



# **MARKSCHEME**

**November 2012**

**COMPUTER SCIENCE**

**Higher Level**

**Paper 2**

11 pages

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## General Marking Instructions

*After marking a sufficient number of scripts to become familiar with the markscheme and candidates' responses to all or the majority of questions, Assistant Examiners (AEs) will be contacted by their Team Leader (TL). The purpose of this contact is to discuss the standard of marking, the interpretation of the markscheme and any difficulties with particular questions. It may be necessary to review your initial marking after contacting your TL. **DO NOT BEGIN THE FINAL MARKING OF YOUR SCRIPTS IN RED INK UNTIL YOU RECEIVE NOTIFICATION THAT THE MARKSCHEME IS FINALIZED.** You will be informed by e-mail, fax or post of modifications to the markscheme and should receive these about one week after the date of the examination. If you have not received them within 10 days you should contact your TL and the IB Assessment Centre. Make an allowance for any difference in time zone before calling. **AEs WHO DO NOT COMPLY WITH THESE INSTRUCTIONS MAY NOT BE INVITED TO MARK IN FUTURE SESSIONS.***

You should contact the TL whose name appears on your “Allocation of Schools listing” sheet.

**Note:**

Please use a personal courier service when sending sample materials to TLs unless postal services can be guaranteed. Record the costs on your examiner claim form.

## General Marking Instructions

1. Once markscheme is received mark in pencil until final markscheme is received.
2. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.
3. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.
4. Sometimes, careful consideration is required to decide whether or not to award a mark. Indeed, another examiner may have arrived at the opposite decision. In these cases write a brief annotation in the **left-hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.
5. Unexplained symbols or personal codes/notations on their own are unacceptable.
6. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer. Show a mark for each part question (a), (b), *etc.* Do **not** circle sub-totals. Circle the total mark for the question in the right-hand margin opposite the last line of the answer.
7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.
8. Record the mark awarded for each of the four questions answered in the Examiner Column on the cover sheet. Add up the marks awarded and enter this in the box marked TOTAL in the Examiner Column on the cover sheet.
9. After entering the marks on the cover sheet check your addition of all marks to ensure that you have not made an arithmetical error. Check also that you have transferred the marks correctly to the cover sheet. **We have script checking and a note of all clerical errors may be given in feedback to all examiners.**
10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.
11. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Once again make a comment to this effect in the left-hand margin.

## 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) A collision occurs when a hashing algorithm produces the same index value for two different inputs; **[1 mark]**
- (b) The weight of the sample must be a numeric type and the value will not necessarily be an integer; **[2 marks]**
- (c) Each object in the `Sample` class contains a variable `nextSample` that can be used to link to another `Sample` object. **[1 mark]**
- (d) *Award marks as follows up to [6 marks max].*  
*Award [1 mark] for the correct method signature;*  
*Award [1 mark] for using `rockHash()` to obtain index value for `rockSample`;*  
*Award [1 mark] for calling `rockHash()` with the `rockType` of the sample, not the sample object itself;*  
*Award [1 mark] for using the index value to access the appropriate linked list in `allSamples`;*  
*Award [1 mark] for setting `nextSample` to the head element of the linked list in `allSamples`;*  
*Award [1 mark] for saving `rockSample` as the new head element of the linked list in `allSamples`;*

*Example answer:*

```
void insertSample(Sample rockSample)
{
    int sampleIndex = rockHash(rockSample.rockType);
    rockSample.nextSample = allSamples[sampleIndex];
    allSamples[sampleIndex] = rockSample;
}
```

**[6 marks]**

*continued ...*

*Question 1 continued*

- (e) *Award marks as follows up to [7 marks max].  
Award [1 mark] for the correct method signature;  
Award [1 mark] for initializing maximum value seen to some reasonable value;  
Award [1 mark] for using the `rockHash()` method to identify the correct linked list;  
Award [1 mark] for iterating through the samples in each linked list;  
Award [1 mark] for correctly implementing the loop to iterate through each linked list's elements;  
Award [1 mark] for comparing the weight of each sample to the maximum seen so far;  
Award [1 mark] for returning the correct sample index;*

*Example answer:*

```
public static int findBigSample(String rockType)
{
    int pos = rockHash(rockType);
    double max = -1.0;
    int maxNumber = -1;
    Sample curr = allSamples[pos];

    while (curr != null)
    {
        if (curr.sampleWeight > max)
        {
            max = curr.sampleWeight;
            maxNumber = curr.sampleNumber;
        }
        curr = curr.nextSample;
    }

    return maxNumber;
}
```

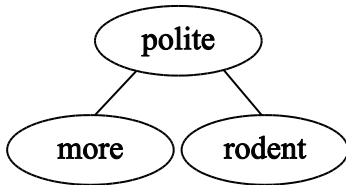
**[7 marks]**

- (f) *Must examine all elements of `allSamples`;  
Must examine all samples in each linked list;  
Output sample if it is from the specified location;*

**[3 marks]**

**Total: [20 marks]**

- 2. (a) 3; **[1 mark]**
- (b) polite; **[1 mark]**
- (c) Left subtree is null, or empty, or does not exist;  
Right subtree:



Award **[1 mark]** for the correct root node and a **[1 mark]** for the correct tree. **[3 marks]**

- (d) ferocious, agile, honourable, polite, more, rodent; **[1 mark]**
- (e) In-order; **[1 mark]**
- (f) `(w.leftChild == null) && (w.rightChild == null)` is TRUE if `w` is a leaf node; **[1 mark]**

- (g) Award marks as follows up to **[6 marks max]**.  
Award **[1 mark]** for the correct method signature;  
Award **[1 mark]** for returning 1 when `w` is a leaf node;  
Award **[1 mark]** for recursively calling `countLeaves` on left and right subtrees;  
Award **[1 mark]** for returning sum of subtree leaves when `w` is not a leaf;  
Award **[2 marks]** for addressing the case where `w` has only one subtree;  
Award **[1 mark]** for anything indicating an awareness of the potential problem;  
Award **[2 marks]** for a correct solution;

Example answer:

```

int countLeaves( WordNode w )
{
    if(w == null) return 0;
    if((w.leftChild == null) && (w.rightChild == null)) return 1;
    else return countLeaves(w.leftChild) + countLeaves(w.rightChild);
}
[6 marks]
  
```

- (h) Award up to **[2 marks max]**.  
Using recursion can lead to stack overflows or memory depletion when large trees are processed;  
Recursive code can be very difficult to troubleshoot;  
Recursive code can be difficult for another programmer to maintain; **[2 marks]**

- (i) Award **[1 mark]** for identifying each modification, up to **[2 marks max]**.  
Award an additional **[2 marks max]** for outlining how such modifications will permit access to the definition of each word.  
The `WordNode` class could be modified to include a String variable. The definition would be contained in the string.  
The `WordNode` class could be modified to contain an integer that could then be used as an index to retrieve the definition from a file. **[4 marks]**

**Total: [20 marks]**



3. (a) The Type Of Part is the key field in the record; **[1 mark]**
- (b) Batch processing; **[1 mark]**
- (c) The records in the master file should be sorted by the Type Of Part field; **[1 mark]**
- (d) The changes are downloaded from a device into a transaction file;  
The transaction file records are sorted by the Type Of Part field;  
A record is read from the transaction file and the master file is read until a record containing the same Type Of Part is found;  
The record in the Master file is updated with the data from the transaction file record; **[4 marks]**
- (e) *Award up to [3 marks max].*  
Handshaking takes place at the start of a communication;  
Device signals it wants to send data to the computer;  
Computer indicates that it can send;  
Computer verifies that device is authorized to send; **[3 marks]**
- (f) Type of Part;  
Quantity used; **[2 marks]**
- (g) Continuous communication allows for inventory to be updated immediately;  
Suggest a reasonable file organization (random access or fully indexed);  
Reasonable description of the resulting update process, including:  
Part ID and quantity used are sent to the computer;  
Computer reduces the quantity in inventory by the quantity used; **[4 marks]**
- (h) Check if the quantity remaining is less than the Re-order level;  
If so, calculate the number to buy as the Maximum Quantity minus the quantity remaining;  
Add the Type of Part and the number to buy to the shopping list;  
Repeat for all each Type of Part; **[4 marks]**

**Total: [20 marks]**

4. (a) *Award up to [2 marks max].*  
WiMax has much greater range than Wi-Fi;  
WiMax has greater bandwidth (speed) than Wi-Fi;  
WiMax is more secure than Wi-Fi; **[2 marks]**
- (b) *Award up to [2 marks max].*  
Bluetooth has much less range than Wi-Fi;  
Bluetooth uses much less power than Wi-Fi;  
Bluetooth cannot work through building walls, Wi-Fi can; **[2 marks]**
- (c) *Award [1 mark] for each reason identified, up to [2 marks max]. Award up to an additional [2 marks] for reasonable explanations.*  
Device is for very text-heavy use (e.g. Blackberry for email);  
Device may have to work in environment where touchpad will not work;  
Device may be subjected to impacts that would break a touchscreen;  
Device may have to be operated without looking at it;  
etc. **[4 marks]**
- (d) *Award [1 mark] for each reason identified, up to [2 marks max]. Award up to an additional [2 marks] for reasonable explanations.*  
Patient data would be sent over internet;  
Patient data may remain on phone (in cache) after it is sent;  
User error could result in the patient data being sent to an unintended recipient;  
etc. **[4 marks]**
- (e) *Award [1 mark] for each mechanism identified, up to [2 marks max]. Award up to an additional [2 marks] for reasonable explanations.*  
Man-in-the-middle public Wi-Fi attacks;  
A trojan in an installed app;  
Phishing and other scams;  
The mobile device is used to access a compromised or malicious host;  
etc. **[4 marks]**
- (f) *Award [1 mark] for each advantage identified. Only award the third mark for an answer that outlines these advantages beyond simply stating them.*  
Companies may produce apps specific to one area (e.g. medicine);  
Greater competition may lower prices / produce a greater variety of apps; **[3 marks]**
- (g) *Award [1 mark] for defining social engineering.*  
*Award [2 marks] for describing a method of getting a user to reveal personal data.*  
*Award [1 mark] clearly identifying the social engineering element of the method described.*  
example:  
Social engineering tries to make use of previously know information and/or promise of rewards in order to persuade users to part with sensitive data.  
For example, an email pretending to be from the user's bank, but with a slightly altered address, requesting certain actions, which could involve the user revealing bank account details. **[4 marks]**

continued ...

*Question 4 continued*

- (h) *The discussion should have two distinct areas. For each area, award [1 mark] for identifying a reasonable area, [1 mark] for an elaboration and [1 mark] for an example.*

*Possible areas for discussion:*

Work/life balance issues.

Employer monitoring of personal behaviour outside of work environment and hours.

Personal use of employer-owned mobile device.

**[6 marks]**

- (i) A standard message format used within a network;  
Contains header and data;  
Header identifies sender and recipient;  
*etc.*

**[3 marks]**

- (j) *Award [1 mark] for each reason identified, up to [2 marks max]. Award up to an additional [2 marks] for reasonable explanations.*

4G bandwidth is shared with other users, wired access is dedicated;

Wired access only available in one place, 4G accessible everywhere;

Wired access more reliable than 4G;

*etc.*

**[4 marks]**

- (k) *Award [1 mark] for each problem faced by OS designers identified, up to [2 marks max]. Award up to an additional [2 marks] for reasonable suggestions as to how they are (or could be ) resolved.*

Support for downloadable apps or plugins but resist viruses, trojans, *etc.*;

Store personal information and make it easy to retrieve but protect it from unauthorized users;

Provide a good user experience on a very small display;

*etc.*

**[4 marks]**

**Total: [40 marks]**