Effective java notes

# Chapter 2. Creating and Destroying Objects

## ITEM 1: CONSIDER STATIC FACTORY METHODS INSTEAD OF CONSTRUCTORS

**One advantage** of static factory methods is that, unlike constructors, they have names. For example, the constructor BigInteger(int, int, Random), which returns a BigInteger that is probably prime, would have been better expressed as a static factory method named BigInteger.probablePrime.

**A second advantage** of static factory methods is that, unlike constructors, they are not required to create a new object each time they’re invoked. 静态方法的一个好处

**A third advantage** of static factory methods is that, unlike constructors, they can return an object of any subtype of their return type

**A fourth advantage** of static factories is that the class of the returned object can vary from call to call as a function of the input parameters

其实三四点可以归纳到一起，第三点是可以返回当前类的子类，第四点是根据输入的，创建不同的子类

**A fifth advantage** of static factories is that the class of the returned object need not exist when the class containing the method is written.

The **main** **limitation** of providing only static factory methods is that classes without public or protected constructors cannot be subclassed.

A **second shortcoming** of static factory methods is that they are hard for programmers to find.

## ITEM 2: CONSIDER A BUILDER WHEN FACED WITH MANY CONSTRUCTOR PARAMETERS

Disadvantage: the telescoping constructor pattern works, but it is hard to write client code when there are many parameters, and harder still to read it.

当一个类的参数过于多时，有些参数是optional的，难道需要针对每种情况都写一个constructer吗

Solution：

1.setter

public class NutritionFacts {

// Parameters initialized to default values (if any)

private int servingSize = -1; // Required; no default value

private int servings = -1; // Required; no default value

private int calories = 0;

private int fat = 0;

private int sodium = 0;

private int carbohydrate = 0;

public NutritionFacts() { }

// Setters

public void setServingSize(int val) { servingSize = val; }

public void setServings(int val) { servings = val; }

public void setCalories(int val) { calories = val; }

public void setFat(int val) { fat = val; }

public void setSodium(int val) { sodium = val; }

public void setCarbohydrate(int val) { carbohydrate = val; }

}

Unfortunately, the JavaBeans pattern has serious disadvantages of its own. Because construction is split across multiple calls, a JavaBean may be in an inconsistent state partway through its construction. The class does not have the option of enforcing consistency merely by checking the validity of the constructor parameters. Attempting to use an object when it’s in an inconsistent state may cause failures that are far removed from the code containing the bug and hence difficult to debug. A related disadvantage is that the JavaBeans pattern precludes the possibility of making a class immutable (Item 17) and requires added effort on the part of the programmer to ensure thread safety. It is possible to reduce these disadvantages by manually “freezing” the object when its construction is complete and not allowing it to be used until frozen, but this variant is unwieldy and rarely used in practice. Moreover, it can cause errors at runtime because the compiler cannot ensure that the programmer calls the freeze method on an object before using it.

总的来说就是线程不安全

2. Builder

public class NutritionFacts {

private final int servingSize;

private final int servings;

private final int calories;

private final int fat;

private final int sodium;

private final int carbohydrate;

public static class Builder {

// Required parameters

private final int servingSize;

private final int servings;

// Optional parameters - initialized to default values

private int calories = 0;

private int fat = 0;

private int sodium = 0;

private int carbohydrate = 0;

public Builder(int servingSize, int servings) {

this.servingSize = servingSize;

this.servings = servings;

}

public Builder calories(int val)

{ calories = val; return this; }

public Builder fat(int val)

{ fat = val; return this; }

public Builder sodium(int val)

{ sodium = val; return this; }

public Builder carbohydrate(int val)

{ carbohydrate = val; return this; }

public NutritionFacts build() {

return new NutritionFacts(this);

}

}

private NutritionFacts(Builder builder) {

servingSize = builder.servingSize;

servings = builder.servings;

calories = builder.calories;

fat = builder.fat;

sodium = builder.sodium;

carbohydrate = builder.carbohydrate;

}

}

**The Builder pattern simulates named optional parameters.**

**The Builder pattern is well suited to class hierarchies**

**// Builder pattern for class hierarchies**

public abstract class Pizza {

public enum Topping { HAM, MUSHROOM, ONION, PEPPER,

SAUSAGE }

final Set<Topping> toppings;

abstract static class **Builder<T extends Builder<T>>** {

EnumSet<Topping> toppings =

EnumSet.noneOf(Topping.class);

public T addTopping(Topping topping) {

toppings.add(Objects.requireNonNull(topping));

**return self();**

}

abstract Pizza build();

**// Subclasses must override this method to return**

**"this"**

**protected abstract T self();**

}

Pizza(Builder<?> builder) {

toppings = builder.toppings.clone(); // See Item 50

}

}

public class NyPizza extends Pizza {

public enum Size { SMALL, MEDIUM, LARGE }

private final Size size;

public static class Builder extends Pizza.Builder<Builder> {

private final Size size;

public Builder(Size size) {

this.size = Objects.requireNonNull(size);

}

@Override public NyPizza build() {

return new NyPizza(this);

}

@Override protected Builder self() { return this; }

}

private NyPizza(Builder builder) {

super(builder);

size = builder.size;

}

}

public class Calzone extends Pizza {

private final boolean sauceInside;

public static class Builder extends Pizza.Builder<Builder> {

private boolean sauceInside = false; // Default

public Builder sauceInside() {

sauceInside = true;

return this;

}

@Override public Calzone build() {

return new Calzone(this);

}

@Override protected Builder self() { return this; }

}

private Calzone(Builder builder) {

super(builder);

sauceInside = builder.sauceInside;

}

}

NyPizza pizza = new NyPizza.Builder(SMALL).addTopping(SAUSAGE).addTopping(ONION).build();

Calzone calzone = new Calzone.Builder() .addTopping(HAM).sauceInside().build();

The Builder pattern has disadvantages as well. In order to create an object, you must first create its builder. While the cost of creating this builder is unlikely to be noticeable in practice, it could be a problem in performance-critical situations.

## ITEM 3: ENFORCE THE SINGLETON PROPERTY WITH A PRIVATE CONSTRUCTOR OR AN ENUM TYPE

## ITEM 4: ENFORCE NONINSTANTIABILITY WITH A PRIVATE CONSTRUCTOR

包含多个静态方法的工具类constructor要private

## ITEM 5: PREFER DEPENDENCY INJECTION TO HARDWIRING RESOURCES

A simple pattern that satisfies this requirement is to pass the resource into the constructor when creating a new instance.

最简单的依赖注入

public class SpellChecker {

private static final Lexicon dictionary = ...;

private SpellChecker() {} // Noninstantiable

public static boolean isValid(String word) { ... }

public static List<String> suggestions(String typo) { ... }

}

public class SpellChecker {

private final Lexicon dictionary;

**public SpellChecker(Lexicon dictionary)** {

this.dictionary = Objects.requireNonNull(dictionary);

}

public boolean isValid(String word) { ... }

public List<String> suggestions(String typo) { ... }

}

## ITEM 6: AVOID CREATING UNNECESSARY OBJECTS

避免反复创建新的对象

String s = new String("bikini"); **// DON'T DO THIS!**

String s = "bikini";

**// Hideously slow! Can you spot the object creation?**

private static long sum() {

Long sum = 0L;

for (long i = 0; i <= Integer.MAX\_VALUE; i++)

sum += i;

return sum;

}

prefer primitives to boxed primitives, and watch out for unintentional autoboxing.

## ITEM 7: ELIMINATE OBSOLETE OBJECT REFERENCES

private Object[] elements;

public Object pop() {

if (size == 0)

throw new EmptyStackException();

return elements[--size];

}

public Object pop() {

if (size == 0)

throw new EmptyStackException();

Object result = elements[--size];

**elements[size] = null; // Eliminate obsolete reference**

return result;

}

## ITEM 8: AVOID FINALIZERS AND CLEANERS PREFER TRY-WITH-RESOURCES TO TRY-FINALLY

# Chapter 3. Methods Common to All Objects

## Item10 OBEY THE GENERAL CONTRACT WHEN OVERRIDING EQUALS

* Each instance of the class is inherently unique
* There is no need for the class to provide a “logical equality” test.
* A superclass has already overridden equals and the superclass behavior is appropriate for this class
* The class is private or package-private and you are certain that the equals method will never be invoked

When you override the equals method, you must adhere to its general contract. Here is the contract, from the specification for Object :

**Reflexivity**—The first requirement says merely that an object must be equal to itself.

**Symmetry**—The second requirement says that any two objects must agree on whether they are equal.

一个不满足的例子：

**public static void** main(String[] args) {  
 CaseInsensitiveString cis = **new** CaseInsensitiveString(**"Polish"**);  
 String s = **"polish"**;  
 System.***out***.println(cis.equals(s) + **" "** + s.equals(cis));  
}  
  
**private static class** CaseInsensitiveString {  
 **private final** String **s**;  
  
 **public** CaseInsensitiveString(String s) {  
 **this**.**s** = s;  
 }  
  
 @Override  
 **public boolean** equals(Object obj) {  
 **if** (obj **instanceof** CaseInsensitiveString) {  
 **return s**.equalsIgnoreCase(((CaseInsensitiveString) obj).**s**);  
 }  
  
 **if** (obj **instanceof** String) {  
 **return s**.equalsIgnoreCase((String) obj);  
 }  
 **return false**;  
 }  
}

**更有可能导致下面后果：**

List<CaseInsensitiveString> list = new ArrayList<>(); list.add(cis);

What does list.contains(s) return at this point? Who knows?

返回的结果和JDK的实现有关

**如何消除这种影响？**

**return** obj **instanceof** CaseInsensitiveString &&  
 ((CaseInsensitiveString) obj).**s**.equalsIgnoreCase(**s**);

**Transitivity**—The third requirement of the equals contract says that if one object is equal to a second and the second object is equal to a third, then the first object must be equal to the third. Again, it’s not hard to imagine violating this requirement unintentionally. Consider the case of a subclass that adds a new *value component* to its superclass. In other words, the subclass adds a piece of information that affects equals comparisons. Let’s start with a simple immutable two-dimensional integer point class:

**public class** Point {  
  
 **private final int x**;  
 **private final int y**;  
  
 **public** Point(**int** x, **int** y) {  
 **this**.**x** = x;  
 **this**.**y** = y;  
 }  
  
 @Override  
 **public boolean** equals(Object o) {  
 **if** (!(o **instanceof** Point))  
 **return false**;  
 Point p = (Point) o;  
 **return** p.**x** == **x** && p.**y** == **y**;  
 }  
}  
  
**public class** ColorPoint **extends** Point {  
 **private final** Color **color**;  
  
 **public** ColorPoint(**int** x, **int** y, Color color) {  
 **super**(x, y);  
 **this**.**color** = color;  
 }  
}

思考一下，这里的ColorPoint的equals方法要怎么写(类不同则一定不同)？

写法1：

*// Broken - violates symmetry!*@Override  
**public boolean** equals(Object o) {  
 **if**(!(o **instanceof** ColorPoint)){  
 **return false**;  
 }  
 **return super**.equals(o) && ((ColorPoint) o).**color** == **color**;  
}

The problem with this method is that you might get different results when comparing a point to a color point and vice versa. The former comparison ignores color, while the latter comparison always returns false because the type of the argument is incorrect. To make this concrete, let’s create one point and one color point:

其实主要是ColorPoint方法里写法有误，怎么修改？

*// Broken - violates transitivity!*@Override   
**public boolean** equals(Object o) {   
 **if** (!(o **instanceof** Point)) {  
 **return false**;  
 }  
 *// If o is a normal Point, do a color-blind comparison* **if** (!(o **instanceof** ColorPoint)){  
 **return** o.equals(**this**);  
 }   
 *// o is a ColorPoint; do a full comparison* **return super**.equals(o) && ((ColorPoint) o).**color** == **color**;   
}

其实这里的写法依然是错误的，违法的传递性，看下面的代码：

ColorPoint **p1** = **new** ColorPoint(1, 2, Color.***RED***);  
Point **p2** = **new** Point(1, 2);  
ColorPoint **p3** = **new** ColorPoint(1, 2, Color.***BLUE***);

**There is no way to extend an instantiable class and add a value component while preserving  
the equals contract**, unless you’re willing to forgo the benefits of object-oriented abstraction.

那么到底有没有方法可以解决这个问题：

You may hear it said that you can extend an instantiable class and add a value component while preserving the equals contract by using a getClass test in place of the instanceof test in  
the equals method:

参见[java中instanceof和getClass()的作用](https://www.cnblogs.com/aoguren/p/4822380.html)

修改Color里的equals方法：

*// Broken - violates Liskov substitution principle (page 43)*@Override   
**public boolean** equals(Object o) {  
 **if** (o == **null** || o.getClass() != getClass()) **return false**;  
 Point p = (Point) o;  
 **return** p.**x** == **x** && p.**y** == **y**;   
}

为什么这里违反了LSP原则？

LSP要求子类能够完全替换父类，但是ColorPoint却不再是Point类了，比如一个HashSet里包含多个Point，HashSet的contains方法用的是equals来判断，所以ColorPoint永远不会等于一个Point。

还有种方法，就是放弃继承：

public class ColorPoint {

private final Point point;

private final Color color;

}

There are some classes in the Java platform libraries that do extend an instantiable class and add a value component. For example, java.sql.Timestamp extends java.util.Date and adds  
a nanoseconds field. The equals implementation for Timestamp does violate symmetry and can cause erratic behavior

if Timestamp and Date objects are used in the same collection or are otherwise intermixed.

Note that you *can* add a value component to a subclass of  
an *abstract* class without violating the equals contract.

**Consistency**—The fourth requirement of the equals contract says that if two objects are equal, they must remain equal for all time unless one (or both) of them is modified.

**Non-nullity—**It says that all objects must be unequal to null.

知道了以上这些，那么到底该如何写equals方法：

1. **Use the == operator to check if the argument is a reference to this object.**

2. **Use the instanceof operator to check if the argument has the correct type.**

Instanceof 会检查null

3. **Cast the argument to the correct type.**

4. **For each “significant” field in the class, check if that field of the argument matches the corresponding field of this object.**

## ITEM 11: ALWAYS OVERRIDE HASHCODE WHEN YOU OVERRIDE EQUALS

**You must override hashCode in every class that overrides equals.**

**Contract:**

• When the hashCode method is invoked on an object repeatedly during an execution of an application, it must consistently return the same value

• If two objects are equal according to the equals(Object) method, then calling hashCode on the two objects must produce the same integer result.

• If two objects are unequal according to the equals(Object) method, it is *not* required that calling hashCode on each of the objects must produce distinct results.

A good hash function tends to produce unequal hash codes for unequal instances.

如何写hashcode：

Equals方法里没有比较的field就不需要写了

其实就是Array.hashcode里的方法，我们可以直接使用Objects.hash()，很方便

**int** prime = 31;  
**int** result = 1;  
result = prime \* result + ((firstName == **null**) ? 0 : firstName.hashCode());  
result = prime \* result + ((lastName == **null**) ? 0 : lastName.hashCode());  
**return** result;

## ITEM 12: ALWAYS OVERRIDE TOSTRING

## ITEM 13: OVERRIDE CLONE JUDICIOUSLY

**in practice, a class implementing Cloneable is expected to provide a properly functioning public clone method.**

## ITEM 14: CONSIDER IMPLEMENTING COMPARABLE

public interface Comparable<T> { int compareTo(T t);

}

The general contract of the compareTo method is similar to that  
of equals:  
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.

**Use of the relational  
operators < and > in compareTo methods is verbose and error-prone and no longer recommended.**

不推荐直接使用< >来进行比较

正确的比较方式：

**public int** compareTo(PhoneNumber pn) {  
 **int** result = Short.*compare*(areaCode, pn.areaCode); **if** (result == 0) {  
 result = Short.*compare*(prefix, pn.prefix);   
 **if** (result == 0)   
 result = Short.*compare*(lineNum, pn.lineNum);   
 }  
 **return** result;   
}

另一种方法

通过构造函数的形式

private static final Comparator<PhoneNumber> COMPARATOR = comparingInt((PhoneNumber pn) -> pn.areaCode)

.thenComparingInt(pn -> pn.prefix)

.thenComparingInt(pn -> pn.lineNum);

public int compareTo(PhoneNumber pn) { return COMPARATOR.compare(this, pn);

}

错误的一种形式：

*// BROKEN difference-based comparator - violates transitivity!*

**static** Comparator<Object> hashCodeOrder = **new** Comparator<>() {  
 **public int** compare(Object o1, Object o2) {   
 **return** o1.hashCode() - o2.hashCode();  
 }   
};

正确的形式：

*// Comparator based on static compare method***static** Comparator<Object> hashCodeOrder = **new** Comparator<>() {  
 **public int** compare(Object o1, Object o2) {  
 **return** Integer.*compare*(o1.hashCode(), o2.hashCode());  
 }  
};  
  
**static** Comparator<Object> hashCodeOrder =  
 Comparator.*comparingInt*(o -> o.hashCode());

In summary, whenever you implement a value class that has a sensible ordering, you should have the class implement  
the Comparable interface so that its instances can be easily sorted, searched, and used in comparison-based collections. When comparing field values in the implementations of

the compareTo methods, avoid the use of the < and > operators. Instead, use the static compare methods in the boxed primitive classes or the comparator construction methods in  
the Comparator interface.

# Chapter 4. Classes and Interfaces

## ITEM 15: MINIMIZE THE

## ACCESSIBILITY OF CLASSES AND

## MEMBERS

好处：

**Information hiding** is important for many reasons, most of which stem from the fact that it *decouples*the components that comprise a system, allowing them to be developed, tested, optimized, used, understood, and modified in isolation. This speeds up system development because components can be developed in parallel. It eases the burden of maintenance because components can be understood more quickly and debugged or replaced with little fear of harming other components. While information hiding does not, in and of itself, cause good performance, it enables effective performance tuning: once a system is complete and profiling has determined which components are causing performance problems (Item 67), those components can be optimized without affecting the correctness of others. Information hiding increases software reuse because components that aren’t tightly coupled often prove useful in other contexts besides the ones for which they were developed. Finally, information hiding decreases the risk in building large systems because individual components may prove successful even if the system does not.

The rule of thumb is simple: **make each class or member as inaccessible as possible.** In other words, use the lowest possible access level consistent with the proper functioning of the software that you are writing.

4种access levels注意package-private 和protected的区别

• **private**—The member is accessible only from the top-level class where it is declared.

• **package-private**—The member is accessible from any class in the package where it is declared. Technically known  
as *default* access, this is the access level you get if no access modifier is specified (except for interface members, which are public by default).

• **protected**—The member is accessible from subclasses of the class where it is declared (subject to a few restrictions [JLS, 6.6.2]) and from any class in the package where it is declared.

• **public**—The member is accessible from anywhere.

**it is wrong for a class to have a public static final array field, or an accessor that returns such a field.**

**// Potential security hole!**

public static final Thing[] VALUES = { ... };

private static final Thing[] PRIVATE\_VALUES = { ... }; public static final List<Thing> VALUES =

Collections.unmodifiableList(Arrays.asList(PRIVATE\_VALUES)) ;

or

private static final Thing[] PRIVATE\_VALUES = { ... }; public static final Thing[] values() {

return PRIVATE\_VALUES.clone(); }

## ITEM 16: IN PUBLIC CLASSES, USE ACCESSOR METHODS, NOT PUBLIC

## FIELDS

## ITEM 17: MINIMIZE MUTABILITY

对于不会改变的类，可以直接声明为final：

Immutable classes are easier to design, implement, and use than mutable classes. They are less prone to error and are more secure. To make a class immutable, follow these five rules:

声明这样的类需要遵循下面几点：

1. **Don’t provide methods that modify the object’s state .**

2. **Ensure that the class can’t be extended.**

3. **Make all fields final.**

4. **Make all fields private.**

5. **Ensure exclusive access to any mutable components.**

**Immutable objects are inherently thread-safe; they require no synchronization.**

**immutable objects can be shared freely.**

**The major disadvantage of immutable classes is that they require a separate object for each distinct value.**

Now that you know how to make an immutable class and you understand the pros and cons of immutability, let’s discuss a few design alternatives. Recall that to guarantee immutability, a class must not permit itself to be subclassed. This can be done by making the class final, but there is another, more flexible alternative. Instead of making an immutable class final, you can make all of its constructors private or package-private and add public static factories in place of the public constructors (Item 1). To make this concrete, here’s how Complex would look if you took this approach:

*// Immutable class with static factories instead of constructors***public class** Complex {  
 **private final double re**;  
 **private final double im**;  
  
 **private** Complex(**double** re, **double** im) {  
 **this**.**re** = re;  
 **this**.**im** = im;  
 }  
  
 **public static** Complex valueOf(**double** re, **double** im) {  
 **return new** Complex(re, im);  
 }  
}

**Constructors should create fully initialized objects with all of their invariants established.** Don’t provide a public initialization method separate from the constructor or static factory unless there is a *compelling* reason to do so.

总之给变量和方法加限定访问符的时候要尽量保守

## ITEM 18: FAVOR COMPOSITION OVER INHERITANCE

**Unlike method invocation, inheritance violates encapsulation**

To make this concrete, let’s suppose we have a program that uses a HashSet. To tune the performance of our program, we need to query the HashSet as to how many elements have been added since it was created (not to be confused with its current size, which goes down when an element is removed). To provide this functionality, we write a HashSet variant that keeps count of the number of attempted element insertions and exports an accessor for this count. The HashSet class contains two methods capable of adding elements, add and addAll, so we override both of these methods:

*// Broken - Inappropriate use of inheritance!***public class** InstrumentedHashSet<E> **extends** HashSet<E> { *// The number of attempted element insertions* **private int addCount** = 0;  
  
 **public** InstrumentedHashSet() {  
 }  
  
 **public** InstrumentedHashSet(**int** initCap, **float** loadFactor) {  
 **super**(initCap, loadFactor);  
 }  
  
 @Override  
 **public boolean** add(E e) {  
 **addCount**++;  
 **return super**.add(e);  
 }  
  
 @Override  
 **public boolean** addAll(Collection<? **extends** E> c) {  
 **addCount** += c.size();  
 **return super**.addAll(c);  
 }  
  
 **public int** getAddCount() {  
  
 **return addCount**;  
 }  
}

AddAll会调用add方法，导致错误

如果是直接添加新方法也会导致一些错误

Luckily, there is a way to avoid all of the problems described above. Instead of extending an existing class, give your new class a private field that references an instance of the existing class. This design is called *composition* because the existing class becomes a component of the new one. Each instance method in the new class invokes the corresponding method on the contained instance of the existing class and returns the results. This is known as *forwarding*, and the methods in the new class are known as *forwarding methods*.

**public class** InstrumentedSet<E> **extends** ForwardingSet<E> {  
 **private int addCount** = 0;  
 **public** InstrumentedSet(Set<E> s) { **super**(s);  
 }  
 @Override **public boolean** add(E e) { **addCount**++;  
 **return super**.add(e);  
 }  
 @Override **public boolean** addAll(Collection<? **extends** E> c) {  
 **addCount** += c.size();  
 **return super**.addAll(c); }  
 **public int** getAddCount() { **return addCount**;  
 }  
}

*// Reusable forwarding class***public class** ForwardingSet<E> **implements** Set<E> {   
 **private final** Set<E> **s**;  
 **public** ForwardingSet(Set<E> s) { **this**.**s** = s; }  
 **public void** clear() { **s**.clear(); }  
 **public boolean** contains(Object o) { **return s**.contains(o); } **public boolean** isEmpty() { **return s**.isEmpty(); } **public int** size() { **return s**.size(); }  
 **public** Iterator<E> iterator() { **return s**.iterator(); } **public boolean** add(E e) { **return s**.add(e); } **public boolean** remove(Object o) { **return s**.remove(o); } **public boolean** containsAll(Collection<?> c)  
 { **return s**.containsAll(c); } **public boolean** addAll(Collection<? **extends** E> c)  
 { **return s**.addAll(c); } **public boolean** removeAll(Collection<?> c)  
 { **return s**.removeAll(c); } **public boolean** retainAll(Collection<?> c)  
 { **return s**.retainAll(c); }  
 **public** Object[] toArray() { **return s**.toArray(); } **public** <T> T[] toArray(T[] a) { **return s**.toArray(a); } @Override **public boolean** equals(Object o)  
 { **return s**.equals(o); }  
 @Override **public int** hashCode() { **return s**.hashCode(); }  
 @Override **public** String toString() { **return s**.toString(); }  
}

Inheritance is appropriate only in circumstances where the subclass really is a *subtype* of the superclass. In other words, a class *B* should extend a class *A* only if an “is-a” relationship exists between the two classes. If you are tempted to have a  
class *B* extend a class *A*, ask yourself the question: Is every *B* really an *A*? If you cannot truthfully answer yes to this question, *B* should not extend *A*. If the answer is no, it is often the case that *B* should contain a private instance of *A* and expose a different API: *A* is not an essential part of *B*, merely a detail of its implementation.

There are a number of obvious violations of this principle in the Java platform libraries. For example, a stack is not a vector,  
so Stack should not extend Vector. Similarly, a property list is not a hash table, so Properties should not extend Hashtable. In both cases, composition would have been preferable.

## ITEM 19: DESIGN AND DOCUMENT FOR INHERITANCE OR ELSE

## PROHIBIT IT

## ITEM 20: PREFER INTERFACES TO ABSTRACT CLASSES

## ITEM 21: DESIGN INTERFACES FOR POSTERITY

Java8之后，在interface里添加方法可以用default关键字修饰了

## ITEM 22: USE INTERFACES ONLY TO DEFINE TYPES