THE DECORATOR PATTERN

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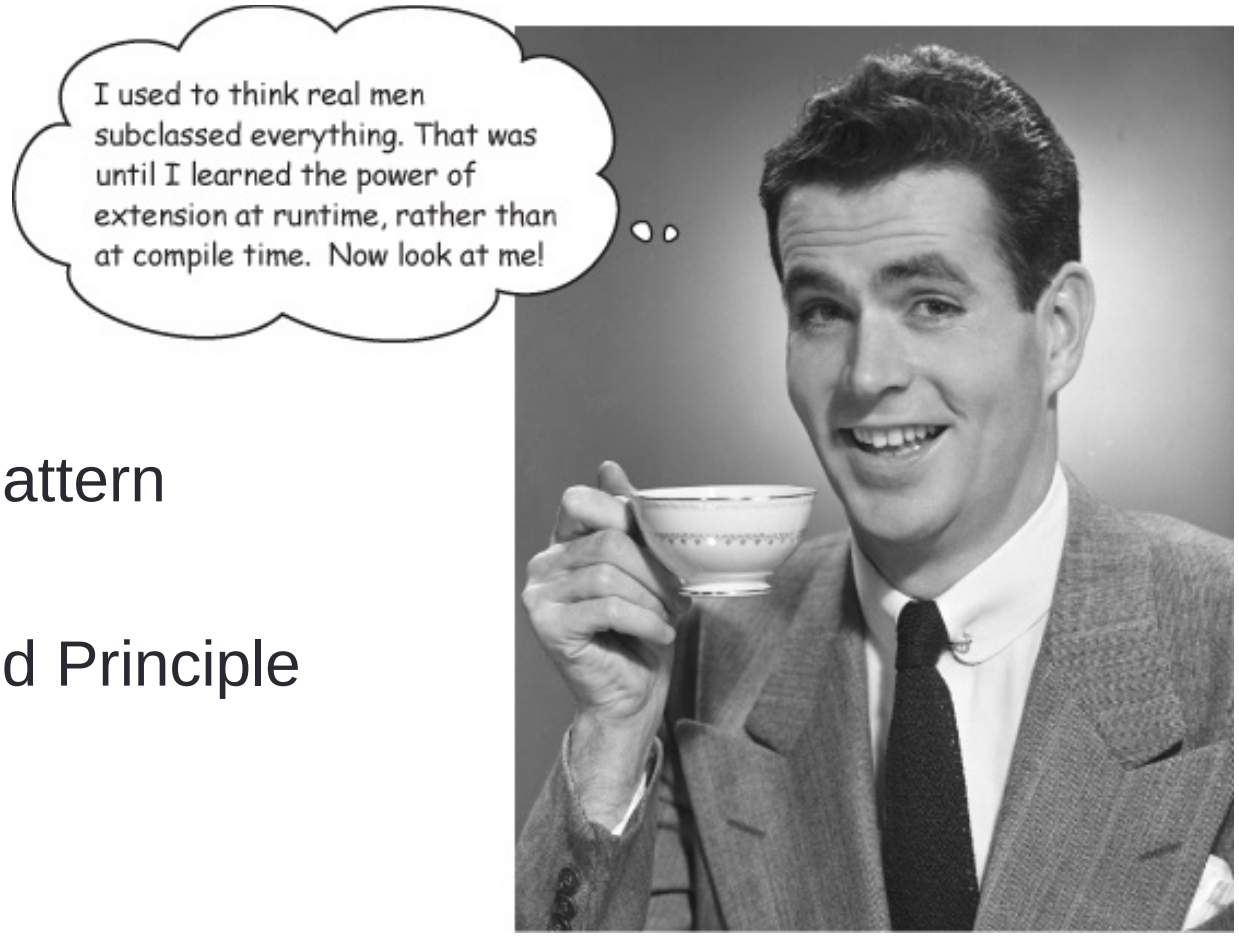
Week 2-1

Today …



- The Decorator Pattern
- The Open-Closed Principle

A Few Words of Caution!

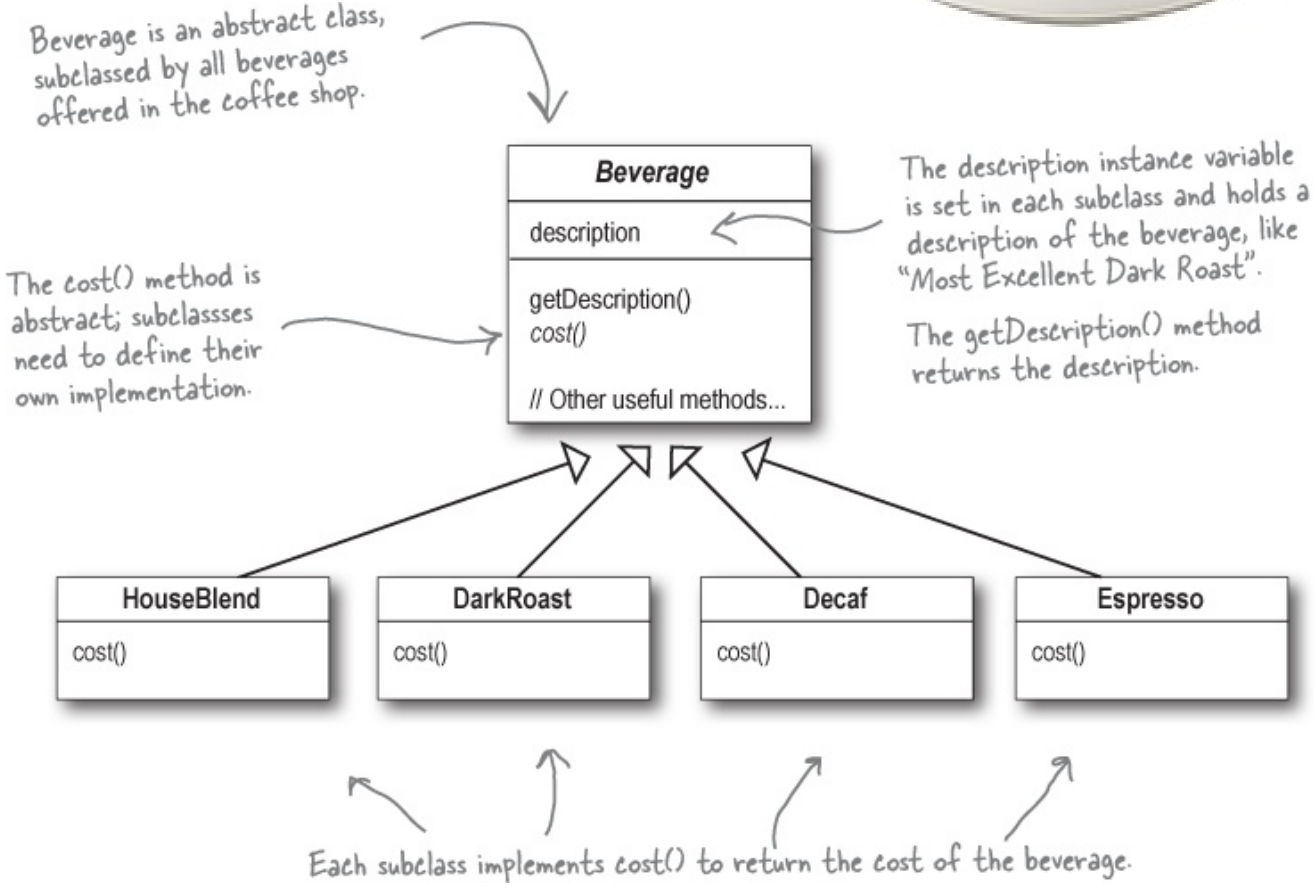
CSSE 374 is a technical course. If you do not pay attention during lectures, Lab/Homework can become a challenge.

Welcome to Starbuzz Coffee

Starbuzz Coffee - the fastest growing coffee shop around the world

Need to update their ordering systems to match their beverage offerings

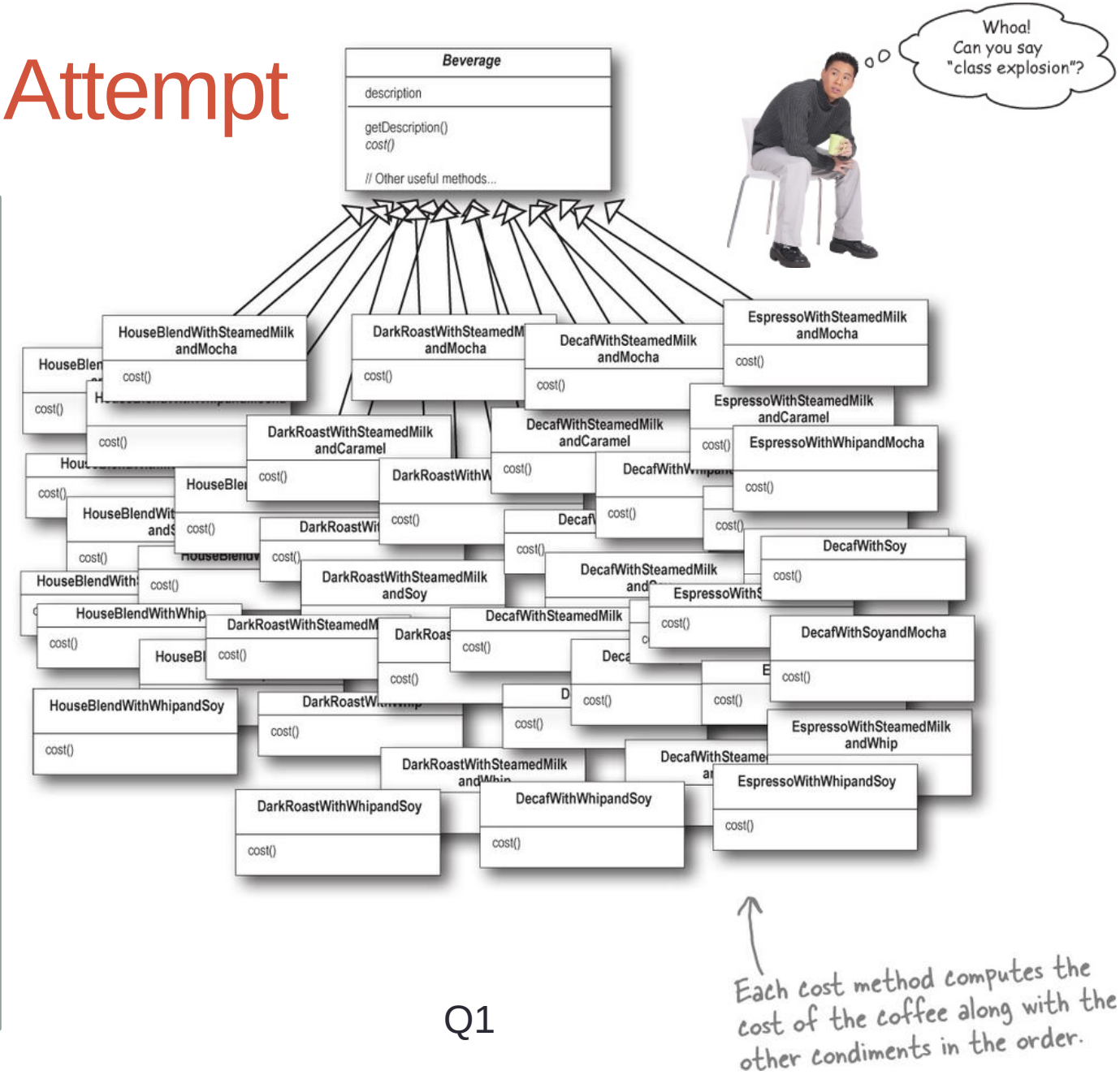
When they first went into business they designed their classes like this...



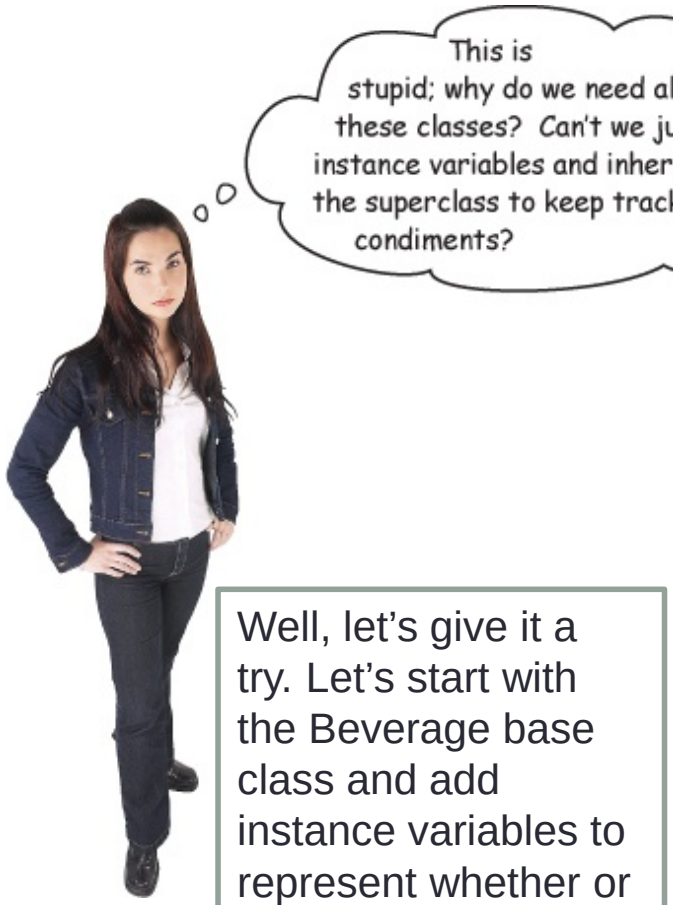
The First Attempt

In addition to your coffee, you can also ask for several condiments like steamed milk, soy, and mocha (otherwise known as chocolate), and have it all topped off with whipped milk.

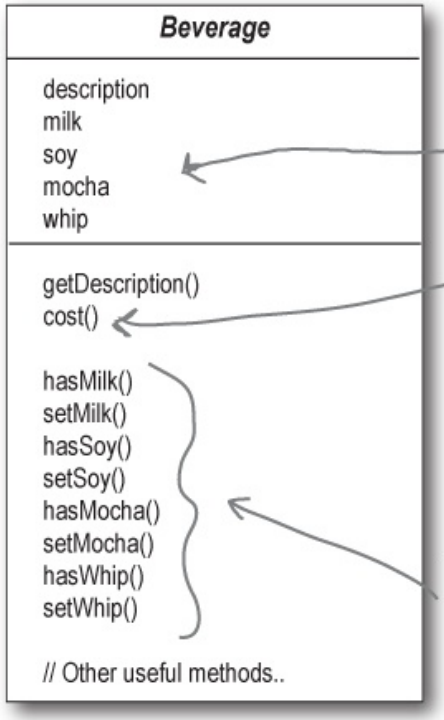
Starbuzz charges a bit for each of these, so they really need to get them built into their order system.



Next Attempt … 1/2



Well, let's give it a try. Let's start with the Beverage base class and add instance variables to represent whether or not each beverage has milk, soy, mocha, and whip...

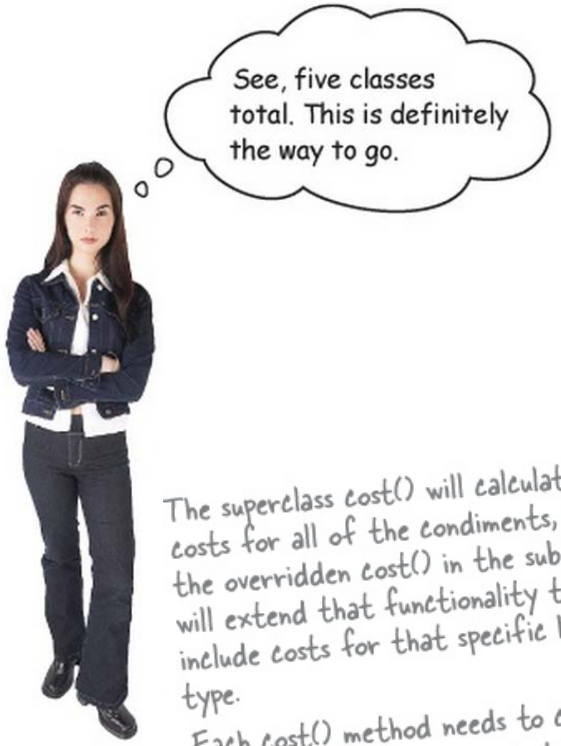


New boolean values for each condiment.

Now we'll implement cost() in Beverage (instead of keeping it abstract), so that it can calculate the costs associated with the condiments for a particular beverage instance. Subclasses will still override cost(), but they will also invoke the super version so that they can calculate the total cost of the basic beverage plus the costs of the added condiments.

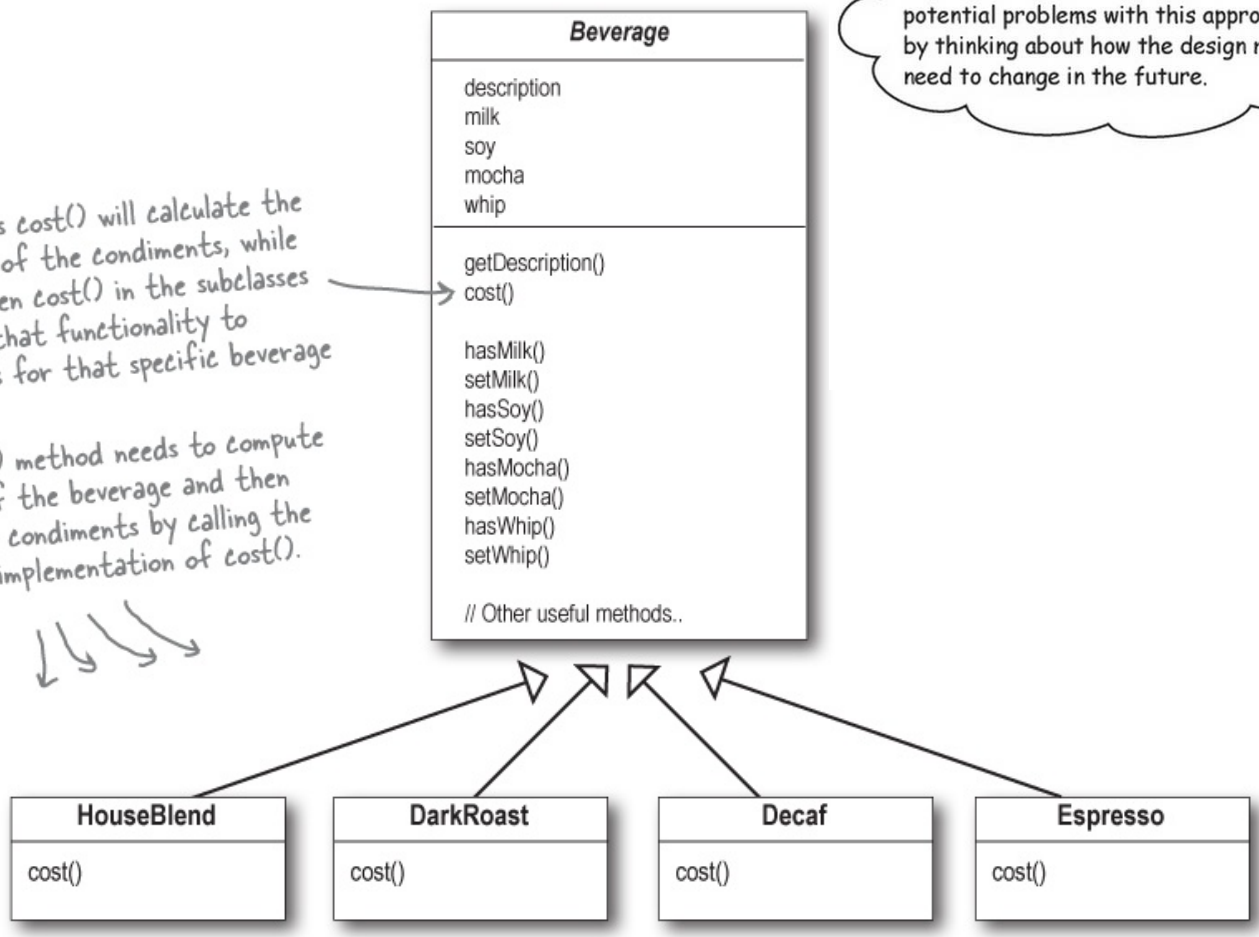
These get and set the boolean values for the condiments.

Next Attempt … 2/2



The superclass cost() will calculate the costs for all of the condiments, while the overridden cost() in the subclasses will extend that functionality to include costs for that specific beverage type.

Each cost() method needs to compute the cost of the beverage and then add in the condiments by calling the superclass implementation of cost().



Try Out: Implement Beverage.cost() and HouseBlend.cost()

The Open-Closed Principle

Design Principle:

Classes should be open for extension, but closed for modification.

Come on in; we're *open*. Feel free to extend our classes with any new behavior you like. If your needs or requirements change, just go ahead and make your own extensions.

Sorry, we're *closed*. That's right, we spent a lot of time getting this code correct and bug free, so we can't let you alter the existing code. It must remain closed to modification.

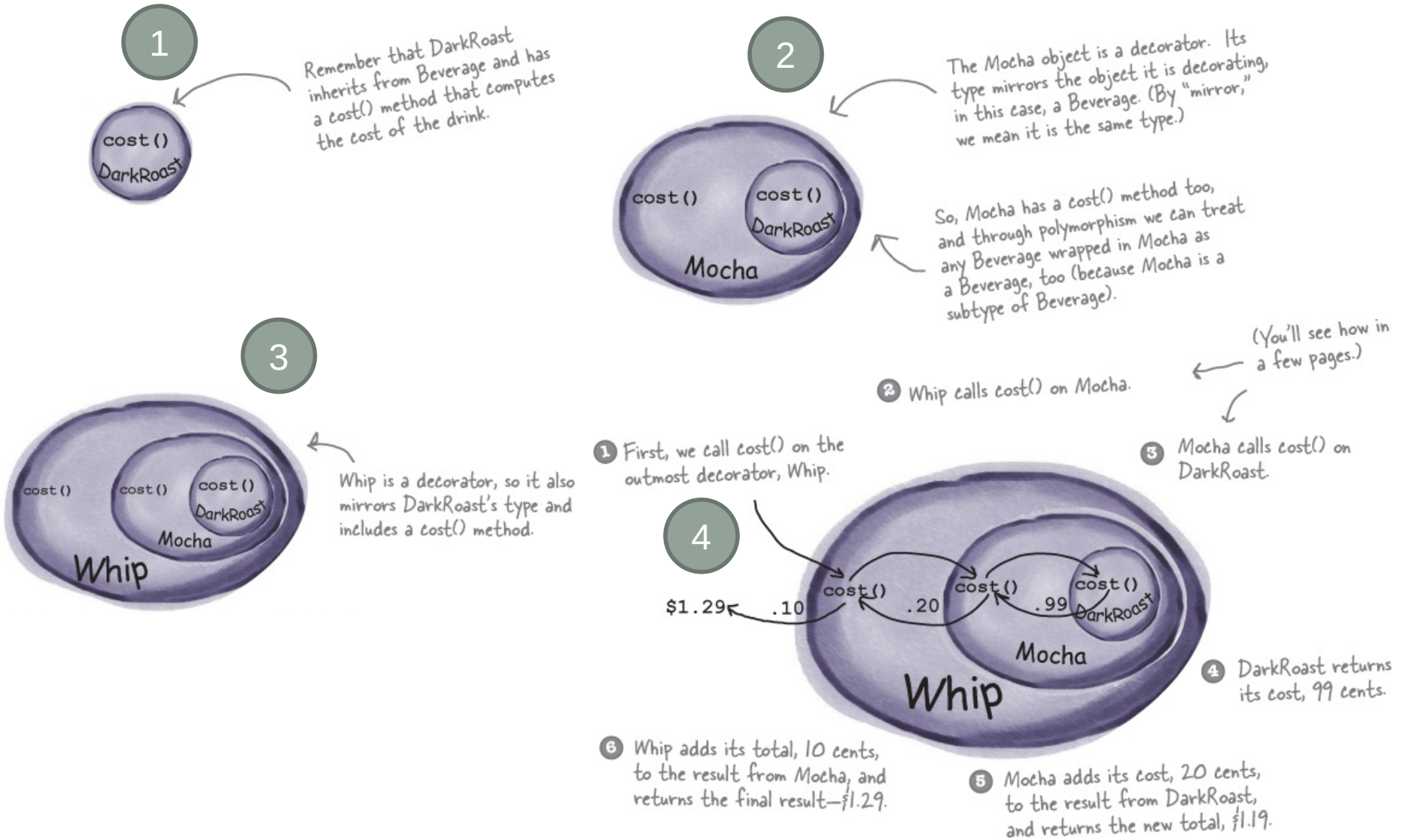
Be careful when choosing the areas of code that need to be extended; applying the Open-Closed Principle EVERYWHERE is wasteful and unnecessary, and can lead to complex, hard-to-understand code.

Meet the Decorator

Using inheritance so far, we got class explosions and rigid designs, or we added functionality to the base class that wasn't appropriate for some of the subclasses.

1. Take a DarkRoast object
2. Decorate it with a Mocha object
3. Decorate it with a Whip object
4. Call the cost() method and rely on delegation to add on the condiment costs

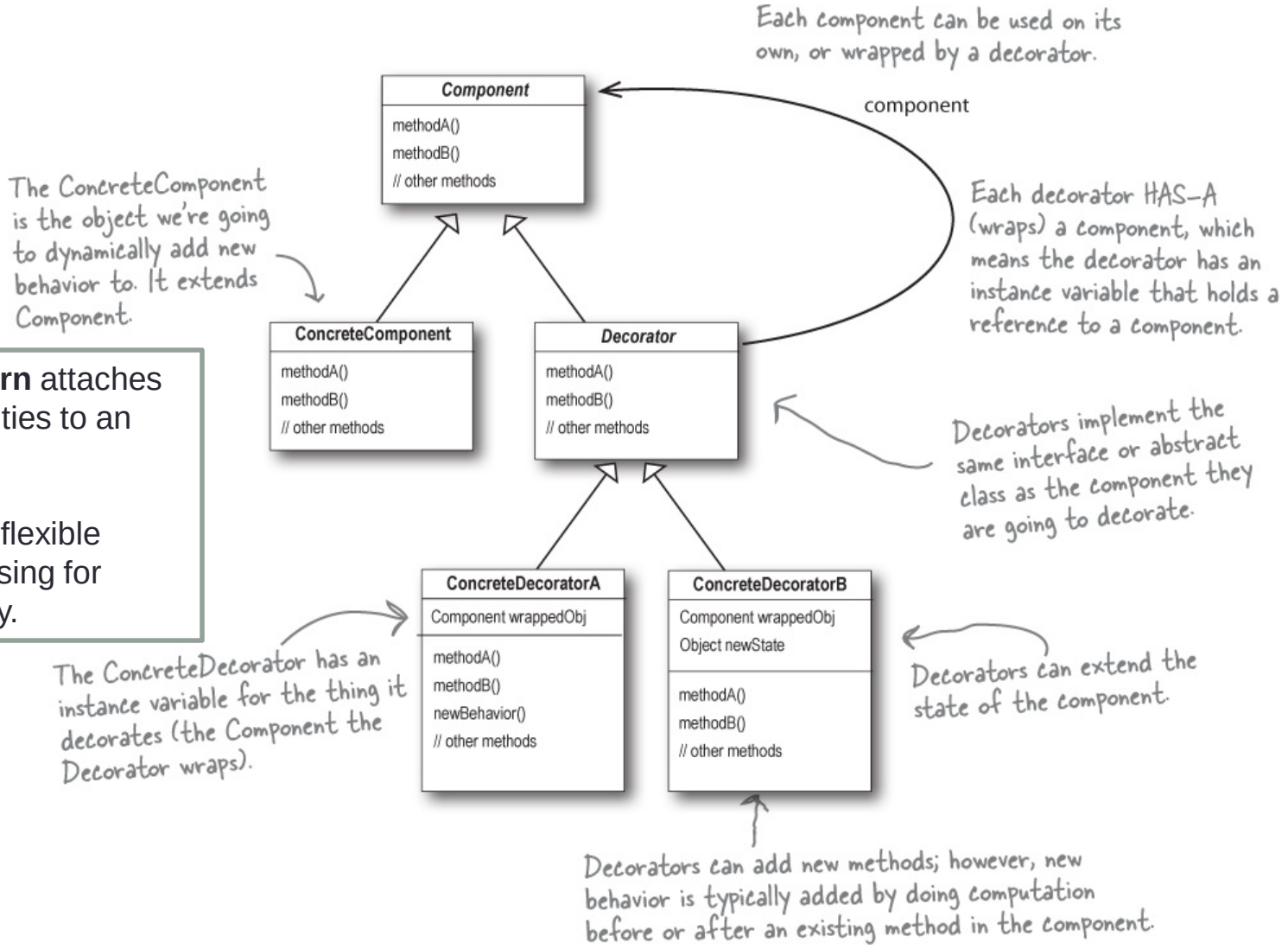
Constructing a drink order with Decorators



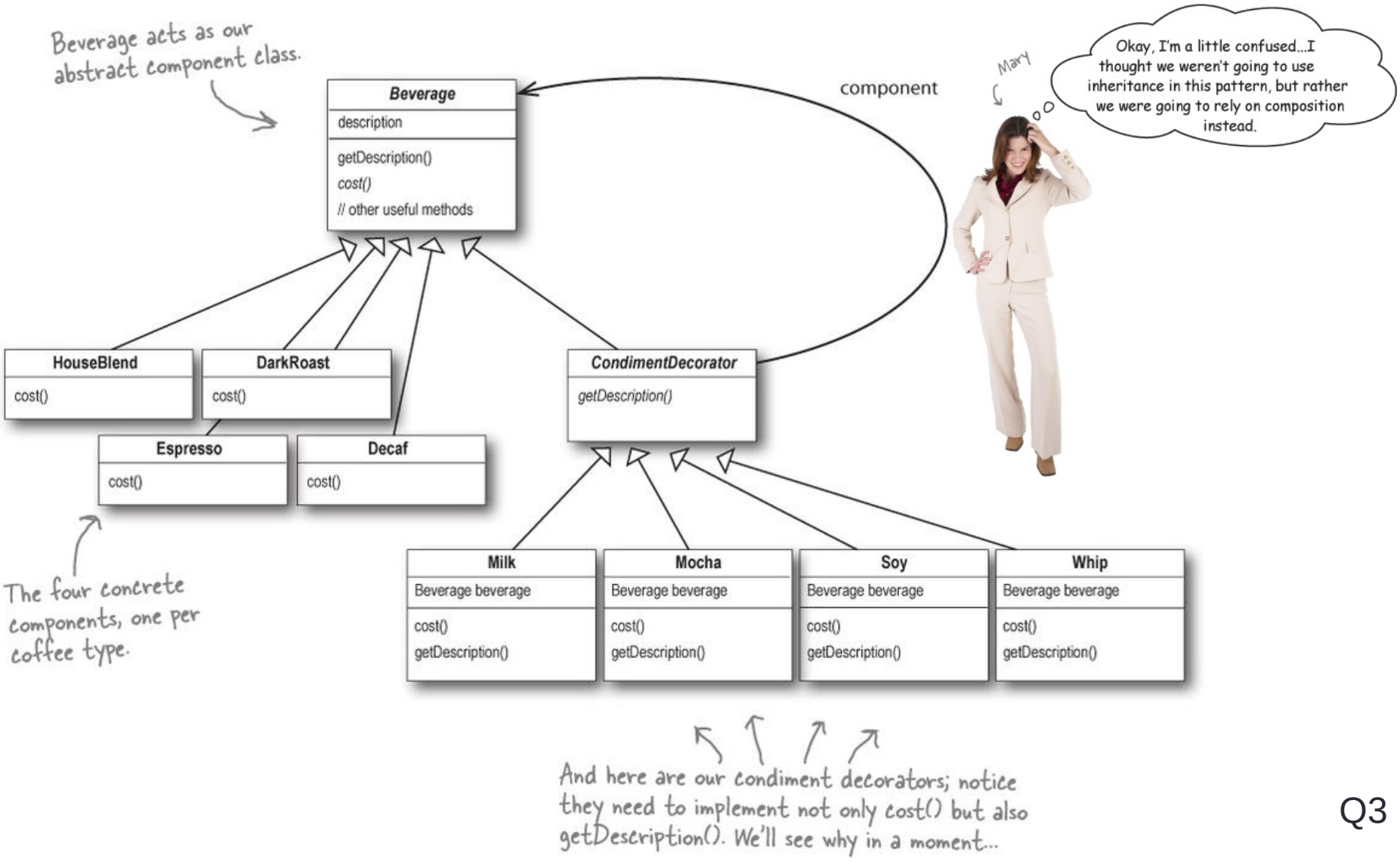
The Decorator Pattern Defined

The Decorator Pattern attaches additional responsibilities to an object dynamically.

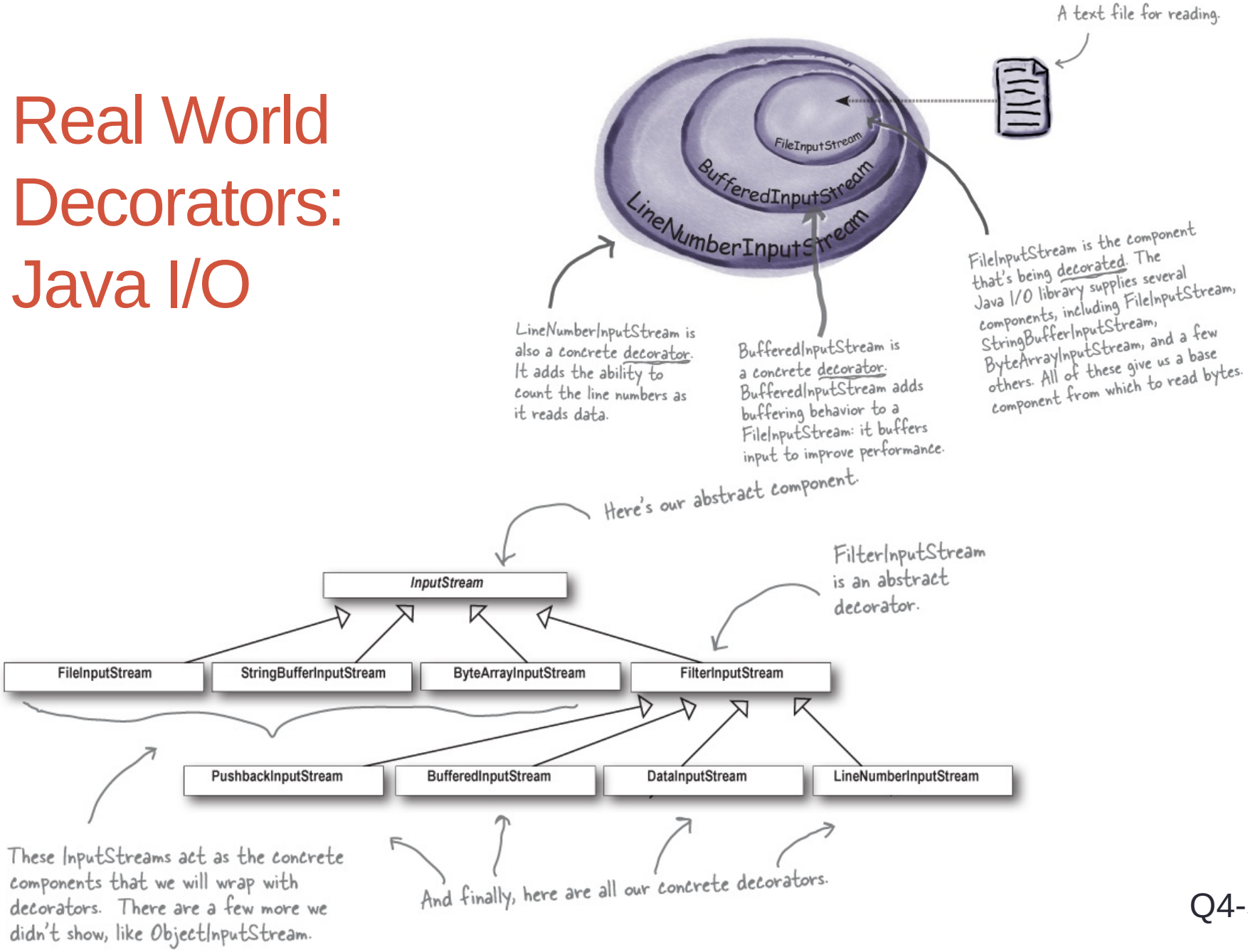
Decorators provide a flexible alternative to subclassing for extending functionality.



Decorating our Beverages



Real World Decorators: Java I/O



Recap

Design Principle:

Classes should be open for extension, but closed for modification.

Inheritance is one form of extension, but not necessarily the best way to achieve flexibility in our designs.

The Decorator Pattern provides an alternative to subclassing for extending behavior.

Decorators can result in many small objects in our design, and overuse can be complex.