CS 1331 Exam 2 Practice

ANSWER KEY

- Signing signifies you are aware of and in accordance with the Academic Honor Code of Georgia Tech.
- Calculators and cell phones are NOT allowed.
- This is an object-oriented programming test. Java is the required language. Java is case-sensitive. DO NOT WRITE IN ALL CAPS. A Java program in all caps will not compile. Good variable names and style are required. Comments are not required.

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1. True or False
   In each of the blanks below, write “T” if the statement beside the blank is true, “F” otherwise.

   (a) T In Java, every class you write is a subclass of at least one other class.

   (b) T In a constructor, if an explicit super call is present, it must be the first statement in the constructor.

   (c) T If a class defines a single constructor, the constructor contains an implicit super call if no explicit super call is provided in the constructor.

   (d) T You can define a subclass of an abstract class without defining any of the abstract methods defined in the superclass.

   (e) T In a concrete class that implements an interface, you must provide definitions for all of the methods declared in the interface.

   (f) T Overloading a superclass method in a subclass means defining a method with the same name as the superclass method but with a different parameter list.

   (g) T protected members are visible to classes in the same package and to subclasses.

   (h) T private members are visible in the class in which they are defined, but not in subclasses.

   (i) T FileNotFoundException is a checked exception.

   (j) T In a try statement with multiple catch clauses, the first catch clause that can catch the exception thrown in the corresponding try block will be executed.
2. **Multiple Choice** Circle the letter of the correct choice.

   (a) In which package is `Object` from the standard library located?
       A. java.util
       B. java.lang
       C. java.text
       D. java.object

   (b) In a class named Pill, what is the correct declaration for a method that overrides the `equals` method defined in `Object`?
       A. public boolean equals(Pill other)
       B. public boolean equals(Object other)
       C. protected boolean equals(Pill other)
       D. protected static boolean equals(Object other)

   (c) A method declared in a superclass is said to be polymorphic in its subclasses if _______.
       A. the method is declared `final` in the superclass
       B. the method is overriden in the subclasses
       C. the method is overloaded in the subclasses
       D. the method chains to the superclasses using `super`

   (d) Which of the following features is required for a language to be called an object-oriented language?
       A. separate compilation
       B. dynamic method binding
       C. lazy evaluation
       D. higher-order functions

   (e) How many classes may a class extend?
       A. 0
       B. 1
       C. 2
       D. `[0, \infty)`
3. **Multiple Choice** Circle the letter of the correct choice.

Given the following class definitions:

```java
public abstract class Animal {
    public abstract void speak();
}

public class Mammal extends Animal {
    public void speak() {
        System.out.println("Hello!");
    }
}

public class Dog extends Mammal {
    public void speak() {
        System.out.println("Woof, woof!");
    }
}

public class Cat extends Mammal {
    public void speak() {
        System.out.println("Meow!");
    }
}
```

(a) Which of the following statements will **not** compile?

A. Animal mittens = new Cat();
B. Animal house = new Animal();
C. Animal farm = new Mammal();

(b) Which of the following statements will **not** compile?

A. Mammal fido = new Dog();
B. Dog fido2 = fido;
C. ((Mammal) fido).speak();

(c) Assuming the statement `Mammal fido = new Dog();` has been executed, what does `fido.speak()` print?

A. Hello!
B. Woof! Woof!
C. Meow!

(d) Assuming the statement `Mammal fido = new Dog();` has been executed, what does `((Mammal) fido).speak()` print?

A. Hello!
B. Woof! Woof!
C. Meow!

(e) Assuming the statement `Mammal sparky = new Mammal();` has been executed, which of the following statements will compile but cause a `ClassCastException` at run-time?

A. Mammal fido = new Dog();
B. Dog huh = (Dog) sparky;
C. Dog fido2 = (Dog) new Dog();
4. Tracing

Consider the following code:

```java
public class Wee {
    static void bar() throws Throwable {
        throw new Throwable("Wee!");
    }

    static void foo() throws Throwable {
        bar();
        System.out.println("Foo!");
    }

    public static void main(String[] args) {
        try {
            foo();
        } catch (Throwable t) {
            System.out.println(t.getMessage());
        }
        System.out.println("I’m still running.");
    }
}
```

What is printed when main is executed?

**Solution:**

```
Wee!
I’m still running.
```
Tracing

Given the following class definitions:

```java
public class Super {
    protected int x = 1;

    public Super() {
        System.out.print("Super");
    }
}

public class Duper extends Super {
    protected int y = 2;

    public Duper() {
        System.out.println(" duper");
    }
}

public class Fly extends Super {
    private int z, y;

    public Fly() {
        this(0);
    }

    public Fly(int n) {
        z = x + y + n;
        System.out.println(" fly times "+ z);
    }

    public static void main(String[] args) {
        Duper d = new Duper();
        int delta = 1;
        Fly f = new Fly(delta);
    }
}
```

What is printed when `Fly` is run?

- Super duper
- Super fly times 2
6. Short Answer

(a) Write the header for a class named `Foo` that extends a class called `Bar` and implements two interfaces, `Baz` and `Bang`.

**Solution:**
```
public class Foo extends Bar implements Baz, Bang
```

(b) Assume you have two variables of type `Foo` and `Foo` is properly written. The variables are named `f1` and `f2`. Write the expression that represents whether or not the objects that `f1` and `f2` reference have the same value, by the `Foo` class’s definition of equal value.

**Solution:**
```
f1.equals(f2) or f2.equals(f1)
```

(c) Assume you have two variables of type `Foo` and `Foo` is properly written. The variables are named `f1` and `f2`. Write the expression that represents whether `f1` is an alias of `f2`.

**Solution:**
```
f1 == f2 or f2 == f1
```

(d) Given that `FileInputStream`’s constructor throws `FileNotFoundException`, which is a subclass of `Exception`, write the header for a public method named `process` that takes a `String` parameter and returns nothing, and whose body instantiates a `FileInputStream` object and does not contain a try-catch statement.

**Solution:**
```
public void process(String file) throws FileNotFoundException
```

(e) Given a method declared as:
```
private void initFromFile(File empData) throws FileNotFoundException, IOException, ParseException
```
And the following declarations for the exception classes:
```
public class FileNotFoundException extends IOException
public class IOException extends Exception
public class ParseException extends Exception
```
Write a try-catch statement in which you call the `initFromFile` method and catch all the possible exceptions that might be thrown from `initFromFile`. Leave your catch clauses empty.

**Solution:**
```
try {
    initFromFile(new File(employeeDataFile)); // 1 pt. Call inside try
} catch (FileNotFoundException e) { // 1 pt. Must be before IOException
    // ...
} catch (IOException e) { // 1 pt.
    // ...
} catch (ParseException e) { // 1 pt. Can appear any order
    // ...
}
// No points off if they include a catch clause for Exception
```
7. Given the following class and interface definitions:

```java
public abstract class Pfunker implements Comparable {
    /**
     * LOLLYPOP < ATLANTEAN < CLONE < PILL < PYRAMID < FLASHLIGHT < ATOMIC_DOG
     */
    public enum Level {LOLLYPOP, ATLANTEAN, CLONE, PILL, PYRAMID, FLASHLIGHT, ATOMIC_DOG}
    private Level level;
    private String name;

    public Pfunker(String name, Level level) {
        this.name = name;
        this.level = level;
    }
}

public interface Comparable {
    /**
     * Compares this object with the specified object for order. Returns a
     * negative integer, zero, or a positive integer as this object is less
     * than, equal to, or greater than the specified object.
     */
    public int compareTo(Object o);
}
```

Write the minimum concrete class named `ConcretePfunker` which is a subclass of `Pfunker`. You compare one `Pfunker` to another by comparing their `levels`. The space provided is more than sufficient. You will not be given any scratch paper. Hints:

- You may want to use `Enum`'s `ordinal()` method, which "Returns the ordinal [int] of this enumeration constant (its position in its enum declaration, where the initial constant is assigned an ordinal of zero)."

- The body of the one non-constructor method you need to write can be done in one line.

```java
public class ConcretePfunker extends Pfunker {
    public ConcretePfunker(String name, Level level) {
        super(name, level);
    }

    public int compareTo(Object other) {
        return this.level.ordinal() - ((Pfunker) other).level.ordinal();
        // or return this.level.compareTo(((PFunker) other).level);
    }
}
```