THE UNIVERSITY OF MELBOURNE

COMP90041 Programming and Software Development

Tutorial 8 Inheritance

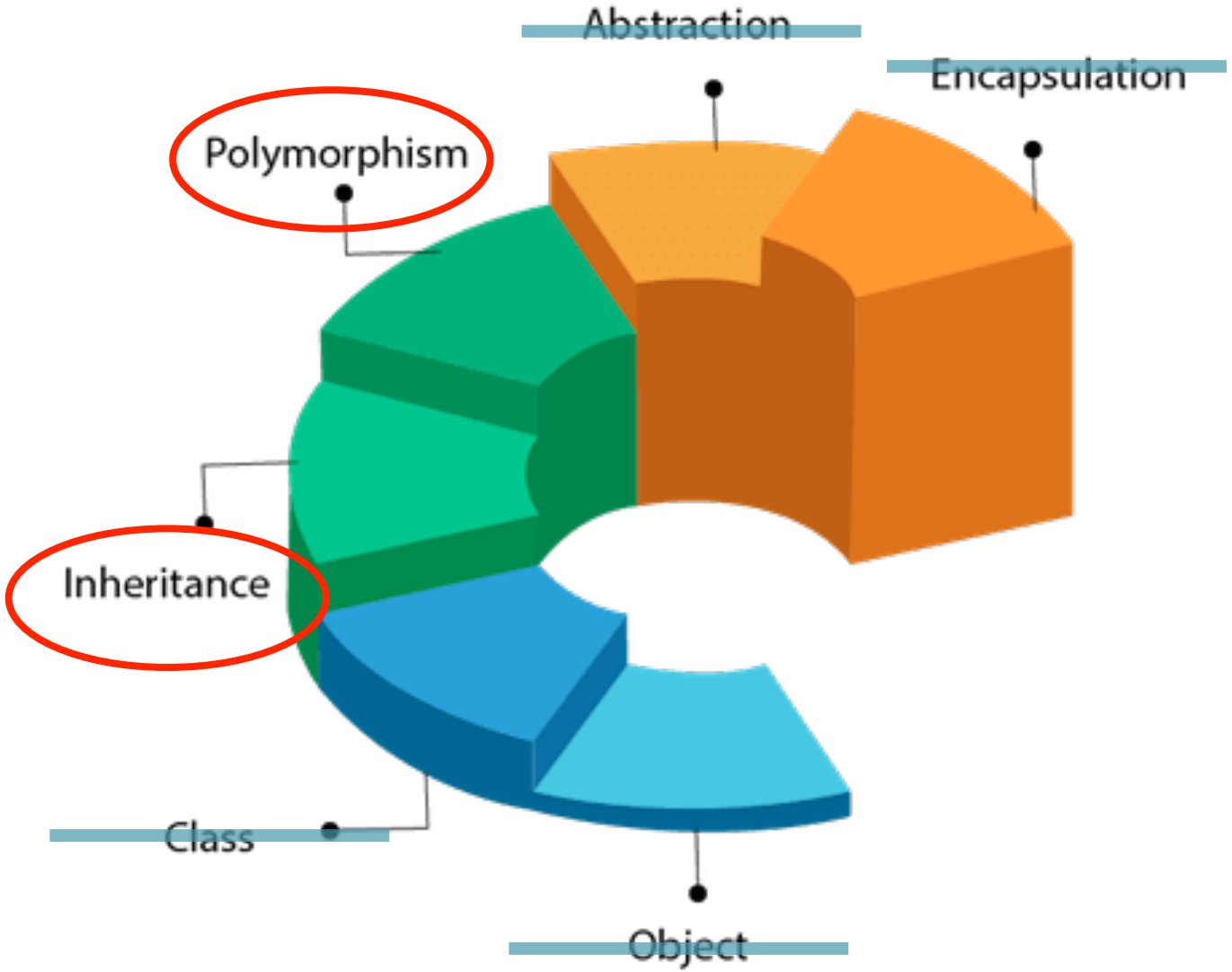
Chuang(Frank) Wang

THE UNIVERSITY OF MELBOURNE

Overview

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

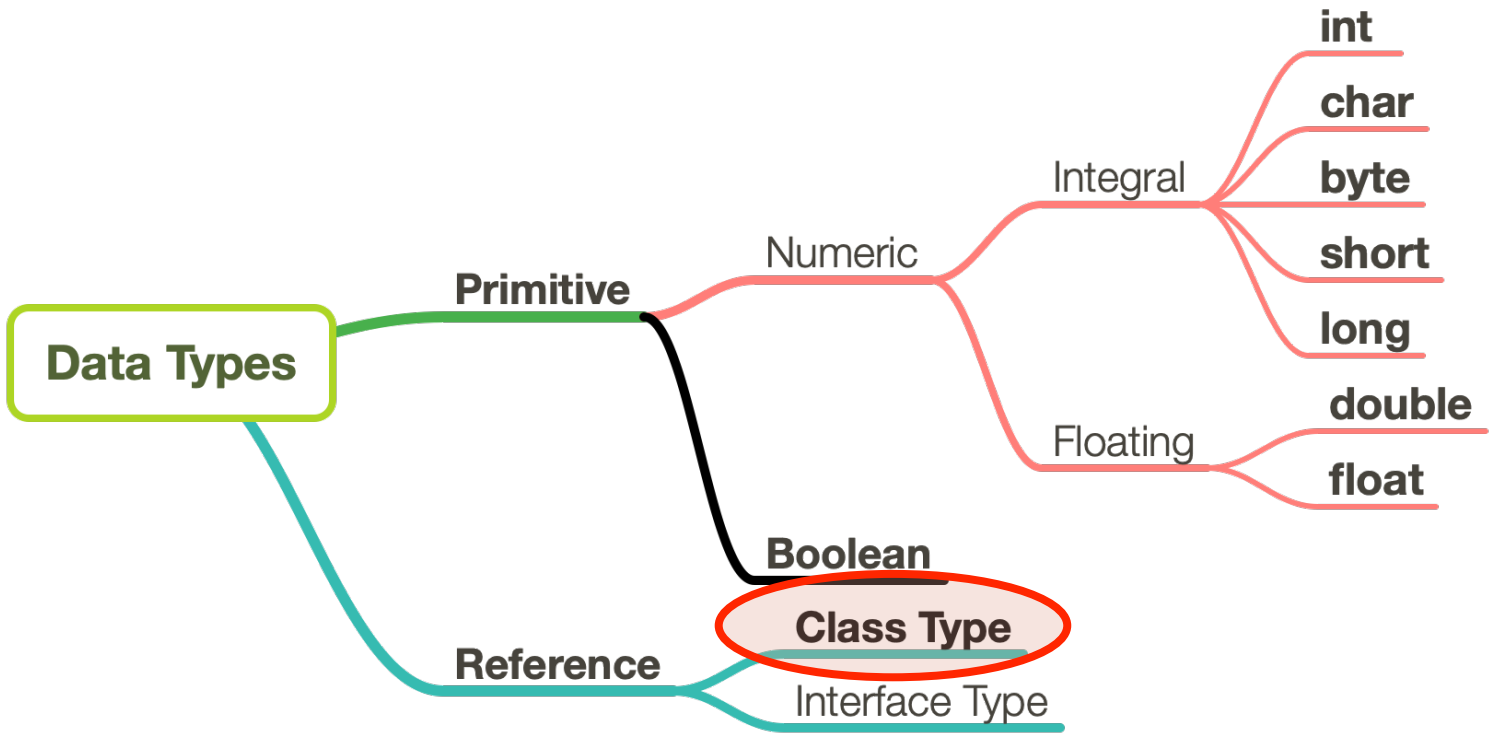
OOP(object-oriented programming) Properties



THE UNIVERSITY OF
MELBOURNE

1. Type hierarchies (inheritance)

Types in Java



Java Class

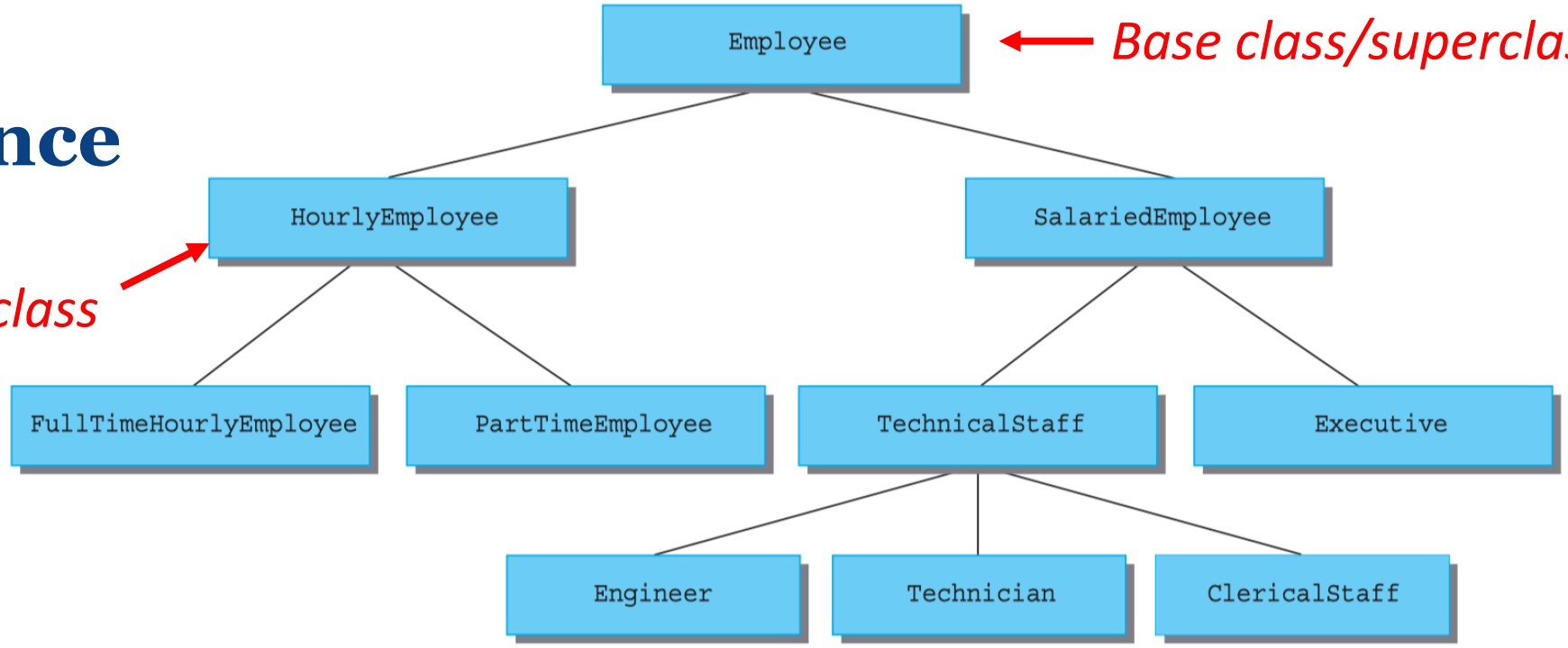
1. Define a type

```
Employee e;
```

2. Create an object

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

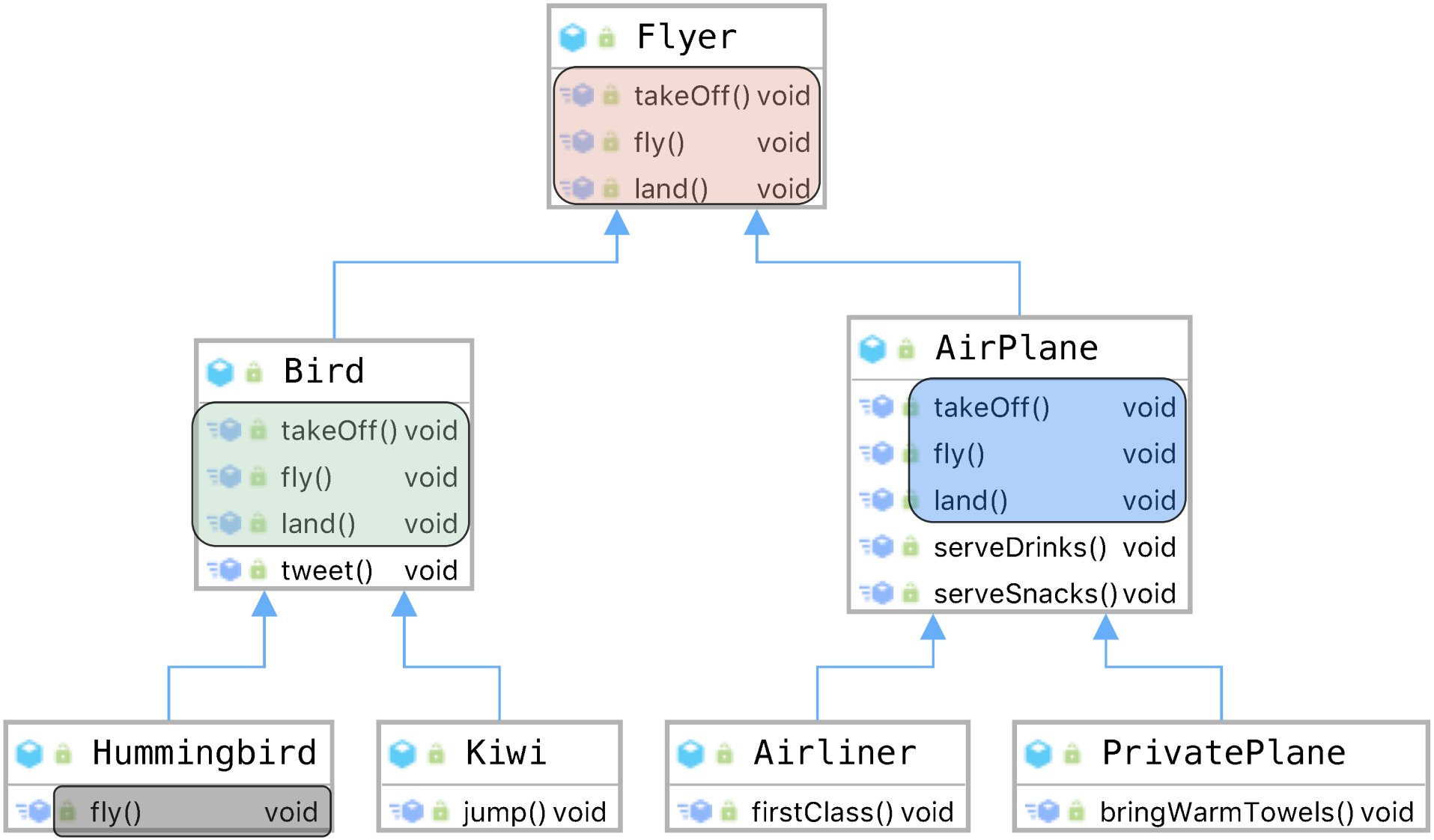
Inheritance



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)
```

THE UNIVERSITY OF MELBOURNE

2. Method dispatch (late binding)

Method Dispatch

A subclass can

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

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

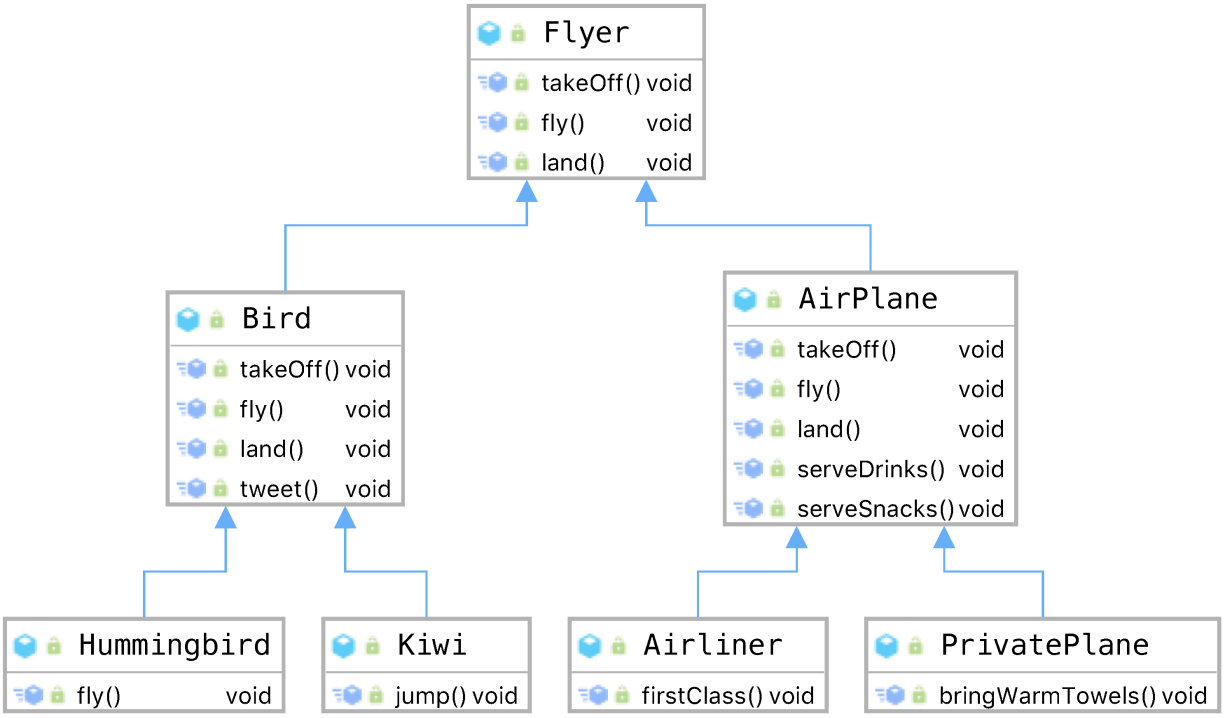
determines what the object can do
(what are methods available to the object)

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 f1 = new Flyer();

Flyer f2 = new Bird();

Bird b1 = new Bird();

Bird b2 = new Kiwi();

PrivatePlane p = new PrivatePlane();


//which of the below statements are valid / true?
```

1. ✓ `f1.fly();`
2. ✗ `f1.bringWarmTowels();`
3. ✗ `f1.tweet();`
4. ✗ `f2.tweet();`
5. ✓ `f2.land();`
6. ✓ `b1.takeoff();`
7. ✗ `b1.jump();`
8. ✓ `b2.tweet();`
9. ✗ `b2.jump();`
10. ✓ `p.serveDrinks();`
11. ✗ `f2.fly() will use fly() implementation in Flyer class`
12. ✗ `b2.fly() will use fly() implementation in Flyer class`

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

THE UNIVERSITY OF
MELBOURNE

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.

THE UNIVERSITY OF MELBOURNE

Thank you