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First, a note about Setters (ch. 3, § 3.2)

- Idea: Give syntax of field assignment but make interceptable by methods.

IMPHO, if a field foo is to be (re-)settable from outside then it is not derived data. It is primary data, so should be a class argument private var _foo

You can write a public setter def setFoo(newFoo: Bar): Unit = _foo = newFoo

Scala Special Syntax:
def foo_=(newFoo: Bar): Unit = _foo = newFoo

Instead of obj.setFoo(bar) can now write simply obj.foo = bar

The foo_= method name is "magic syntax" for any field name in place of foo.

Can rewrite the method body (or override it in a subclass) to do further checks and updates, as may become needed, while never breaking client syntax.
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Scala Symbolic Names

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  \[ + - * / \% \mid \& \sim \sim ! \lt \gt = \? \$ \backslash : \quad \text{Also} \quad @ \# \]
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- We’ve already used the triple-char operators ::= and += and :+= for prepending and appending. The text covers related ones on pages 189–199.
Think of Inheritance as “up/down.”
Three Dimensions of Polymorphism (§§ 3.5, 4.2, 4.3)

- Think of Inheritance as “up/down.”
- Case classes are horizontal—in the sense of not inheriting from each other.

Example code: RealOrComplex.scala (for all these slides).
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Multiple Inheritance and the Diamond Problem

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- A UB_Student is a UB_Person. It (the class) inherits the UB_ID and name fields. The UB_ID is immutable, but the name is mutable, so a UB_Student instance has its own copy of name. It also defines a method updateAccount.
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But which version of the field and method is inherited?
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**But which version of the field and method is inherited?**

- Of course, *good code* would avoid clashes, but in order to troubleshoot *bad code*, we need to specify rules and behavior subject to those rules.
Diamond-Avoidance Policies

- C++ recycles the `virtual` keyword to require all but one of the inherited classes to not be primary lookup.
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- In both Java and Scala, a subclass can inherit only one *class*. 

A Scala *trait* is like a Java interface but allowed to have method bodies and some kinds of data. Disallows class arguments... except Scala 3 will allow them. Uses linearization to disambiguate. This constructs a linear order of inheritance for any concrete class. Goes in reverse order. Example NewCar.scala
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The NewCar example shows that the runtime system will look “down” for a superclass method, but then “bounce up” to re-poll the actual class of the invoking object, in this case newCar, then look down again...
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Case classes give ways to avoid this problem when hierarchy is really not needed.
Rectangle Versus Square, Part Deux (text end of §4.3)

- An *immutable* Square “Is-A” immutable Rectangle
An immutable Square “Is-A” immutable Rectangle

How about Array[Square] “Is-A” Array[Rectangle]?
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- Problem: the array itself is mutable:

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val as = //create a new Array[Square]
var ar: Array[Rectangle] = as //compile error!
ar = ar :+ new Rectangle(3.0,4.0) //that’s why
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An immutable Square “Is-A” immutable Rectangle

How about Array[Square] “Is-A” Array[Rectangle]?

Problem: the array itself is mutable:

```scala
case class Square(x: Double, y: Double)
case class Rectangle(x: Double, y: Double, width: Double, height: Double)

val as = //create a new Array[Square]
var ar: Array[Rectangle] = as //compile error!
ar = ar :+ new Rectangle(3.0,4.0) //that’s why
```

So Array[Square] is not a subtype of Array[Rectangle]

Can work around by writing generic methods or classes with type parameter [A <: Rectangle], so that we can instantiate Array[A] as either Array[Rectangle] or Array[Square].