Software Development (CS2514) Assignment 1

Inheritance (Specifications subject to change; Due: March 14th; Marks: 50)

**General Comments**

Please, carefully read the submission guidelines before you submit the assignment.  
This is an exercise about implementing *maintainable* classes. You should always assume the specifications may change (slightly) and you should make sure your implementation can implement these changes with the minimum amount of effort. Before you start implementing your classes, please make sure you understand the API. If you do, this’ll make your life much easier.

**Learning Objectives**

For this assignment you will learn about inheritance in Java. You will learn how to design a class hierarchy for Garments and Fabrics. You should start by studying the dependencies between the different Garment/Fabric classes, by working out which are the more general Garment/Fabric types, and by determining which Garment/Fabric types are more specific than other Garment/Fabric types. As part of this exercise you may have to introduce intermediate Garment/Fabric classes and other classes that aren’t mentioned in the specification. You will then translate your class hierarchy to a Java **inheritance**-based hierarchy, with the more general classes at the top of the hierarchy and the more specific classes at the bottom of the hierarchy. Please note that you are supposed to implement an **inheritance**-based hierarchy: you may not use interfaces or enumerated classes. Your aim should be to maximise code re-use in the hierarchy, so *don’t use copy-and-paste* to “implement” shared behaviour.

**Main Details**

In this assignment you will implement a Garment class hierarchy that has the class Garment sitting at the top of the hierarchy. Each garment also has a name, which is a proper English name of the garment. There are three kinds of Garments: *trousers, shirts,* and *coats.* Each garment has getName( ) behaviour, which returns the name of the garment. Garments also have printPurpose( ) behaviour. This behaviour prints the purpose of the garment. The following are the purposes of the garments.

**Trousers** Cover the legs; The only trousers at the moment are *jeans.*

**Shirts** Cover the body. The only shirt at the moment is a *t-shirt.*

**Coats** Provide extra protection against the elements. The only coats at the moment are: *winter coat, rain coat,* and *jacket.*

**Garment # of Units Fabric**

Jeans 2.0 cotton

T-Shirt 1.5 cotton

Winter coat 2.5 polyester

Rain coat 2.5 acrylic

Jacket 2.0 tweed

*Table1: Garments and the number of units of fabric which they’re made of*

**Natural Fabrics Price per Unit**

Cotton 2.0  
Tweed 3.0  
**Synthetic Fabrics Price per Unit**

Polyester 5.0  
acrylic 6.0

*Table2: Fabrics and their(made up)price per unit of fabric*

Each garment has a price which depends on the fabric which it is made of and the number of units of fabric which are needed to produce one item of the garment. A garment is made from a single *fabric,* which may be *natural* or *synthetic.*

**Natural fabrics** For natural fabrics (*tweed, cotton,* ...) the price of the garment is *c* × *u*, where *c* is the cost of the fabric per unit and *u* is the number of units of fabric which are needed to produce one item of the garment.

**Synthetic fabric** For synthetic fabrics, such as *polyester* and *acrylic,* the price of the garment is (*c* + *e*) × *u*, where *c* is the cost of the fabric per unit, *e* is the 2.0 Euro *environment tax* per unit of fabric, and *u* is the number of units of fabric which are needed to produce one item of the garment.

Table 1 lists each garment, the fabric which it’s made of, and the number of units of fabric which are needed to produce one item of garment. Table 2 lists the kind of each fabric (natural or synthetic) and the unit price of the fabric.

Natural fabrics also have a *source,* which provides additional information about the origin of the material. For example the source of tweed and cotton, which are the only natural fabrics, are wool for tweed and Gossypium for cotton. You get the source of a natural fabric with its getSource( )method. Synthetic fabrics don’t have a source.

Each garment can print an itemised bill of its name and price with a method called void printItemisedBill( ).

**Additional Implementation Details**

Please remember that your classes should respect encapsulation, so all class and instance attributes should be private. Using private attributes is part of the challenge. If you use attributes that are not private you can lose up to 50% of the marks.

Each class in your implementation should be in its own .java source file. Multiple classes per source file are not allowed. You may lose up to 50% of the marks if you submit files consisting of more than one class.

**Example**

The file Main-Assignment1.java which is posted on the CS2514 assignment section *Canvas* provides an example of a Main. The file OUTPUT-Assignment1 shows the output.

Your Main class should create instances of all garments listed in this assignment.

**Output**

jeans cover the legs

Itemised bill for jeans

Made of 2.0 units of cotton made of Gossypium

environment tax: 2.0 \* 0.0 = 0.0

base price: 2.0 \* 2.0 = 4.0

grand total: 2.0 \* 2.0 = 4.0