



MARKSCHEME

May 2011

COMPUTER SCIENCE

Standard Level

Paper 1

12 pages

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General Marking Instructions

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.
- 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.

SECTION A

Total: [30 marks]

1. *Award up to [2 marks max].*
A compiler produces an executable / machine code / object code file whereas an interpreter compiles and executes each line of code without saving a compiled copy.

A compiler does not execute any code until the translation process is complete whereas an interpreter executes each line of code as soon as it has translated it.

A compiler will not run any code until all syntax errors are eliminated whereas an interpreter will translate and execute each line of code until it encounters a syntax error. **[2 marks]**
2. *Note: The answers in part (a) and part (b) are to be 6-bit numbers. If a student has used a different number of bits but has the correct numbers, award [0 marks] for part (a) and [1 mark] for follow-through on part (b).*
- (a) 010001; **[1 mark]**
- (b) 101111; **[1 mark]**
- (c) *Award [1 mark] for each block.*
1010 0011 **[2 marks]**
3. (a) Allocates an appropriate section / amount of memory;
For each program (currently) running;
Do not accept answers describing the management of hard drives. **[2 marks]**
- (b) Deals with passwords / access levels;
So that only the appropriate person(s) can work with particular files;
Do not accept answers describing firewall and anti-virus functions. **[2 marks]**
4. Defragmentation software places sections of the same file next to each other;
To allow for faster access (to that file);
Do not credit answers which imply that extra space is created. **[2 marks]**
5. (a) (**double**) $(11 \% 2) / 2 = 1/2 = 0.5$; **[1 mark]**
- (b) To prevent a possible “division by zero” / run-time/execution error / program from crashing; **[1 mark]**
- (c) *Award up to [2 marks max].*
Because (otherwise) the operator “/” will perform integer division;
And return the answer 0;
And the method has to return a **double**;
The cast (**double**) ensures that $(x \% y)$ is of type **double**;
So real division is carried out;

So the cast / (**double**) converts the answer to a **double**;

[2 marks]

6. Data could be compressed (before sending);
Which means less data to send;

High speed lines / fibre optics / dedicated lines could be used;
Which allow faster transmission than “traditional lines”;

In lieu of suggesting a type of high-speed cable, allow good explanations of how increased bandwidth means that more bits can sent in a given time interval and thus the time required to transmit the file will be reduced.

[4 marks]

7. (a) Possible answers include:

.jpg/jpeg, .bmp, .png, .gif, .tif/.tiff, .svg...;

[1 mark]

- (b) Award ***[1 mark]*** for a general comment. Award ***[1 mark]*** more for a detailed response, up to ***[2 marks max]***. Possible answers include:

.jpg/jpeg: Lossy compression (reduced size);
Good for artificial images;
Widely supported;
Compatible compression with pdf;

.bmp: Uncompressed files (large size);
Simplicity of use;
Widely accepted by Windows programs;

Do NOT accept any statements suggesting that bitmap files are smaller or compressed.

.png: Opensource development;
Supports truecolours (16 million), indexed colours, grayscale;
Supports both lossless and lossy compression;
Adequate for streaming;
Adopted by modern browsers;

.gif: It handles 256 colours: adequate for shapes/diagrams/cartoon;
Supports lossless compression;
Supports image animation;

.tif/.tiff: Widely available;
Developed for professional use (graphics/photo industry);
Conceived for scanners/fax;
Specific applications: museum documentation and medical imagery;

.svg: Vector graphics;
Unlimited scalability;
Higher compression for certain types of images;

[2 marks]

8. *Award marks as follows up to [3 marks max].
Award [1 mark] for describing the bus network topology;
Award [1 mark] for describing the star network topology;
Award [1 mark] for comparing the two topologies;*

Bus topology: Each computer/server connected to one single bus cable through some connector;
Easy to add new machines, but the traffic on the cable reduces the performances;
One wire only, hence cheap to implement;
High risk of failure (if the cable breaks all the network breaks);
High costs of maintenance;
Adequate for LAN only;
A message is sent on the bus and only the machine with the identical IP address as in the message filters it and accepts it;

Star topology: Each machine of the network has a one-to-one connection to a hub in the network;
Easy to add new machine to the network;
The hub acts as a repeater of the signal, and can send it to long distances;
The hub is the only point of failure;
Easy to maintain;
Adequate for LAN, with possibility of getting out of the LAN through the hub/router;
A message is sent directly to the machine, passing through the hub;

[3 marks]

9. (a) *Award [1 mark] for benefit, [1 mark] for outline, up to [2 marks max].*

Machine-independence;

High-level syntax abstracts away the computational details of the machine;

User-friendly;

They may include constructions similar to natural language;

Intuitive;

Beneficial for non-expert programmers;

Portability;

Programs are more easily portable across platforms through intermediate representations/translations;

Robustness/formal verification/certification;

Programs' correctness can be formally verified/certified;

Fast prototyping;

Fewer lines of code, which has been shown to correlate with speed of development and number of bugs;

[2 marks]

- (b) *Award up to [2 marks max].*

Analysis/correctness of the entire program depends on the analysis/correctness of its modules and their mutual relations;

Better maintenance of the system;

Incremental extensibility/update of the system by adding/modifying modules;

Better portability of the system;

Reusability, modules can be used again in other contexts than what they were originally designed for;

[2 marks]

SECTION B

Total: [40 marks]

10. (a) *Award up to [1 mark max].*

A computer network covering a small physical area;
Whose links do not need telecommunication lines;
Often characterized by high data-transfer rate;
Do not accept “Local Area Network”

[1 mark]

(b) *Award [1 mark] each for processes related to the server, up to [5 marks max].
Do not accept processes that are not related to the server, such as scanning the card with the card reader.*

It must be clear that a process is connected to the server in order for it to receive a mark.

1. Server receives request to access an account with a specified ID.
2. The student’s account record is retrieved from the server’s database.
3. The account balance is extracted from the account record.
4. The server sends either authorization to select a meal or a denial.
5. Server receives request to update an account with a specified ID.
6. The account balance is reduced by the specified amount.

[5 marks]

(c) *For each of two suggested improvements, award [1 mark] for a good improvement (see examples) and award [1 mark] more for an explanation up to [4 marks max].*

Award only [1 mark max] for anything related to converting the system to one that bills students (or debits their accounts).

Examples:

Introducing a way to top-up the account balance;
Introducing a way for students to pay the difference between the meal cost and their account balance;
Improve the security of the account/card;
Change to use a “smart card” as a payment card;

[4 marks]

Total: [10 marks]

11. (a) *Award [1 mark] for each input device, up to [2 marks max].*

Web-cam;

Microphone;

Tablet;

Interactive whiteboard;

Scanner;

Do not accept “network card”.

[2 marks]

(b) *Award up to [2 marks max] for the advantages provided by each school.*

School A

Coursework can be accessed by the patient at any time;

At times compatible with the schedule of medical treatments;

According to the wish/will of the patient;

School B

The patient can virtually join the classroom;

Providing a way of socializing with the classmates;

And means of direct participation/immediate feedback on taught topics;

[4 marks]

(c) *Award up to [4 mark max].*

The impact of long-term hospitalization on the success of the studies is reduced;

The patient would still feel part of the school community;

Schoolmates could psychologically/emotionally better accept the disease;

Extra formations/skills on the school’s technicians/teachers might be needed;

Increase the sensibility/receptivity of the wide public and politicians on the subject;

[4 marks]

Total: [10 marks]

12. (a) For all columns except the third one ($i < j$), award **[1 mark]** for a fully complete and correct column.

i	j	$i < j$	<code>s.charAt(i) != s.charAt(j)</code>	return value
0	5	true	false	
1	4	true	false	
2	3	true	true	false

[4 marks]

- (b) Award up to **[1 mark max]**.

To recognize palindromes;

Words that are read the same way from left-to-right and right-to-left;

[1 mark]

- (c) Award **[1 mark]** for detecting both (correct) conditions, **[1 mark]** for appropriately using the Boolean operators.

$(i < j)$ **and** characters at indexes i and j are different

OR

$(i \geq j)$

[2 marks]

- (d) Award **[1 mark]** for detecting the effect, **[2 marks max]** for the explanation.

Effect:

Strings of odd length (e.g. radar) are treated differently than before;

Explanation:

The original code does not check the character in the ‘pivot’ position;

The modified version checks that for $i = j$ the corresponding character is the same;

All the other cases are treated similarly because the test $i \leq j$ extends the test $i < j$; **[3 marks]**

Total: [10 marks]

13. (a) *Award [1 mark] for the method of data collection, [1 mark] for the benefit, up to [4 marks max].*

Observation;

Allows the analyst to see exactly how the processes are carried out;

Questionnaires;

Can cover every aspect;

Might get the “official” answers rather than the real ones;

Research;

Allows analyst to see how other similar businesses solve the problem;

Different businesses get different results so research may not reveal the best solution;

Interviews;

Interaction allows all aspects to be thoroughly investigated;

Can be time-consuming;

[4 marks]

- (b) (i) *Award [1 mark] each for up to two items from the*

Feasibility report;

A brief description of the proposed system;

Estimated costs;

Economic / technical / and legal responsibility;

Possible completion date;

[2 marks]

- (ii) *Award [1 mark] each for up to two items from the*

Requirements specification;

A (precise) definition of the problem;

A definition of inputs and outputs;

A list of tools/facilities/people available for developing the solution;

A schedule for the next stages of the project;

Systems flowchart (or similar diagrams);

[2 marks]

- (c) *Award up to [2 marks max]. Accept documentation produced at any stage after the analysis stage.*

User guide;

For the personnel that will use the system;

Flowcharts / code;

To aid programmers in future modifications;

[2 marks]

Total: [10 marks]