

OLLSCOIL NA hÉIREANN
THE NATIONAL UNIVERSITY OF IRELAND, CORK
COLÁISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

SAMPLE EXAMINATION

CS2514 Introduction to Java

Dr. D.G. Bridge

Answer **both** questions.
Silent non-programmable calculators may be used.

Time allowed: 90 minutes

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PLEASE ENSURE THAT YOU HAVE THE CORRECT EXAM PAPER**

1. (40 marks) You **must** write your answers into your answer booklet.

i) What is the effect of attempting to compile and run the following fragment of code:

```
int x = 12;
double y = 47.9;
x = y;
```

- a. the assignment `x = y` gives a compile-time error
- b. the assignment `x = y` gives a run-time error
- c. at run-time, `x` will come to contain 47
- d. at run-time, `x` will come to contain 48
- e. at run-time, `x` will come to contain 47.9

Select the most appropriate answer.

ii) Which of the following will correctly print all years between 2006 and 2016 *inclusive*?

- a.

```
for (int i = 2005; i <= 2015; i = i + 1) {
    System.out.println(i);
}
```
- b.

```
for (int i = 2005; i <= 2015; i = i + 1) {
    System.out.println(i + 1);
}
```
- c.

```
for (int i = 2006; i <= 2015; i = i + 1) {
    System.out.println(i);
}
```
- d.

```
for (int i = 2006; i <= 2015; i = i + 1) {
    System.out.println(i + 1);
}
```

Select all correct answers.

iii) What is the effect of attempting to compile and run the following program:

```
class Test {
    public static void main(String[] args) {
        java.util.Scanner sc = new java.util.Scanner(System.in);
        int x = sc.nextInt();
        if (x < 0) {
            String y = "A" + x;
        } else {
            y = "B";
        }
        System.out.println(x);
    }
}
```

- a. the program compiles and, when run, displays the value of `x`
- b. the compiler reports an error for the expression `"A" + x`
- c. the compiler reports an error for `y = "B"`
- d. the compiler reports an error for `System.out.println(x)`

Select the most appropriate answer.

- iv) A programmer is reading about Java strings and arrays, and encounters the following fragment of example code:

```
String str = "abc";
System.out.println(str.length());
int[] a = new int[3];
System.out.println(a.length);
```

The programmer comes to two of the following conclusions. Which ones?

- a. For Strings, length is a variable
- b. For Strings, length is a method
- c. For arrays, length is a variable
- d. For arrays, length is a method

Select both correct answers.

- v) What is the effect of attempting to compile and run the following program:

```
class Test {
    public static void main(String[] args) {
        int[] arrayOfIntegers;
        for (int i = 1; i < arrayOfIntegers.length; i = i + 1) {
            arrayOfIntegers[i] = i;
        }
    }
}
```

- a. the program compiles and runs, filling the cells of the array with different integers
- b. it does not compile
- c. it compiles but, when run, gives an array index out of bounds error
- d. it compiles but, when run, gives a null pointer error

Select the most appropriate answer.

- vi) Which of the following are variables that may be declared in a Java program?

- a. class variables
- b. local variables
- c. instance variables
- d. formal parameters
- e. actual parameters

Select all correct answers.

- vii) Which of the following can be used as a signature for a constructor that is to appear in the Test class definition:

- a. public void Test()
- b. public Test()
- c. public static Test()
- d. public static void Test()

Select the most appropriate answer.

- viii) What is the effect of attempting to compile and run the following two class definitions that are in separate files:

```
class One {
    private String name;

    public One(String name) {
        this.name = name;
    }

    public String getName() {
        System.out.println(name);
    }
}
```

```
class Two {
    public static void main(String[] args) {
        One o = new One("Java");
        o.getName();
    }
}
```

- a. it compiles and runs but produces no output
- b. it does not compile
- c. it compiles and, when run, displays Java
- d. it compiles but, when run, gives a run-time error

Select the most appropriate answer.

- ix) A program consists only of the following two class definitions in separate files:

```
class One {
    public int count;
}
```

```
class Two {
    public static void main(String[] args) {
        System.out.println(count); // a
        System.out.println(One.count); // b
        One o = new One(); // c
        System.out.println(o.count); // d
        System.out.println(this.count); // e
    }
}
```

Select all lines of the program (a, b, c, d, e) that contain compile-time errors.

x) What is the effect of attempting to compile and run the following program:

```
class Test {
    private String[] a;

    public Test(String[] a) {
        this.a = a;
    }

    public void replace() {
        a[0] = a[1];
    }

    public static void main(String[] args) {
        String[] b = new String[2];
        b[0] = "first";
        b[1] = "second";
        Test obj = new Test(b);
        obj.replace();
        System.out.println(b[0]);
    }
}
```

- a. the program doesn't compile
- b. it compiles but, when run, gives a run-time error
- c. it compiles and, when run, displays *first*
- d. it compiles and, when run, displays *second*

Select the most appropriate answer.

xi) Which of the following is a legal return type of a method that *overloads* the following method:

```
public void insert(int a) {
    // statements
}
```

- a. void
- b. int
- c. can be anything

Select the most appropriate answer.

xii) To say that Java uses dynamic method binding means that...

- a. ...programmers can easily change the bodies of methods
- b. ...programmers can easily change the signatures of methods
- c. ...the choice of which method to run, for a particular method call, is made at compile-time
- d. ...the choice of which method to run, for a particular method call, is made at run-time

Select the most appropriate answer.

xiii) What is the effect of attempting to compile and run the following class definitions which are in separate files:

```
class One {
    private int x = 10;

    public One() {
        x = 5;
    }

    public String toString() {
        return "x: " + x;
    }
}

class Two extends One {
    private int y;

    public Two(int y) {
        this.y = y;
    }

    public String toString() {
        return "y: " + y;
    }

    public static void main(String[] args) {
        Two obj = new Two(12);
        System.out.println(obj);
    }
}
```

- a. they compile and, when run, display a reference (pointer)
- b. they compile and, when run, display: y: 12
- c. they compile and, when run, display: x: 5, y: 12
- d. they compile and, when run, display: x: 10, y: 12

Select the most appropriate answer.

xiv) Which of the following is correct for a method that *overrides* the following method:

```
public void insert(int a) {
    // statements
}
```

- a. the overriding method must return void
- b. the overriding method must return int
- c. the overriding method can return whatever it likes

Select the most appropriate answer.

- xv) A polymorphic array of Objects is one...
- a. ...that can change its length easily
 - b. ...whose contents can change their type easily
 - c. ...that can contain values drawn from any of the primitive types
 - d. ...that can contain references to any Java object
 - e. ...that can contain references to any object of class Object or subclass of Object

Select all correct answers.

- xvi) What is the effect of attempting to compile and run the following class definitions which are in separate files:

```
class Tree {
    public void display() {
        System.out.println("tree");
    }
}
```

```
class Oak extends Tree {
    public void display() {
        System.out.println("oak");
    }

    public static void main(String[] args) {
        Oak v1 = new Oak();
        Tree v2 = v1;
        Oak v3 = new Oak();
        v1.display();
        v2.display();
        v3.display();
    }
}
```

- a. it compiles and, when run, displays tree three times
- b. it compiles and, when run, displays oak three times
- c. it compiles and, when run, displays tree once and oak two times
- d. it compiles and, when run, displays oak just two times

Select the most appropriate answer.

- xvii) One is a Java interface, defined as follows:

```
interface One {
    public void insert(int a);
    public void delete(int a);
}
```

A class definition, Two, begins as follows:

```
class Two implements One
```

Hence, which of the following is true:

- a. Class Two must include concrete definitions of insert and delete
- b. Class Two must include abstract definitions of insert and delete
- c. Class Two must include concrete definitions of insert or delete
- d. Class Two must include abstract definitions of insert or delete

Select the most appropriate answer.

- xviii) Using the One Java interface from the previous question, a class definition, Three, begins as follows:

```
abstract class Three implements One
```

Hence, which of the following is true:

- a. Class Three must include definitions of insert and delete and they must both be concrete
- b. Class Three must include definitions of insert and delete and they must both be abstract
- c. Class Three must include definitions of insert and delete and they may be either concrete or abstract
- d. Class Three must include abstract definitions of insert or delete and they must both be concrete or both abstract

Select the most appropriate answer.

- xix) What is the effect of attempting to compile and run the following program:

```
class Test {
    private int id;
    private static int count = 9;

    public Test() {
        count = count + 1;
        id = count;
        if (id <= 10) {
            System.out.println(id);
        }
    }

    public static void main(String[] args) {
        Test t1 = new Test();
        Test t2 = new Test();
    }
}
```

- a. the compiler reports an error for the assignment `id = count`
- b. the compiler reports an error for the declaration of `count`
- c. the value 10 is displayed twice
- d. the value 10 is displayed once

Select all correct answers.

xx) Which of the following are grammatical and true?

a. Java rocks

b. Java sucks

c. Java rocks

d. Java sucks

Select four correct answers.

2. (40 marks) An online music retailer is using a Java program to handle downloads of music tracks. A `Track` class definition has already been written. It includes a getter which returns the number of downloads:

```
public int getNumDownloads()
```

Tracks are stored in an object called a catalogue. There is a method for adding a new track to the catalogue. And there is a method for getting the most downloaded tracks (i.e. the ones with joint highest downloads). Here is an incomplete version of the `Catalogue` class definition:

```
import java.util.List;

class Catalogue {

    public Catalogue()

    public void addNewTrack(Track track)

    public List<Track> getMostDownloaded()
}
```

Complete this class definition.