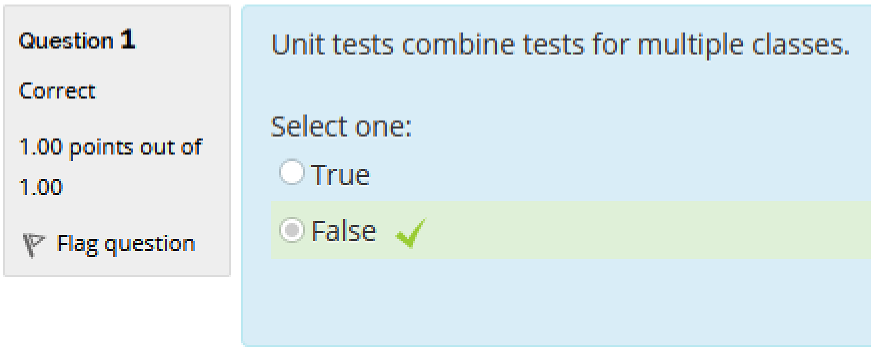
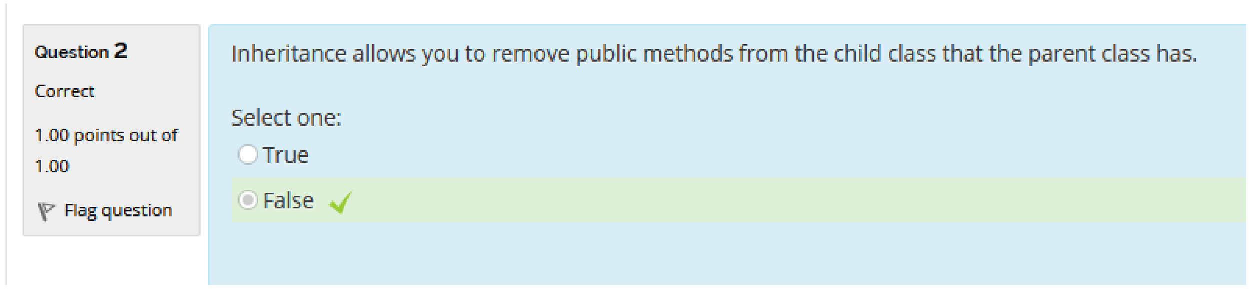
1. 15 True/False (1 point each)


Question 1
Correct
1.00 points out of 1.00
Flag question

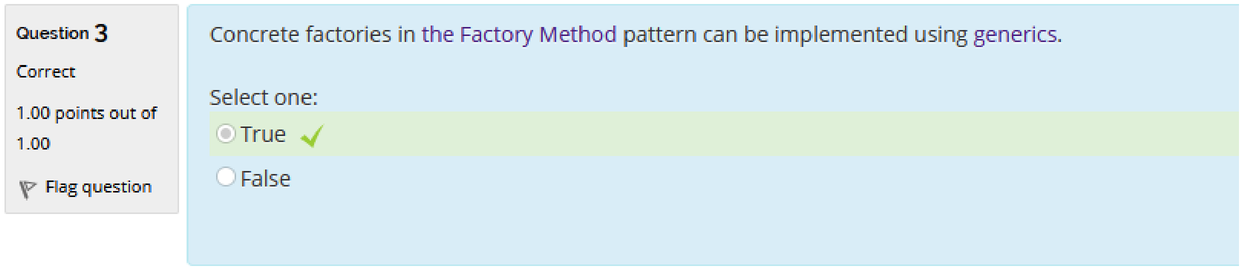
Unit tests combine tests for multiple classes.

Select one:
True
[✓ False]


Question 2
Correct
1.00 points out of 1.00
Flag question

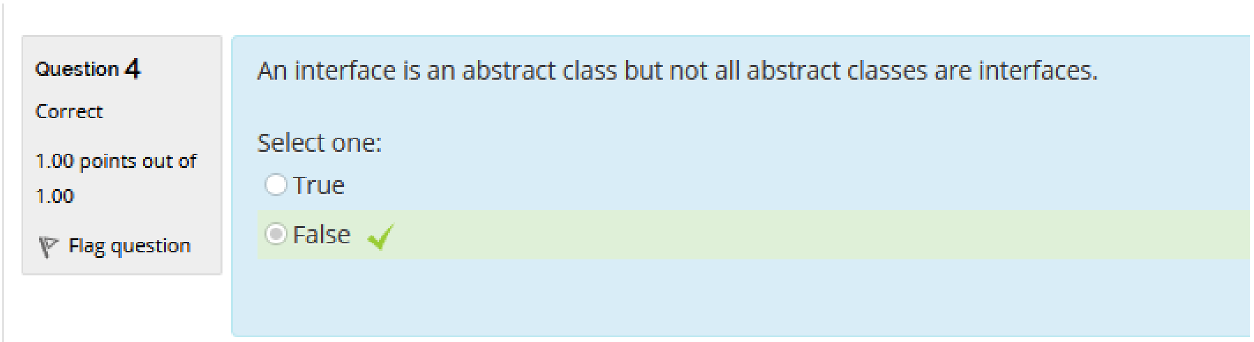
Inheritance allows you to remove public methods from the child class that the parent class has.

Select one:
True
[✓ False]


Question 3
Correct
1.00 points out of 1.00
Flag question

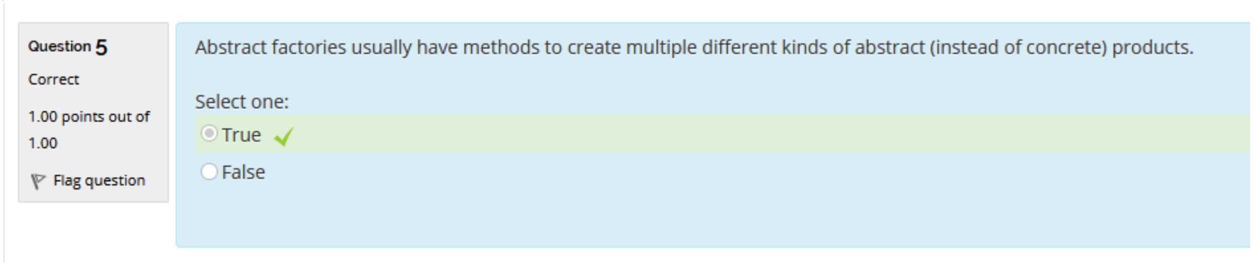
Concrete factories in the Factory Method pattern can be implemented using generics.

Select one:
[✓ True]
False


Question 4
Correct
1.00 points out of 1.00
Flag question

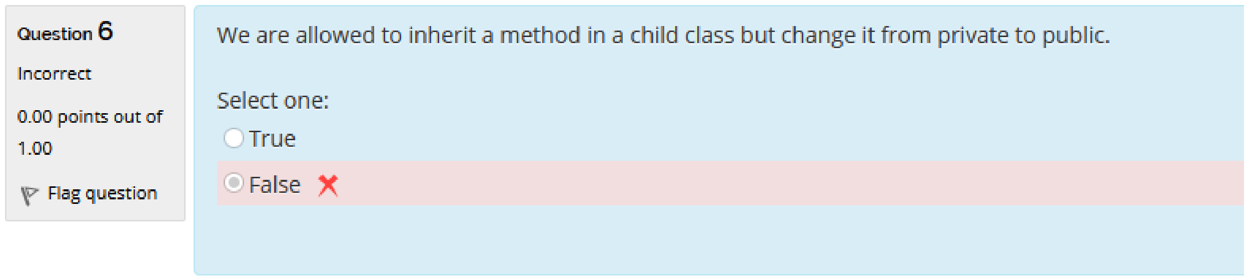
An interface is an abstract class but not all abstract classes are interfaces.

Select one:
True
[✓ False]


Question 5
Correct
1.00 points out of 1.00
Flag question

Abstract factories usually have methods to create multiple different kinds of abstract (instead of concrete) products.

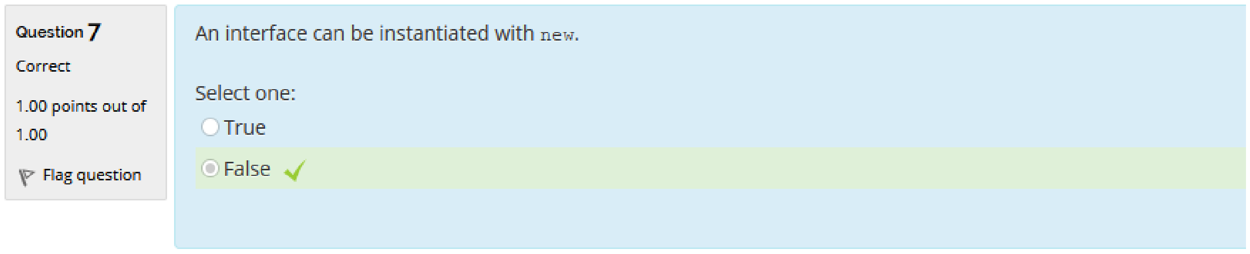
Select one:
[✓ True]
False



Question 6
Incorrect
0.00 points out of 1.00
Flag question

We are allowed to inherit a method in a child class but change it from private to public.

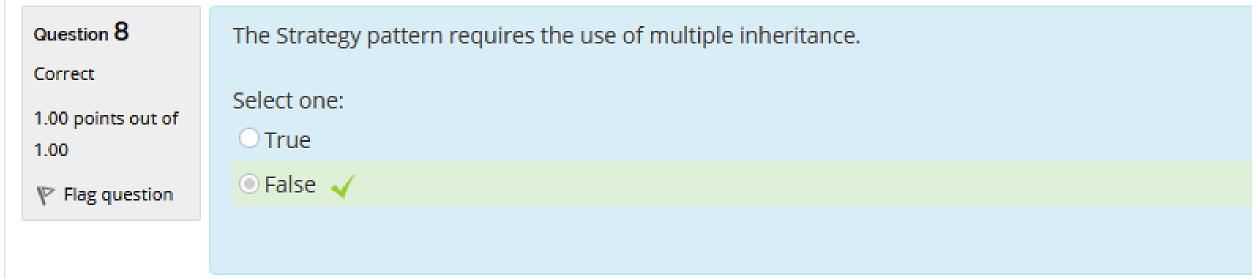
Select one:
- True
- [✓ False] ✗



Question 7
Correct
1.00 points out of 1.00
Flag question

An interface can be instantiated with `new`.

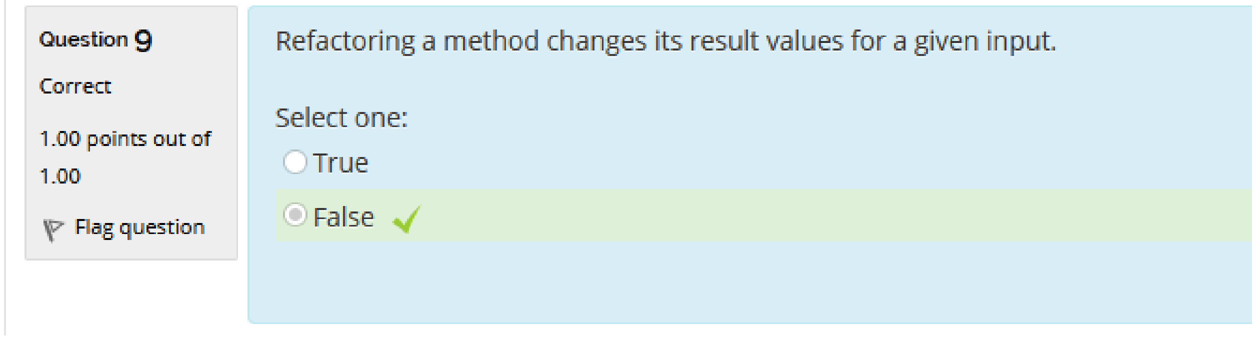
Select one:
- True
- [✓ False] ✓



Question 8
Correct
1.00 points out of 1.00
Flag question

The Strategy pattern requires the use of multiple inheritance.

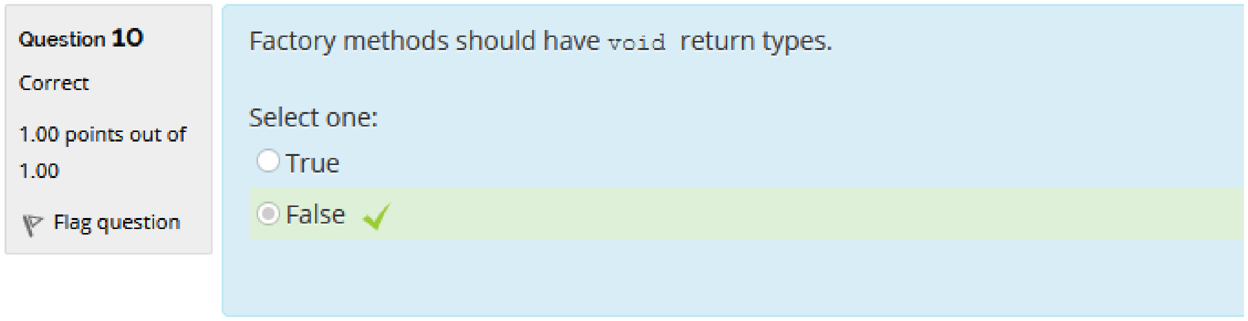
Select one:
- True
- [✓ False] ✓



Question 9
Correct
1.00 points out of 1.00
Flag question

Refactoring a method changes its result values for a given input.

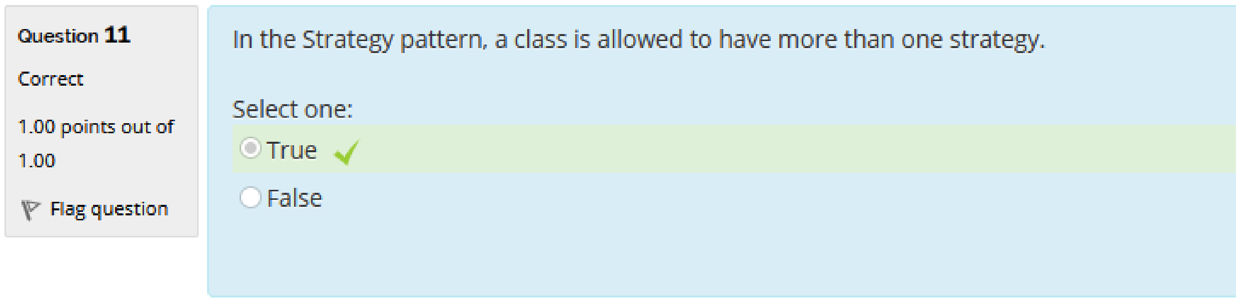
Select one:
- True
- [✓ False] ✓



Question 10
Correct
1.00 points out of 1.00
Flag question

Factory methods should have `void` return types.

Select one:
- True
- [✓ False] ✓



Question **11**

Correct

1.00 points out of 1.00

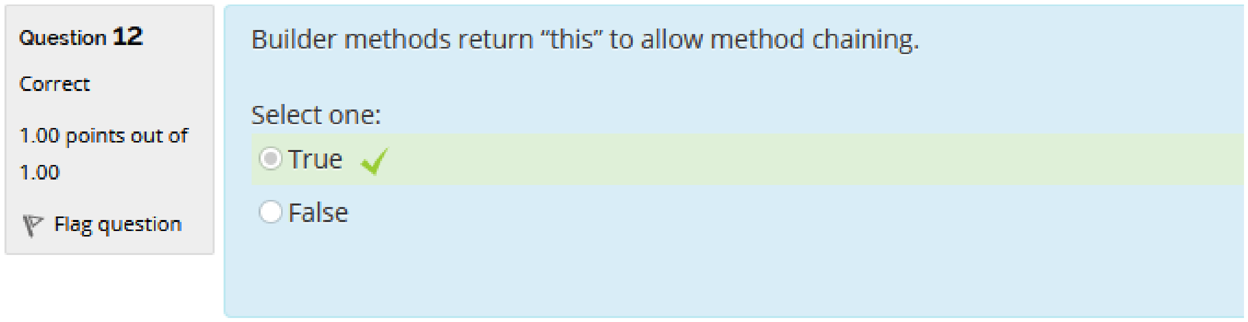
Flag question

In the Strategy pattern, a class is allowed to have more than one strategy.

Select one:

[✓ True] ✓

False



Question **12**

Correct

1.00 points out of 1.00

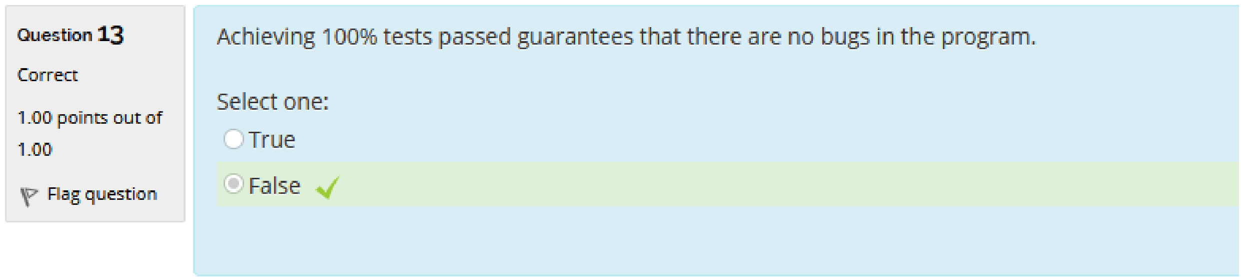
Flag question

Builder methods return “this” to allow method chaining.

Select one:

[✓ True] ✓

False



Question **13**

Correct

1.00 points out of 1.00

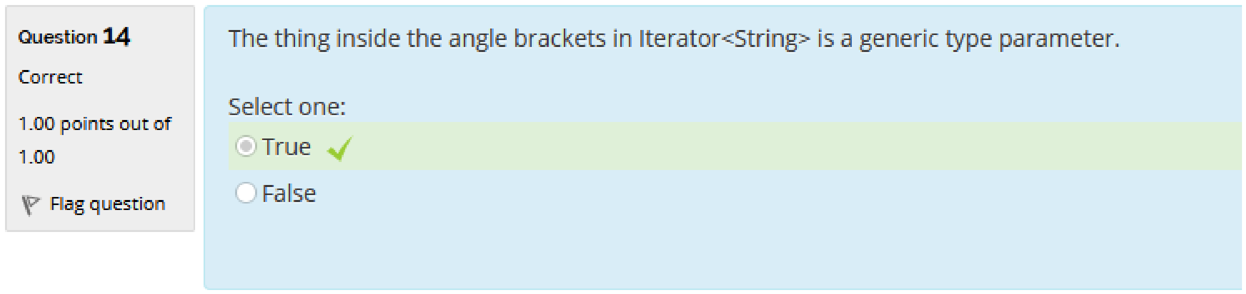
Flag question

Achieving 100% tests passed guarantees that there are no bugs in the program.

Select one:

True

[✓ False] ✓



Question **14**

Correct

1.00 points out of 1.00

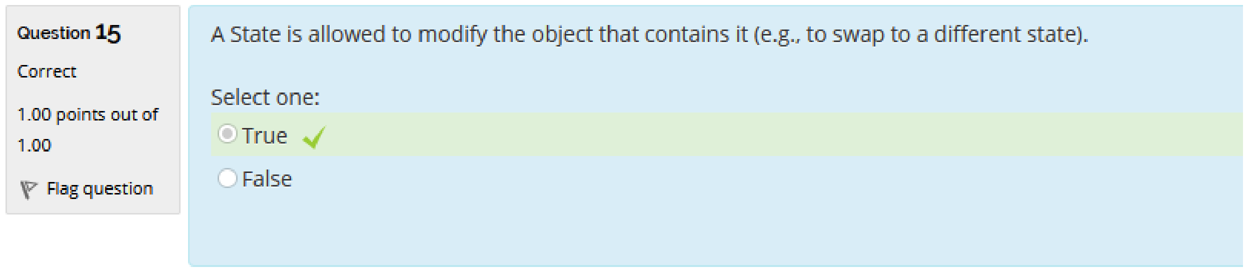
Flag question

The thing inside the angle brackets in Iterator<String> is a generic type parameter.

Select one:

[✓ True] ✓

False



Question **15**

Correct

1.00 points out of 1.00

Flag question

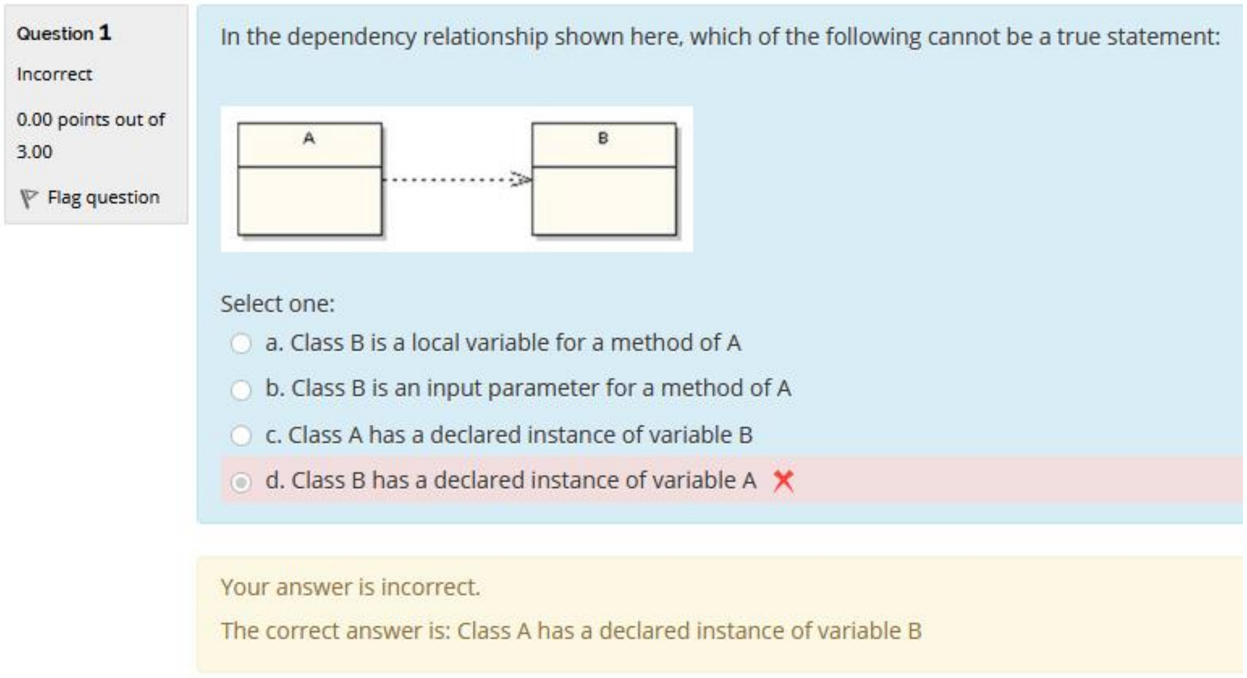
A State is allowed to modify the object that contains it (e.g., to swap to a different state).

Select one:

[✓ True] ✓

False

2. 10 Multiple Choice (3 points each)



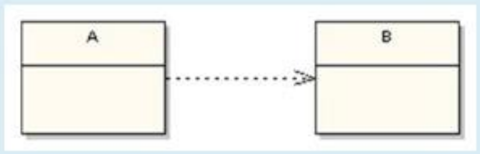
Question 1

Incorrect

0.00 points out of 3.00

Flag question

In the dependency relationship shown here, which of the following cannot be a true statement:

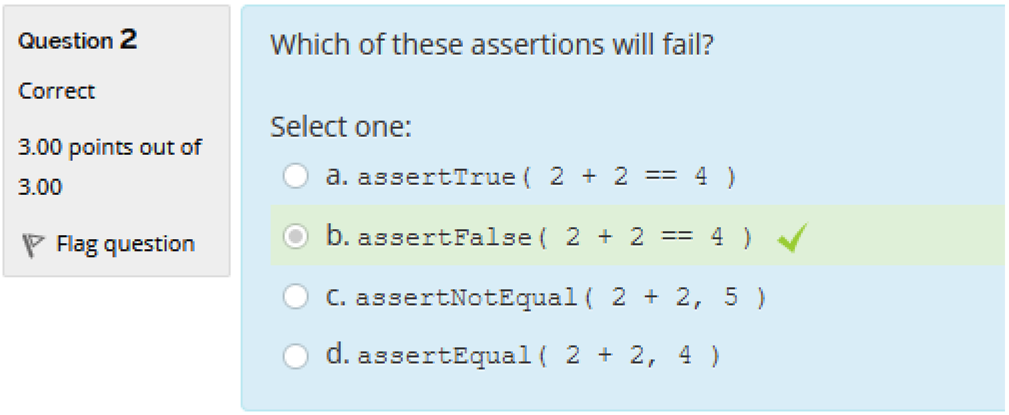


Select one:

- a. Class B is a local variable for a method of A
- b. Class B is an input parameter for a method of A
- c. Class A has a declared instance of variable B
- [✓ d. Class B has a declared instance of variable A] ✗

Your answer is incorrect.

The correct answer is: Class A has a declared instance of variable B



Question 2

Correct

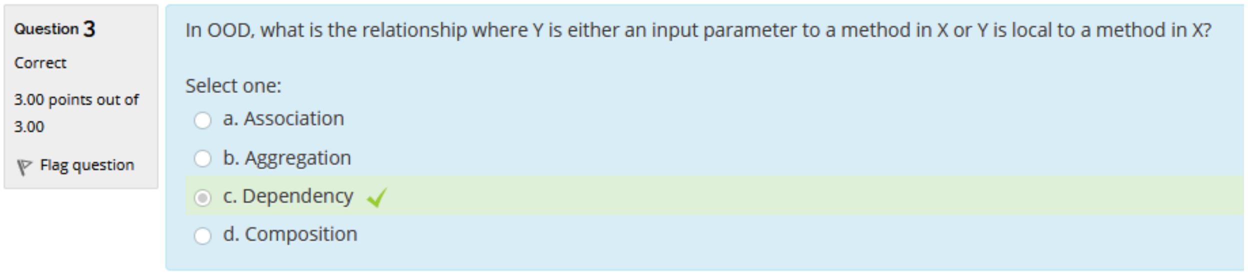
3.00 points out of 3.00

Flag question

Which of these assertions will fail?

Select one:

- a. `assertTrue( 2 + 2 == 4 )`
- [✓ b. `assertFalse( 2 + 2 == 4 )`] ✓
- c. `assertNotEqual( 2 + 2, 5 )`
- d. `assertEqual( 2 + 2, 4 )`



Question 3

Correct

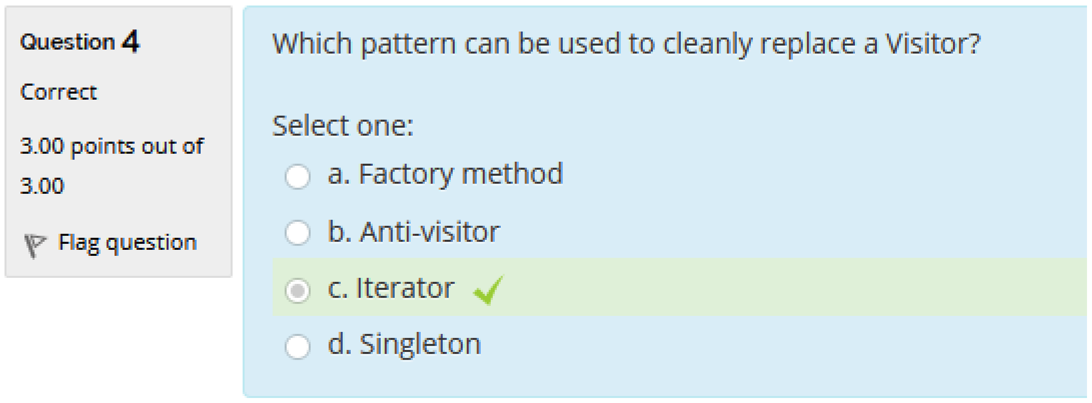
3.00 points out of 3.00

Flag question

In OOD, what is the relationship where Y is either an input parameter to a method in X or Y is local to a method in X?

Select one:

- a. Association
- b. Aggregation
- [✓ c. Dependency] ✓
- d. Composition



Question 4

Correct

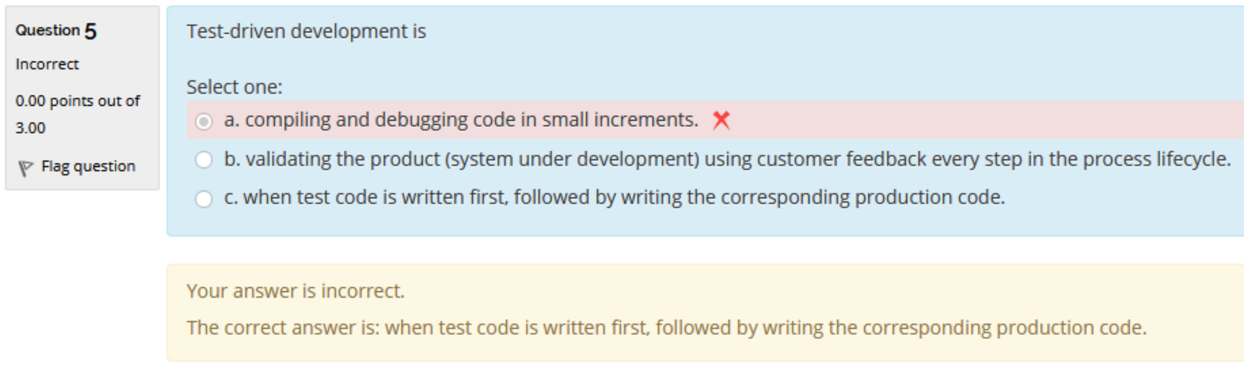
3.00 points out of 3.00

Flag question

Which pattern can be used to cleanly replace a Visitor?

Select one:

- a. Factory method
- b. Anti-visitor
- [✓ c. Iterator] ✓
- d. Singleton



Question 5

Incorrect

0.00 points out of 3.00

Flag question

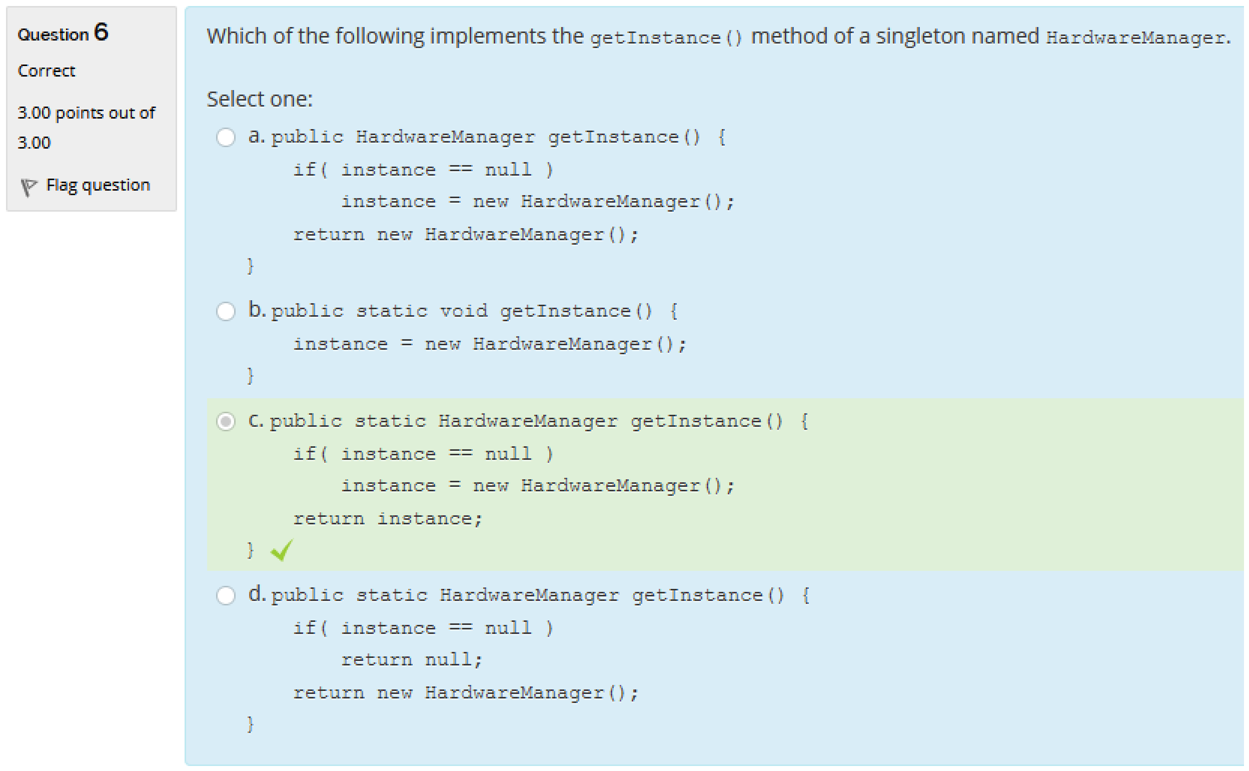
Test-driven development is

Select one:

- [✓ a. compiling and debugging code in small increments.] ✗
- b. validating the product (system under development) using customer feedback every step in the process lifecycle.
- c. when test code is written first, followed by writing the corresponding production code.

Your answer is incorrect.

The correct answer is: when test code is written first, followed by writing the corresponding production code.



Question 6

Correct

3.00 points out of 3.00

Flag question

Which of the following implements the `getInstance()` method of a singleton named `HardwareManager`.

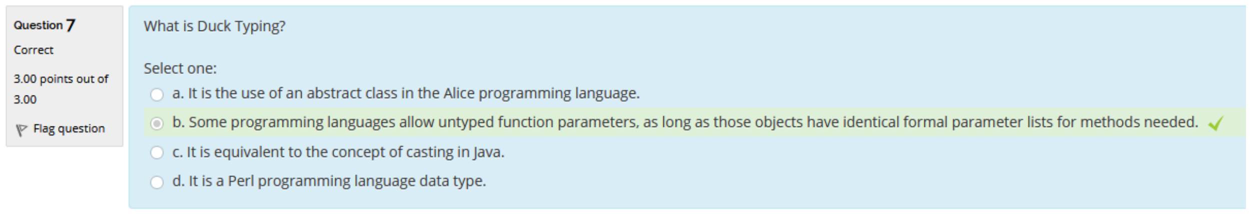
Select one:

a.
```
public HardwareManager getInstance() {
    if( instance == null )
        instance = new HardwareManager();
    return new HardwareManager();
}
```

b.
```
public static void getInstance() {
    instance = new HardwareManager();
}
```

[✓ c.]
```
public static HardwareManager getInstance() {
    if( instance == null )
        instance = new HardwareManager();
    return instance;
}
```
✓

d.
```
public static HardwareManager getInstance() {
    if( instance == null )
        return null;
    return new HardwareManager();
}
```

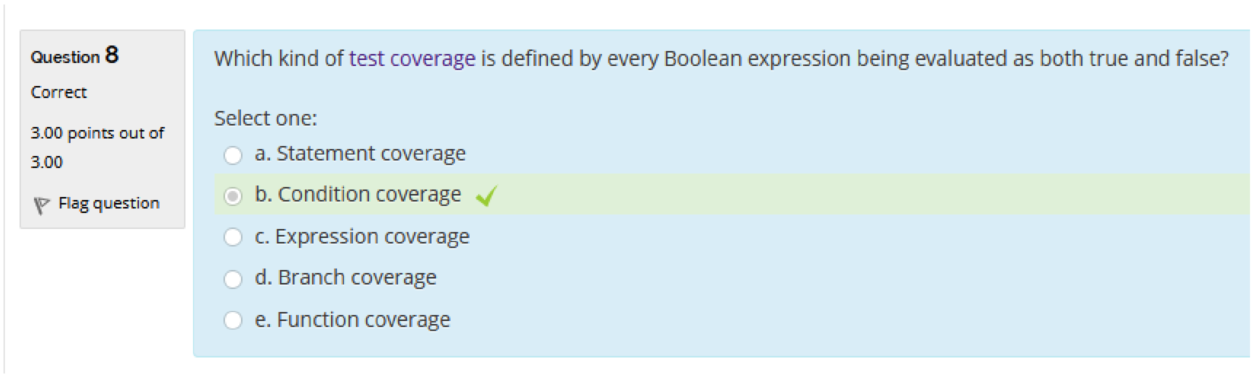


Question 7
Correct
3.00 points out of 3.00
Flag question

What is Duck Typing?

Select one:

- a. It is the use of an abstract class in the Alice programming language.
- [✓ b. Some programming languages allow untyped function parameters, as long as those objects have identical formal parameter lists for methods needed.] ✓
- c. It is equivalent to the concept of casting in Java.
- d. It is a Perl programming language data type.

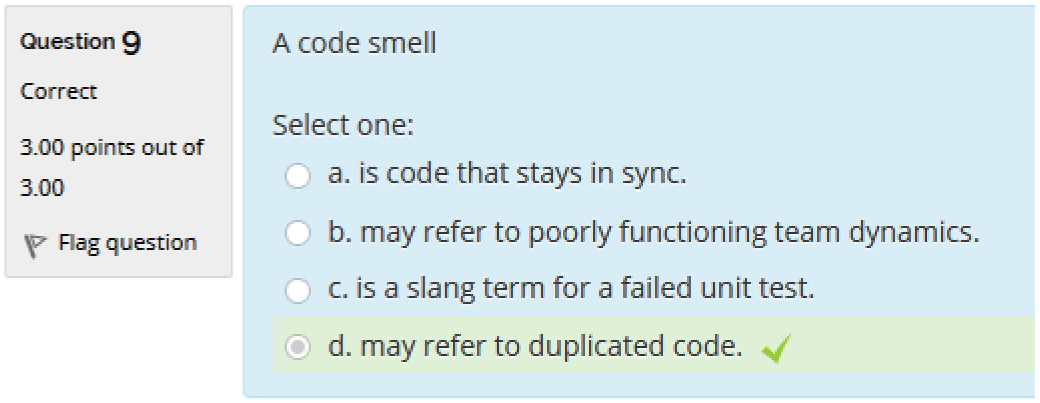


Question 8
Correct
3.00 points out of 3.00
Flag question

Which kind of test coverage is defined by every Boolean expression being evaluated as both true and false?

Select one:

- a. Statement coverage
- [✓ b. Condition coverage] ✓
- c. Expression coverage
- d. Branch coverage
- e. Function coverage

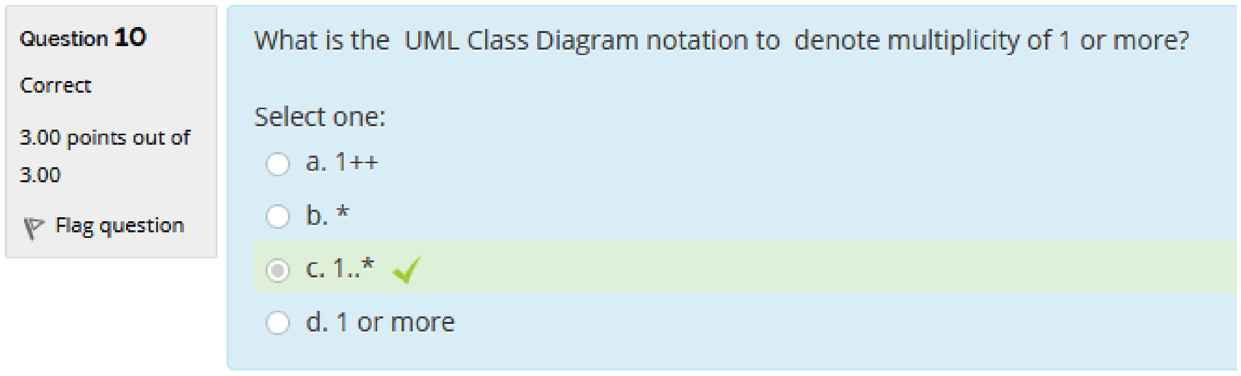


Question 9
Correct
3.00 points out of 3.00
Flag question

A code smell

Select one:

- a. is code that stays in sync.
- b. may refer to poorly functioning team dynamics.
- c. is a slang term for a failed unit test.
- [✓ d. may refer to duplicated code.] ✓



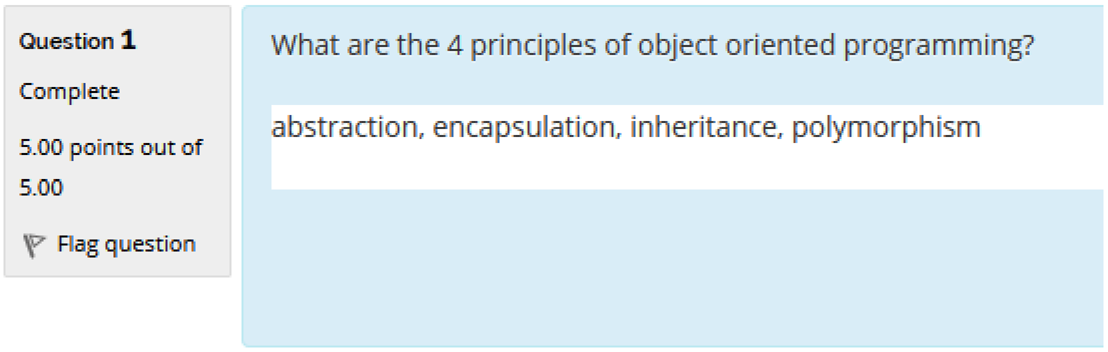
Question 10
Correct
3.00 points out of 3.00
Flag question

What is the UML Class Diagram notation to denote multiplicity of 1 or more?

Select one:

- a. 1++
- b. *
- [✓ c. 1..*] ✓
- d. 1 or more

3. 7 Short Answer (5 points each)



Question 1

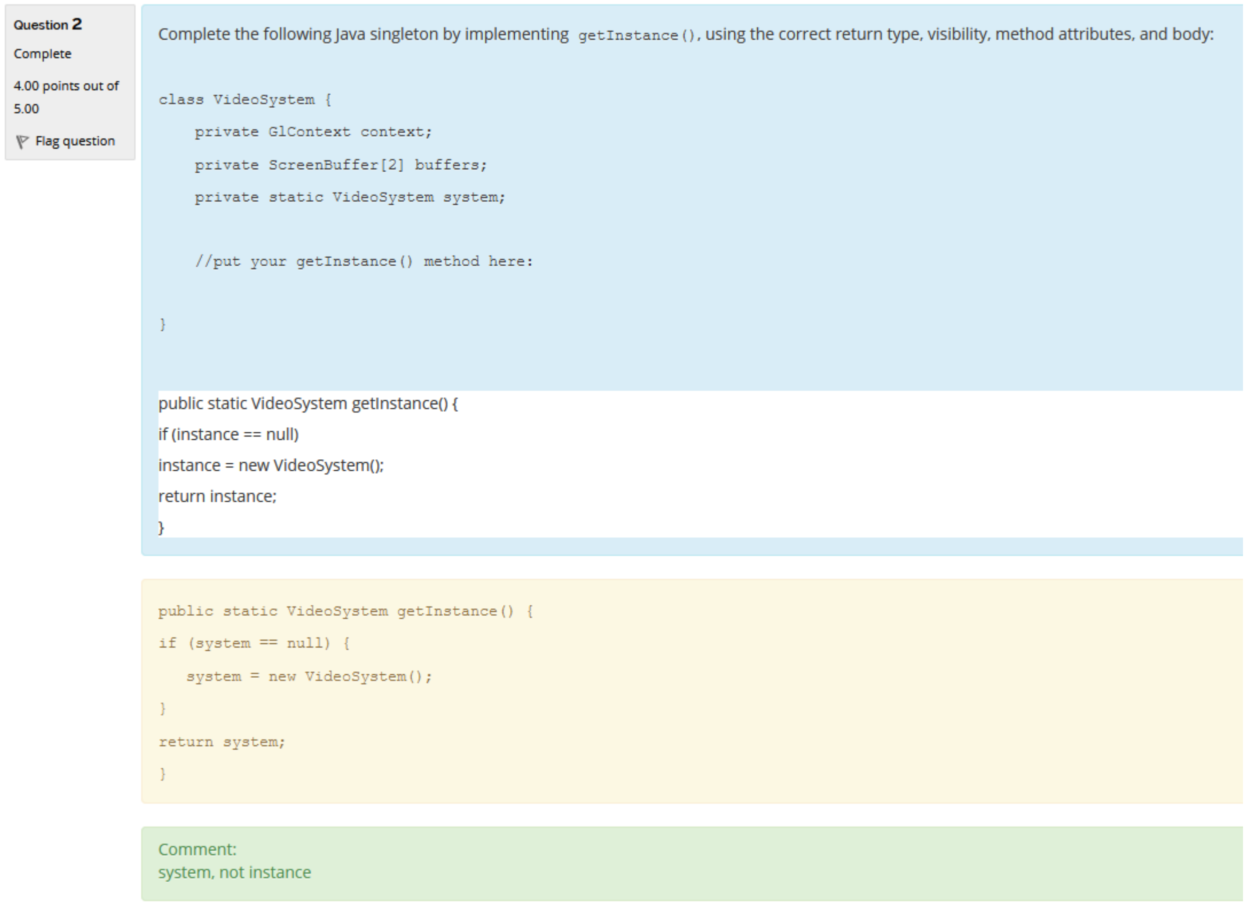
Complete

5.00 points out of 5.00

Flag question

What are the 4 principles of object oriented programming?

abstraction, encapsulation, inheritance, polymorphism



Question 2

Complete

4.00 points out of 5.00

Flag question

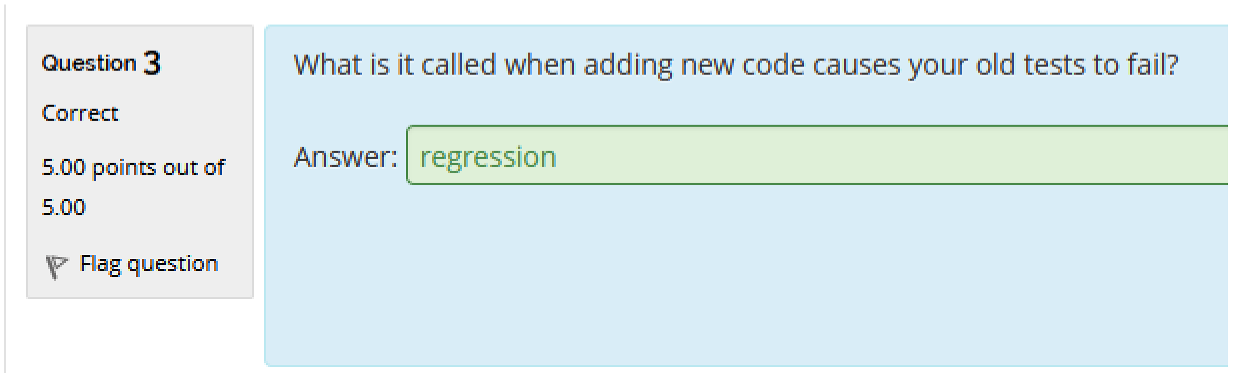
Complete the following Java singleton by implementing `getInstance()`, using the correct return type, visibility, method attributes, and body:

```
class VideoSystem {
    private GlContext context;
    private ScreenBuffer[2] buffers;
    private static VideoSystem system;

    //put your getInstance() method here:

}
```

```
public static VideoSystem getInstance() {
if (instance == null)
instance = new VideoSystem();
return instance;
}
```

```
public static VideoSystem getInstance() {
if (system == null) {
   system = new VideoSystem();
}
return system;
}
```

Comment:
system, not instance



Question 3

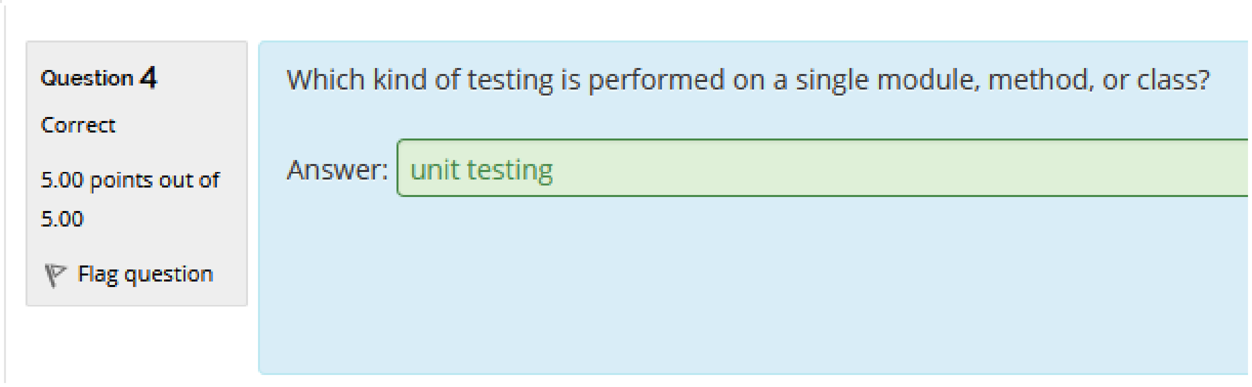
Correct

5.00 points out of 5.00

Flag question

What is it called when adding new code causes your old tests to fail?

Answer: regression



Question 4

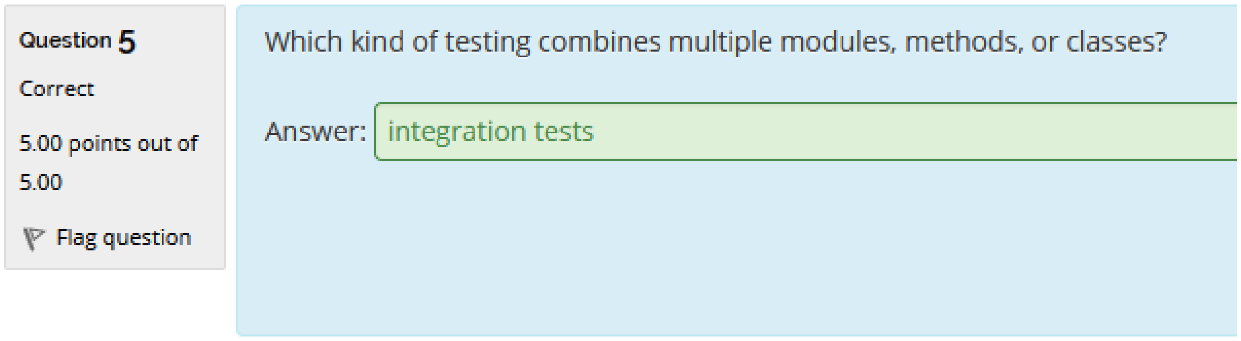
Correct

5.00 points out of 5.00

Flag question

Which kind of testing is performed on a single module, method, or class?

Answer: unit testing



Question 5

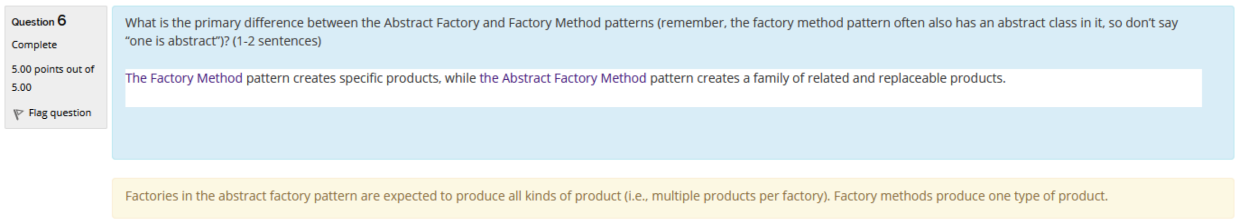
Correct

5.00 points out of 5.00

Flag question

Which kind of testing combines multiple modules, methods, or classes?

Answer: integration tests


Question 6

Complete

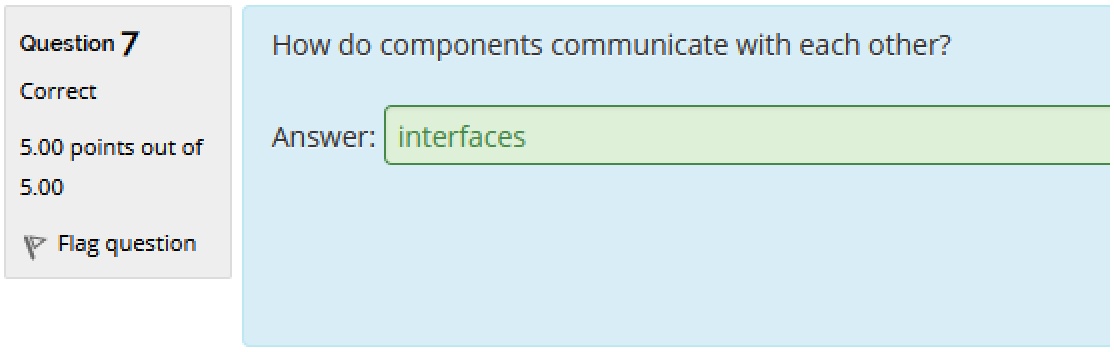
5.00 points out of 5.00

Flag question

What is the primary difference between the Abstract Factory and Factory Method patterns (remember, the factory method pattern often also has an abstract class in it, so don't say "one is abstract")? (1-2 sentences)

The Factory Method pattern creates specific products, while the Abstract Factory Method pattern creates a family of related and replaceable products.

Factories in the abstract factory pattern are expected to produce all kinds of product (i.e., multiple products per factory). Factory methods produce one type of product.


Question 7

Correct

5.00 points out of 5.00

Flag question

How do components communicate with each other?

Answer: interfaces

4. 1 Long Answer (10 points)

Question **1**

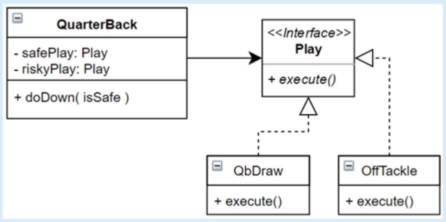
Complete

9.00 points out of 10.00

Flag question

Given the following UML, write the code for each class and interface in Java or C++. The `doDown()` method should check its argument: if it's true, it should execute `safePlay`, otherwise `riskyPlay`. For each concrete class, implement "`execute()`" to print "`Executing: [name of the play]`" (replace brackets with actual name). Ensure correct return types and visibility.

What pattern is this?

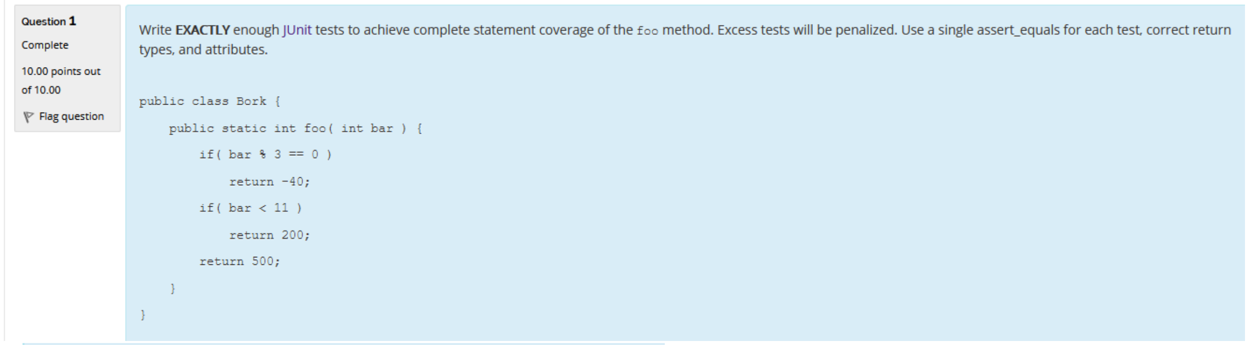


This is the command pattern.

```
public interface Play {
 public void execute();
}

public class QuarterBack {
 private Play safePlay;
 private Play riskyPlay;
 public QuarterBack(Play safePlay, Play riskyPlay) {
  this.safePlay = safePlay;
  this.riskyPlay = riskyPlay;
 }
 public void doDown(isSafe) {
  if(isSafe) safePlay.execute();
  else riskyPlay.execute();
 }
}

public class QbDraw implements Play {
 public void execute() {
  System.out.println("Executing: QbDraw");
 }
}

public class OffTackle implements Play {
 public void execute() {
  System.out.println("Executing: OffTackle");
 }
}
```

```
interface Play {
  public void execute();
}
class QuarterBack {
  private Play safePlay;
  private Play riskyPlay;
  public voic doDown (boolean isSafe) {
    if (isSafe)
      safePlay.execute();
    else
      riskyPlay.execute();
  }
}
class QbDraw implements Play {
  public void execute() {
    System.out.print("Executing: QB draw");
  }
}
class OffTackle implements Play {
  public void execute() {
    System.out.print ("Executing: off tackle");
  }
}
```

5. 1 Long Answer (10 points)



Question **1**

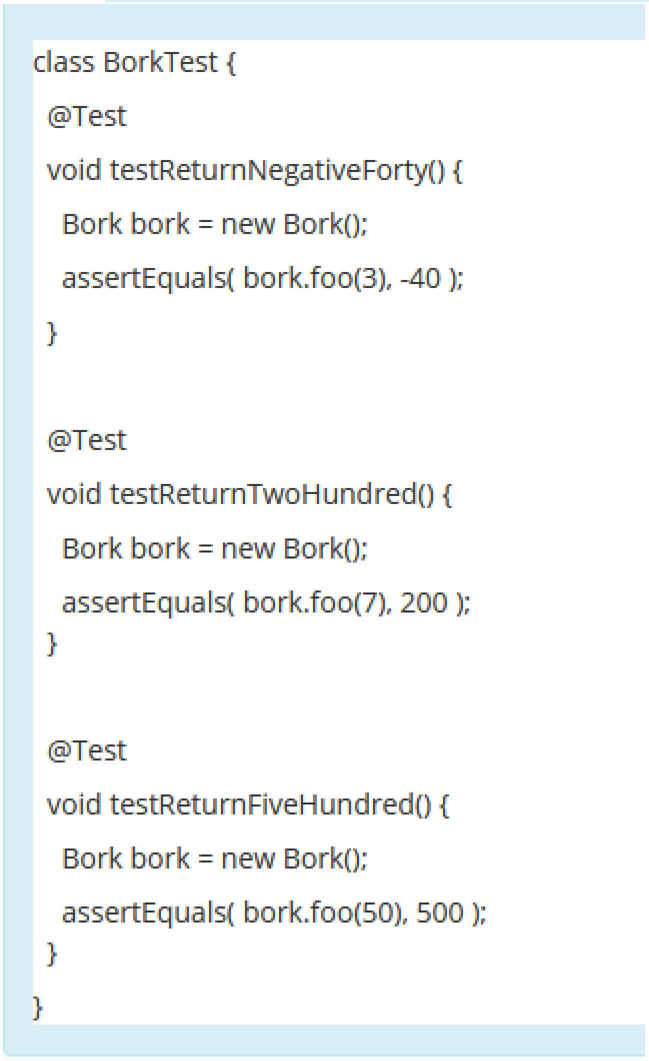
Complete

10.00 points out of 10.00

Flag question

Write **EXACTLY** enough JUnit tests to achieve complete statement coverage of the `foo` method. Excess tests will be penalized. Use a single assert_equals for each test, correct return types, and attributes.

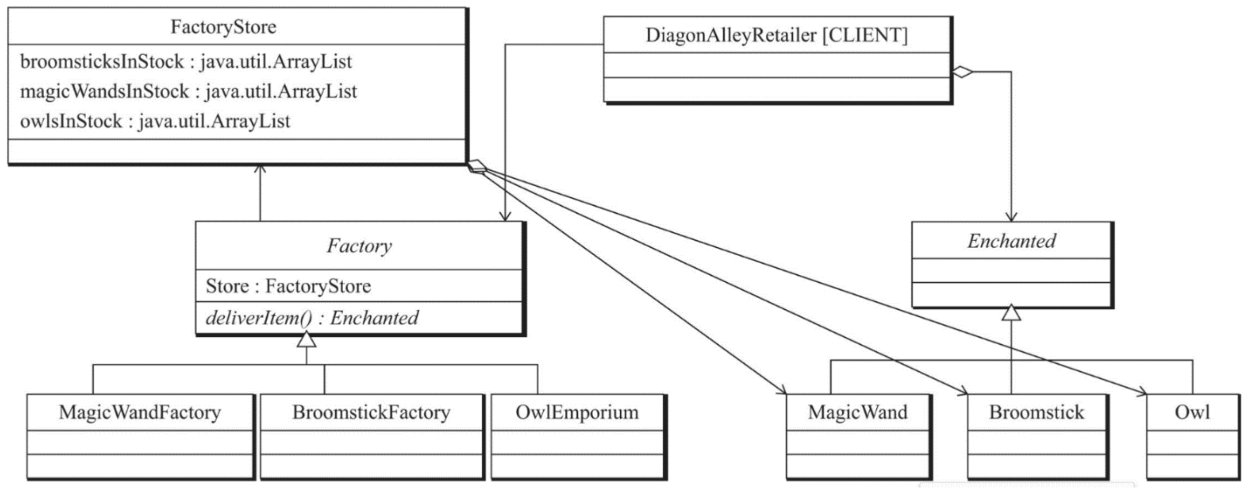
```
public class Bork {
    public static int foo( int bar ) {
        if( bar % 3 == 0 )
            return -40;
        if( bar < 11 )
            return 200;
        return 500;
    }
}
```



```
class BorkTest {
 @Test
 void testReturnNegativeForty() {
  Bork bork = new Bork();
  assertEquals( bork.foo(3), -40 );
 }


 @Test
 void testReturnTwoHundred() {
  Bork bork = new Bork();
  assertEquals( bork.foo(7), 200 );
 }


 @Test
 void testReturnFiveHundred() {
  Bork bork = new Bork();
  assertEquals( bork.foo(50), 500 );
 }
}
```

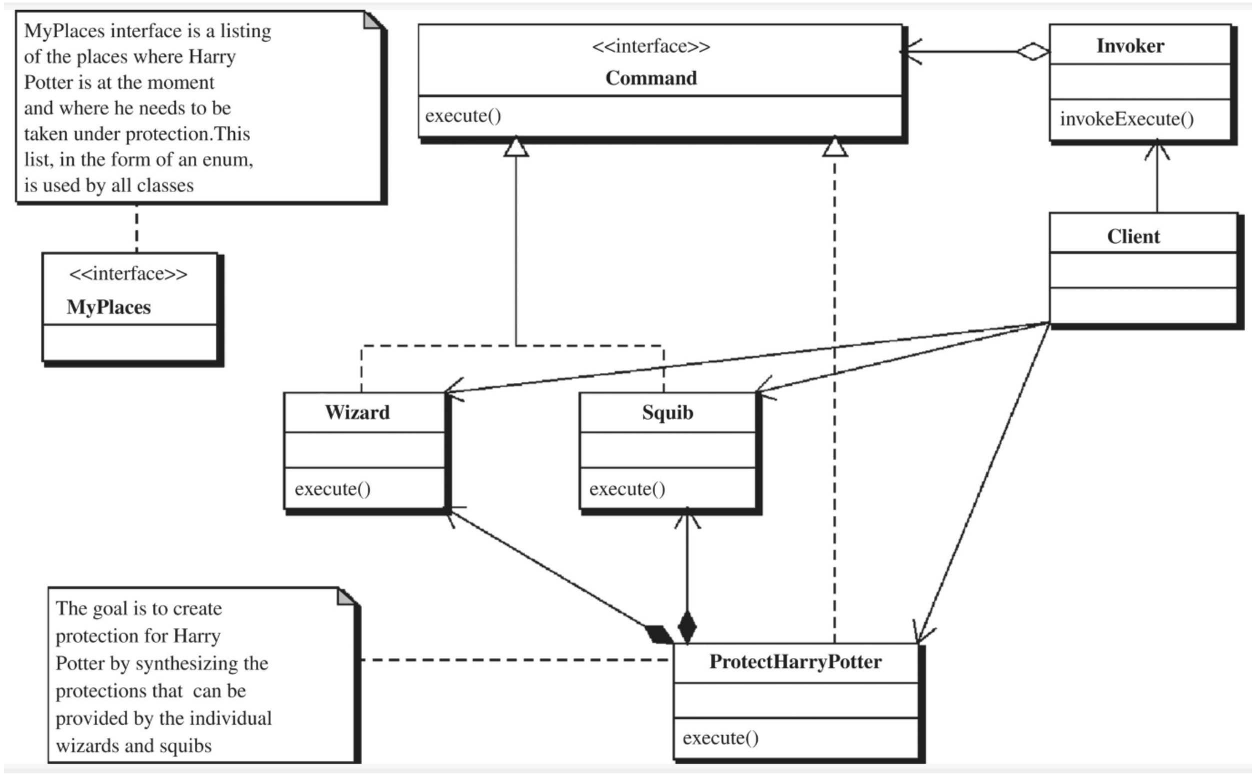
```
@Test
void testFoo1() {
   assertEquals( -40, Bork.foo(9));
}

@Test
void testFoo2(){
   assertEquals( 200, Bork.foo(5));
}

@Test
void testFoo3(){
   assertEquals( 500, Bork.foo(17));
}
```

6. 6 Pattern identification (3 points each)


FactoryStore
broomsticksInStock : java.util.ArrayList
magicWandsInStock : java.util.ArrayList
owlsInStock : java.util.ArrayList
DiagonAlleyRetailer [CLIENT]
Factory
Store : FactoryStore
deliverItem() : Enchanted
Enchanted
MagicWandFactory
BroomstickFactory
OwlEmporium
MagicWand
Broomstick
Owl

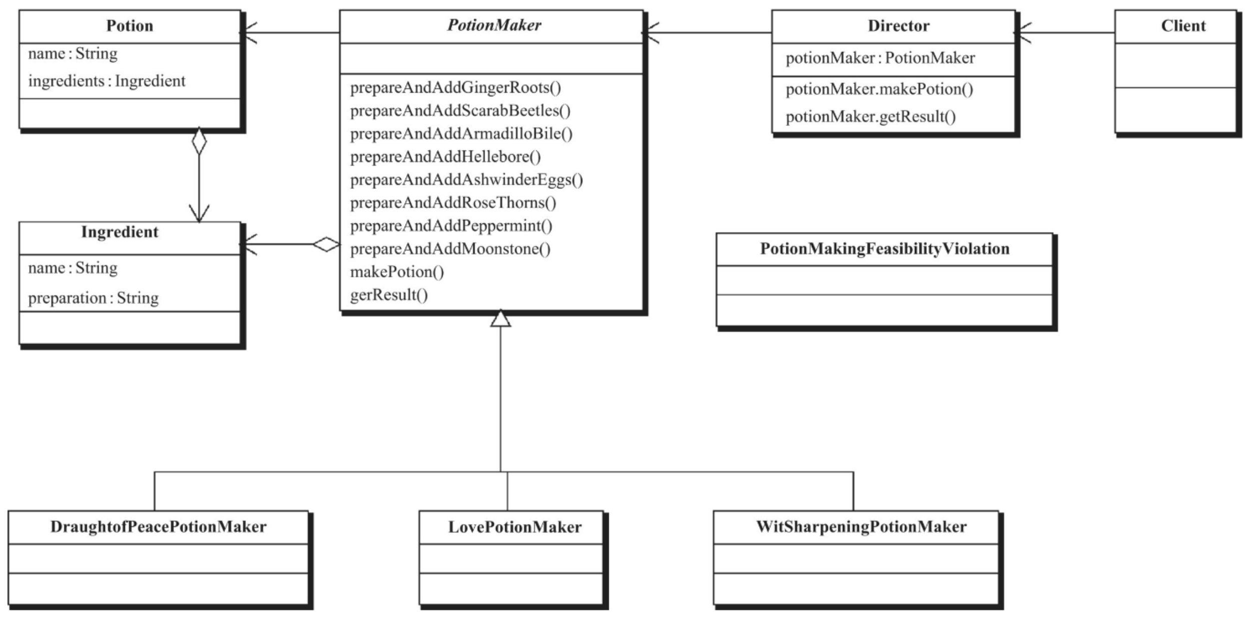
Your answer is incorrect.

The correct answer is: The Abstract Factory Pattern


MyPlaces interface is a listing of the places where Harry Potter is at the moment and where he needs to be taken under protection.This list, in the form of an enum, is used by all classes
<<interface>>
MyPlaces
<<interface>>
Command
execute()
Invoker
invokeExecute()
Client
Wizard
execute()
Squib
execute()
The goal is to create protection for Harry Potter by synthesizing the protections that can be provided by the individual wizards and squibs
ProtectHarryPotter
execute()

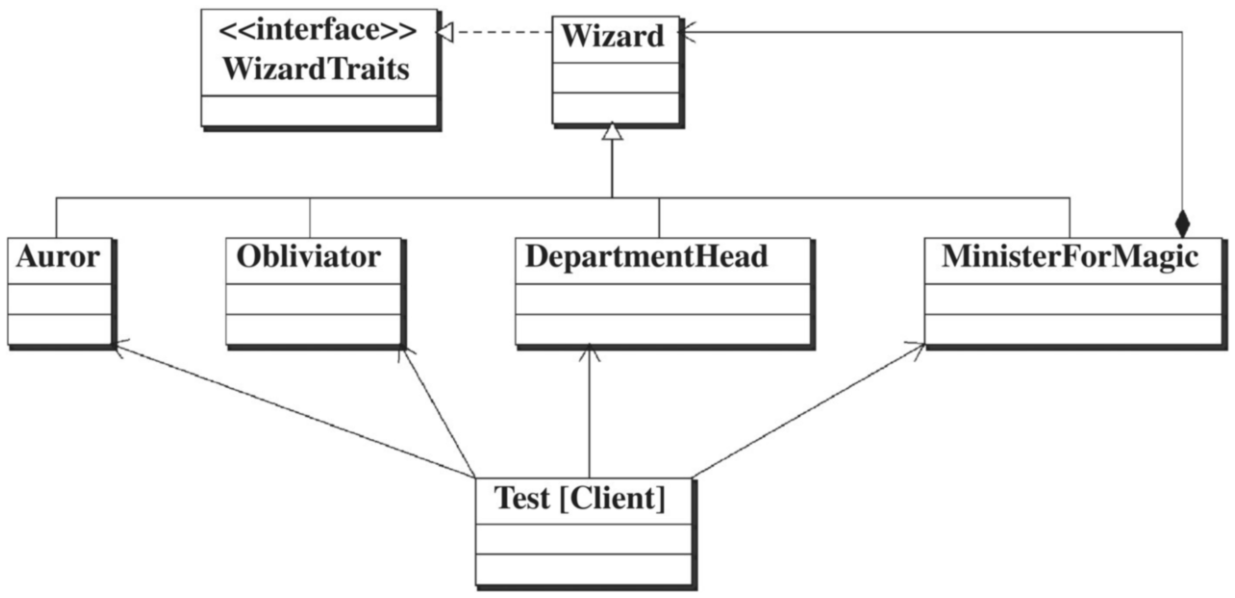
Your answer is correct.

The correct answer is: The Command Pattern



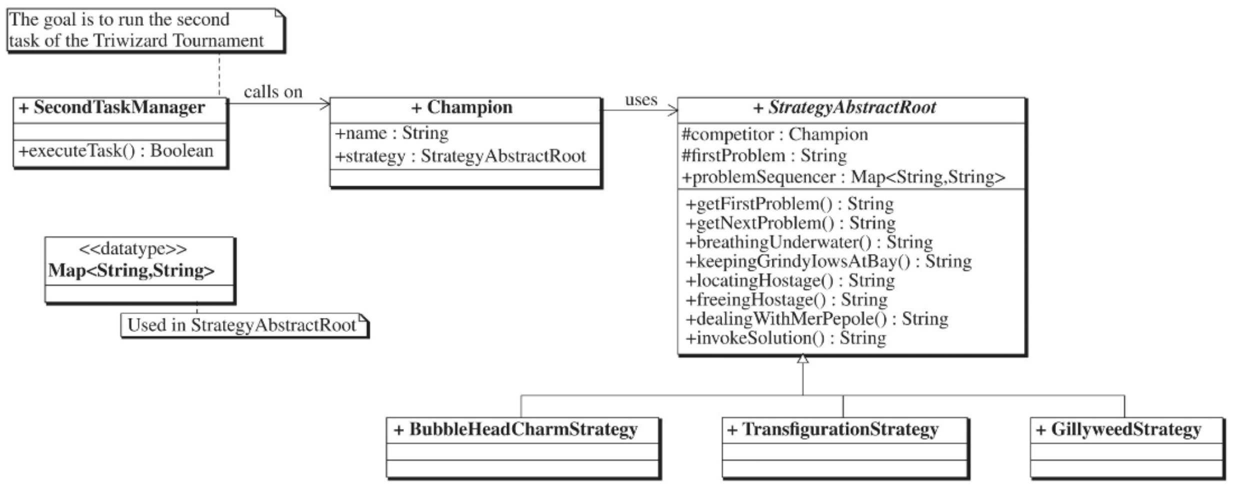
Your answer is incorrect.

The correct answer is: The Builder Pattern



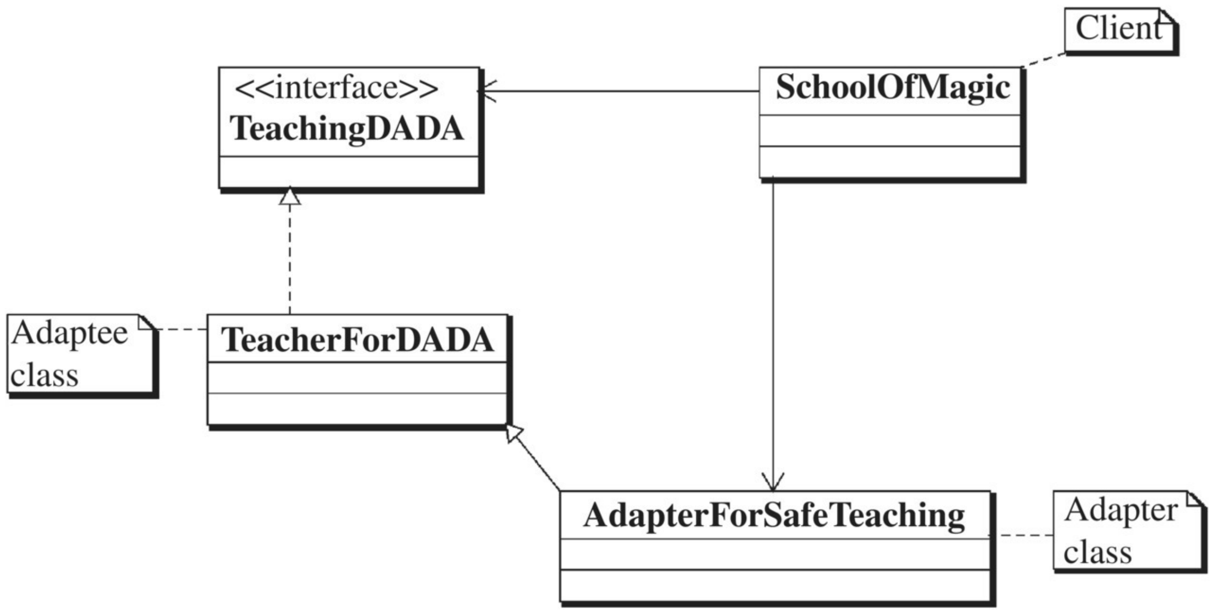
Your answer is incorrect.

The correct answer is: The Composite Pattern


The goal is to run the second task of the Triwizard Tournament
+ SecondTaskManager
+executeTask() : Boolean
calls on
+ Champion
+name : String
+strategy : StrategyAbstractRoot
uses
+ StrategyAbstractRoot
#competitor : Champion
#firstProblem : String
+problemSequencer : Map<String,String>
+getFirstProblem() : String
+getNextProblem() : String
+breathingUnderwater() : String
+keepingGrindyIowsAtBay() : String
+locatingHostage() : String
+freeingHostage() : String
+dealingWithMerPepole() : String
+invokeSolution() : String
<<datatype>>
Map<String,String>
Used in StrategyAbstractRoot
+ BubbleHeadCharmStrategy
+ TransfigurationStrategy
+ GillyweedStrategy

Your answer is correct.

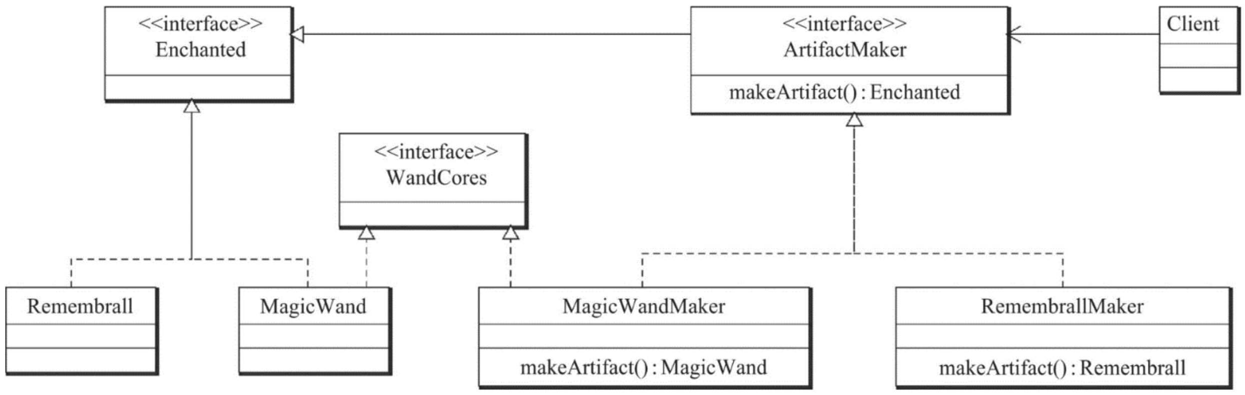
The correct answer is: The Strategy Pattern



Your answer is correct.

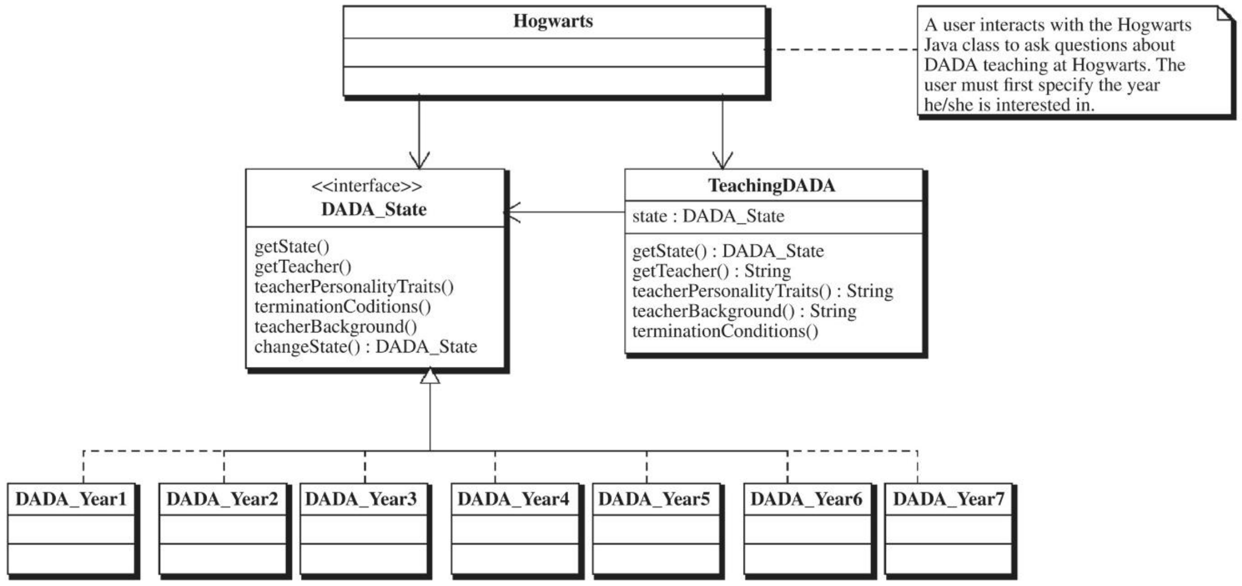
The correct answer is: The Adapter Pattern

7. 6 Pattern Identification (3 points each)



Your answer is correct.

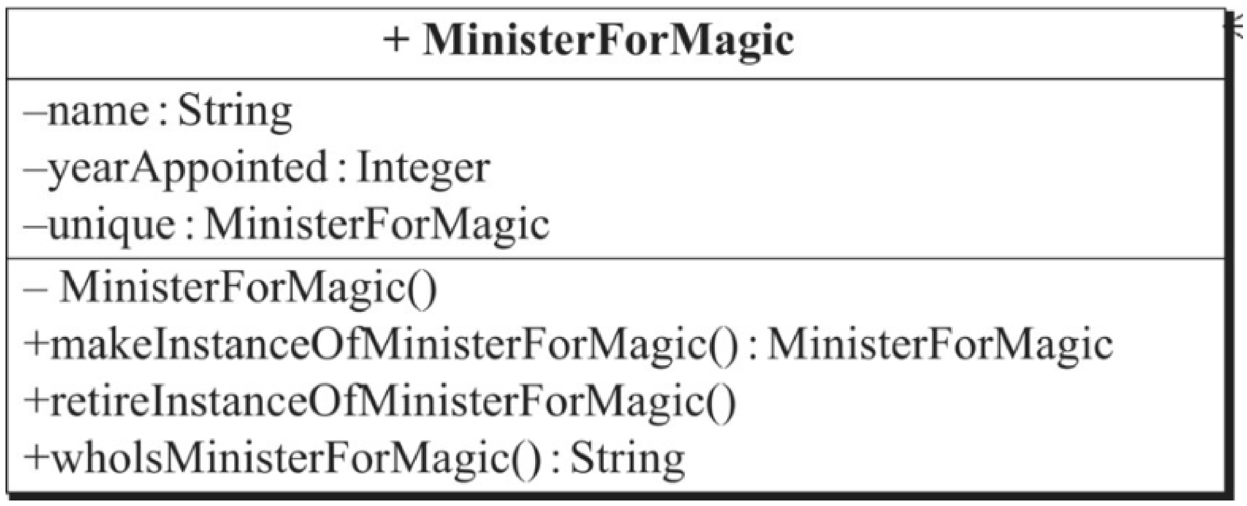
The correct answer is: The Factory Method



Hogwarts
A user interacts with the Hogwarts Java class to ask questions about DADA teaching at Hogwarts. The user must first specify the year he/she is interested in.
<<interface>>
DADA_State
getState()
getTeacher()
teacherPersonalityTraits()
terminationCoditions()
teacherBackground()
changeState() : DADA_State
TeachingDADA
state : DADA_State
getState() : DADA_State
getTeacher() : String
teacherPersonalityTraits() : String
teacherBackground() : String
terminationConditions()
DADA_Year1
DADA_Year2
DADA_Year3
DADA_Year4
DADA_Year5
DADA_Year6
DADA_Year7

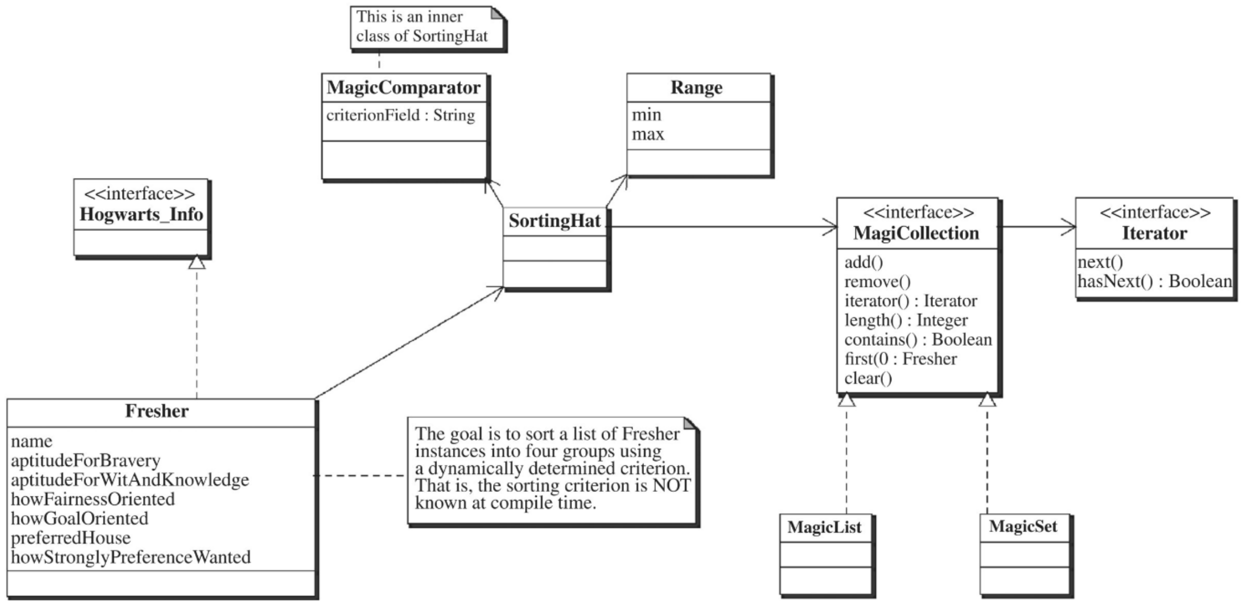
Your answer is incorrect.

The correct answer is: The State Pattern


+ MinisterForMagic
–name : String
–yearAppointed : Integer
–unique : MinisterForMagic
– MinisterForMagic()
+makeInstanceOfMinisterForMagic() : MinisterForMagic
+retireInstanceOfMinisterForMagic()
+whoIsMinisterForMagic() : String

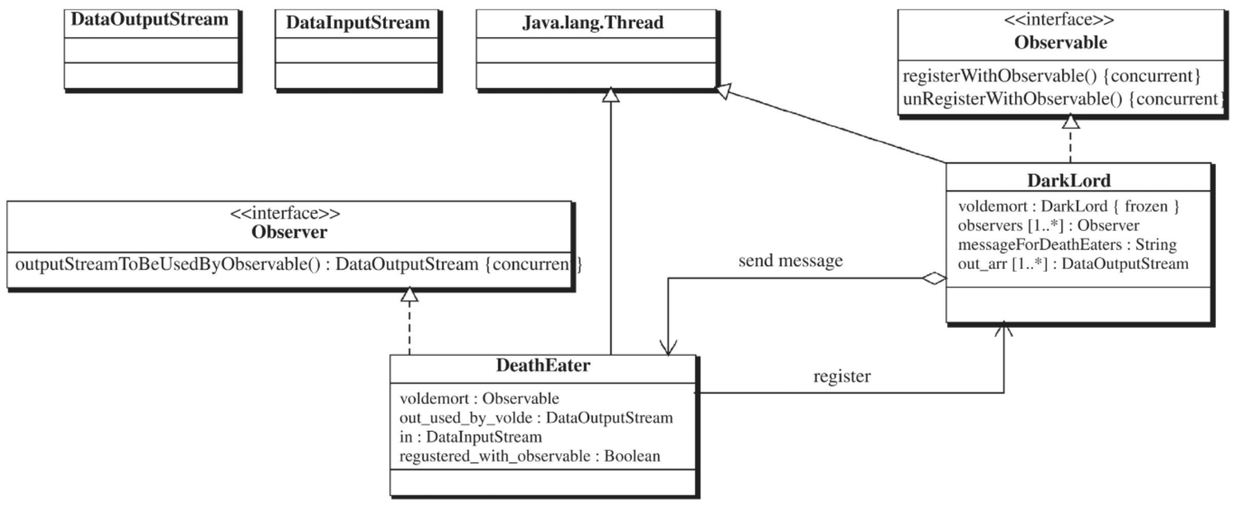
Your answer is correct.

The correct answer is: The Singleton Pattern



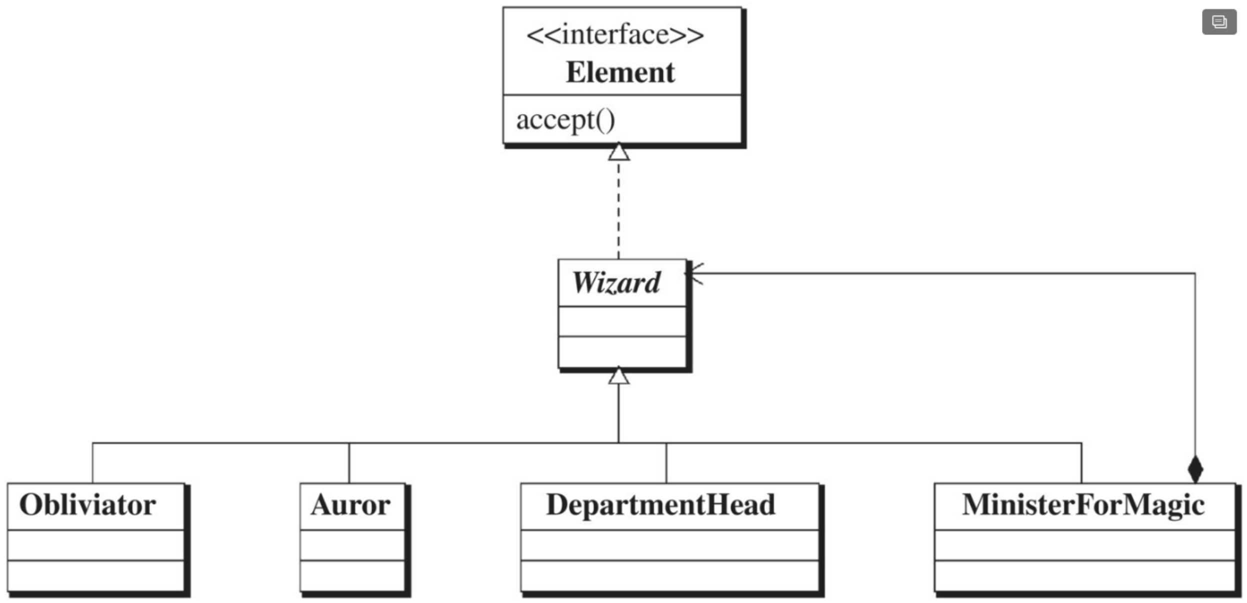
Your answer is correct.

The correct answer is: The Iterator Pattern


DataOutputStream
DataInputStream
Java.lang.Thread
<<interface>> Observable
registerWithObservable() {concurrent}
unRegisterWithObservable() {concurrent}
DarkLord
voldemort : DarkLord { frozen }
observers [1..*] : Observer
messageForDeathEaters : String
out_arr [1..*] : DataOutputStream
<<interface>> Observer
outputStreamToBeUsedByObservable() : DataOutputStream {concurrent}
send message
register
DeathEater
voldemort : Observable
out_used_by_volde : DataOutputStream
in : DataInputStream
regustered_with_observable : Boolean

Your answer is correct.

The correct answer is: The Observer Pattern



Your answer is correct.

The correct answer is: The Visitor Pattern