.getElement(0), "Incorrect on lower bound");
    assertThrows(
            IndexOutOfBoundsException.class,
            () -> list.getElement(-1),
            "Doesn't throw on lower bound"
    );
}
```

The test for the lower boundary

```java
@Test
public void testUpperBoundaryIndices() {
    // Upper boundary
    assertEquals(99, list.getElement(99), "Incorrect on upper bound");
    assertThrows(
            IndexOutOfBoundsException.class,
            () -> list.getElement(100),
            "Doesn't throw on upper bound"
    );
}
```

3 Git

Which git commands perform the following series of actions. Hint: if you need help read the relevant chapters of this book: https://git-scm.com/book/en/v2

1. The git repository myproject is stored on a server under the URL https://github.com/myproject. Which command downloads the entire repository, including the latest version of the software?
2. You create a new file f1 in your local directory myproject. Which command tells git to start tracking f1?
3. You modify an existing file f2 in myproject. How do you tell git to include this new version in the next snapshot? (Do not yet create that snapshot.)
4. There is a file f3 that is no longer needed in the next snapshot. How do you tell git to get rid of f3 in the next snapshot, but not in the preceding ones?

5. Now create a new snapshot with a log message “f1 new, f2 changed, f3 deleted”.
6. Next, create a branch called testing.
7. Switch to that branch.
8. You change file f2 again with an editor. How do you create a new snapshot on the branch testing including the new version of f2?
9. You find out that there is a branch called hotfix. You need to merge testing with hotfix. How is that done?
10. Finally, how do you upload the master branch to the server?

Solution

1. `git clone https://github.com/myproject.git`
2. `git add f1`
3. `git add f2`
4. `git rm --cached f3`
5. `git commit -m “f1 new, f2 changed, f3 deleted”`
6. `git branch testing`
7. `git checkout testing`
8. `git add f2`
   `git commit -m "..."`
9. `git merge hotfix`
10. `git push origin master`