N13/5/COMSC/HP2/ENG/TZ0/XX/M

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

MARKSCHEME

November 2013

COMPUTER SCIENCE

Higher Level

Paper 2

11 pages

Subject Details: Computer Science HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer ALL questions ***[20 marks]*** for question 1, ***[20 marks]*** for question 2, ***[20 marks]*** for question 3 and ***[40 marks]*** for question 4. Maximum total = ***[100 marks]***.

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for that part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each statement worth one point has a separate line and the end is signified by means of a semi-colon (;).
- An alternative answer or wording is indicated in the markscheme by a "/"; either wording can be accepted.
- Words in (…) in the markscheme are not necessary to gain the mark.
- If the candidate's answer has the same meaning or can be clearly interpreted as being the same as that in the markscheme then award the mark.
- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalizing them for what they have not achieved or what they have got wrong.
- Remember that many candidates are writing in a second language; be forgiving of minor linguistic slips. In this subject effective communication is more important than grammatical accuracy.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with "**FT**".

1. (a) (i)
```
FarmField firstField = new FarmField();
```
[1 mark]

(ii)
```
firstField.fieldSize = 12000;
firstField.fieldName = "Back forty";
```
[2 marks]

(b) *Award marks as follows:*
*Award **[1 mark]** for correct structure of a class declaration;*
*Award **[1 mark]** for correct declaration of the array `theFields`;*
*Award **[1 mark]** for correct declaration of the other instance variables;*

```
public class Farm
{
     String farmerName;
     int farmID;
     int numberOfFields;
     FarmField[] theFields;
}
```
[3 marks]

(c) *Award marks as follows:*
*Award **[1 mark]** for correctly initializing the largest field variable;*
*Award **[1 mark]** for returning the largest field size;*
*Award **[2 marks]** for correctly looping through all the `Farm` objects;*
*Award **[1 mark]** for correctly looping through all the fields in a `Farm` object;*
*Award **[1 mark]** for correctly updating the largest field size;*

```
int findLargest(Farm [] allFarms)
{
  int largestField = 0;
  int iField;
  Farm currentFarm;
  int iFarm = 0

  currentFarm = allFarms[iFarm];
  while (currentFarm != null)
  {
    for (iField = 0; iField < currentFarm.numberOfFields; iField++)
    {
      if (currentFarm.theFields[iFields].fieldSize > largestField)
      {
      largestField = currentFarm.theFields[iFields].fieldSize;
      }
    }
    iFarm += 1;
    currentFarm = allFarms[iFarm];
  }
  return largestField;
}
```
[6 marks]

Question 1 continued

(d) Describes how to find the end of the "used" elements in the array;
Describes the process of shifting the "used" array elements to free the first;
States that the new farm object is inserted into the first array element;
Any reasonable diagram illustrating the shifting of the array elements; ***[4 marks]***

(e) *Award **[3 marks max]** if this is not shown through code.*
Identifies the 2 instance variables common between the classes;
Suggests creation of a single super-class;
States that the two sub-classes would inherit the common instance variables from the new class / extend the super-class;
States that the two sub-class declarations would need to add the variables that are unique to each; ***[4 marks]***

2. (a) `leftChild` identifies a node in the tree;
Each node in the tree is a `NameNode` object; ***[2 marks]***

(b) Creates a new binary search tree called `myTree`;
That consists of a single node containing the name "Charley"; ***[2 marks]***

(c) (i) *Award up to **[4 marks max]**.*
`searchName` is compared to the root;
If smaller (alphabetically) it is then compared with the left child (if bigger, the right child);
This continues until the node is found;
It has to be ascertained whether the found node is a left child or right child;
The corresponding link to this node is replaced with `null`; ***[4 marks]***

(ii) When it is ascertained whether the found node is a left child or right child;
Then the appropriate link to the found node is changed to link to the found node's child; ***[2 marks]***

(d) *Award marks as follows:*
*Award **[2 marks]** for correctly searching the tree;*
*Award **[1 mark]** for using the correct String functions;*
*Award **[1 mark]** for returning the correct value;*

```
boolean findName(String queryName)
{
  NameNode currentNode = treeRoot;
  while(currentNode != null)
  {
    if(currentNode.name.equals(queryName))
      return true;

    if(currentNode.name.compareTo(queryName) > 0)
    {
      currentNode = currentNode.leftChild;
    }
    else
    {
      currentNode = currentNode.rightChild;
    }
  }

  return false;
}
```
[4 marks]

Question 2 continued

(e) *Award marks as follows:*
*Award **[1 mark]** for producing an algorithm that is recursive;*
*Award **[2 marks]** for checking for an empty tree;*
*Award **[1 mark]** for the correct recursive calls;*
*Award **[1 mark]** for the correct statement for displaying the names;*
*Award **[1 mark]** for printing in in-order (alphabetical);*

```
void displayNames(NameNode root)
{
   if (root != null)
   {
      displayNames(root.leftChild);
      System.out.println(root.name);
      displayNames(root.rightChild);
    }
}
```

OR

```
{
  if (root.leftChild != null)
  {
    displayNames(root.leftChild);
  }
  System.out.println(root.name);
  if (root.rightChild != null)
  {
    displayNames(root.rightChild);
  }
}
```

[6 marks]

3. (a) The numerical identifier the whale will be the master file key; ***[1 mark]***

(b) (i) *Award up to **[3 marks max]**.*
The records in the file should be sorted;
Based on the value of the whale identifier (or key field);
The whale identifiers must be unique;
The whale identifiers cannot have any "gaps", if there are N whales, the whale identifiers should be 0 to N–1; ***[3 marks]***

(ii) The (fixed) size of a record;
Should be multiplied by the whale identifier;
The result gives the offset from the start of the file to the start of the desired record; ***[3 marks]***

(c) The record corresponding to the received whale identifier will be retrieved;
The number of dives should be increased by one;
The distance between the last recorded location and the new position should be calculated and added to the total distance the whale has travelled;
The last recorded location should be changed to the newly received position;
The date/time of the last position should be replaced with the current date/time; ***[5 marks]***

(d) The archive file could be broken into smaller files;
That are small enough to fit in the available memory;
The individual files can would then be sorted;
The sorted files can be merged into a single, sorted archive file; ***[4 marks]***

(e) *Award marks as follows, up to **[4 marks max]**.*
*Award **[1 mark]** for identifying a group with whom the information might be shared or an ethical issue.*
*Award **[2 marks]** for identifying 2 issues or discussing one issue with its consequence related to a particular group.*
*Award **[3 marks]** for a discussion that considers more than 1 ethical issue with their consequences related to a particular group.*
*Award **[4 marks]** for a sound discussion of at least 2 ethical issues and their consequences and 2 corresponding groups of people related to these issues.* ***[4 marks]***

4. (a) *Award marks as follows up to **[4 marks max]**.*
*Award **[1 mark]** for identifying the precaution;*
*Award **[1 mark]** for describing the precaution beyond simply stating it;*
*For **two** precautions.*

For example:

Assign a password to the device;
So it cannot be accessed by an unauthorized user;

Do not store sensitive data on the smartphone;
So that it is not there to be found if the device is lost;

Do not store username/password account logins (or "remember me" cookies) on the device;
So somebody finding the device will not be able to access your accounts; ***[4 marks]***

(b) *Award marks as follows up to **[4 marks max]**.*
*Award **[1 mark]** for identifying the reason;*
*Award **[1 mark]** for an elaboration;*
*For **two** reasons.*

For example:

Uses a smaller battery;
So weighs less;

Can be marketed as green;
Increases sales;

Will charge up when outside;
Less chance it will run out of power; ***[4 marks]***

(c) They change frequencies several times a second;
Limited range;
Addressing (not pairing); ***[3 marks]***

(d) *Award up to **[3 marks max]**.*
Bluetooth is much slower than Ethernet;
Ethernet requires a physical connection, Bluetooth does not;
Ethernet is more secure than Bluetooth;
An Ethernet network requires additional hardware (routers, hubs, *etc*). Bluetooth does not; ***[3 marks]***

Question 4 continued

(e) *Award **[1 mark]** for each advantage up to **[2 marks max]**.*
*Award **[1 mark]** for each disadvantage up to **[2 marks max]**.*
*Award **[2 marks]** for a discussion that does more than state them.*

Advantages:
Emergency services can locate a distress call;
Friends can see where you are and meet you;
Advertisements could be tailored for things that are near you;

Disadvantages:
Illegal surveillance is possible;
Advertisers could profile your physical habits as well as your online;
Loss of location information (*eg* in a tunnel) could create erroneous data in systems; ***[6 marks]***

(f) (i) Flash memory, or EEPROM, or hard-drive; ***[1 mark]***

(ii) Cache memory is much faster than secondary memory (*eg* a hard-drive);
Data that will not fit in RAM but will be needed soon is put into cache;
And loaded back into memory when needed; ***[3 marks]***

(g) (i) *Award marks as follows up to **[4 marks max]**.*
*Award **[1 mark]** for identifying the idea;*
*Award **[1 mark]** for elaborating on how it helps;*
*For **two** cases.*

For example:

By letting them access nutrition information when eating out;
So they can eat healthier food;

By supporting applications to monitor/track exercise;
So they will be inspired to do more of it;

By monitoring vital signs;
To detect unhealthy conditions; ***[4 marks]***

(ii) *Award marks as follows up to **[2 marks max]**.*
*Award **[1 mark]** for identifying the reason;*
*Award **[1 mark]** for elaborating on why;*

For example:

By being too engaging;
Causing the user to not pay attention to the real world;

By taking up too much of the users' time;
Causing them to exercise or socialize less; ***[2 marks]***

Question 4 continued

(h) *Award marks as follows up to **[4 marks max]**.*
*Award **[1 mark]** for identifying the consequence;*
*Award **[1 mark]** for elaborating on the result;*
*For **two** consequences.*

For example:

Seamless integration with internet service;
Allows more effective communication;

The IP routing/handling hardware and software design is standard;
So designs can be re-used thereby reducing unit costs;

The "translation" between the cellular and Internet protocols is no longer needed;
Which makes the network faster, overall; ***[4 marks]***

(i)

Marks	Details
1–2	The candidate conveys some understanding of at least one effect of widespread ownership but merely states it/them without elaboration or example.
3–4	The candidate clearly identifies two or more effects and elaborates on one of them to explore at least one consequence of this effect.
5–6	The candidate clearly identifies and elaborates on the consequences of two or more effects.

Answer to be focused on students. Examples include:
Positive:
- Contact teachers with queries
- Research topics
- Replace expensive textbooks
- Make study schedules
- Store PowerPoint presentations

Negative:
- Become a distraction in class
- Reliance on smartphones as knowledge source
- Plagiarism issues
- Cheating in exams

[6 marks]