



22107014



International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

**COMPUTER SCIENCE
STANDARD LEVEL
PAPER 2**

Friday 7 May 2010 (morning)

1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.

Answer **all** the questions.

1. (a) Suggest a suitable data structure that can hold the responses to a set of 100 questions, where each response is either “yes” or “no”. Include reasons for your suggestion.

[4 marks]

- (b) Using the data structure suggested in part (a), construct the method `yesTotals()` that will return the total number of “yes” responses. The method has been started below.

```
public int yesTotals()
{
    // lines of code missing
}
```

[4 marks]

The method `numberSorter()` receives an `int` array of unknown length (but with a maximum of 100 items), and places the integers into three different arrays `a`, `b` and `c`, where

`a` = negative integers
`b` = non-negative even integers
`c` = integers neither in `a` nor in `b`.

The method then returns the number of items in array `b`.

- (c) Construct the method `numberSorter()`, which has been started below. You can assume that the arrays are initially empty.

```
public int numberSorter(int[] original)
{
    // lines of code missing
    if (...)
        // lines of code missing
    else
        // lines of code missing
}
```

[8 marks]

- (d) Without writing any code, suggest how the method `numberSorter()` could be modified so that it not only returns the total number of elements in array `b`, but also returns the total number of elements in array `a`. No additional methods should be considered.

[4 marks]

2. A *master file* has been created that contains details of the players in a soccer (football) league. Each record in the file contains the name of the player and the total number of goals that they have scored. The records are stored in alphabetical order of the players' names.

The first three records are shown below:

Record 0	
name	goals
Adams P.	5

Record 1	
name	goals
Alvez J.	1

Record 2	
name	goals
Aziz M.	3

The master file is updated each week by a *transaction file*.

- (a) Outline the differences between a master file and a transaction file. [2 marks]

Each week the following processing then takes place:

- a user inputs data into a new transaction file which has the same record structure as the master file and which contains details of the goal scorers for that week
- the transaction file is sorted into the same order as the master file
- the master file is updated by the transaction file
- the total number of goals scored that week is printed out.

- (b) Draw a *systems flowchart* for the above processing. [6 marks]

For the update process to take place, the records in the master file are read into the array `master[]`, which is an array of `Player` objects. A `Player` object is defined by the class `Player`, shown below.

```
class Player
{
    public String name;    // name of player
    public int goals;     // number of goals scored by that player
}
```

The records in the transaction file are read into the array `transaction[]` which is also an array of `Player` objects.

- (c) Explain why it is important to have both the master file and the transaction file in the same order. [2 marks]

(This question continues on the following page)

(Question 2 continued)

(d) With reference to the data given in the original master file, state the value of

(i) `master[0].name`; *[1 mark]*

(ii) `master[2].goals`. *[1 mark]*

The update process is as follows:

repeat for each player in the array `transaction[]`

- search sequentially in the array `master[]`, until the same player is found
- update the number of goals scored for that player.

The method `update()` performs this process and **also** returns the total number of goals scored for that week.

(e) Construct the method `update()`, which has been started below.

```
// both arrays are declared as class (global) variables
public int update()
{
    // lines of code missing
}
```

You can assume that all the players that appear in the transaction file are already in the master file.

[8 marks]

3. *This question requires the use of the case study.*
- (a) The construction of Heathrow’s Terminal 5 included a new control tower for the whole airport. The changeover was carried out by running the new system in parallel with the old system.
- (i) Outline what is meant by running systems in parallel. *[2 marks]*
- (ii) Outline **one** reason for choosing a parallel form of changeover, as opposed to any other. *[2 marks]*
- (b) Suggest why the airport authorities chose the particular testing strategy outlined on page 4 of the case study. *[2 marks]*
- (c) Describe **two** different security procedures that would help prevent physical access by unauthorised people into restricted sections of the airport. *[4 marks]*
- (d) (i) Identify an airport system that would use real-time processing. *[1 mark]*
- (ii) Explain, for the system identified in part (i), why it would require real-time processing. *[3 marks]*
- (e) A computerized system is being designed to replace the paper flight strips used in Air Traffic Control. A concern of the controllers is that interacting with a computer system might distract them from their tasks.
- (i) Explain why *voice recognition* would **not** be suitable as a *user-interface*. *[3 marks]*
- (ii) Describe a user-interface that would be suitable. *[3 marks]*
- (iii) Describe **one** useful feature that could be incorporated into the new user interface, that was not present in the original one. *[2 marks]*
- (iv) Suggest **one** possible back-up strategy in case of a system failure in Air Traffic Control. *[2 marks]*
- (f) By considering both sides of the argument, discuss whether or not governments should have access to the “passenger name records (PNR)” files (see page 10 of the case study). *[6 marks]*
-