



COMP90041 Programming and Software Development

Tutorial 8 Inheritance

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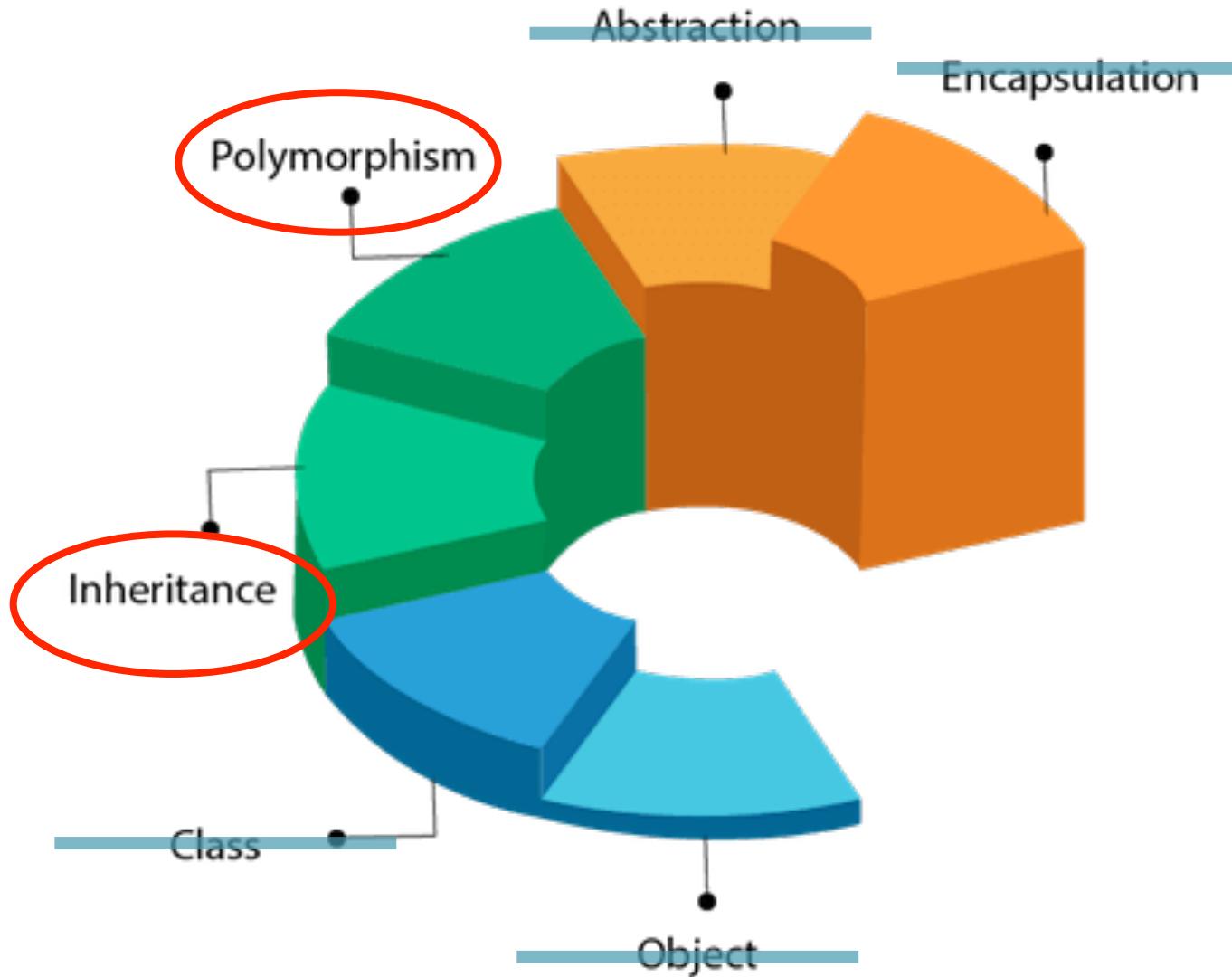


Overview

1. Type hierarchies(inheritance)
2. Method dispatch(late binding)
3. Exercise



OOP(object-oriented programming) Properties





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1. Type hierarchies (inheritance)



Types in Java

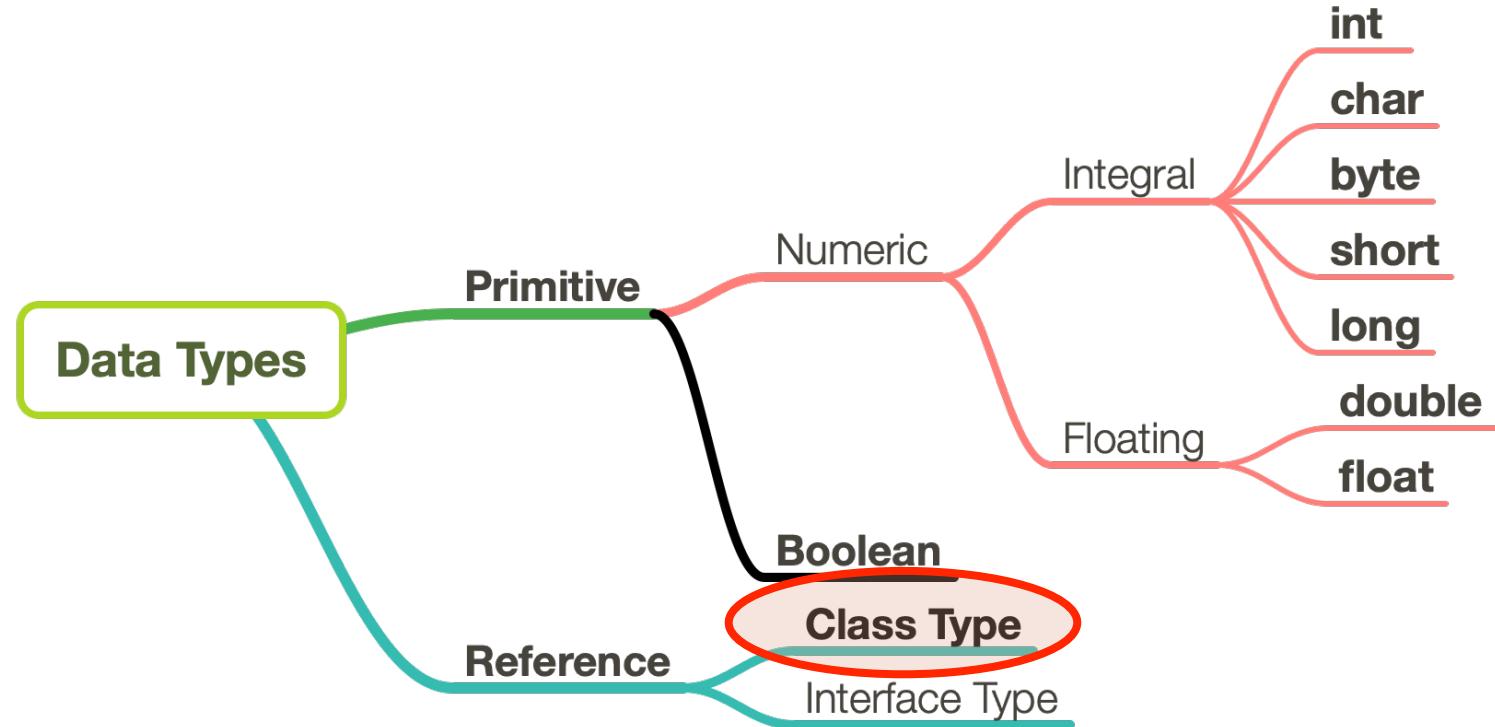
Java Class

1. Define a type

```
Employee e;
```

2. Create an object

```
e = new Employee();
```

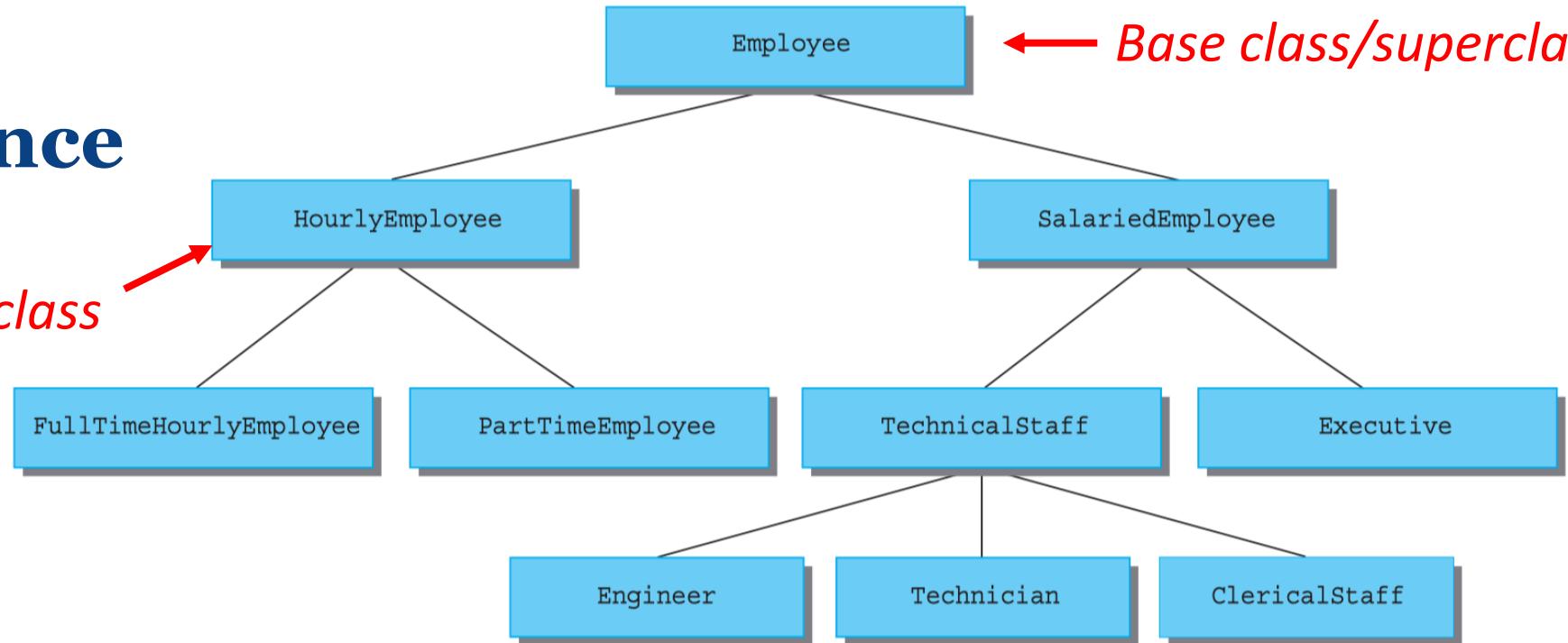




Inheritance

Derived class/subclass

← Base class/superclass



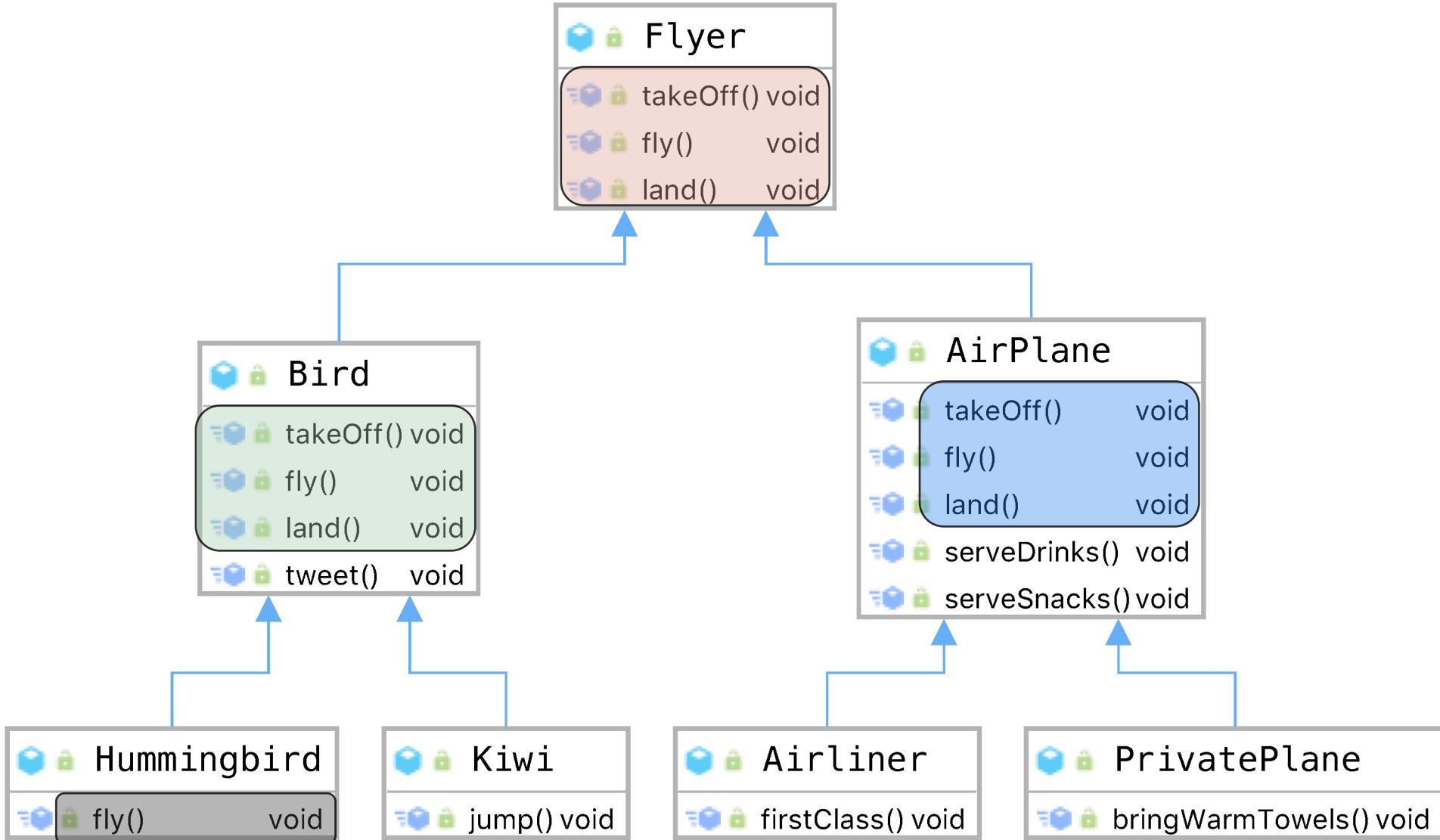
Shared attributes & methods!



- ✓ the ability of **building classes based on an existing class**
- ✓ so that they can have **inherited**(shared) data and methods, or further **adding/changing** methods



Another Example





Method Overriding VS Method Overloading

Method Overriding

a subclass can supply its **own implementation** for a method that also exists in the superclass.

```
public class Flyer {  
    ...  
    public void takeOff(){  
        System.out.println("takeoff from flyer class");  
    }  
    ...  
}
```

```
public class Bird extends Flyer{  
    ...  
    public void takeoff(){  
        System.out.println("takeoff from bird class");  
    }  
    ...  
}
```

Method Overloading

two methods have the **same name** but with different parameter lists
(only the types of the parameters matter)

```
public double computeGPA(double sub1, double sub2)  
public double computeGPA(int studentID)
```



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2. Method dispatch (late binding)



Method Dispatch

A subclass can

- ✓ Inherit all data & methods from its superclass
- ✓ Override methods that exist in superclass already
- ✓ Add extra methods in its own class

Method Dispatch

- ✓ Deciding which method to call (which implementation to use)



Apparent and actual types

```
Flyer f; //declare an object f
```

```
f = new Airplane(); // instantiate the object
```

```
Flyer f = new Airplane();
```



Declared/apparent type

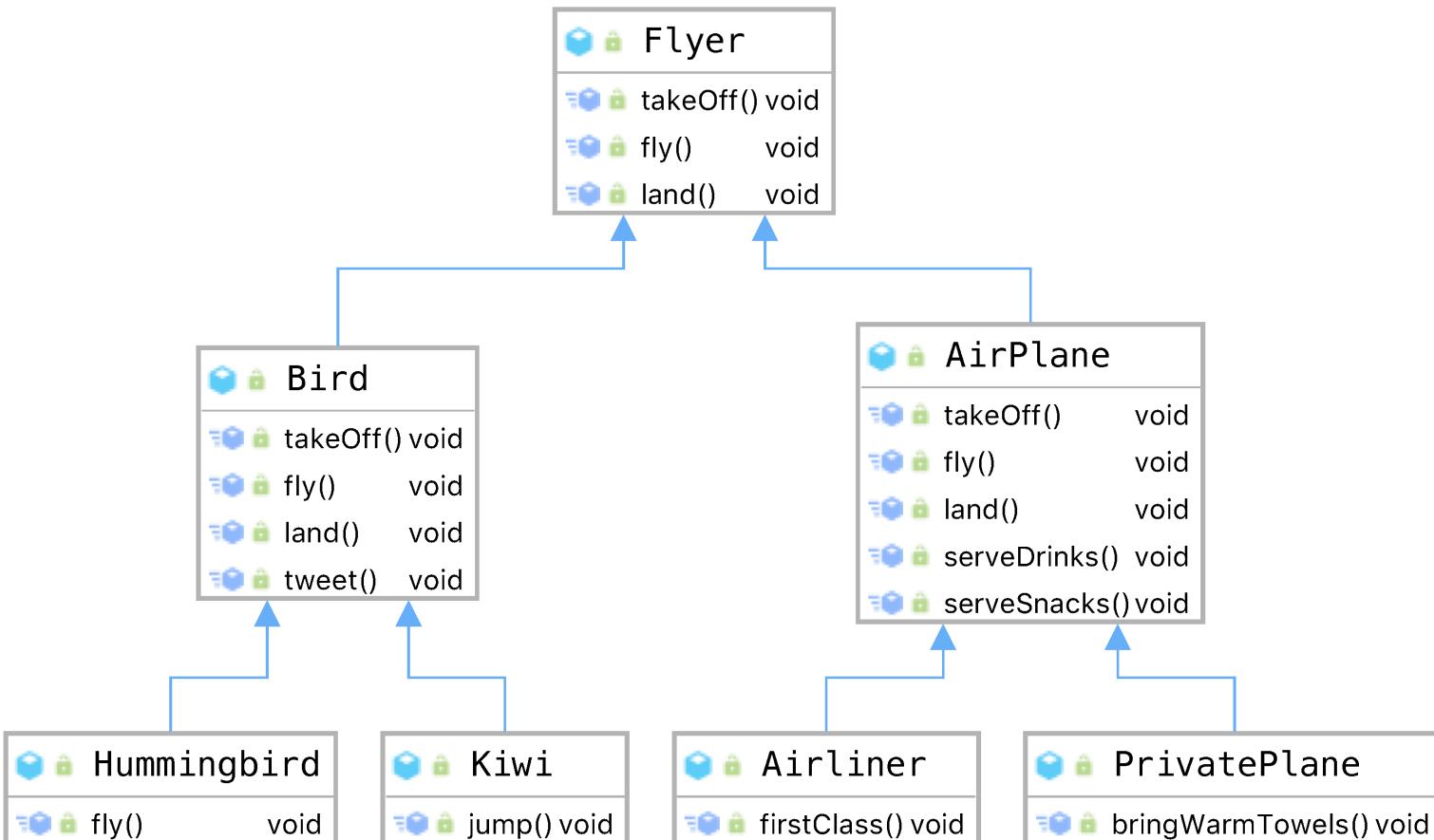
determines what the object can do
(what are methods available to the object)

actual/instantiated type

determines how the object will behave
(Which method implementation will be used)

*Java's ***method dispatch starts at the instantiated/actual type***, meaning that it first looks in the instantiated type for the implementation, and then looks up the hierarchy until it finds an implementation.

Questions



```

Flyer f = new Flyer();
Bird b = new Bird();
Kiwi k = new Kiwi();

PrivatePlane p = new PrivatePlane();

// which of the below statements are valid?

1. f.fly(); ✓
2. f.bringWarmTowels(); ✗
3. f(tweet()); ✗
4. b.takeOff(); ✓
5. b.jump(); ✗
6. k.jump(); ✓
7. k(tweet()); ✓
8. p.serveDrinks(); ✓
9. p.bringWarmTowels(); ✓
  
```

The code snippet at the top defines objects of the **Flyer**, **Bird**, **Kiwi**, and **PrivatePlane** classes. Below this, a series of numbered statements are presented, each followed by a green checkmark or a red X. The statements are:

- `f.fly();` ✓
- `f.bringWarmTowels();` ✗
- `f(tweet());` ✗
- `b.takeOff();` ✓
- `b.jump();` ✗
- `k.jump();` ✓
- `k(tweet());` ✓
- `p.serveDrinks();` ✓
- `p.bringWarmTowels();` ✓



Question

```
public class Flyer {  
    ...  
    public void takeOff(){  
        System.out.println("takeoff from flyer class");  
    }  
    ...  
}
```

```
public class Bird extends Flyer{  
    ...  
    public void takeoff(){  
        System.out.println("takeoff from bird class");  
    }  
    ...  
}
```

What is the output?

```
Flyer f = new Bird();  
f.takeoff();
```

takeoff from bird class



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3. Exercise



Tutorial Exercise

1. Write a java **Shoe** class. Every shoe should have a color (String), designer (String) and size (float). Your class should provide all the usual methods (i.e. constructors, accessors and mutators).
2. Write a java **DressShoe** class. In addition to the attributes listed above, a dress shoe should have a heel type that is one of: pump, heel, or flat.



Homework

3. Write a java **TennisShoe** class. In addition to the attributes listed for **Shoe**, tennis shoes should have a sole type and canvas type, both Strings.
4. Write a java **Boot** class. In addition to the attributes listed for **Shoe**, boots should have a heel type that is one of: pump, heel, or flat.
5. Add a **toString** and **equals** methods to each of these classes.
6. Define an enum to represent heel type, ensuring that only valid heel types are used in both the **DressShoe** and **Boot** classes. Where no heel type is known, assume it is a heel.

Hint: you can define an enum type in a separate file much as you would define a class. Just use the word **enum** in place of **class**, and list the enum constants between the braces instead of instance variables and methods.



Thank you





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