International Baccalaureate®
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MARKSCHEME

November 2012

COMPUTER SCIENCE

Standard Level

Paper 1

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. **Section A:** Add together the total for the section and write it in the Examiner Column on the cover sheet.
    Section B: Record the mark awarded for each of the six questions answered in the Examiner Column on the cover sheet.
    Total: 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 SL Paper 1 Markscheme**

Mark Allocation

Section A: Candidates are required to answer **all** questions. Total 30 marks.
Section B: Candidates are required to answer **all** questions. Total 40 marks.
             Maximum total = 70 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**".

SECTION A   *Total: [30 marks]*

1.   (a)   *Award up to [1 mark max].*
              On-line shopping;
              On-line reservation;
              etc.   *[1 mark]*

         (b)   *Award up to [1 mark max].*
              Controlling heating system;
              Monitoring traffic;
              etc.   *[1 mark]*

2.   *Award up to [2 marks max].*
         Primary memory size;
         Processor (frequency, word length);
         Backing storage capacity;
         I/O devices;
         Cost;
         Design;
         etc.   *[2 marks]*

3.   *Award up to [2 marks max].*
         Larger parts of programs from RAM could be stored in it;
         Since cache memory is faster than RAM / instructions will be retrieved from cache memory faster than from RAM;
         Computer will run faster;   *[2 marks]*

4.   All data and programs are stored in digital form within the computer;
         So all non-digital/analog values must be changed into digital form;   *[2 marks]*

5.   *Award up to [2 marks max].*
         Prototype could be used to obtain an early feedback from the end user;
         To avoid unnecessary work;

         Or

         Prototype could be used for investigation;
         Which allows preparation of better or alternative solution;   *[2 marks]*

6.   *Award up to [3 marks max].*
         Before sending data a parity bit is calculated from data;
         To make the number of 1s an even/odd number;
         This bit is added to the data and sent as an integral unit;
         After receiving data number of 1s is calculated;
         If it is not an even/odd number an error is indicated;   *[3 marks]*

7.   (a)   *Award [1 mark] for minus sign and [1 mark] for correct value.*
             $-15_{(10)}$ *[2 marks]*

      (b)

0	1	1	1	1	1	1	1

                                                                          [1 mark]

8. $1111101001110001_{(2)}$;   *[1 mark]*

9.   *Award up to [4 marks max].*

E-mail	Video conferencing
E-mail message can be quickly prepared, sent, and information is exchanged	Time consuming arrangements to make sure all staff are ready at the same time before any information is exchanged
Different time zones / if recipients are not currently available e-mail message will wait	All recipients must be available at the same time
Hard copy of correspondence available for future use	No hard copies
etc.	

                                                                          [4 marks]

10. Mode of operation that allows two or more tasks to be performed at the same time;   *[1 mark]*

11. (a)   (i)   `discount is 10 %;`   *[1 mark]*

             (ii)   `discount is 5 %;`   *[1 mark]*

             (iii) *Award [1 mark] for both outputs.*
                    `discount is 2 %`
                    `discount is 10 %;`   *[1 mark]*

      (b)   Logic error;   *[1 mark]*

12. *Award up to [4 marks max].*
      Award [2 marks] for any described advantage to society,
      For example helping persons with disabilities to work.
      Award [2 marks] for any described disadvantage to society,
      For example illegal activities such as credit card fraud, piracy, *etc.*   *[4 marks]*

SECTION B   *Total: [40 marks]*

13.   (a)   *Award [1 mark] for the use and [1 mark] for indicating why it is better for each part.*

        (i)   Interview allows the analyst to ask questions in response to vague answers from interviewee which cannot be done with questionnaires;   *[2 marks]*

        (ii)   Questionnaire is better because it is prepared in format that allows easier/faster analysis of answers obtained from many users;   *[2 marks]*

    (b)   *Award up to [2 marks max].*
Solutions could be of different cost;
So the management can select one which is in current situation better for the firm;

      Or

Solutions could require different amounts of time;
So management can select one depending on the urgency of using the computer system;   *[2 marks]*

    (c)   *Award [1 mark] for the clearly explained task, [1 mark] for a vague answer, ×2.*
Software should be fully tested with test data to make sure it is working correctly;
Staff should be trained to be ready to use the computer system;
All data files should be converted/created into a format accessible by the new software otherwise they could not be used by the system because of incompatible formats;
etc.   *[4 marks]*

Total: [10 marks]

14. (a) (i) *Award [1 mark] for each data type, up to [3 marks max].*
Student Code: String;
Score: int / accept any numeric data type;
Passed: boolean/String; *[3 marks]*

(ii) *Award up to [3 marks max].*
An array of records/objects;
With 200 elements / size of at least 200;
Each record/object contains the three data items (code, score, passed);

Or

Three parallel arrays;
Each with 200 elements / each of size of at least 200;
String array for codes, integer / any numeric array for scores and boolean/String array for passed/failed;

Or

A linked list of records/objects;
With unlimited size ;
Each record/object contains the data field with three data items (code, score, passed);
And a link field; *[3 marks]*

(b) *Award [1 mark] for device, [1 mark] for data preparation requirements, ×2, up to [4 marks max].*

To capture Student Code
Input device: bar code reader
Bar codes should be prepared;

Or

Input device: keyboard;
No need for data preparation;

To capture Students' answers to questions
Input device: scanner;
Answer sheets with area to be marked/shaded should be prepared;

Passed (Yes/No) will not be captured, it will be automatically processed;
No need for data preparation; *[4 marks]*

Total: [10 marks]

15. (a) (i) *Award up to [1 mark max].*
To write/update/delete/modify statements written in the programming language;
Create a text file containing the source code;   *[1 mark]*

(ii) *Award up to [1 mark max].*
To translate the source code into bytecodes;
To find/report possible syntax errors;   *[1 mark]*

(iii) To translate bytecodes into machine language;   *[1 mark]*

(b) (i) RAM;   *[1 mark]*

(ii) RAM;   *[1 mark]*

(iii) addition/+;   *[1 mark]*

(iv) ALU;   *[1 mark]*

(v) *Award up to [1 mark max].*
RAM;
Temporarily it will be stored in ALU;   *[1 mark]*

(vi) *Award [1 mark] for showing what address bus is and [1 mark] for applying this knowledge to the given situation, up to [2 marks max].*
A device that transfers addresses along;
within the CPU;
when fetching values for x and y;
and storing result in s;   *[2 marks]*

Total: [10 marks]

16.   (a)   *Award **[1 mark]** for correct parameter passing (should be evident that A=Numbers and target=32) and **[1 mark]** for each column ×4 in the trace table, up to **[4 marks max]**.*

pos	found	A[pos]==target	output
−1	False		
0	False	False	
1	True	True	32 is found at position 1

[4 marks]

(b)   Sequential/linear search;   *[1 mark]*

(c)   (i)   *Award up to **[2 marks max]**.*
          Because 20 is not within the array
          Logical expression !found always evaluates to true;
          Execution of while loop will not terminate;
          Run time error (array subscript out of bounds) will occur;
          Accept infinite loop.   *[2 marks]*

(ii)   *Award up to **[3 marks max]**.*
          To terminate the execution of the while loop in finite number of times,
          to avoid out of bounds error;
          Boolean expression should be changed to
          (!found && (pos < A.length));

Or

          (!found && (A[pos] < target));

          To alert the user about the error a suitable error message should be outputted;
          If statement could be changed to if-else statement;

          For example:

```
if (found)
{ output(target + " is found at position " + pos); }
else
{ output(target + " is not within the array "); }
```
[3 marks]

Total: [10 marks]