

## JAVA Programming Language Homework VII: OO Review

ID:

Name:

1. Given the following Java code:

```
10.     interface A { public int getValue();}
11.     class B implements A {
12.         public int getValue() { return 1;}
13.     }
14.     class C extends B {
15.         // insert code here
16.     }
```

What three code fragments individually at line 15, make use of polymorphism?  
(Choose three)

- (A) `public void add (C c) {c.getValue();}`
- (B) `public void add (B b) {b.getValue();}`
- (C) `public void add (A a) {a.getValue();}`
- (D) `public void add (A a, B b) {a.getValue();}`
- (E) `public void add (C c1, C c2) {c1.getValue();}`

**ANS: B C D**

- 題目是要有多型的特徵
- A, E: 傳入 C 型別參數，本身就是 C 的實體，以 C 物件呼叫 `getValue()`，並未有多型的特徵
- B, C, D: 傳入 A 或 B 型態的參數，而本身的物件實體 is-a A 或 B，就是利用了多型的特徵

2. Given the following Java code:

```
1.     class Test {
2.         static void alpha() { /* more code here */ }
3.         void beta(){ /* more code here */ }
4.     }
```

Which two statements are true? (Choose two)

- (A) Test.beta() is a valid invocation of beta()
- (B) Test.alpha() is a valid invocation of alpha()
- (C) Method beta() can directly call method alpha()
- (D) Method alpha() can directly call method beta()

**ANS: B C**

- alpha() 是 static method; 所以直接 Test.alpha() 即可呼叫使用
- beta() 是 non-static method; 則必須建構物件實體才可呼叫使用
- 在 beta() 中可以直接呼叫使用相同類別之 static method
- static method 則無法直接呼叫使用 non-static method

3. Given the following Java code:

```
1. class D extends C {
2.     private int v1 = 3;
3.     String tmp = "D";
4.     void m( ) {
5.         System.out.print(tmp + ",");
6.         System.out.print(((C)this).tmp + ",");
7.         System.out.print(((B)this).tmp + ",");
8.         System.out.print(((A)this).tmp + ",");
9.     }
10.    public static void main ( String[ ] args) {
11.        new D( ).m( );
12.    }
13. }
14. class A {String tmp = "A";}
15. class B extends A {String tmp = "B";}
16. class C extends B {String tmp = "C";}
```

What is the result of attempting to compile and run the above program?

- (A) Prints: D,D,D,D
- (B) Prints: D,C,B,A

- (C) Compiler Error at 04.
- (D) Compiler Error at 06.
- (E) Compiler Error at 11.

**ANS: B**

類別 D 中的字串 tmp 將 superclass 中的同名字串隱藏起來，但不是覆寫。

4. Given the following Java code:

```
1.    class A {  
2.        private int x = 1;  
3.        A( ) throws Exception { }  
4.    }  
5.    class B extends A {  
6.        B( ) throws Exception { }  
7.    }  
8.    class C extends A {  
9.        C( ) { }  
10.   }
```

Which of the following statements are true? (Choose two)

- (A) Class A extends Object
- (B) Compiler error at 03.
- (C) Compiler error at 06..
- (D) Compiler error at 09.
- (E) Compiler error at 02.

**ANS: A D**

不具備 extends 字眼的類別，預設來說會繼承 Object。

而子類別 C 的建構子應該要跟著父類別建構子丟出例外狀況。

5. Given the following Java code:

```
1. interface Data {public void load();}
2. abstract class Info {public abstract void load();}
```

Which class correctly uses the Data interface and Info class?

- (A) public class Employee extends Info implements Data {  
 public void load(){/\* do something\*/}  
}
- (B) public class Employee implements Info extends Data {  
 public void load(){/\* do something\*/}  
}
- (C) public class Employee extends Info implements Data {  
 public void load(){/\* do something\*/}  
 public void Info.load(){/\* do something\*/}  
}
- (D) public class Employee implements Info extends Data {  
 public void Data.load(){/\* do something\*/}  
 public void load(){/\* do something\*/}  
}

**ANS: A**

- A: 正確
- B: Info 是類別，應使用 extends; Data 是介面，應使用 implements
- C: 沒有 Info.load() 這種寫法
- D: 沒有 Data.load() 這種寫法

6. Given the following Java code:

```
1. public abstract class Shape {
2.     int x ;
3.     int y ;
4.     public abstract void draw() ;
5.     public void setAnchor(int x, int y) {
6.         this.x = x;
7.         this.y = y;
```

```
8.      }
9.      }
```

Add a class Circle that extends and fully implements the Shape class. Which is correct?

- (A) `Shape s = new Shape();`  
`s.setAnchor(10,10);`  
`s.draw();`
- (B) `Circle c = new Shape();`  
`s.setAnchor(10,10);`  
`s.draw();`
- (C) `Shape s = new Circle();`  
`s.setAnchor(10,10);`  
`s.draw();`
- (D) `Shape s = new Circle();`  
`s->setAnchor(10,10);`  
`s->draw();`
- (E) `Circle c = new Circle();`  
`s.Shape.setAnchor(10,10);`  
`s.Shape.draw();`

**ANS: C**

- 題目說明有一個類別 Circle 完全實作 Shape，故需將 Shape 抽象類別中的 draw() 方法中實作出來。
- A: 無法建構出 Shape，因為其為抽象類別
- B: 無法以抽象類別之建構子建構物件實體
- C: 正確
- D: 無此寫法
- E: 無此寫法

7. Which of the following are the valid ways to define a constructor for class Test?

- (A) `public void Test () {}`
- (B) `public Test () {}`
- (C) `private Test () {}`

- (D) public static Test ()
- (E) final Test () {}

**ANS: B C**

正確的定義宣告建構子如下：

- 無傳回值型態的宣告
- 不可為 final, native, static, synchronized 及 abstract

8. Given the following Java code:

```
1. class B extends A {
2.     String m(short s) {return new String();}
3.     private void m(char c) {}
4.     protected void m(int i) {}
5.     void m(String s1) {}
6.     void m(boolean b) {}
7.     void m(byte b) throws Exception {}
8. }
9. class A {void m(String s1) {}}
```

What is the result of attempting to compile and run the above program?

- (A) Compiler Error at line 2.
- (B) Compiler Error at line 3.
- (C) Compiler Error at line 4.
- (D) Compiler Error at line 7.
- (E) None of the above.

**ANS: E**

函式的 Overloading 允許不同的回傳資料型態和不同的 throws Exception 敘述，所以本程式並無編譯錯誤。

9. Given the following Java code:

```
1.     class A {
2.         void m(A a) {private int x = 1; System.out.print("A");}
3.     }
4.     class B extends A {
5.         void m(B b) {private int x = 1; System.out.print("B");}
6.     }
7.     class C extends B {
8.         void m(C c) {private int x = 1; System.out.print("C");}
9.     }
10.    class D {
11.        public static void main(String[] args) {
12.            A c1 = new C();
13.            B c2 = new C();
14.            C c3 = new C();
15.            C c4 = new C();
16.            c4.m(c1);
17.            c4.m(c2);
18.            c4.m(c3);
19.            System.out.print("Done!");
20.        }
21.    }
```

What is the result of attempting to compile and run the above program?

- (A) Prints: AAADone!
- (B) Prints: ABCDone!
- (C) Prints: CCCDone!
- (D) Compiler Error
- (E) Run time Error

**ANS: B**

類別 C 繼承類別 B，類別 B 繼承類別 A。而其中各有三個函式 m，由於所納入的參數類不同，屬於函式的 overloading 而非 override。

12 至 15 行宣告了 4 個物件，其類別型態分別為 A，B，C，D。

16 行將導入型態為 A 的物件變數 c1，因而呼叫第 2 行，以此類推答案為 B。

10. Which of the following statements are true?
- (A) The body of a final method can be inline by a machine-code generator.
  - (B) A final method is not allowed to be overridden by a sub-class.
  - (C) All methods declared in a final class are implicitly final.
  - (D) If a private method is declared final then it is a compile-time error.
  - (E) The methods declared in a final class must be explicitly declared final or else Java compiler will raise error.

**ANS: A B C**

類別 final 中所有的方法都被視為 final，但不強求加上關鍵字 final。  
所有 private 方法都被 java compiler 視為 final，但不強求加上關鍵字 final。  
被定義為 private 和 final 的方法是可以被繼承的。  
machine-code generator 具有內嵌(Inline) final 方法的功能。