Java Programming
Class Inheritance, Abstract Class and Interface

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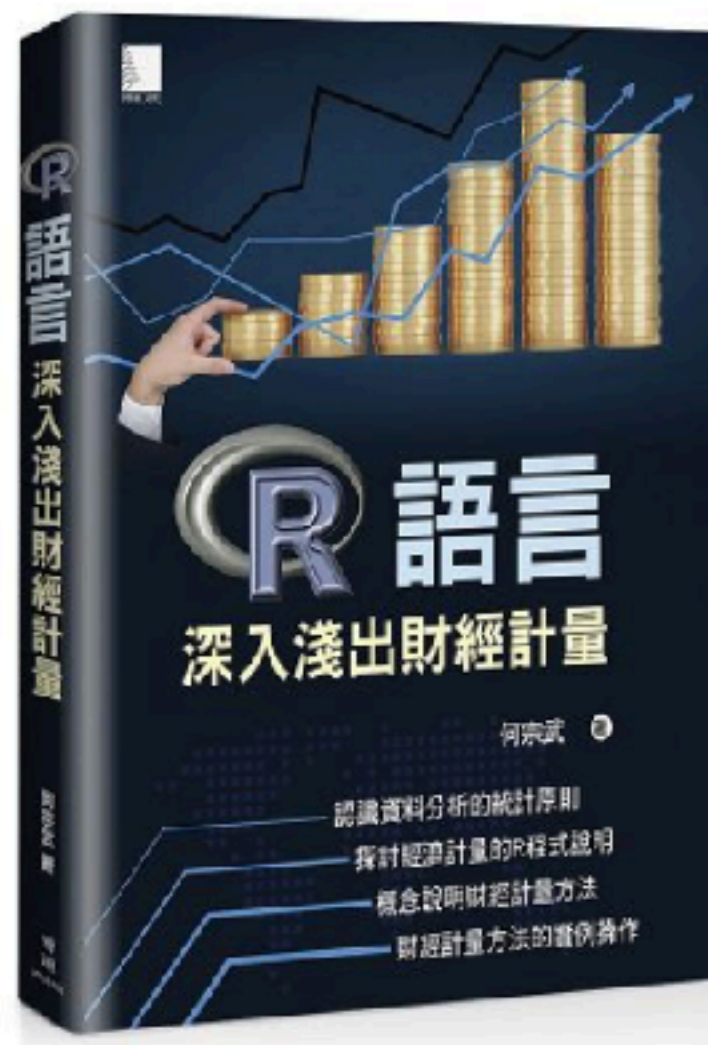*Asia University*
April 9, 2017

Class Inheritance (類別繼承)

* 以開發「亞大書局」系統為例
* 商品:
  * 書籍
  * 文具
  * 光碟

R 語言：深入淺出財經計量

作者：何宗武　追蹤

出版社：博碩文化　出版社追蹤　?

出版日：2017/4/5

ISBN：9789864341948

語言：中文繁體

適讀年齡：全齡適讀

定價：~~580 元~~
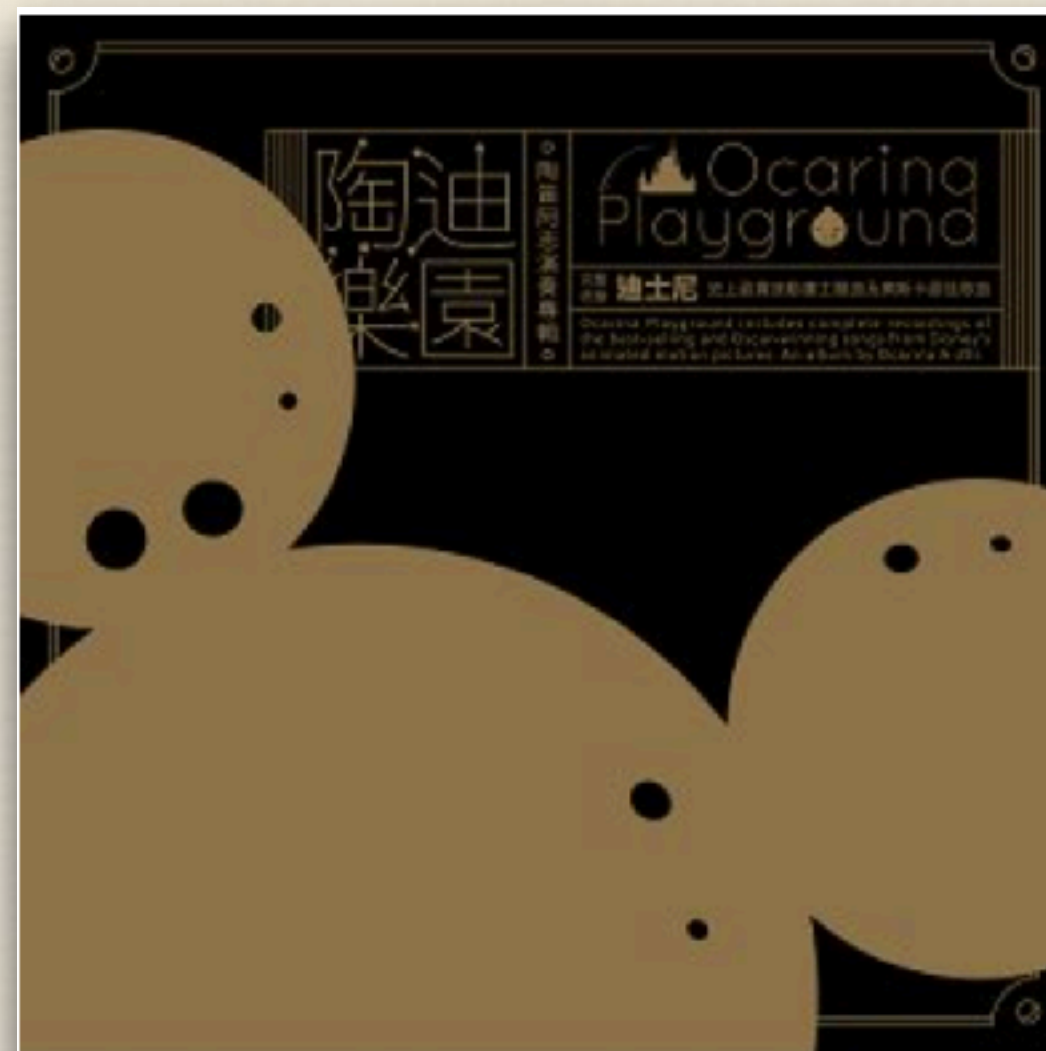
特價：**79 折 458 元** (可得紅利4點)

紅利優惠價：**77 折 444 元** (折抵說明)

紅利可抵：**14 元**

信用卡紅利：可折抵多家銀行 (扣抵說明)

運送方式：全球配送　香港到店　國內宅配　國內店取

<< >>

陶迪樂園

陶笛丫志悠遊在迪士尼樂園裡最活潑、最逗趣 、最暖心的詮釋。完整收錄迪士尼史上最賣座動畫主題曲及奧斯卡最佳歌曲

★來自土地與生命的感動，重拾創作與分享的本質

商品貨號：　　　**MAX-003**

金石碼：　　　　**2099140002720**

定價：　　　　　**500 元**

特價：　　　　　**9 折 450 元**

紅利優惠價：　　**87 折 436 元** (折抵說明)

紅利可抵：　　　**14 元**

商品狀態：　　　參考庫存量:3個

預計出貨日：　　2017/4/10

信用卡紅利：　　可折抵多家銀行 (扣抵說明)

運送方式：　　　國內宅配　國內店取　台灣限定

分享：f P t

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Quasi專用水筆長桿組/大+中+小 3支入

Quasi系列專用長桿水筆組，內有5mm、3mm、2mm三種不同筆尖，含筆蓋帽

★一次滿足書寫、彩繪、水彩的超值優惠組

商品貨號：　　　**WPL-3**

商品尺寸：　　　長 18 cm x寬 1.35 cm x高 1.35 cm

商品規格：　　　長桿組

定價：　　　　　**300 元**

特價：　　　　　**66 折199 元** (可得紅利1點)

紅利優惠價：　　**64 折 193 元** (折抵說明)

紅利可抵：　　　**6 元**

商品狀態：　　　參考庫存量:8個

信用卡紅利：　　可折抵多家銀行 (扣抵說明)

運送方式：　　　國內宅配　國內店取　台灣限定

分享：f P t

追蹤　分類

<< >>

Book

-id
-name
-barcode
-category
-price
-description
-publisher
-authors
-publishDate
-language
-isbn

+setName(name)
+getName()
+setBarCode(barcode)
+getBarCode()
+setPrice(price)
+getPrice(price)
+setCategory(type)
+getCategory()
+setPublisher(publiser)
+getPublisher()
+setAuthor(authors)
+getAuthor()
+setLang(language)
+getLanguage()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+setISBN(isbn)
+getISBN()
+getInfo()
+show()

AudioDVD

-id
-name
-barCode
-category
-price
-description
-publisher
-publishDate

+setName(name)
+getName()
+setBarCode(barCode)
+getBarCode()
+setPublisher(publisher)
+getPublisher()
+setCategory(category)
+getCategory()
+setPrice(price)
+getPrice()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+getInfo()
+show()

Stationery

-id
-name
-barCode
-category
-price
-description
-vendor
-length
-width
-height

+setName(name)
+getName()
+setBarCode(barcode)
+getBarcode()
+setVendor(vendor)
+getVendor()
+setCategory(category)
+getCategory()
+setLength(length)
+getLength()
+setWidth(width)
+getWidth()
+setHeight(height)
+getHeight()
+setPrice(price)
+getPrice()
+setDescription(description)
+getDescription()
+getInfo()
+show()

```java
Book
1    /**
2     💡 Created by yungchen on 09/04/2017.
3     */
4    public class Book {
5        // ════════════════════ 資料成員 (Data member)════════════════════
6        private String id, name, isbn, category, publisher, authors, language,
7                barcode, publishDate, description;
8        private float price;
9        // ════════════════════ 建構元 (Constructor) ════════════════════
10       public Book(){}
11       public Book(String name, String id){
12           this.name = name;
13           this.id = id;
14       }
15       // - * - * - * - * - 函式成員 (Function members) - * - * - * - * -
16       public void setName(String name) { this.name = name; }
19       public String getName(){ return this.name; }
20       public void setISBN(String isbn) { this.isbn = isbn; }
23       public String getISBN() { return this.isbn; }
24       public void setPrice(float price) { this.price = price; }
27       public float getPrice() { return this.price; }
28       public void setCategory(String type) { this.category = type; }
31       public String getCategory() { return this.category; }
32       public void setPublisher(String publisher){
33           this.publisher = publisher;
34       }
35       public String getPublisher() { return this.publisher; }
36       public void setAuthor(String author) { this.authors = author; }
39       public String getAuthors() { return this.authors; }
```

```java
39       public String getAuthors() { return this.authors; }
40       public void setLang(String language) { this.language = language; }
43       public String getLanguage() { return this.language; }
44       public void setBarcode(String barcode) { this.barcode = barcode; }
47       public String getBarcode() { return this.barcode; }
48       public String getInfo(){
49           return "name: " + this.getName() + " (id: " +
50                   this.id + ") \nDescription: " +
51                   this.description + "\nprice:" +
52                   this.getPrice() + "\nBarcode: " +
53                   this.getBarcode();
54       }
55       public void show(){
56           System.out.println("name: " + this.getName() +
57                   " (id: " + this.id + ") \nDescription: " +
58                   this.description + "\nprice:" +
59                   this.getPrice() + "\nBarcode: " +
60                   this.getBarcode());
61       }
62       public void setPublishDate(String publishDate) { this.publisher = publishDate; }
65       public String getPublishDate(){ return this.publishDate; }
66       public void setDescription(String description) { this.description = description; }
69       public String getDescription(){ return this.description; }
70   }
```

```java
/**
💡 Created by yungchen on 09/04/2017.
*/
public class AudioDVD {
    // ──────────────── 資料成員 (Data member)────────────────
    private String id, name, barCode, publisher,
            category, publishDate, description;
    private float price;
    // ════════════════ 建構元 (Constructor) ════════════════
    public AudioDVD(){ }
    public AudioDVD(String name, String id){
        this.name = name; this.id = id;
    }
    // - * - * - * - * - 函式成員 (Function members) - * - * - * -
    public void setName(String name) { this.name = name; }
    public String getName(){ return this.name; }
    public void setBarCode(String barCode) { this.barCode = barCode; }
    public String getBarCode() { return this.barCode; }
    public void setPublisher(String publisher) { this.publisher = publisher; }
    public String getPublisher(){ return this.publisher; }
    public void setCategory(String category) { this.category = category; }
    public String getCategory() { return this.category; }
    public void setPrice(float price) { this.price = price; }
    public float getPrice(){ return this.price; }
    public void setPublishDate(String publishDate) { this.publishDate = publishDate;
    public String getPublishDate() { return this.publishDate; }
    public String getInfo(){
        return "name: " + this.getName() + " (id: " +
                this.id + ") \nDescription: " +
                this.description + "\nprice:" +
                this.getPrice() + "\nBarcode: " +
                this.getBarCode();
    }
    public void show(){
        System.out.println("name: " + this.getName() +
                " (id: " + this.id + ") \nDescription: " +
                this.description + "\nprice:" +
                this.getPrice() + "\nBarcode: " +
                this.getBarCode());
    }
    public void setDescription(String description) { this.description = description;
    public String getDescription() { return this.description; }
}
```

```java
/**
 * 💡 Created by yungchen on 09/04/2017.
 */
public class Stationery{
    // ———— 資料成員 ————
    private String id, name, barCode, vendor,
            category, description;
    private int length, width, height;
    private float price;
    // ———— 建構元 ————
    public Stationery(){}; // 建構元
    // 建構元
    public Stationery(String name, String id){
        this.name = name;
        this.id = id;
    }
    // ———— 函式成員 ————
    public void setName(String name) { this.name = name; }
    public String getName(){ return this.name; };
    public void setBarCode(String barCode) { this.barCode = barCode; }
    public String getBarCode() { return this.barCode; }
    public void setVendor(String vendor) { this.vendor = vendor; }
    public String getVendor(){ return this.vendor; }
    public void setPrice(float price){
        this.price = price;
    }
    public float getPrice(){ return this.price; }
    public String getInfo(){
        return "name: " + this.getName() + " (id: " +
                this.id + ") \nDescription: " +
                this.description + "\nprice:" +
                this.getPrice() + "\nBarcode: " +
                this.getBarCode();
    }
    public void show(){
        System.out.println("name: " + this.getName() +
                " (id: " + this.id + ") \nDescription: " +
                this.description + "\nprice:" +
                this.getPrice() + "\nBarcode: " +
                this.getBarCode());
    }
}
```

```java
Main
1   /**
2    💡 Created by yungchen on 07/04/2017.
3    */
4   public class Main {
5       public static void main(String args[]){
6           Book book1 = new Book( name: "Java",  id: "123456");
7           Book book2 = new Book( name: "English",  id: "6778374");
8           book1.setISBN("PN234534");
9           book1.show();
10          book2.show();
11          AudioDVD dvd1 = new AudioDVD( name: "ABC Tutorial",  id: "998877");
12          dvd1.setCategory("語言學習");
13          dvd1.show();
14          Stationery stationery1 = new Stationery( name: "自動鉛筆",  id: "6637463");
15          stationery1.setPrice(234.5f);
16          System.out.println(stationery1.getInfo());
17      }
18  }
```

String id, name, barcode, category, publishDate, description

```
Book
1  /**
2   💡 Created by yungchen on 09/04/2017.
3   */
4  public class Book {
5      // ———————————— 資料成員 (Data member)————————————
6      private String id, name, isbn, category, publisher, authors, language,
7          barcode, publishDate, description;
8      private float price;
9      // ================ 建構元 (Constructor) ========
10     publi
11     publi
12         t
13         t
14     }
15     // —
16     publi
19     publi
20     publi
23     publi
24     publi
27     publi
28     publi
31     publi
32     publi
33         t
34     }
35     publi
36     publi
39     publi
```

```
AudioDVD
1  /**
2   💡 Created by yungchen on 09/04/2017.
3   */
4  public class AudioDVD {
5      // ————————————— 資料成員 (Data member)———
6      private String id, name, barCode, publisher,
7          category, publishDate, description;
8      private float price;
9      // ================ 建構元 (Constructor) =======
10     public AudioDVD(){ }
11     public AudioDVD(String name, String id){
12         this.name = name; this.id = id;
13     }
14     // - * - * - * - * - 函式成員 (Function members) -
15     public void setName(String name) { this.name = na
18     public String getName(){ return this.name; }
19     public void setBarCode(String barCode) { this.bar
22     public String getBarCode() { return this.barCode;
23     public void setPublisher(String publisher) { this
26     public String getPublisher(){ return this.publish
27     public void setCategory(String category) { this.c
30     public String getCategory() { return this.categor
```

```
Stationery
1  /**
2   💡 Created by yungchen on 09/04/2017.
3   */
4  public class Stationery{
5      // ———— 資料成員 ————
6      private String id, name, barCode, vendor,
7          category, description;
8      private int length, width, height;
9      private float price;
10     // ———— 建構元 ————
11     public Stationery(){}; // 建構元
12     // 建構元
13     public Stationery(String name, String id){
14         this.name = name;
15         this.id = id;
16     }
17     // ———— 函式成員 ————
18     public void setName(String name) { this.name = name; }
21     public String getName(){ return this.name; };
22     public void setBarCode(String barCode) { this.barCode = barCode; }
25     public String getBarCode() { return this.barCode; }
26     public void setVendor(String vendor) { this.vendor = vendor; }
29     public String getVendor(){ return this.vendor; }
30     public void setPrice(float price){
31         this.price = price;
32     }
```

重覆的資料成員與函式成員很多，把
這些收集起來建立父類別

Book

-id
-name
-barcode
-category
-price
-description
-publisher
-authors
-publishDate
-language
-isbn

+setName(name)
+getName()
+setBarCode(barcode)
+getBarCode()
+setPrice(price)
+getPrice(price)
+setCategory(type)
+getCategory()
+setPublisher(publiser)
+getPublisher()
+setAuthor(authors)
+getAuthor()
+setLang(language)
+getLanguage()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+setISBN(isbn)
+getISBN()
+getInfo()
+show()

AudioDVD

-id
-name
-barCode
-category
-price
-description
-publisher
-publishDate

+setName(name)
+getName()
+setBarCode(barCode)
+getBarCode()
+setPublisher(publisher)
+getPublisher()
+setCategory(category)
+getCategory()
+setPrice(price)
+getPrice()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+getInfo()
+show()

Stationery
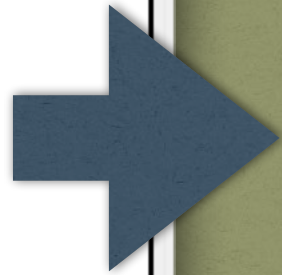
-id
-name
-barCode
-category
-price
-description
-vendor
-length
-width
-height

+setName(name)
+getName()
+setBarCode(barcode)
+getBarcode()
+setVendor(vendor)
+getVendor()
+setCategory(category)
+getCategory()
+setLength(length)
+getLength()
+setWidth(width)
+getWidth()
+setHeight(height)
+getHeight()
+setPrice(price)
+getPrice()
+setDescription(description)
+getDescription()
+getInfo()
+show()

Book

-id
-name
-barcode
-category
-price
-description
-publisher
-authors
-publishDate
-language
-isbn

+setName(name)
+getName()
+setBarCode(barcode)
+getBarCode()
+setPrice(price)
+getPrice(price)
+setCategory(type)
+getCategory()
+setPublisher(publiser)
+getPublisher()
+setAuthor(authors)
+getAuthor()
+setLang(language)
+getLanguage()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+setISBN(isbn)
+getISBN()
+getInfo()
+show()

Book

-publisher
-authors
-publishDate
-language
-isbn

+setPublisher(publiser)
+getPublisher()
+setAuthor(authors)
+getAuthor()
+setLang(language)
+getLanguage()
+setPublishDate(publishDate)
+getPublishDate()
+setISBN(isbn)
+getISBN()

AudioDVD

-id
-name
-barCode
-category
-price
-description
-publisher
-publishDate

+setName(name)
+getName()
+setBarCode(barCode)
+getBarCode()
+setPublisher(publisher)
+getPublisher()
+setCategory(category)
+getCategory()
+setPrice(price)
+getPrice()
+setPublishDate(publishDate)
+getPublishDate()
+setDescription(description)
+getDescription()
+getInfo()
+show()

AudioDVD

-publisher
-publishDate

+setPublisher(publisher)
+getPublisher()
+setPublishDate(publishDate)
+getPublishDate()

Stationery

-id
-name
-barCode
-category
-price
-description
-vendor
-length
-width
-height

+setName(name)
+getName()
+setBarCode(barcode)
+getBarcode()
+setVendor(vendor)
+getVendor()
+setCategory(category)
+getCategory()
+setLength(length)
+getLength()
+setWidth(width)
+getWidth()
+setHeight(height)
+getHeight()
+setPrice(price)
+getPrice()
+setDescription(description)
+getDescription()
+getInfo()
+show()

Product

#id
#name
#barCode
#category
#price
#description

+setName(name)
+getName()
+setBarCode(barcode)
+getBarCode()
+setCategory(category)
+getCategory()
+setPrice(price)
+getPrice()
+setDescription(description)
+getDescription()
+getInfo()
+show()

Stationery

-vendor
-length
-width
-height

+setVendor(vendor)
+getVendor()
+setLength(length)
+getLength()
+setWidth(width)
+getWidth()
+setHeight(height)
+getHeight()

Abstract class

❖ 使用繼承可以將類別中相同程式碼的部份收集到另一個 class 檔，可方便維護也精簡程式碼

❖ 但有時候，這些類別都 "必須" 要有某個功能，可是該功能在不同子類別中做法又都不一樣，例如動物這個類別，人類與犬類都繼承自「動物」，可是造物主怕忘了在產生新的動物物種時忘了實作「走」這個功能，所以就在「動物」這個父類別上設定一個一定要有的功能「走」，只是各種物種就必須要有「走」這個功能，至於要怎麼走，則可由各個物種自己設定，例如人就用兩隻腳在走，犬類就用四隻腳在走

Interface (介面)

- 在書局賣產品的例子中，有Book, AudioDVD 及Stationery等類別分別繼承自AbsProduct 抽象類別

- AbsProduct 抽象類別中有getInfo()及 show()這兩個抽象函式只宣造但不實作。主要目的是要讓繼承者一定要具有這兩個功能，至於怎麼做，就留給繼承者自己發揮

- 不管什麼產品到最後都是要賣，因此就會有一個「賣」出去的介面，如此一來不管是什麼類別所產生的產品，都必須要有一個賣的介面東西才賣得出去，於是 Book, AudioDVD及Stationery就必須去實作「賣」這個介面