UNIVERSITY OF LONDON

GOLDSMITHS COLLEGE

B. Sc. Examination 2002

COMPUTER SCIENCE

IS51008A(CIS109)   Introduction to Java and Object–Oriented Programming

Duration: 3 hours

Date and time:

Answer 4 Questions from section A, 4 from section B, and 4 from section C.

THIS EXAMINATION PAPER MUST NOT BE REMOVED FROM THE EXAMINATION ROOM

Section A

Answer four questions from section A

QUESTION 1

(a) (i) What is the purpose of the *main method* in a Java application?

    (ii) When we compile the program below for the first time, what is the name of the new file that will appear in the current directory?

```
//Our First Program
class HelloWorld
{
        public static void main(String[] args)
        {
          System.out.println("Hello World");
        }
}
```

[**4 Marks**]

(b) (i) Briefly describe what methods are and why they are useful in programming.

    (ii) What is a recursive method? Give an example of a recursive method.

[**6 Marks**]

QUESTION 2

(a) Briefly explain the purpose of *Exceptions* in a Java program.

[**4 Marks**]

(b)   (i) List three *primitive types* in Java

    (ii) Give an example of a *variable declaration* and explain what it does.

    (iii) Give an example of an *assignment statement* and explain what it does.

[**6 Marks**]

QUESTION 3

(a)   (i) What are the possible values that *boolean expressions* evaluate to.

    (ii) List two boolean operators in Java and, with examples, briefly explain their meaning.

[**4 Marks**]

(b)   (i) Describe the similarities and differences between *arrays* and *Vectors* in Java.

    (ii) How do you refer to the third element of array x? (Reminder: The third element of an array has exactly two elements before it)

    (iii) How do you refer to the third element of Vector v? (Reminder: The third element of a Vector has exactly two elements before it)

[**6 Marks**]

QUESTION 4

(a) Give an example of a *compilation error* and explain how the compiler informs us of the error.

[**4 Marks**]

(b) (i) Write a complete Java program that tests whether *times* binds more tightly than *plus*. Explain how the output of your program will enable you to decide.

  (ii) Explain why it is not necessary to remember the precedence of operators when writing programs.

[**6 Marks**]

QUESTION 5

(a) (i) What does it mean to say that Java is *case sensitive*?

   (ii) Give an example of a Java program with an error caused by the fact that Java is case sensitive.

[**4 Marks**]

(b) (i) Consider the two programs below. Explain what each of their outputs is and why.

```
class div1
{
    public static void main(String[] args)
    {
     System.out.println(3/2);
    }
}
```

```
class div2
{
    public static void main(String[] args)
    {
     System.out.println(3/2.0);
    }
}
```

   (ii) Explain the output of the following program:

```
class abs
{
 public static void main(String[] args)
 {
   System.out.println(Math.abs(-5));
   System.out.println(Math.abs(5));
 }
}
```

[**6 Marks**]

Section B

Answer four questions from section B

QUESTION 6

(a) Write a program that prints out every other character of a file. i.e The first, third, fifth etc. character. The name of the file should be is passed to the program as a command line argument.

[**7 Marks**]

QUESTION 7

(a) Describe the *Bubble Sort* Algorithm.

[**2 Marks**]

(b) Write a method whose heading is

```
public static void ascendingBubbleSort(int[] a, int size)
```

which sorts an array of integers into ascending order.

[**5 Marks**]

QUESTION 8

Using `try` and `catch` and the method `Integer.parseInt`, write a static method, `isInt` that takes a String as a parameter and returns `true` if the String contains only digits and `false` otherwise.

[**7 Marks**]

QUESTION 9

Consider the class `Person`

```
package LectureSimpleObjects;
import LectureSimpleObjects.*;

public class Person
{
    public String firstname;
    public String lastname;
    public Date dob;
    public boolean sex; //true= female, false = male

    public Person(String f, String l, Date birth , boolean s)
    {
      firstname=f;
      lastname=l;
      dob=birth;
      sex=s;
     }


    public Person(String f, String l, Date birth, String s)
    {
      firstname=f;
      lastname=l;
      dob=birth;
      if (s.charAt(0)=='f' || s.charAt(0)=='F') sex=true;
      else sex=false;
    }
}
```

Extend the class `Person`, to a class `NatPerson` so that a person also has a nationality which is a String. We require two new constructors corresponding to each of the two constructors of `Person`.

[**7 Marks**]

QUESTION 10

(a) What is the output of the program below and why?

```
class test1
{
    public static void main(String[ ] args)
    {
        int[ ] a = new int[1];
        a[0]=5;
        int [ ] b =a;
        a[0]=6;
        System.out.println(b[0]);
    }

}
```

(b) What is the output of the program below and why?

```
class p1
{
    static void f()
    {
      int x=3;
    }

     public static void main(String [ ] args)
    { int x;
      x=2;
      f();
      System.out.println(x);
    }
}
```

[**7 Marks**]

QUESTION 11

(a) Given the class `Arrays`:

```java
package LectureNonVoidMethods;
import java.io.*;
public class Arrays
{
    public static int sum(int [] a)
    {
        int sum=0;
        for (int i=0;i<a.length;i++)sum=sum+a[i];
        return sum;
    }

    public static double average(int [] a)
    {
        return (sum(a)*1.0)/a.length;
    }


    public static int [] readintarray() throws IOException
    {
        BufferedReader in =new BufferedReader(new InputStreamReader(System.in));
        System.out.println("How many numbers are you going to enter? ");
        String s =in.readLine();
        int n = Integer.parseInt(s);
        System.out.println("Enter "+n+ " numbers ");
        int[] a; //declares a to be an array of ints
        a =new int[n];   //gives a enough space to hold n ints
        for(int i=0;i<n;i++)  /*read them into an array*/
        {
            s =in.readLine();
            a[i]=Integer.parseInt(s);
        }
         return a;
    }

}
```

The methods in class **Arrays** can be referred to in other classes. Write a complete Java application which calls some of the methods in the class **Arrays** which asks the user how many numbers they are going to enter, reads in the numbers and prints their average.

[**7 Marks**]

Section C

Answer four questions from section C

QUESTION 12

Write a simple spell checker. You can assume the existence of a file called `words` in the current directory consisting of a big list of English words (courtesy of Unix), one per line. The user simply types the beginning of the word he wants to check as a command line argument. For example,

`java spell freq`

will print out all English words starting with `freq`

```
frequencies
frequency
frequent
frequented
frequenter
frequenters
frequenting
frequently
frequents
```

You may also use the `String` method `startsWith`.

[**8 Marks**]

QUESTION 13

Write a complete program that asks the user to enter two numbers and then prints out the Greatest Common Divisor of the two numbers. Your solution may be iterative or recursive.

[**8 Marks**]

QUESTION 14

(a) Define a class `house` that consists of three fields:

  (i) an integer which gives its number

  (ii) another integer which gives the number of rooms in the house

  (iii) an array of `Person`s living in the house. (You do not need to define `Person`. See page 6 for the definition of `Person`.)

  Your definition should include a constructor method with three parameters.

(b) Define another class called `Street` consisting of two fields

  (i) A String representing the name of the street.

  (ii) An array of `Houses` in the street.

  Your definition of `Street` should contain a constructor method with two parameters and an instance method called `UpMarket` which returns true if every house in the street contains more rooms than people.

[**8 Marks**]

QUESTION 15

A *palindrome* is a String that reads the same backwards as forwards. Write a complete Java program that asks the user to enter a String. The program outputs 'Yes' if the String entered by the user is a palindrome and 'no' otherwise. The program repeatedly asks the user if he wants another go to enter further Strings.

[**8 Marks**]