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Chapter 13 Check Point Questions

Section 13.2

▼ 13.2.1

Which of the following classes defines a legal abstract class?

(a)
`class A {
 abstract void unfinished() {
 }
}`

(b)
`public class abstract A {
 abstract void unfinished();
}`

(c)
`public class abstract A {
 abstract void unfinished();
}`

(d)
`abstract class A {
 protected void unfinished();
}`

(e)
`abstract class A {
 abstract void unfinished();
}`

(f)
`abstract class A {
 abstract int unfinished();
}`

e and f

Hide Answer

▼ 13.2.2

The `getArea()` and `getPerimeter()` methods may be removed from the `GeometricObject` class. What are the benefits of defining `getArea()` and `getPerimeter()` as abstract methods in the `GeometricObject` class?

The benefits are for generic programming. A variable of `GeometricObject` type can use the `getArea` and `getPerimeter` methods at compilation time.

Hide Answer

▼ 13.2.3

True or false?

- a. An abstract class can be used just like a nonabstract class except that you cannot use the new operator to create an instance from the abstract class.
- b. An abstract class can be extended.
- c. A subclass of a nonabstract superclass cannot be abstract.
- d. A subclass cannot override a concrete method in a superclass to define it as abstract.
- e. An abstract method must be nonstatic.

- a. True
- b. True
- c. False
- d. False
- e. True

Hide Answer

Section 13.3

▼ 13.3.1

Why do the following two lines of code compile but cause a runtime error?

```
Number numberRef = new Integer(0);  
Double doubleRef = (Double)numberRef;
```

At runtime, JVM attempts to convert numberRef to a Double object, but numberRef is an instance of Integer, not Double.

Hide Answer

▼ 13.3.2

Why do the following two lines of code compile but cause a runtime error?

```
Number[] numberArray = new Integer[2];  
numberArray[0] = new Double(1.5);
```

numberArray[0] is of the Integer type. It will be a casting error at runtime.

Hide Answer

▼ 13.3.3

Show the output of the following code.

```
public class Test {  
    public static void main(String[] args) {  
        Number x = 3;  
        System.out.println(x.intValue());  
        System.out.println(x.doubleValue());  
    }  
}
```

3
3.0

Hide Answer

▼ 13.3.4

What is wrong in the following code? (Note that the compareTo method for the Integer and Double classes was introduced in Section 10.7.)

```
public class Test {  
    public static void main(String[] args) {  
        Number x = new Integer(3);  
        System.out.println(x.intValue());  
        System.out.println(x.compareTo(new Integer(4)));  
    }  
}
```

The program has a syntax error because x does not have the compareTo method.

Hide Answer

▼ 13.3.5

What is wrong in the following code?

```
public class Test {  
    public static void main(String[] args) {  
        Number x = new Integer(3);  
        System.out.println(x.intValue());  
        System.out.println((Integer)x.compareTo(new Integer(4)));  
    }  
}
```

The program has a syntax error because the member access operator (.) is executed before the casting operator.

Hide Answer

Section 13.4

▼ 13.4.1

Can you create a Calendar object using the Calendar class?

No. Calendar is an abstract class.

Hide Answer

▼ 13.4.2

Which method in the Calendar class is abstract?

The add method in the Calendar class is abstract.

Hide Answer

▼ 13.4.3

How do you create a Calendar object for the current time?

Use the GregorianCalendar class's no-arg constructor, you can create an instance of Calendar.

Hide Answer

▼ 13.4.4

For a Calendar object c, how do you get its year, month, date, hour, minute, and second?

Show Answer

Section 13.5

▼ 13.5.1

Suppose A is an interface. Can you create an instance using new A()?

No

Hide Answer

▼ 13.5.2

Suppose A is an interface. Can you declare a reference variable x with type A like this?

A x;

Yes

Hide Answer

▼ 13.5.3

Which of the following is a correct interface?

(a)

```
interface A {  
    void print() { }  
}
```

(b)

```
abstract interface A {  
    abstract void print() { }  
}
```

(c)

```
abstract interface A {  
    print();  
}
```

(d)

```
interface A {  
    void print();  
}
```

(e)

```
interface A {  
    default void print() {  
    }  
}
```

(f)

```
interface A {  
    static int get() {  
        return 0;  
    }  
}
```

- (a) is wrong, because the print() method has a body.
- (b) is wrong, because the interface cannot have the abstract keyword.
- (c) is wrong, because the interface cannot have the abstract keyword.
- (d) is correct.
- (e) is correct. JDK 8 allows default methods in the interface.
- (f) is correct. JDK 8 allows static methods in the interface.

Hide Answer

▼ 13.5.4

Show the error in the following code:

```
interface A {  
    void m1();  
}  
  
class B implements A {  
    void m1() {  
        System.out.println("m1");  
    }  
}
```

All methods defined in an interface are public. When a class implements the interface, the method must be declared public. The visibility cannot be reduced.

Hide Answer

▼ 13.5.5

The following questions are based on the Edible interface and the classes defined in Listing 13.7 and also assume LittleChicken is a subtype of Chicken. For each question, answer if the code can compile, can run. If not, give a reason. If it runs, give the output.

- a. Edible x = new Tiger();
- b. Edible x = new Chicken();
System.out.println(x.sound());
- c. Edible x = new Chicken();
System.out.println((Animal)x.sound());
- d. Edible x = new Chicken();
System.out.println(((Animal)x).sound());
- e. Edible x = new LittleChicken();
System.out.println(x.howToEat());
- f. LittleChicken x = new Chicken();

- a. Compile error. Tiger is not Edible.
- b. Compile error. x is declared Edible, but Edible does not have the sound() method.
- c. Compile error. x.sound() performed first before casting. x does not have the sound() method.
- d. Chicken: cock-a-doodle-doo
- e. Chicken: Fry it
- f. Compile error. Chicken is not a LittleChicken. Cannot assign a Chicken object to a variable of type LittleChicken.

Hide Answer

Section 13.6

▼ 13.6.1

True or false? If a class implements Comparable, the object of the class can invoke the compareTo method.

True

Hide Answer

▼ 13.6.2

Which of the following is the correct method header for the compareTo method in the String class?

```
public int compareTo(String o)
public int compareTo(Object o)
```

The first one is correct.

Hide Answer

▼ 13.6.3

Can the following code be compiled? Why?

```
Integer n1 = new Integer(3);
Object n2 = new Integer(4);
System.out.println(n1.compareTo(n2));
```

n1 is an Integer object whose compareTo method require an Integer argument, but n2 is declared as Object. The compiler will raise an error.

Hide Answer

▼ 13.6.4

You can define the compareTo method in a class without implementing the Comparable interface. What are the benefits of implementing the Comparable interface?

By implementing the Comparable interface, the object of the class can be passed to a method that requires a Comparable type.

Hide Answer

▼ 13.6.5

What is wrong in the following code?

```
public class Test {
    public static void main(String[] args) {
        Person[] persons = {new Person(3), new Person(4), new Person(1)};
        java.util.Arrays.sort(persons);
    }
}

class Person {
    private int id;
```

```

    Person(int id) {
        this.id = id;
    }
}

```

A: The Person class does not implement the Comparable interface, two persons can not be compared using the compareTo method.

Hide Answer

▼ 13.6.6

Simplify the code in lines 10-15 in Listing 13.9 using one line of code. Also override the equals method in this class.

```
return getArea() > o.getArea() ? 1 : (getArea() < o.getArea() ? -1 : 0);
```

The equals method can be overridden as follows:

```

@Override
public boolean equals(Object o) {
    return getArea() == ((CompareRectangle)o).getArea();
}

```

Hide Answer

▼ 13.6.7

Listing 13.5 has an error. If you add `list.add(new BigInteger("3432323234344343102"));` in line 11, you will see that the result is incorrect. This is due to the fact that a double value can have up to 17 significant digits. When invoking `doubleValue()` on a `BigInteger` object in line 24, precision is lost. Fix the error by converting the numbers into `BigDecimal` and compare them using the `compareTo` method in line 24.

```

        if (new BigDecimal(number + "").compareTo
            (new BigDecimal(list.get(i) + "")) < 0) {

```

The complete code is here:

```

import java.util.ArrayList;
import java.math.*;

public class LargestNumber {
    public static void main(String[] args) {
        ArrayList<Number> list = new ArrayList<>();
        list.add(45); // Add an integer
        list.add(3445.53); // Add a double
        // Add a BigInteger
        list.add(new BigInteger("3432323234344343101"));
        list.add(new BigInteger("3432323234344343102"));

        // Add a BigDecimal
        list.add(new BigDecimal("2.0909090989091343433344343"));

        System.out.println("The largest number is " +
            getLargestNumber(list));
    }

    public static Number getLargestNumber(ArrayList<Number> list) {

```

```

        if (list == null || list.size() == 0)
            return null;

        Number number = list.get(0);
        for (int i = 1; i < list.size(); i++)
            if (new BigDecimal(number + "").compareTo
                (new BigDecimal(list.get(i) + "")) < 0) {
                number = list.get(i);
            }

        return number;
    }
}

```

Hide Answer

Section 13.7

▼ 13.7.1

Can a class invoke `super.clone()` when implementing the `clone()` method if the class does not implement `java.lang.Cloneable`? Does the `Date` class implement `Cloneable`?

You can invoke `super.clone()` when implementing the `clone()` method if the class does not implement `java.lang.Cloneable`, as shown below:

```

class Foo {
    int x = 5;
    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }
}

```

However, it does not actually clone the object. The following code will throw `CloneNotSupportedException`.

```

public class Test1 {
    public static void main(String[] args) throws CloneNotSupportedException {
        Foo foo = (Foo)new Foo().clone();
        System.out.println(foo.x);
    }
}

```

If the `Foo` class implements `java.lang.Cloneable` as follows, the `Test1` class will run fine.

```

class Foo implements java.lang.Cloneable {
    int x = 5;
    public Object clone() throws CloneNotSupportedException {
        return super.clone();
    }
}

```

Yes, the `Date` class implements `Cloneable`.

Hide Answer

▼ 13.7.2

What would happen if the `House` class (defined in Listing 13.11) did not override the `clone()` method or if `House` did not implement `java.lang.Cloneable`?

If the House class does not override the clone() method, the program would receive a syntax error because clone() is protected in java.lang.Object. For example, the following code cannot compile.

```
public class Test1 {  
    public static void main(String[] args) throws CloneNotSupportedException {  
        House house = (House)new House().clone(); // clone() is not visible  
    }  
}
```

If House does not implement java.lang.Cloneable, a CloneNotSupportedException would occur when invoking super.clone().

Hide Answer

▼ 13.7.3

Show the output of the following code:

```
java.util.Date date = new java.util.Date();  
java.util.Date date1 = date;  
java.util.Date date2 = (java.util.Date)(date.clone());  
System.out.println(date == date1);  
System.out.println(date == date2);  
System.out.println(date.equals(date2));
```

```
true  
false  
true
```

Hide Answer

▼ 13.7.4

Show the output of the following code:

```
ArrayList<String> list = new ArrayList<>();  
list.add("New York");  
ArrayList<String> list1 = list;  
ArrayList<String> list2 = (ArrayList<String>)(list.clone());  
list.add("Atlanta");  
System.out.println(list == list1);  
System.out.println(list == list2);  
System.out.println("list is " + list);  
System.out.println("list1 is " + list1);  
System.out.println("list2.get(0) is " + list2.get(0));  
System.out.println("list2.size() is " + list2.size());
```

```
true  
false  
list is [New York, Atlanta]  
list1 is [New York, Atlanta]  
list2.get(0) is New York  
list2.size() is 1
```

Hide Answer

▼ 13.7.5

What is wrong in the code in (a)? Why does the code in (b) have no compile errors?

(a)

```
public class Test {  
    public static void main(String[] args) {  
        GeometricObject x = new Circle(3);  
        GeometricObject y = x.clone();  
        System.out.println(x == y);  
    }  
}
```

(b)

```
public class Test5 {  
    public static void main(String[] args) throws CloneNotSupportedException {  
        Test5 x = new Test5();  
        GeometricObject y = (GeometricObject)x.clone();  
    }  
}
```

In (a), a compile error is reported because `clone()` is protected in `Object`. To enable cloning, do two things: (1) override `clone()` in the class for the object to be cloned; (2) implement `java.lang.Cloneable` for the class.

In (b), no compile errors, because `Test5` extends `Object` and the `clone()` method is defined in the `Object` class, which is visible in `Test5`. However, when you run the code, a `CloneNotSupportedException` will be thrown, because the `clone()` method is not implemented in `Test5` and `Test5` does not implement the `Cloneable` interface.

Hide Answer

▼ 13.7.6

Show the output of the following code.

```
public class Test {  
    public static void main(String[] args) {  
        House house1 = new House(1, 1750, 50);  
        House house2 = (House)house1.clone();  
        System.out.println(house1.equals(house2));  
    }  
}
```

false

Hide Answer

Section 13.8

▼ 13.8.1

Give an example to show why interfaces are preferred over abstract classes.

See the example in the text in the section on Interfaces vs. Abstract Classes.

Hide Answer

▼ 13.8.2

Define the terms abstract classes and interfaces. What are the similarities and differences between abstract classes and interfaces?

See the section on Interfaces vs. Abstract Classes.

Hide Answer

▼ 13.8.3

True or false?

- a. An interface is compiled into a separate bytecode file.
- b. An interface can have static methods.
- c. An interface can extend one or more interfaces.
- d. An interface can extend an abstract class.
- e. An interface can have default methods.

- a. True
- b. True in Java 8
- c. True
- d. False
- e. True in Java 8

Hide Answer

Section 13.9

▼ 13.9.1

Show the output of the following code?

```
Rational r1 = new Rational(-2, 6);  
System.out.println(r1.getNumerator());  
System.out.println(r1.getDenominator());  
System.out.println(r1.intValue());  
System.out.println(r1.doubleValue());
```

```
-1  
3  
0  
0.333333333333
```

Hide Answer

▼ 13.9.2

Why is the following code wrong?

```
Rational r1 = new Rational(-2, 6);  
Object r2 = new Rational(1, 45);  
System.out.println(r2.compareTo(r1));
```

The Object type r2 does not have the compareTo method.

Hide Answer

▼ 13.9.3

Why is the following code wrong?

```
Object r1 = new Rational(-2, 6);  
Rational r2 = new Rational(1, 45);  
System.out.println(r2.compareTo(r1));
```

The `compareTo(Rational)` method requires a `Rational` type object in the parameter in the `Rational` class.

Hide Answer

▼ 13.9.4

Simplify the code in lines 82-85 in Listing 13.13 `Rational.java` using one line of code without using the `if` statement. Simply the code in lines 110-115 using a conditional operator.

```
public boolean equals(Object o) {
    return (this.subtract((Rational)(other)))
        .getNumerator() == 0;
}

public int compareTo(Rational o) {
    return this.subtract(o).getNumerator() > 0 ? 1 :
        (this.subtract(o).getNumerator() == 0 ? 0 : 1);
}
```

Hide Answer

▼ 13.9.5

Trace the program carefully and show the output of the following code.

```
Rational r1 = new Rational(1, 2);
Rational r2 = new Rational(1, -2);
System.out.println(r1.add(r2));
```

0/4

Hide Answer

▼ 13.9.6

The preceding question shows a bug in the `toString` method. Revise the `toString()` method to fix the error.

```
public String toString() {
    if (numerator == 0 || denominator == 1)
        return numerator + "";
    else
        return numerator + "/" + denominator;
}
```

Hide Answer

▼ 13.9.7

What happens if you create a `Rational` using `new Rational(1, 0)`? Discuss the appropriate ways for handling this case.

`new Rational(1, 0)` would create a `Rational` with denominator 0. The best way to handle this case is to throw an `IllegalArgumentException` when denominator is 0.

Hide Answer

Section 13.10

▼ 13.10.1

Describe class design guidelines.

[See the text.](#)

Hide Answer