

OOP Exercises

1. Suppose that a Java class *A* extends another class *B*, and implements interface *If1*. *B* extends the abstract class *Ab* and implements interface *If2*.

(a) What are the requirements that *A* should meet, in terms of contracts with other classes and interfaces?

Answer:

(b) What are the requirements that *B* should meet, in terms of contracts with other classes and interfaces?

Answer:

2. For each of the following sets, construct a possible inheritance hierarchy of classes that model relationships of objects in the set - use your intuition and common sense; just draw pictures, nothing else. Some objects may not fit into any hierarchy that you construct – in that case, draw them as separate classes.

(a) {"Reading Material", Alphabet, Words, Paperback, "Hard Cover"}

(b) {Student, "Undergrad Student", "Grad Student", Freshman, "Doctoral Student", Animal, Bird, Professor, "Doctoral Degree"}

Answer:

3. Suppose you have two Java packages `edu.newpaltz.pds` and `edu.newpaltz.test`. *A* and *B* are in package `edu.newpaltz.pds`, *B* extends *A*. *C* and *D* are in `edu.newpaltz.test` and *C* extends *A*. If *A* has a method `f()` with default (package) access and a method `g()` with protected access, describe objects (of which classes) have access to `f()` and `g()`.

Answer:

Objects of type _____ have access to `f()`.

Objects of type _____ have access to `g()`.

4. Consider:

```
interface I1 {  
    public void f();  
}  
  
class A implements I1 {  
    public void f() {  
        //implementation  
    }  
    public static void g(){  
        //implementation  
    }  
}  
  
class B extends A {  
    public void f() {  
        //implementation  
    }  
    public static void g(){  
        //implementation  
    }  
}
```

Suppose

```
I1 i1=new B();  
I1 i2=new A();  
A a1= new A();  
A a2=new B();  
A b1= (A) new B();
```

Without writing any code, explain in words the effect of each of the following method calls. Just say things like "will call f method implemented in A" etc.

```
b1.f();  
b1.g();  
i1.f();  
a1.g();  
i2.f();  
a2.g();
```

Answer:

<i>method</i>	<i>will call</i>
b1.f();	
b1.g();	
i1.f();	
a1.g();	
i2.f();	
a2.g();	

5. Visibility Exercise.

Consider classes A through G:

```
package my.p1;
public class A {
    public int x;
    int y;
    protected z;
    private t;
    .....
}
class B {
    .....
}
class C extends A {
    ....
}
```

```
package my.p2;
import my.p1.A;
public class D extends A{
    .....
}
class E {
    .....
}
```

```
package my.p2.q1;
import my.p1.A;
public class F extends A{
    .....
}
class G {
    .....
}
```

Based on the structure of classes shown, fill in the following visibility diagram showing the visibility of members of class A to the other classes:

Modifier (applied to a member of A)	A	B	C	D	E	F	G
<i>public</i>	Y						
<i>private</i>	Y						
<i>protected</i>	Y						
<i>no modifier</i>	Y						

6. Draw a sequence diagram for checking out a movie from the Red Box console at your local grocery store. Assume the following sequence of actions.

The main screen has options Rent and Return.

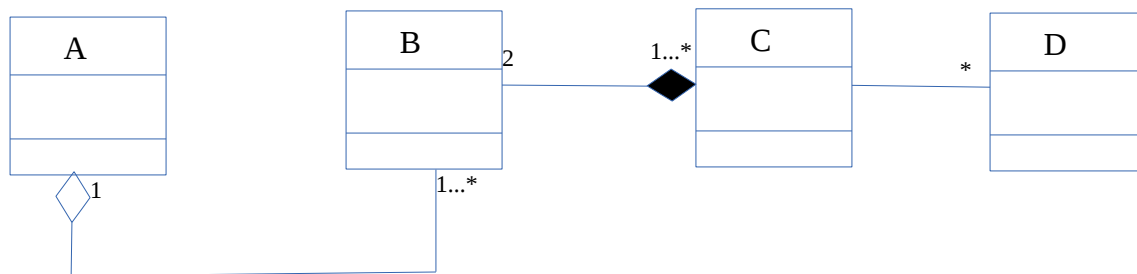
From the rent menu, one could browse the movies, select, and them to the cart.

To check out one should swipe the credit card and for security input the billing address zip code. Charge the credit card

Print a receipt

Deliver the movie to the customer

7. In the UML class diagram below, describe (in words) the relationship between various classes in as much detail as possible, including the multiplicities of associations in each case.



8. Suppose you have an elementary Java application, with a “loginGUI” class that presents the user with a login screen. The user inputs username and password, and on clicking “login” button, the “loginGUI” object calls a method , loginVerify(), in a “loginManager” object, with the input values as parameters. The “loginManager” checks username and password with a “dataBaseAccess” object with a checkAccess() method, and returns a string message to the “loginGUI” object. (Don't worry about the nature and handling of this string)
Write a sequence diagram for method calls between the three java classes “loginGUI” and “loginManager”and “dataBaseAccess”.