Paper 1

Question 1 (a)

Define the terms:

(i) hardware

(ii) software

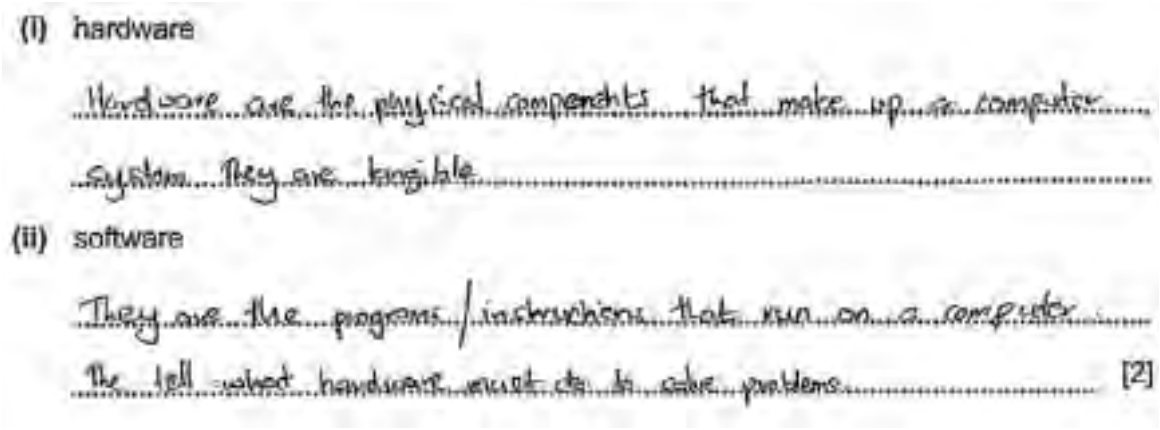
Mark scheme

(i) – The physical/electronic parts of a computer system

Parts you can see/touch no mark

(ii) – Sequence of instructions/programs [2]

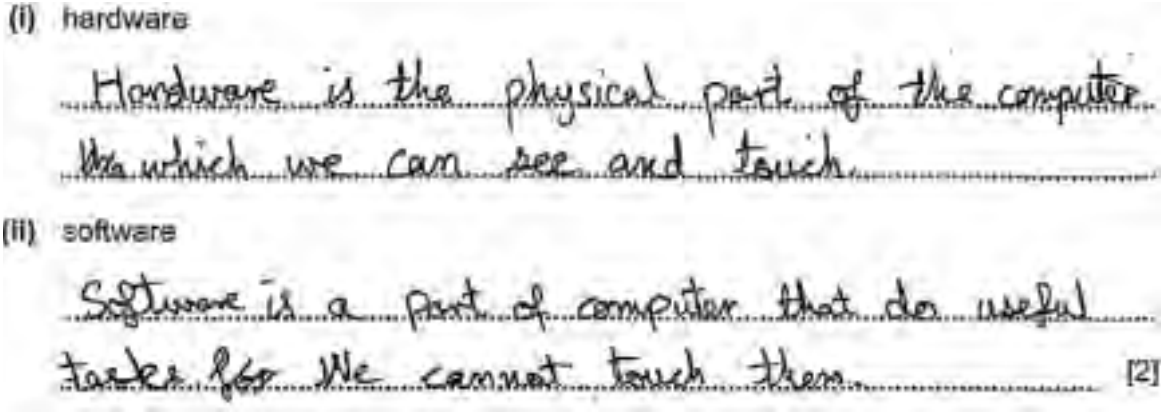
Example candidate response – grade A



Examiner comment

This candidate response was clear and precise. In both parts of the question the definitions were almost straight from the text book. A very good answer.

Example candidate response – grade C



Examiner comment

There was some idea that hardware are the physical parts of the computer, but the candidate struggled to define software to an adequate standard. This is a noticeably weaker response than a grade A candidate.

Example candidate response – grade E

(i) hardware

They are parts of computer system that we can see and touch. Example, printer

(ii) software

They are instructions for the system so that the system works. Example, Operating System [2]

Examiner comment

Grade E candidates usually got one part of the definition correct; it was rare to see both parts answered correctly. There is evidence that actual definitions had not been learnt and the candidate was trying to do the description from memory or experience.

Question 1(b)

A supermarket has a number of point-of-sale terminals.
Data is read from goods at the terminals and information is produced.

State **two** output devices which would be used at the point-of-sale, justifying their use.

Mark scheme

– Printer/to print till receipt
– Beeper/to indicate correctly read barcode/error reading barcode
  Speakers/to give instructions to customer
– LED/LCD screen to show information about purchase

(2 per –, max 4) [4]

Example candidate response – grade A

Device 1 Monitor

Justification To display the items purchased and net price, to select methods of payment for the cashier to visually verify the items entered.

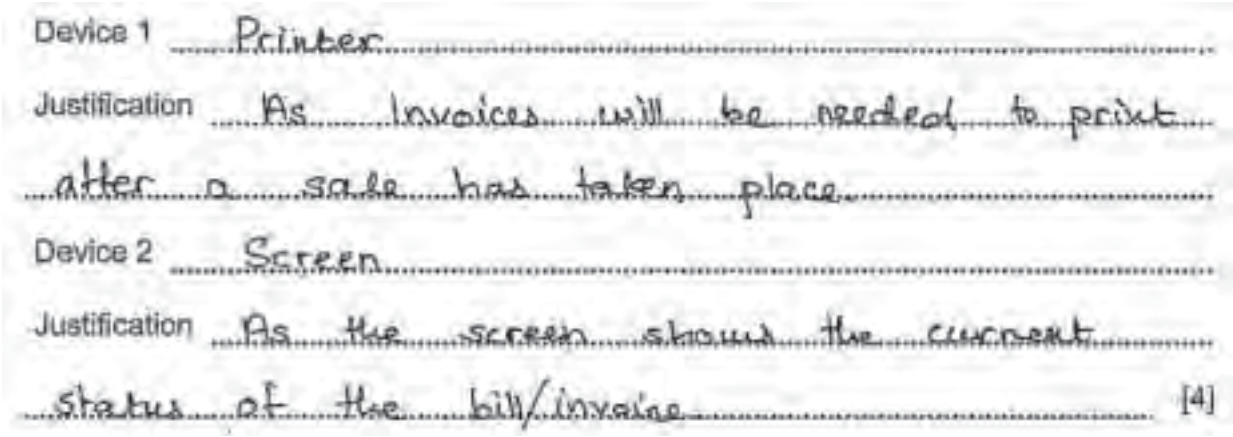
Device 2 Printer

Justification To produce an itemized hard copy receipt ~~for~~ including the list of goods purchased their quantities and prices As proof of purchase. [4]

Examiner comment

Two good examples of output devices were given in this answer (*monitor* and *printer*). The choices were very clearly justified by the candidate. The answer was further expanded indicating a clear and deep understanding of peripheral devices and the reasons why a device would be chosen for a given application.

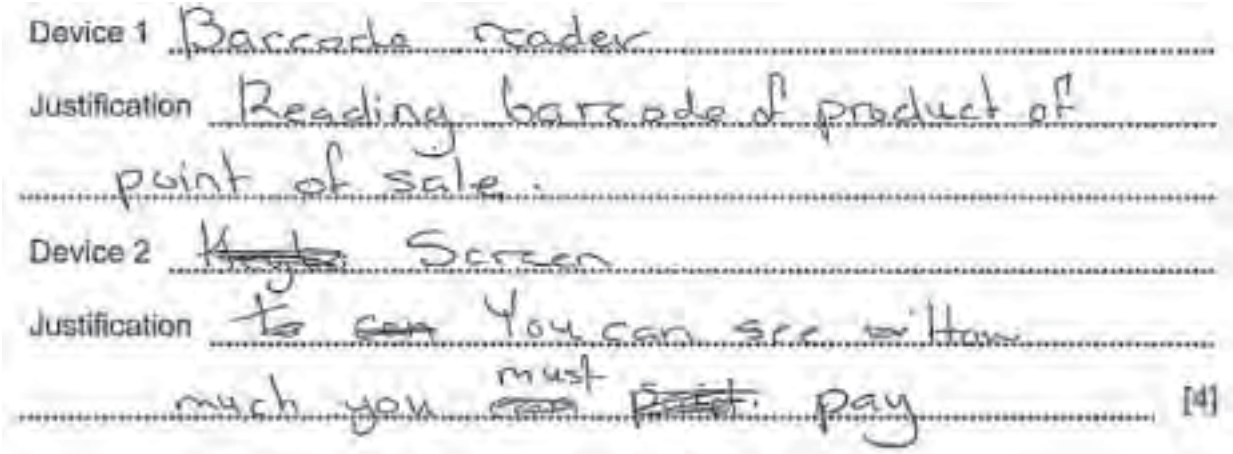
Example candidate response – grade C



Examiner comment

There was little difference between grade A answers and grade C answers in this question. The main difference being the lack of additional information in the answer when compared to an grade A candidate; but enough was usually done to get full marks.

Example candidate response – grade E



Examiner comment

In this candidate's response there is obvious confusion between output devices and input devices. In this case, a barcode reader has been chosen as an output device.

Question 1 (c)

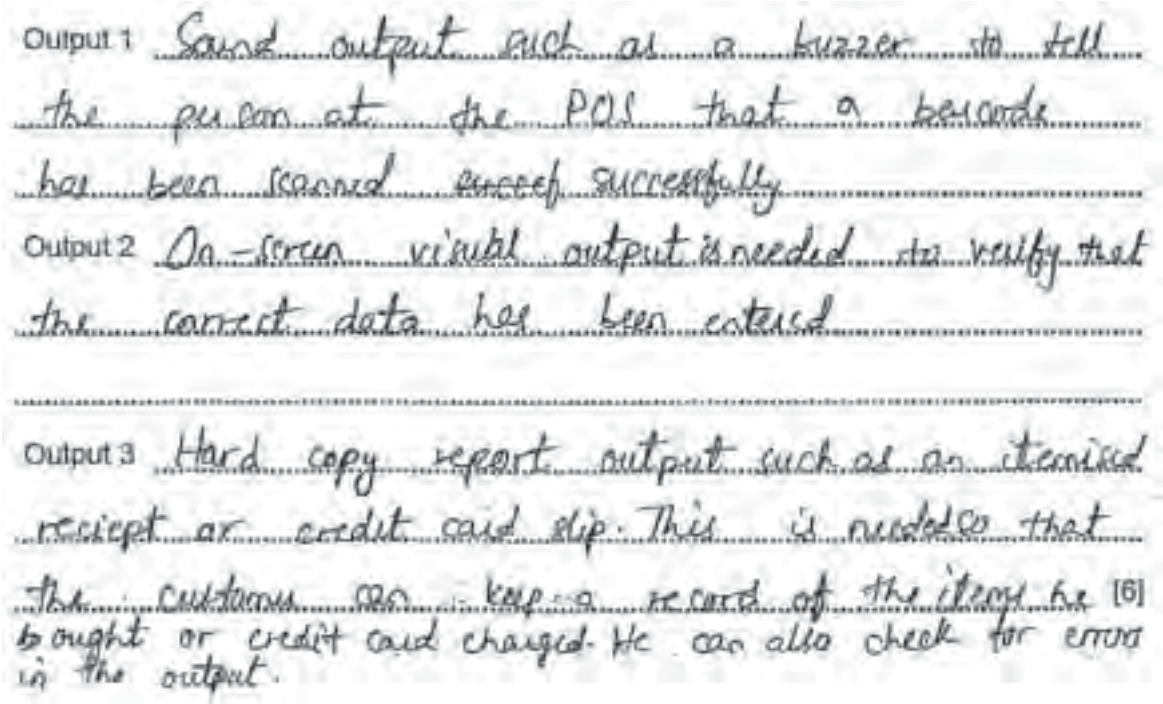
State **three** types of output needed at the point-of-sale terminals. For each type of output explain why the output is needed.

Mark scheme

- Sound/indicates barcode properly read without operator diverting attention from job
- sound to indicate terminal is free
- Video image or screen output or soft copy/to allow shopper to check goods and prices as they are input to system
- Receipt or printout or hard copy/to allow shopper to check payments and shopping at home, proof of purchases.

(2 per –, max 6) [6]

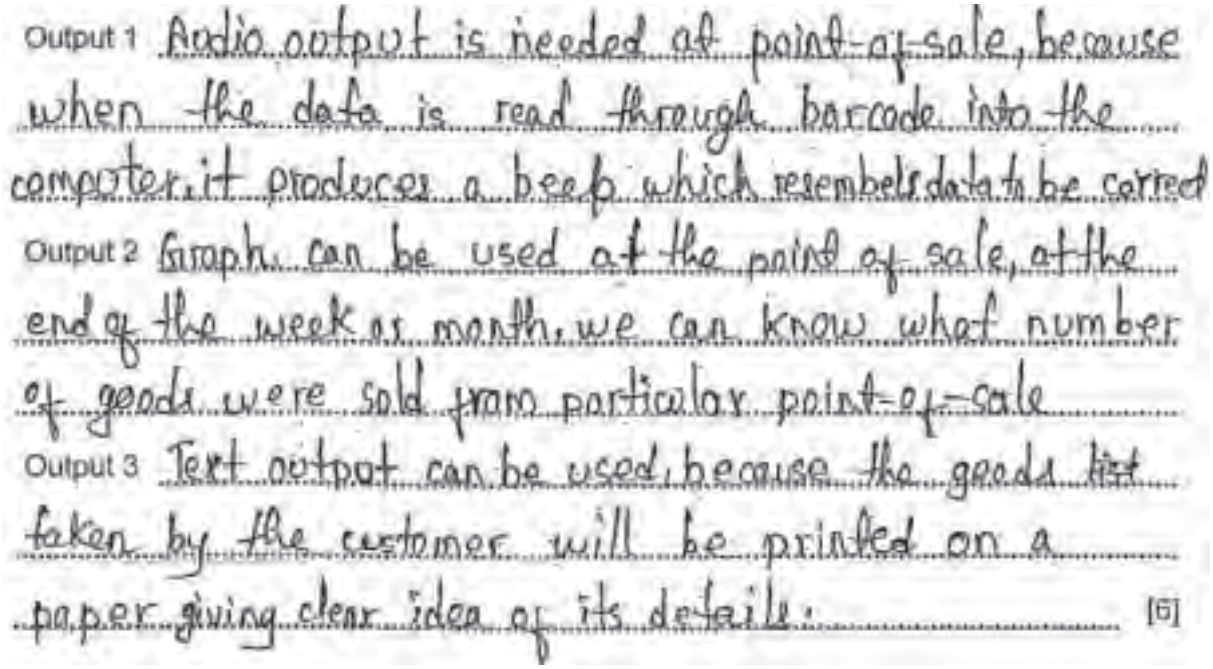
Example candidate response – grade A



Examiner comment

Three good choices were given which were clearly correct types of output. The reasons for type of output were well laid out and referred correctly to the application in the question.

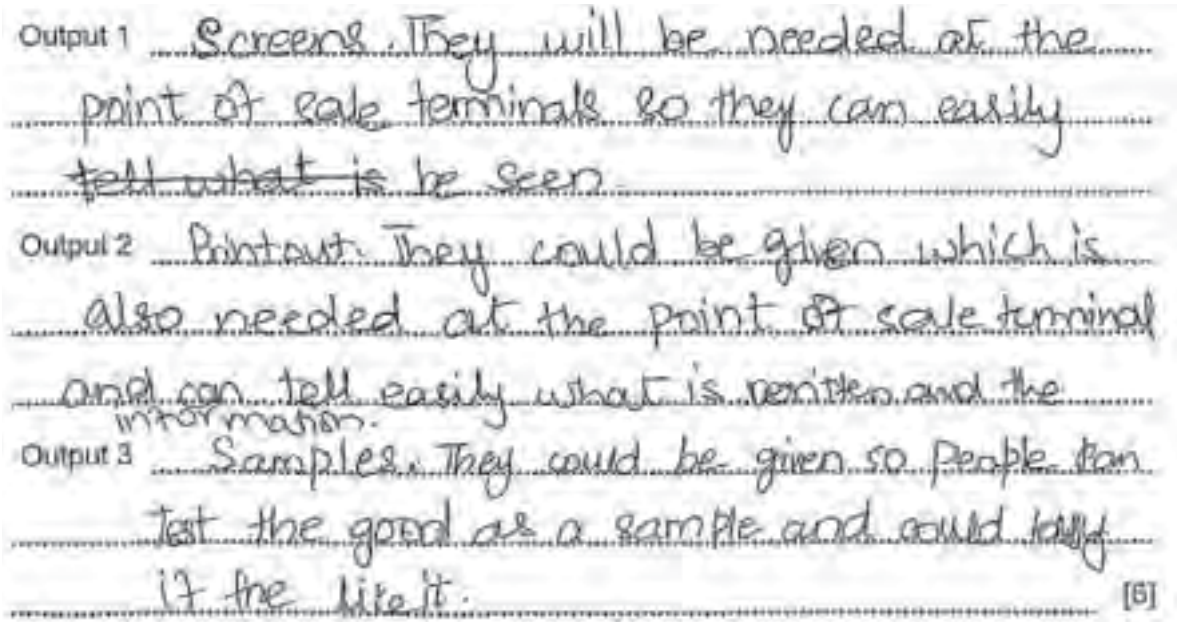
Example candidate response – grade C


Output 1 Audio output is needed at point-of-sale, because when the data is read through barcode into the computer, it produces a beep which resembels data to be correct
Output 2 Graph can be used at the point of sale, at the end of the week or month, we can know what number of goods were sold from particular point-of-sale
Output 3 Text output can be used, because the goods list taken by the customer will be printed on a paper giving clear idea of its details. [6]

Examiner comment

The candidate correctly knows that the question required output types and gave audio (in the form of a beeping sound), then found it difficult to distinguish between output device and type of output, and came up with the answers 'graphs' and 'texts'. Both of these were throw away answers. It is common at grade C level for candidates not to understand the subtle difference between output device and the output produced by a device.

Example candidate response – grade E


Output 1 Screens. They will be needed at the point of sale terminals so they can easily ~~tell what is be seen~~
Output 2 Printout. They could be given which is also needed at the point of sale terminal and can tell easily what is written and the information.
Output 3 Samples. They could be given so people can test the good as a sample and could buy it the like it. [6]

Examiner comment

A typical grade E candidate finds it difficult to distinguish between output devices and output types. This candidate's answer was typical of the confusion; although they did suggest a 'print out' which gained them a mark.

Question 1 (d) (i)

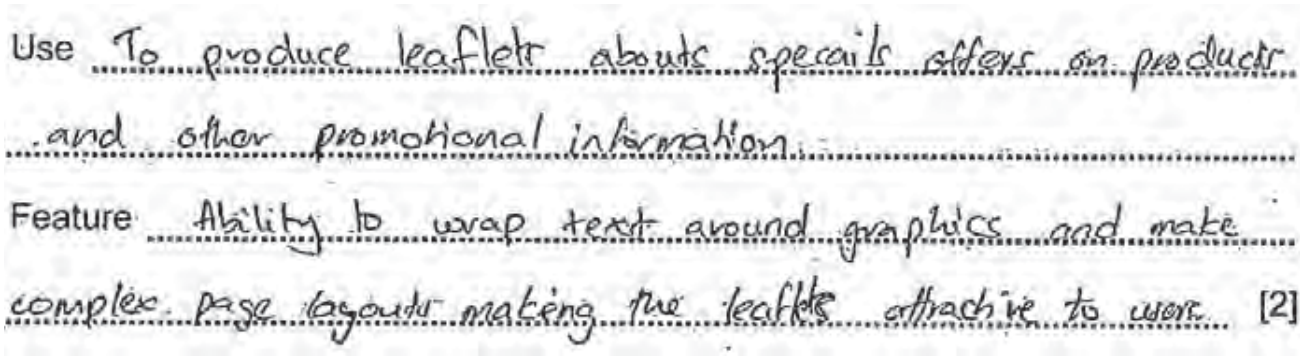
The management of the supermarket use a number of different types of software.
State what each of the following types of software would be used for.
Give a feature of each which makes it suitable for your use.

(i) Desktop publishing (DTP)

Mark scheme

– Producing leaflets/flyers/brochures/posters
– Using frames to divide up content/editing features/...
– combining images and text [2]

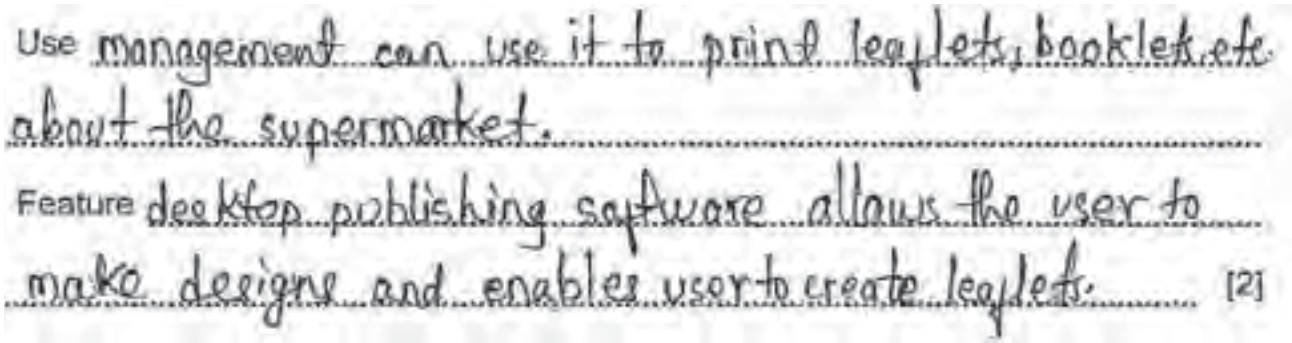
Example candidate response – grade A



Examiner comment

In this response there was good use of DTP i.e. producing leaflets; but the candidate expanded the answer to indicate why the supermarket would produce leaflets. It produced a very good, comprehensive answer. The features of DTP were clearly understood and distinguished it from other software such as word processors i.e. wrap text around graphics and make complex page layouts.

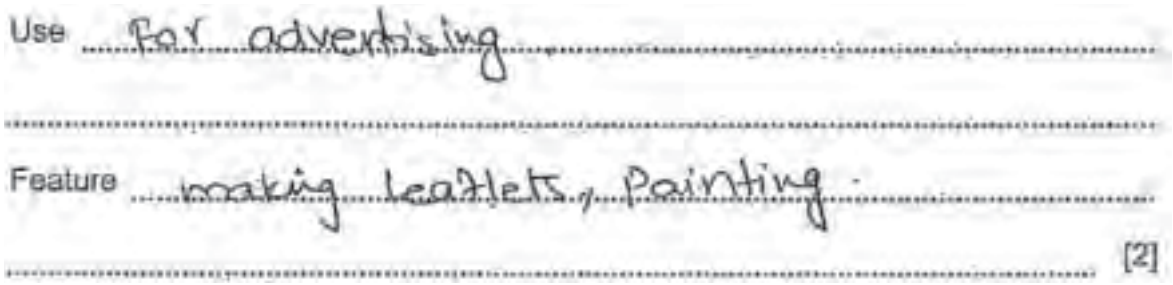
Example candidate response – grade C



Examiner comment

The candidate obviously knows what DTP can be used for but found it difficult to explain what features make this software suitable for the task chosen. It was very common among grade C candidates to find it difficult describing the features of DTP.

Example candidate response – grade E



Examiner comment

Frequently at this level, use of features were confused or combined together. A mark was frequently gained for, e.g. leaflets, but generally little or no idea about software features.

Question 1 (d) (ii)

(ii) Presentation software

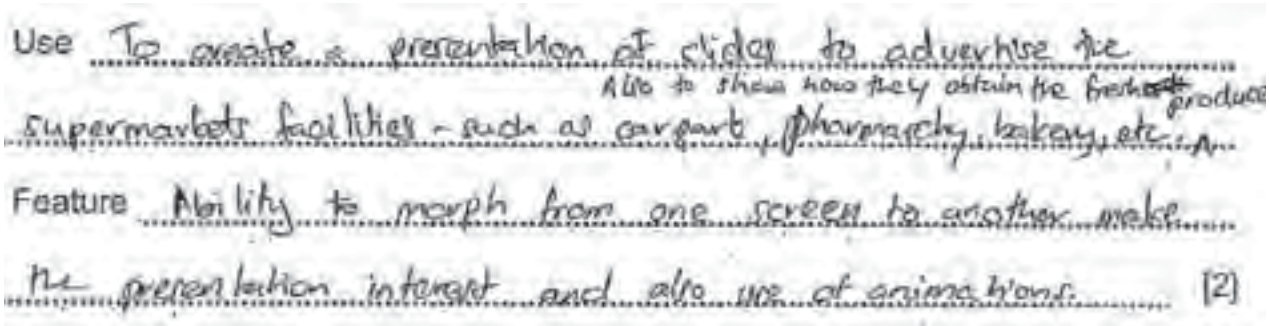
Mark scheme

– Producing presentation for an audience, perhaps for head office/to produce training materials
– for advertisements
– Use of multi-media to maintain interest in presentation.

*Don't accept same point in **(i)** and **(ii)***

(1 per –, max 2) [2]

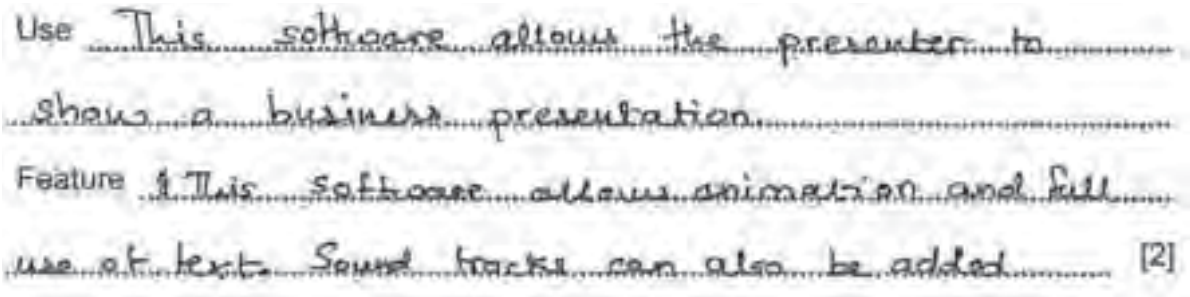
Example candidate response – grade A



Examiner comment

Use of presentation software to advertise products to an audience is a good use of this software. The features were particularly well explained i.e. 'morph one screen into another …. and use of animation' – the candidate made more points than were necessary to gain the maximum marks.

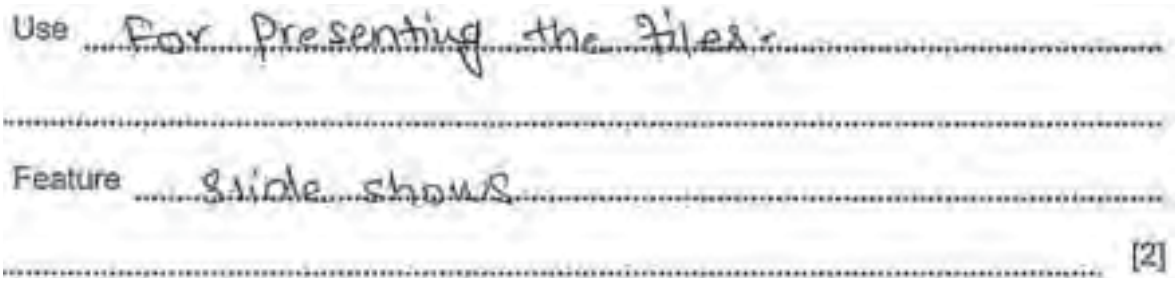
Example candidate response – grade C



Examiner comment

'Allows a business presentation' doesn't say much, but the candidate was aware of the features of the software (although they were a little too close to a description of multi media software). There was evidence of lack of depth of knowledge when compared to grade A answers.

Example candidate response – grade E



Examiner comment

Not a lot of idea really apart from claiming to present something. There was little idea about the software features and vague answers were given such as 'slide shows' without explaining how they would be used or why.

Question 2 (a)

A systems analyst is employed to produce a new stock control system for a company. The manager of the company is not satisfied with the present system.

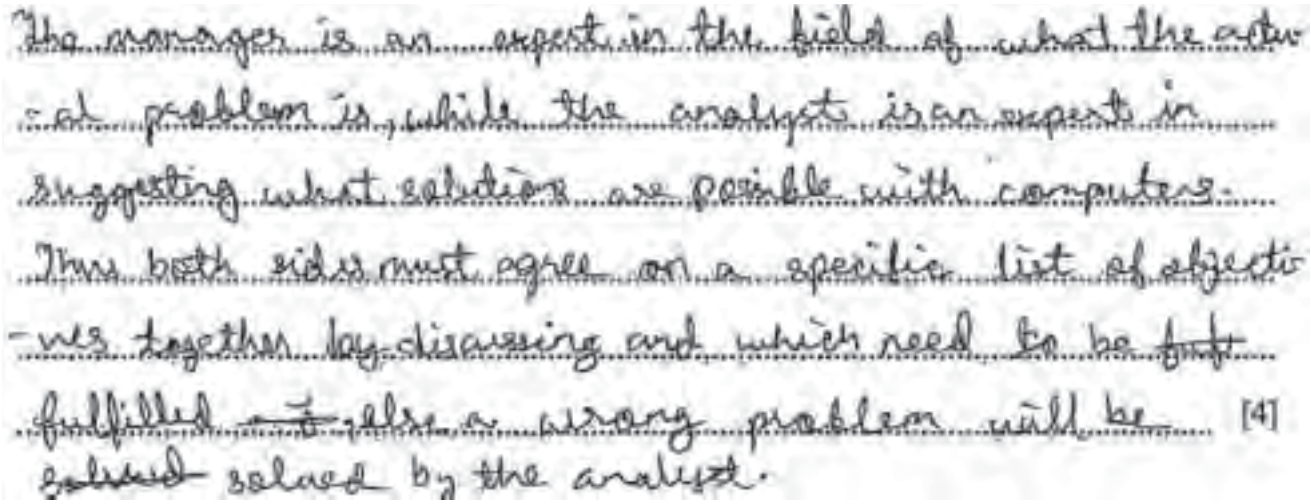
Explain the importance to both analyst and manager of defining the problem accurately. You should make clear the part played by each person.

Mark scheme

- Manager must provide knowledge of...
- and requirements of business as...
- they are expert in how the business works.
- Analyst provides knowledge of what is possible...
- particularly within confines placed by manager/e.g. budget
- If not properly defined analyst will solve the wrong problem
- Manager's requirements and analyst's understanding must match

(1 per –, max 4) [4]

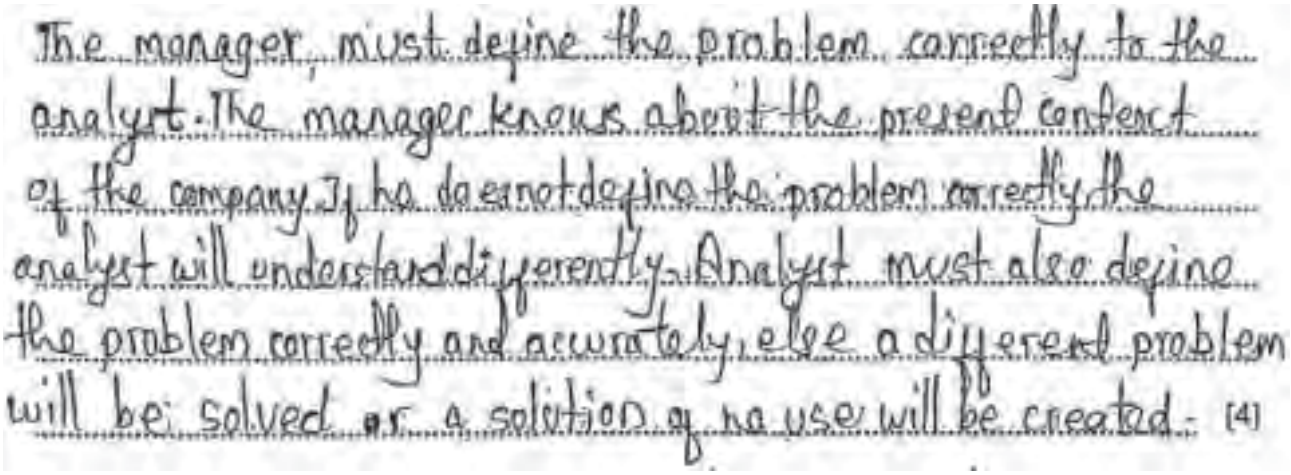
Example candidate response – grade A


The manager is an expert in the field of what the actual problem is, while the analyst is an expert in suggesting what solutions are possible with computers. Thus both sides must agree on a specific list of objectives together by discussing and which need to be fulfilled else a wrong problem will be solved by the analyst. [4]

Examiner comment

Four clear points were made here in a well structured response. The grade A candidate should make it very clear what the roles of the manager and the analyst are and avoid very vague references to their areas of expertise.

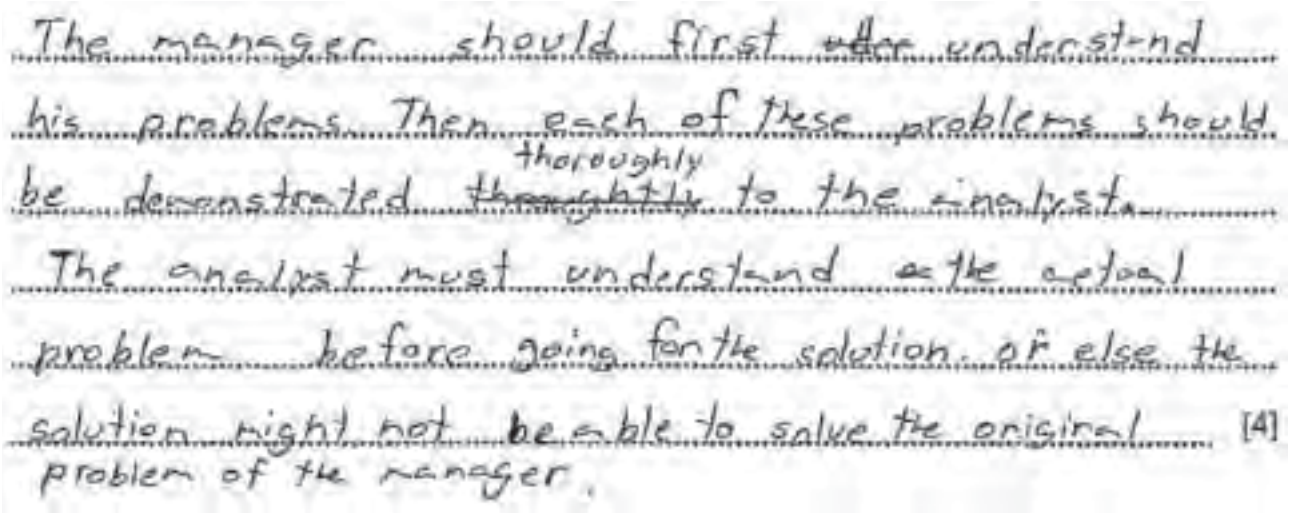
Example candidate response – grade C


The manager must define the problem correctly to the analyst. The manager knows about the present context of the company. If he does not define the problem correctly the analyst will understand differently. Analyst must also define the problem correctly and accurately, else a different problem will be solved or a solution of no use will be created. [4]

Examiner comment

A lot of writing saying 'they must define the problem correctly otherwise a different problem will be solved'". The candidate clearly knows why it is important to define the problem but misses out some of the key points, for example, the manager is the expert in how the company works and the analyst is the person who knows what is possible.

Example candidate response – grade E


The manager should first ~~the~~ understand his problems. Then each of these problems should be demonstrated thoroughly ~~thoughtly~~ to the analyst. The analyst must understand the actual problem before going for the solution. or else the solution might not be able to solve the original problem of the manager. [4]

Examiner comment

There was obviously no real idea of what needs to be done for this question. General answers like 'manager has to understand problem …… and the analyst has to understand same problem … or else might not be able to solve original problem" are insufficient and common at this level. This answer lacks substance and there is no mention of the role of the manager or the analyst.

Question 2 (b)

(i) Explain how the evaluation of the new system will be carried out.

(ii) Explain why the evaluation is important to both the analyst and the manager.

Mark scheme

(i) Evaluation carried out by:

- Functional/black box testing
- Testing against the agreed objectives
- Testing against user requirements / specification
- Testing done by software house/alpha
- Testing done by users/beta

(ii)
- Important to analyst to ensure that there is evidence that all objectives have been met
- or will not be paid / ruin his reputation
- Important to manager to ensure that there is evidence that all objectives have been met
- or system may prove unsatisfactory in the future.

(1 per –, max 3 points per dotty, max 4) [4]

Example candidate response – grade A

(i) Explain how the evaluation of the new system will be carried out.

The list of objectives completed should be checked against the requirement and design specification designed earlier on and then stage the system can also be tested and run in presence of the users

(ii) Explain why the evaluation is important to both the analyst and the manager.

The manager needs to make sure all the objectives are achieved so that the new system can run and see if actually solves problem properly A while the analyst has to evaluate success successfully and to get payments on the basis of the extent of objectives achieved [4]

Examiner comment

In this response four clear points were made across parts (i) and (ii); correct references were made to testing the system and meeting the objectives set out when originally defining the problem.

Example candidate response – grade C

(i) Explain how the evaluation of the new system will be carried out.

The analyst will check if all the objectives have been are achieved or not by doing some test. The manager will also check the system to see if it's according to it's requirement.

(ii) Explain why the evaluation is important to both the analyst and the manager.

Evaluation helps the analyst to thoroughly check the system as it is the end point of it's work. Manager needs to see if all the requirements are accordingly. [4]

Examiner comment

In this response the candidate's ideas are not very clear about how evaluation is done. There is some reference to objectives but no mention of any testing. Throw away answers such as '… see if all requirements are met accordingly' indicate a lack of understanding of the main features of evaluation, but some understanding of why it is done.

Example candidate response – grade E

(i) Explain how the evaluation of the new system will be carried out.

Testing will done ~~be~~ is the new system working properly and is the problem solved.

(ii) Explain why the evaluation is important to both the analyst and the manager.

Analyst should be paid and the manager should make sure is the problem solved and is the new system working properly. [4]

Examiner comment

This candidate has written very vague answers such as 'testing is to be done' or 'make sure problem solved'. A mention of the analyst getting paid was one of the only points which gained a mark at this level. Generally, grade E candidates didn't really understand what evaluation entails.

Question 3 (a)

(i) Explain what is meant by the character set of a computer.

(ii) Explain how a character is represented in a computer.

Mark scheme

(i)
- The symbols recognised/used by the computer
- Often equates to the symbols on the keyboard

(ii)
- Represented by a set of bits...
- Unique to that character
- The number of bits needed is equal to 1 byte / 2 bytes
- ASCII/Unicode is a common set

(1 per –, max 3 per dotty, max 4) [4]

Example candidate response – grade A

(i) Explain what is meant by the character set of a computer.

It is a standard set of characters which the computer recognises.

(ii) Explain how a character is represented in a computer.

Each character is assigned a unique binary code of 7 bits, 8 bits, 16 bits etc. There is an ASCII code for every character which is different from one another. [4]

Examiner comment

In this answer four clear points were made:

- characters computer understands
- each character has a unique binary code …
- … which can be 7, 8 or 16 bits
- use of ASCII codes

The candidate had a very clear understanding of how characters are represented in a computer system and the answer was laid out in a very structured manner. An excellent answer.

Example candidate response – grade C

(i) Explain what is meant by the character set of a computer.

character set of a computer means a special character to which is set so that the input can be compared to it to give a meaningful result.

(ii) Explain how a character is represented in a computer.

A character is represented with a 8 bit ~~data~~ binary digits. A particular character is denoted by the set of bits which forms the respective character. [4]

Examiner comment

The candidate did not really understand what a character was. However, they had a good idea of how characters can be represented in a computer i.e. using 8 bits. There was clearly not as much understanding of the topic as a grade A candidate.

Example candidate response – grade E

(i) Explain what is meant by the character set of a computer.

character set of a computer is the characters on the keyboard and the system can recognize those characters.

(ii) Explain how a character is represented in a computer.

characters are represented in a binary form which the computer can understand which is ~~the~~ in the form of 0's and 1's [1]

Examiner comment

The candidate knew that characters were found on a standard keyboard and that the computer recognised these characters. However, there was very little idea of how these characters could be represented in a computer. Some vague reference to binary and a mention of 1s and 0s was made but ther was clearly not enough understanding to gain many marks.

Question 3 (b)

Explain the representation of integers in a computer.

Mark scheme

- Bits are used to store the correct binary representation of the integer
- Leading zeroes included to complete required number of bits
- Standard number of bits irrespective of size of integer
- Concept of short and long integer dependent on sizes of integers
- Two's complement used to represent negative numbers

(1 per –, max 3) [3]

Example candidate response – grade A

- Integers are whole numbers which allow arithmetic to be done. There are types 2 byte (short integer) and 4 byte (longer integer).
- Integers are converted into a series of 1's and 0's so that they could be understood by the system. For example the number 18 could be written as follows: [3]

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	0	0	1	0	0	1	0

$(00010010)_2 = (18)_{10}$

- Representing in machine code as binary digits which are created by binary system which is a system that contains 2 digits only, 0 and 1.

Examiner comment

An excellent answer worth more than the three marks available. The candidate gave examples of how integers are stored showing leading zeros etc. The answer was very clear with good examples making it much easier for the candidate to explain how integers are represented typically in a computer. Diagrams in questions of this type are to be recommended since they make any description much clearer.

Example candidate response – grade C

An integer is represented by a 8 bit ~~code~~ binary. Integers have the initial bit as the sign bit and other 7 bits represent the ~~di~~ integer. A bit is carried if the sign bit is removed. [3]

Examiner comment

The candidate seems to have a reasonable idea of how integers are represented in a computer and understands the use of 8 bits and the sign bit. However, they were not confident enough to give examples or to show how sign bits and 2s complement tie up. Not as much depth as the grade A candidate above.

Example candidate response – grade E

- An integer is 8 bits; one byte
- Represented using 1 and 0
- ASCII codes

[3]

Examiner comment

This is a very vague answer with some reference to bytes and binary numbers 1 and 0. It was frequent at grade E to see reference to ASCII codes here indicating a lot of confusion between representation of characters and integers.

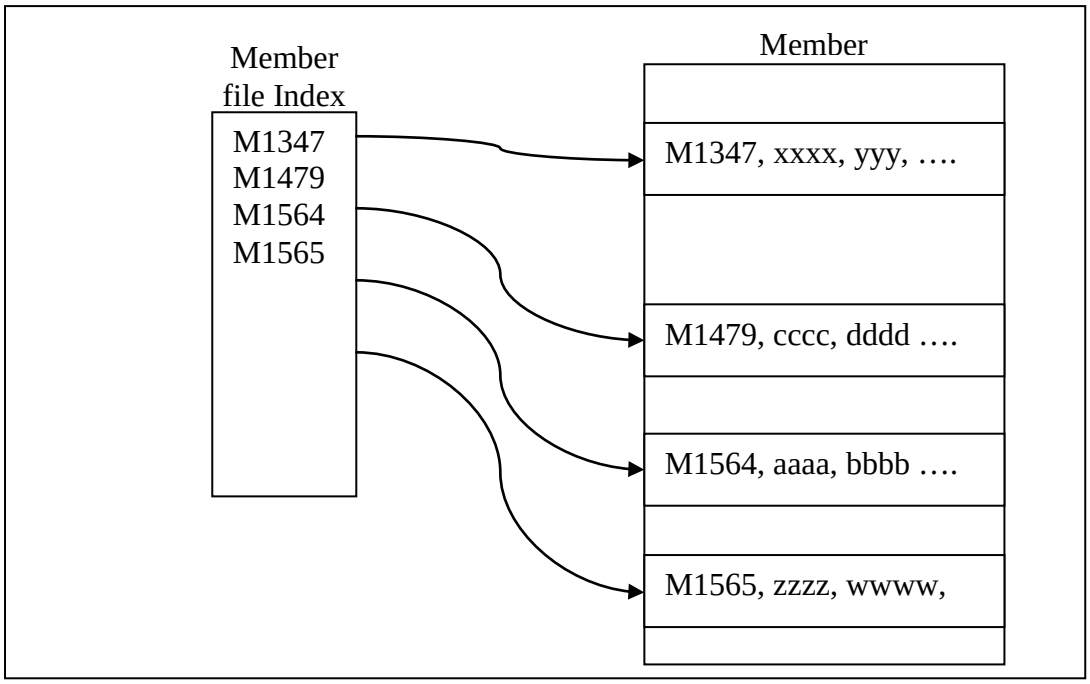
Question 4 (a)

A library membership system identifies members by their unique 6-digit ID number.

Explain how the member file could be accessed using indexes.
(You may find it helpful to draw a diagram.)

Mark scheme

- IDs/indexes kept in sequence
- Attached to each is a pointer...
- which points to the data for that ID
- Possible to use multiple indexes



(1 per –, max 2) [2]

Example candidate response – grade A

The ID number is broken down in 3 groups of two. The base index, the second and third index. This would be a multi-level index. The base index point to the second and the second to third and then to the data. Ex: The base 00 point to all codes with first two digits being (00) and so on.

[2]

Examiner comment

This question was well answered by the candidate with good diagrams to accompany and enhance the description. Diagrams generally greatly improve the clarity of the text. More than two points were made by the candidate (idea of pointers, indexes in sequence, multi level indexes, and so on). This is a very good answer showing a sound understanding of the topic.

Example candidate response – grade C

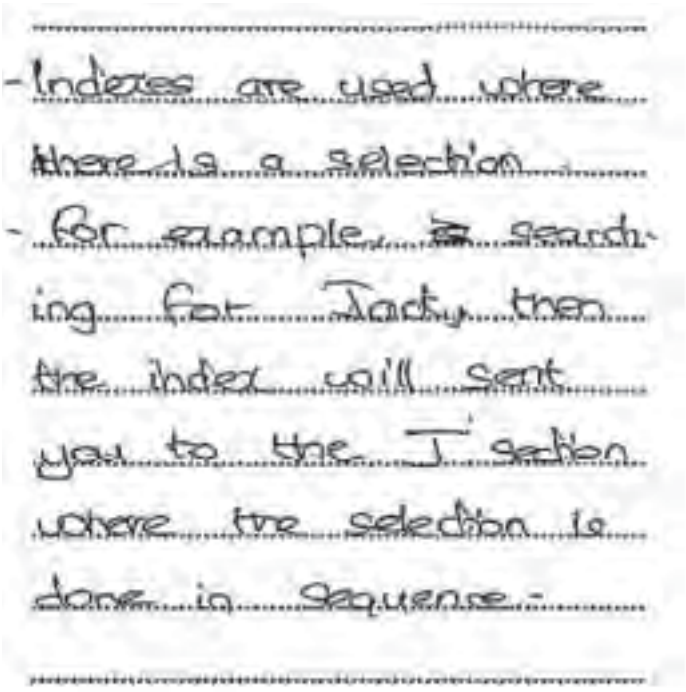
First of all the initial two digits will be taken for instance. If the 6-digit number is "083948", the application would go to the page containing "08" then next digit would be expected to be entered i.e "3" the index would be taken where "3" lies. In same manner it would be taken to further steps and the code would be found.

[2]

Examiner comment

The text simply describes the diagram which, unfortunately, isn't a correct example of how indexes are used. Although the candidate has to be applauded for attempting to draw a diagram, it isn't very good and is rather confusing (which is also reflected in the text).

Example candidate response – grade E


- Indexes are used where there is a selection
- for example a search ing for Jacky then the index will sent you to the J section where the selection is done in sequence.

[2]

Examiner comment

No diagram was supplied in this answer. The candidate relied totally on text, which went against advice given in the question. The whole answer was revolved around a very general method of searching with no indication of how indexes used, etc.

Question 4 (b)

(i) Explain how hashing could be used to access the member file randomly.

(ii) When the member file is accessed using hashing, clashes can occur.
State what is meant by a clash and how it can be dealt with.

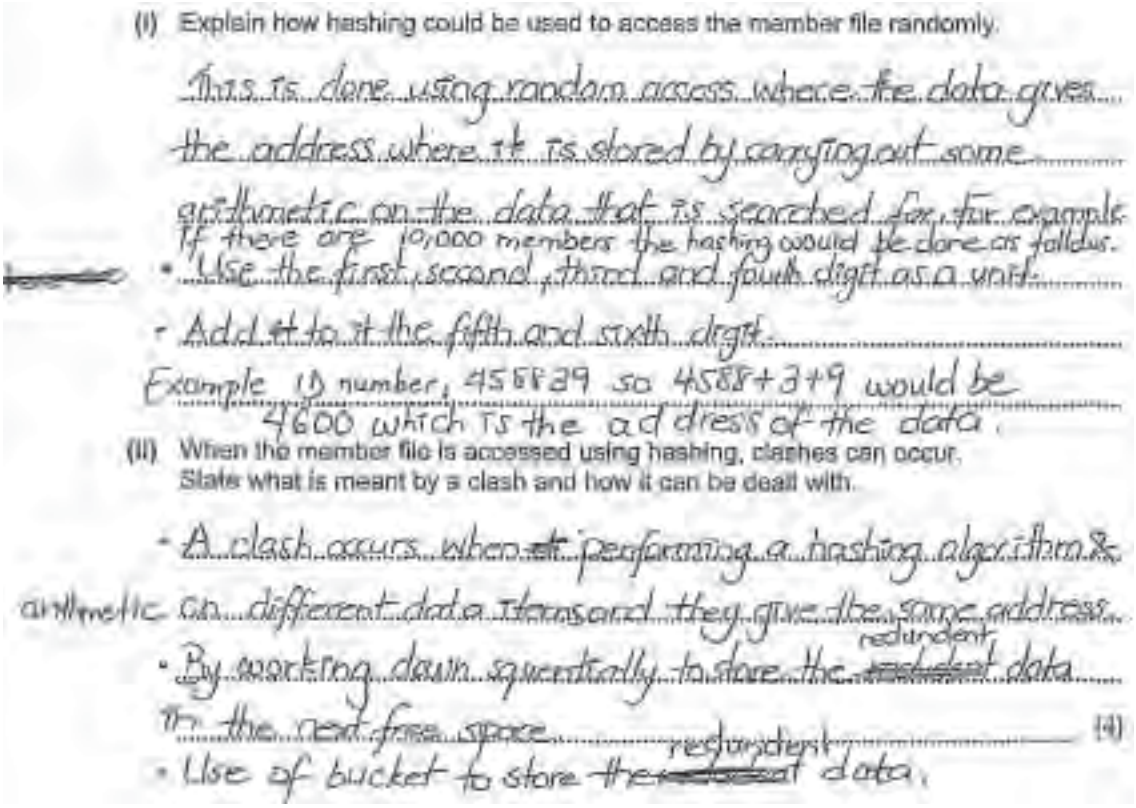
Mark scheme

(i)
- Digits in ID are used as input...
- to arithmetic algorithm
- Result is the location of the data (or pointer to it)

(ii)
- When 2 IDs hash to the same value
- Locations read sequentially from clash until correct value found..
- or free location, in which case error.
- or a linked list structure
- stored in overflow area with tag or pointer to it
- a second hashing algorithm is applied

(1 per –, max 3 per dotty, max 4) [4]

Example candidate response – grade A



(i) Explain how hashing could be used to access the member file randomly.

This is done using random access where the data gives the address where it is stored by carrying out some arithmetic on the data that is searched for, for example if there are 10,000 members the hashing would be done as follows.

- Use the first, second, third and fourth digit as a unit
- Add it to it the fifth and sixth digit

Example ID number, 458839 so 4588+3+9 would be 4600 which is the address of the data.

(ii) When the member file is accessed using hashing, clashes can occur.
State what is meant by a clash and how it can be dealt with.

- A clash occurs when performing a hashing algorithm & arithmetic on different data items and they give the same address.
- By working down sequentially to store the redundant data in the next free space redundant (4)
- Use of bucket to store the redundant data.

Examiner comment

The candidate gave a very good example of a hashing algorithm and showed clearly how an address can be calculated from the ID digits. There were almost enough points in part (i) to gain full marks. In part (ii), the candidate explained clearly how clashes can occur and how the problem is overcome using the next free space. The candidate covered more than the necessary points to gain maximum marks. A very good answer.

Example candidate response – grade C

(i) Explain how hashing could be used to access the member file randomly.

To access a random file using Hashing the data itself is used to give the address of where it is stored. This is done by carrying out some pseudo arithmetic on the data that is being searched. E.g. you are searching Jehan's data. The rule is that the first and last letter should be multiplied so, 10×17 = 170 address is 170 i.e. the 170th in memory.

(ii) When the member file is accessed using hashing, clashes can occur.
State what is meant by a clash and how it can be dealt with.

If we try and find Jehan's data, Jehan = 10×17 = 170. The data for Jehan cannot be here because Jehan's data is here. This is called a clash. When a clash occurs the simple solution is to work down sequentially until there is free space. [4]

Examiner comment

There was a marked difference here to the grade A answer. No real examples of how a hashing algorithm works were given, but there was a good general idea of why clashes occur and how it can be overcome using next free space. The level of knowledge between the grade A candidate and grade C candidate responses is very marked in this question.

Example candidate response – grade E

(i) Explain how hashing could be used to access the member file randomly.

Hashing could be used to access the member files randomly by the key fields. All the members are in order and they could be accessed very quickly.

(ii) When the member file is accessed using hashing, clashes can occur.
State what is meant by a clash and how it can be dealt with.

Clashes means Problems and error could occur which could be dealt by keeping the exact order of the members and the exact and Proper information. [4]

Examiner comment

There was no mention of a hashing algorithm with the candidate repeating the words of the question. The idea of why clashes occur was clearly not understood.

Question 5 (a)

Describe the purpose of each of the following parts of a processor:

(i) Control unit

(ii) Memory unit

(iii) ALU

Mark scheme

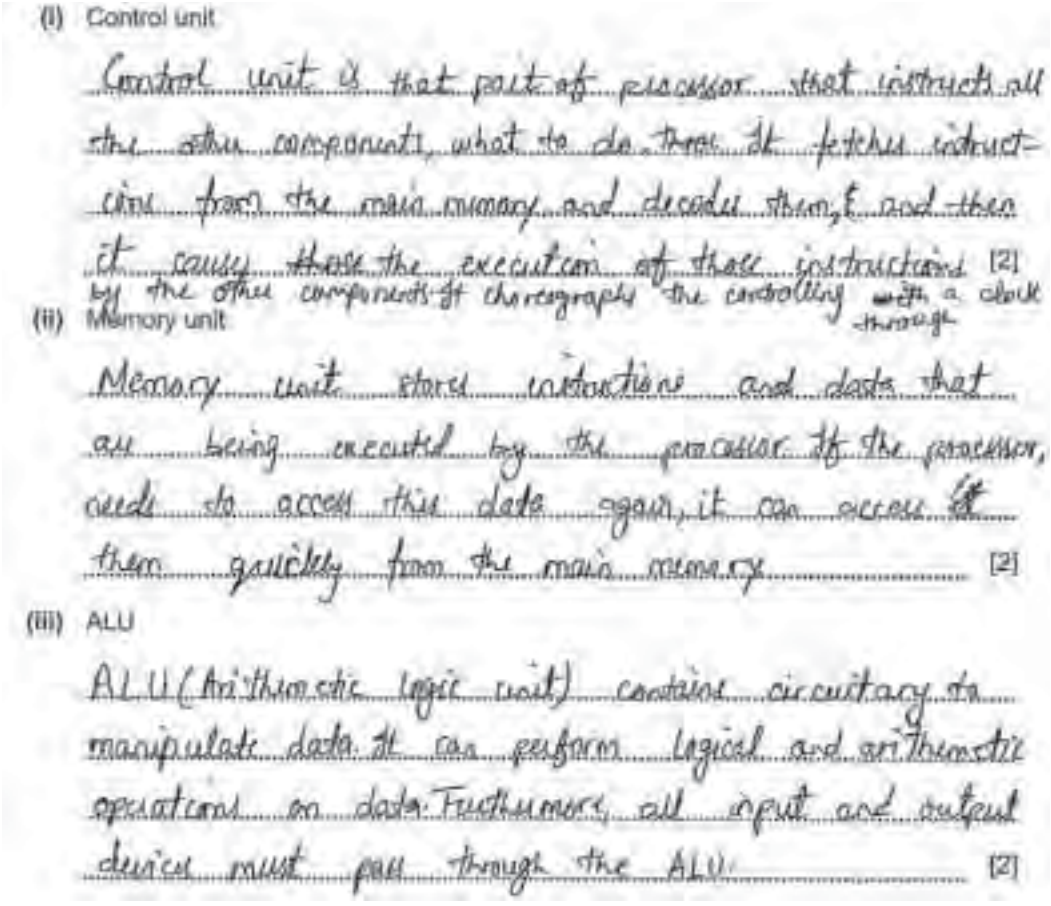
(i) – Manages the execution of instructions
– Fetches each instruction in turn
– Decodes and synchronises its execution...
– by sending control signals to other parts of processor [2]

(ii) – Stores program in current use
– Stores data in current use
– Stores parts of OS in current use [2]

(iii) – Carries out arithmetic operations
– Carries out comparisons
– Acts as gateway in and out of processor

(1 per –, max 2 per dotty, max 6) [2]

Example candidate response – grade A


(i) Control unit

Control unit is that part of processor that instructs all the other components what to do. Then it fetches instructions from the main memory and decodes them, & and then it carries these the execution of these instructions [2]
by the other components it choreographs the controlling with a clock through

(ii) Memory unit

Memory unit stores instructions and data that are being executed by the processor. If the processor needs to access this data again, it can access it from the main memory quickly [2]

(iii) ALU

ALU (Arithmetic logic unit) contains circuitary to manipulate data. It can perform logical and arithmetic operations on data. Furthermore, all input and output devices must pass through the ALU. [2]

Examiner comment

In part **(i)**, the answer went way beyond what was necessary for full marks. They referred to the *fetch cycle, execution of decoded instructions, reference to clock* etc. More than enough for full marks. In part **(ii)**, the candidate clearly understood that data and instructions (currently in use) are stored in the memory unit. This reference to *currently in use* distinguished grade A candidates from the grade C candidates, as seen in the example below. The third part was also clearly laid out – *the ALU performs logical and arithmetic operations* is very clear and unambiguous. Lower ability candidates tend to refer to *doing some arithmetic* and *making logical decisions* which indicates a lack of understanding of how the ALU works.

Example candidate response – grade C

(i) Control unit

control unit does the activity to control all the activities of ~~mete~~ computer including the proceses of fetch, Decode and execute.

[2]

(ii) Memory unit

Memory unit stores the data which ~~could~~ can be used in future but not now. It also holds the data temporarily on which the processor is working

[2]

(iii) ALU

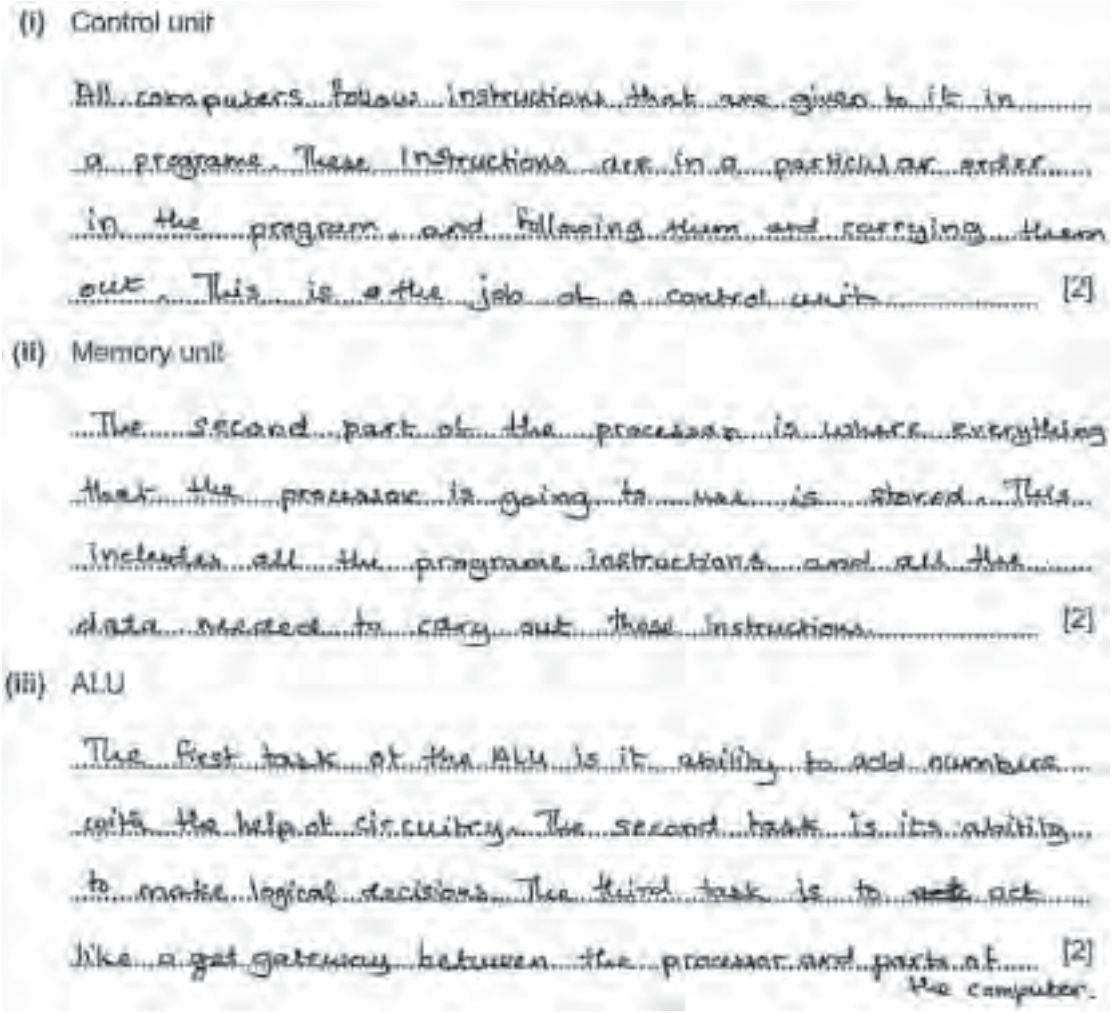
Arithmetic logic unit acts as a gateway through the processor. It does simple computational calculations and gives logic for some inputs.

[2]

Examiner comment

The candidate uses all the right words in part **(i)** (i.e. *fetch, decode and execute*) but doesn't really know how they all link in together. Part **(ii)** referred to RAM and that data is held here temporarily. No real mention that data currently in use is stored here.

Example candidate response – grade C



(i) Control unit

All computers follow instructions that are given to it in a program. These instructions are in a particular order in the program and following them and carrying them out. This is the job of a control unit. [2]

(ii) Memory unit

The second part of the processor is where everything that the processor is going to use is stored. This includes all the programme instructions and all the data needed to carry out these instructions. [2]

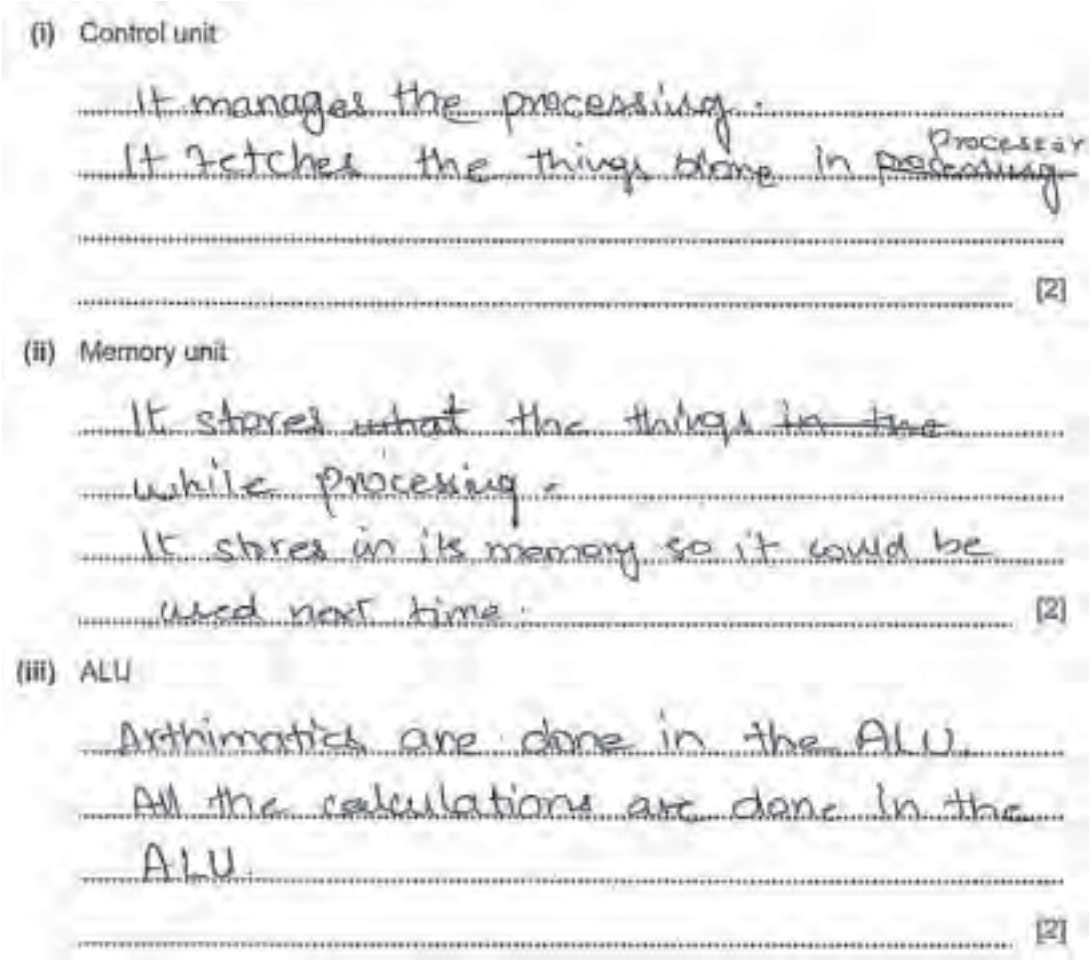
(iii) ALU

The first task of the ALU is it ability to add numbers with the help of circuitry. The second task is its ability to make logical decisions. The third task is to act like a gat gateway between the processor and parts of the computer. [2]

Examiner comment

Part **(i)** was not really describing the control unit. Part **(ii)** did not mention that data and instructions currently in use are stored here. The third part was sketchy with the candidate describing the ALU as 'adding numbers' and 'making logical decisions'. The only part which was awarded a mark was the reference to the ALU acting as a *gateway.* Candidates at grade C tended to know the terms but were unclear of how it all interlinked and produced very vague, often incorrect, answers to questions of this type.

Example candidate response – grade E



(i) Control unit

It manages the processing.
It fetches the things done in Processor processing.

[2]

(ii) Memory unit

It stores what the things in the while processing.
It stores in its memory so it could be used next time.

[2]

(iii) ALU

Arthimatics are done in the ALU.
All the calculations are done in the ALU.

[2]

Examiner comment

The occasional correct word like *fetch* was used, but the candidate had no real understanding of how the control unit works. Part **(ii)** was a little better, with the candidate showing some idea of how the memory unit works but falls short of making some key comments which could gain marks. In part **(iii)**, a reference to arithmetic and calculations was the level of understanding. There was no mention of arithmetic operations or logical comparisons in their answer.

Question 5 (b)

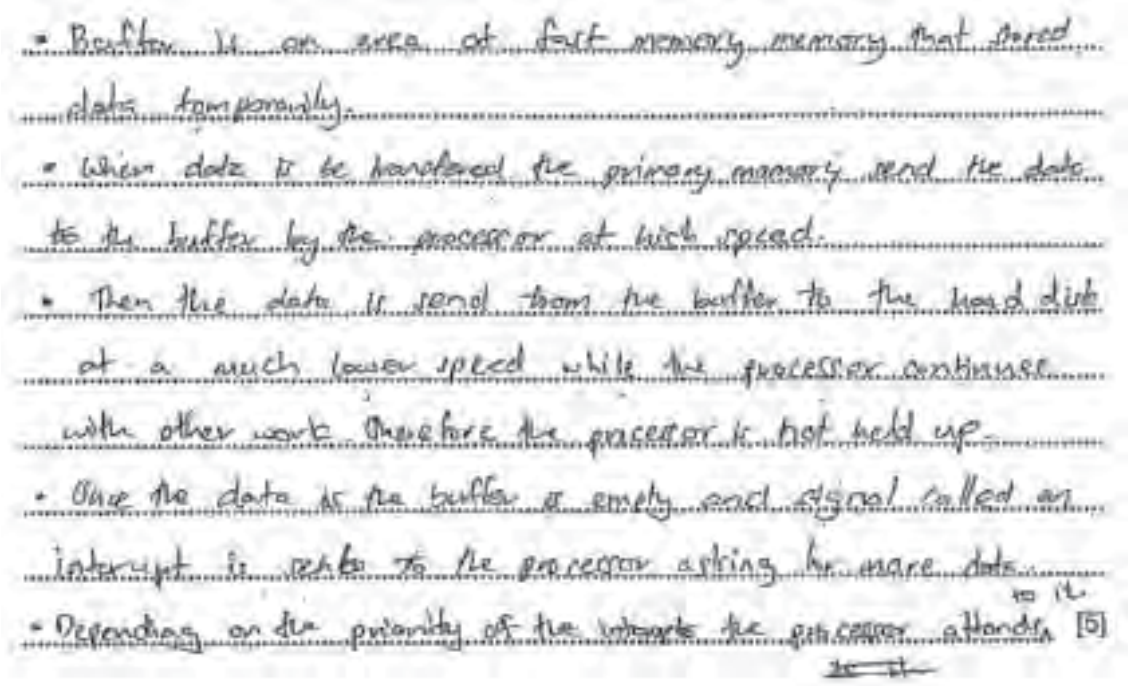
Describe the use of buffers and interrupts in the transfer of data between primary memory and hard disk.

Mark scheme

– temporary storage area
– Data transferred from primary memory to buffer (or vice versa)
– When buffer full, processor can carry on with other tasks
– Buffer is emptied to the hard disk
– When buffer empty, interrupt sent...
– to processor...
– requesting more data to be sent to buffer.
– according to priorities

(1 per –, max 5) [5]

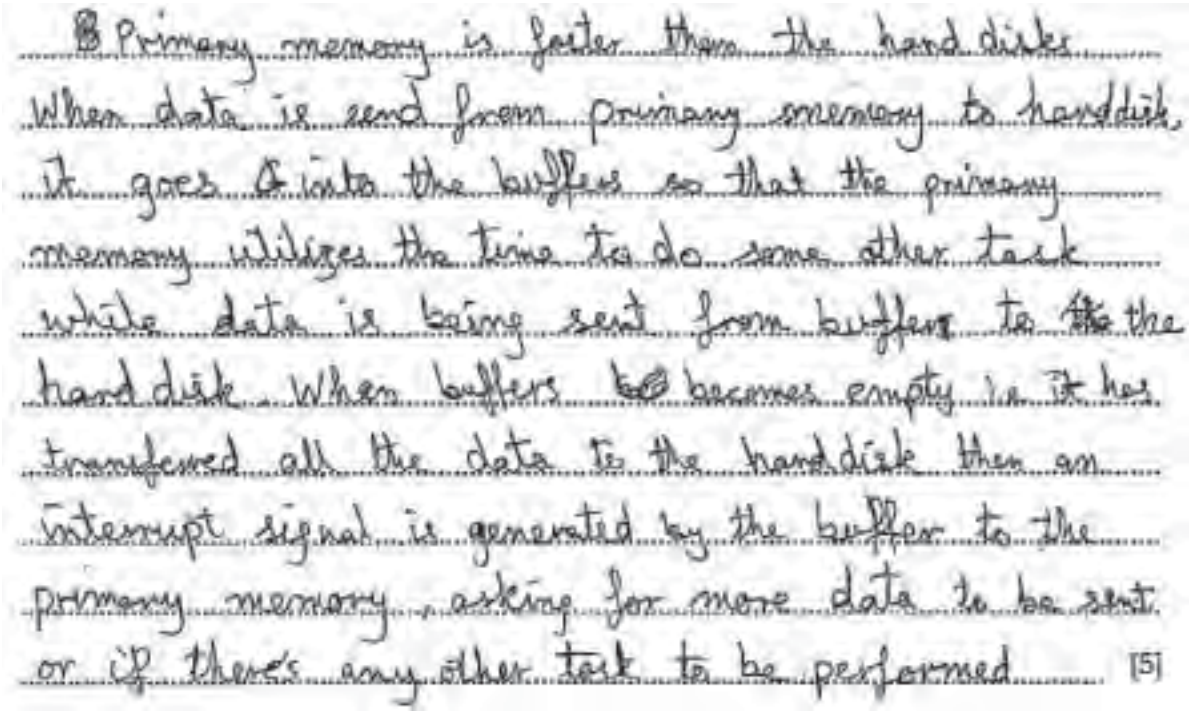
Example candidate response – grade A



Examiner comment

There are eight points on the mark scheme and this candidate covered all these points to ensure maximum marks were gained. The answer was logically set out using bullet points which made it easy to see each step in their discussion. A good clear answer.

Example candidate response – grade C

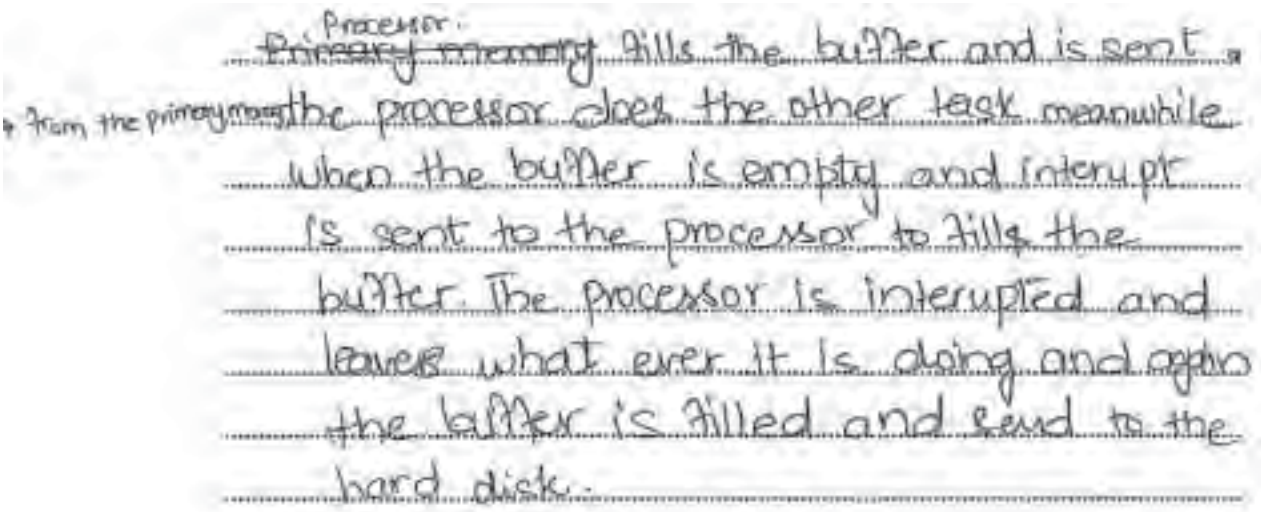


Primary memory is faster than the hard disks. When data is send from primary memory to harddisk, it goes & into the buffers so that the primary memory utilizes the time to do some other task while data is being sent from buffers to the the hard disk. When buffers becomes empty i.e. it has transfered all the data to the harddisk then an interrupt signal is generated by the buffer to the primary memory, asking for more data to be sent. or if there's any other task to be performed [5]

Examiner comment

The candidate shows some idea of how buffers and interrupts work but was not very clear with the finer details and confused processor with memory. The candidate clearly understands the concept but finds it difficult to link it all together logically.

Example candidate response – grade E



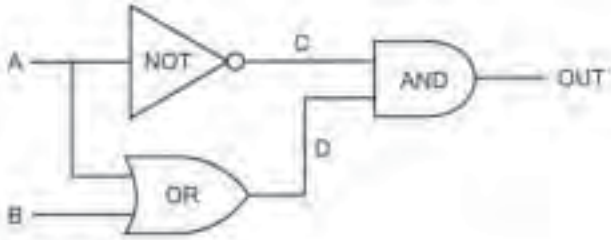
Processor. ~~Primary memory~~ fills the buffer and is sent from the primary mem the processor does the other task meanwhile. When the buffer is empty and interupt is sent to the processor to fills the buffer. The processor is interupted and leaves what ever it is doing and again the buffer is filled and send to the hard disk.

Examiner comment

It was typical to see some reference to how a buffer works and the idea that an interrupt is sent. But all the other stages in the process were usually absent. 'The buffer is filled and sends data to the hard disk' is typical of the type of answer seen which shows no real knowledge of how this is done or why it is done.

Question 6

Complete the table for this circuit of logic gates.



A	B	C	D	OUT
0	0			
0	1			
1	0			
1	1			

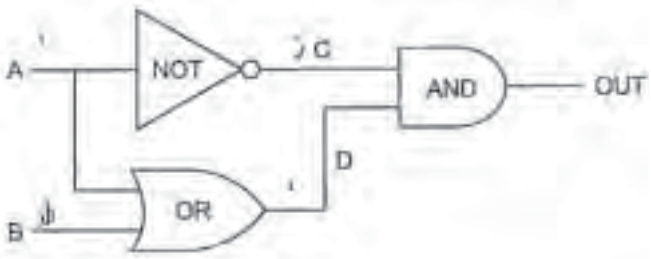
Mark scheme

A	B	C	D	OUT
0	0	1	0	0
0	1	1	1	1
1	0	0	1	0
1	1	0	1	0

Mark points:

– Column C first two values
– Column C last two values
– Column D first two values
– Column D last two values
– OUT first two values
– OUT last two values [6]

Example candidate response – grade A

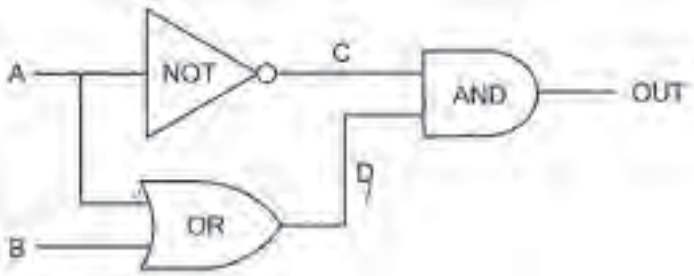


A	B	C	D	OUT
0	0	1	0	0
0	1	1	1	1
1	0	0	1	0
1	1	0	1	0

Examiner comment

No errors were made in the table. This is clearly an easy question at this level.

Example candidate response – grade C



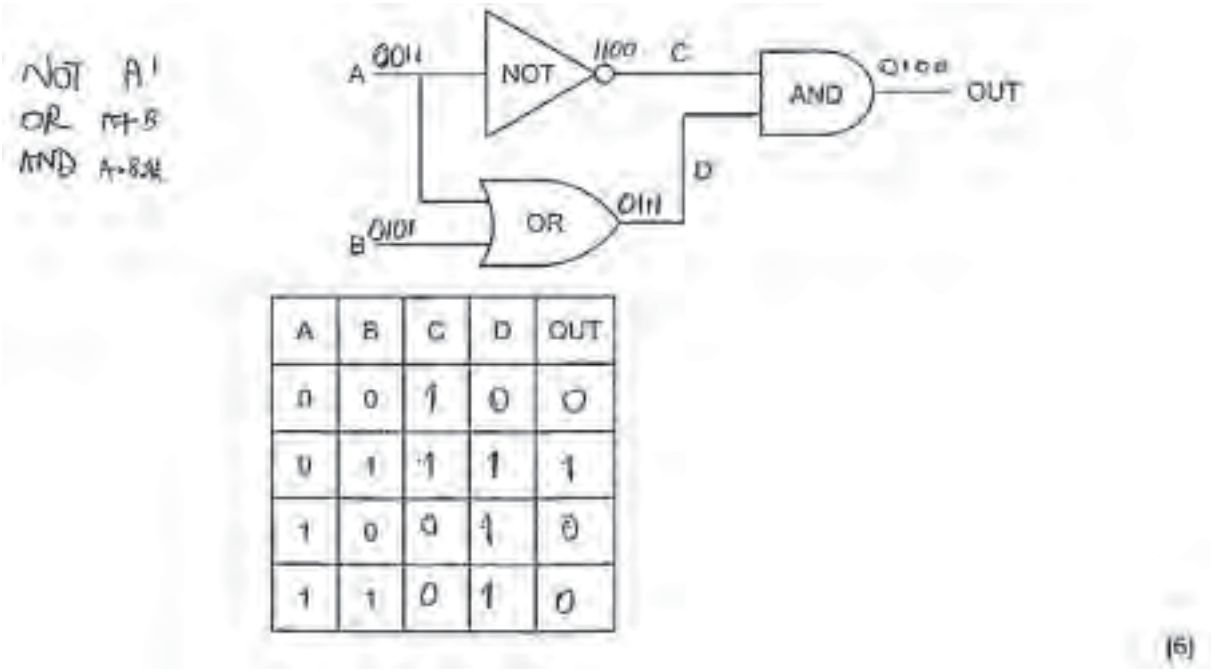
A	B	C	D	OUT
0	0	1	0	0
0	1	1	1	1
1	0	0	1	0
1	1	0	1	0

[6]

Examiner comment

There was no distinction between grade A and grade C candidate responses in this question. Both found it equally easy.

Example candidate response – grade E



A	B	C	D	OUT
0	0	1	0	0
0	1	1	1	1
1	0	0	1	0
1	1	0	1	0

[6]

Examiner comment

This is probably the one question on the exam paper where a grade E candidate matched a grade A candidate.

Question 7

An interactive computer system in a shopping mall is intended to give information to customers.
Discuss how the use of colour, layout and content will influence the design of the human computer interface (HCI).

Mark scheme

Colour…

- Colours should provide suitable contrasts
- should be meaningful e.g. red for danger
- reference to colour blindness / epilepsy

Layout...

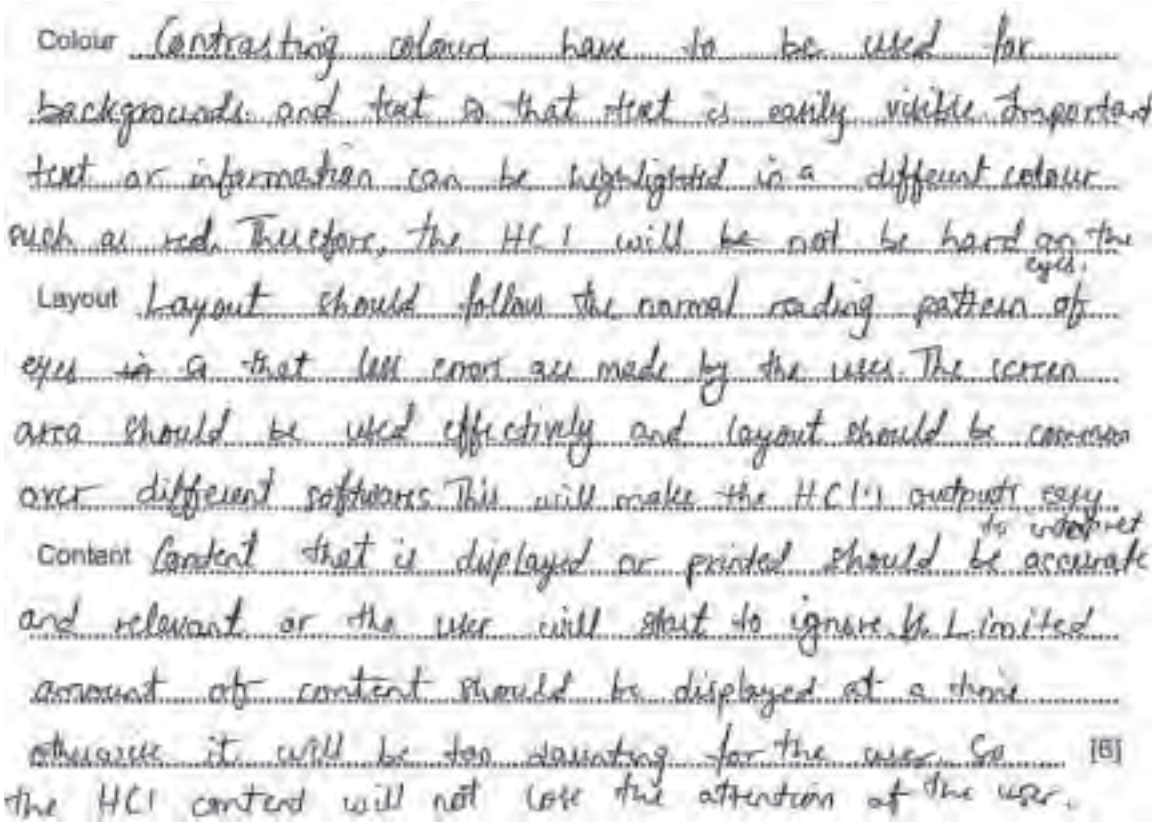
- should use whole screen...
- important information in top left hand corner/centre of screen
- big buttons for ease of navigation
- similar content grouped together
- consistent layout when moving from screen to screen

Content...

- must be relevant...
- must be understandable
- must be restricted so no information overload

(1 per –, max 2 per section, max 6) [6]

Example candidate response – grade A


Colour Contrasting colours have to be used for backgrounds and text so that text is easily visible. Important text or information can be highlighted in a different colour such as red. Therefore, the HCI will be not be hard on the eyes.

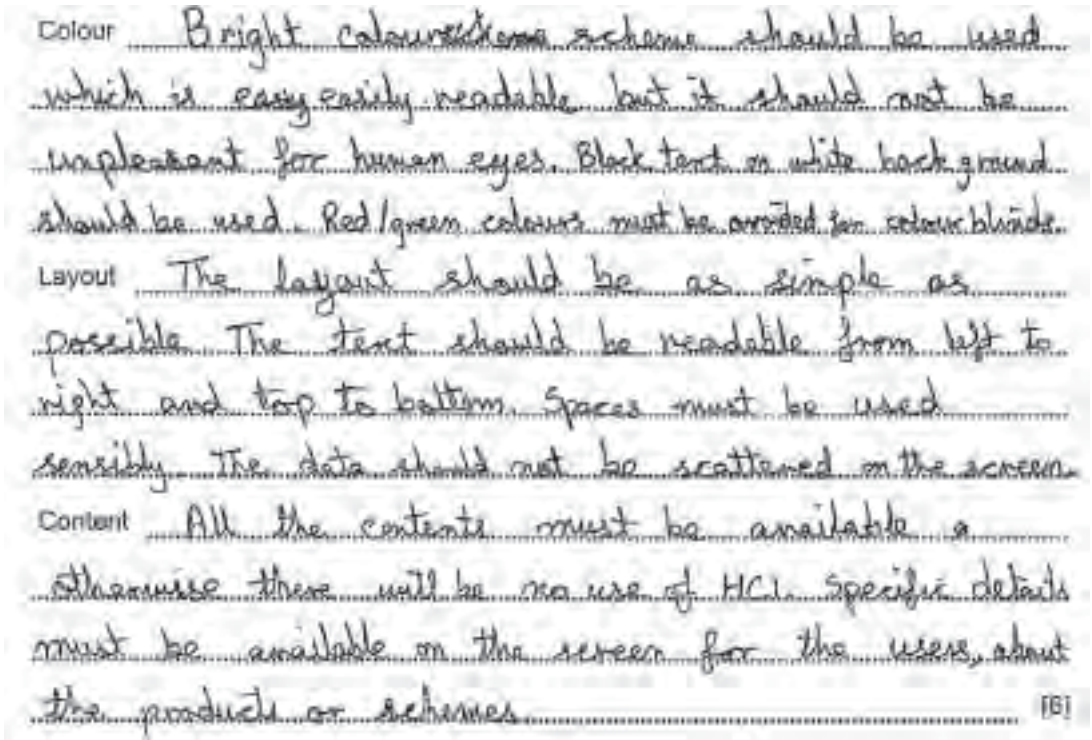
Layout Layout should follow the normal reading pattern of eyes so that less errors are made by the user. The screen area should be used effectively and layout should be consistent over different softwares. This will make the HCI's outputs easy to interpret

Content Content that is displayed or printed should be accurate and relevant or the user will start to ignore it. Limited amount of content should be displayed at a time otherwise it will be too daunting for the user. So the HCI content will not lose the attention of the user. [6]

Examiner comment

This was a very thorough answer. The candidate was clearly aware of what made a good HCI. Several of the points on the mark scheme were covered. The candidate explained why certain things were done and didn't just state facts.

Example candidate response – grade C


Colour Bright colour/theme scheme should be used which is easy easily readable but it should not be unpleasant for human eyes. Black text on white background should be used. Red/green colours must be avoided for colour blinds.

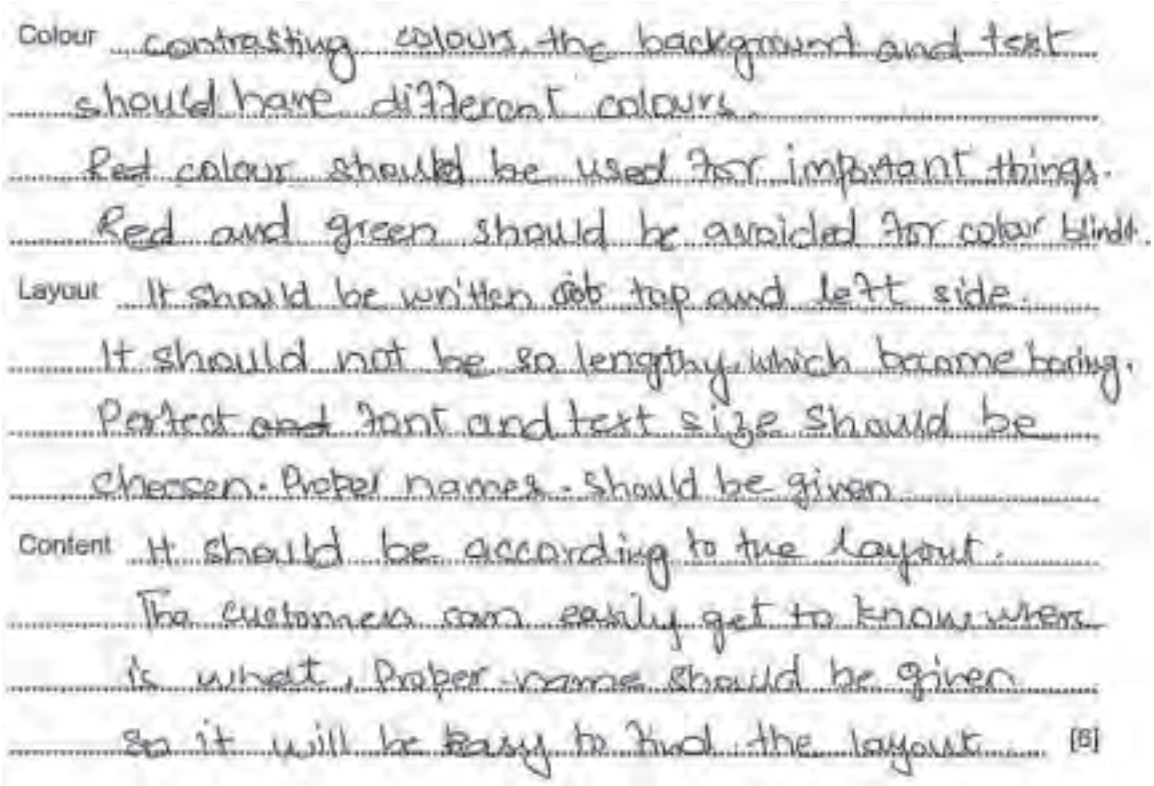
Layout The layout should be as simple as possible. The text should be readable from left to right and top to bottom. Spaces must be used sensibly. The data should not be scattered on the screen.

Content All the contents must be available a otherwise there will be no use of HCI. Specific details must be available on the screen for the users, about the products or schemes. [6]

Examiner comment

The answer covers all the main points but struggles to explain the contents part. Although comments about use of colours were correct, the candidate couldn't explain why some of the features given were done under layout and content. Again, a good general idea but lacking in the finer detail to get more than half marks.

Example candidate response – grade E



Examiner comment

The use of colour seemed to be understood; but layout and content were even sketchier than for grade C candidates. E.g. 'it should be written top and left' in the layout section was correct but the candidate couldn't explain why this was done. The answer was often very vague with little understanding of how layout and content can influence HCI design.

Question 8 (a)

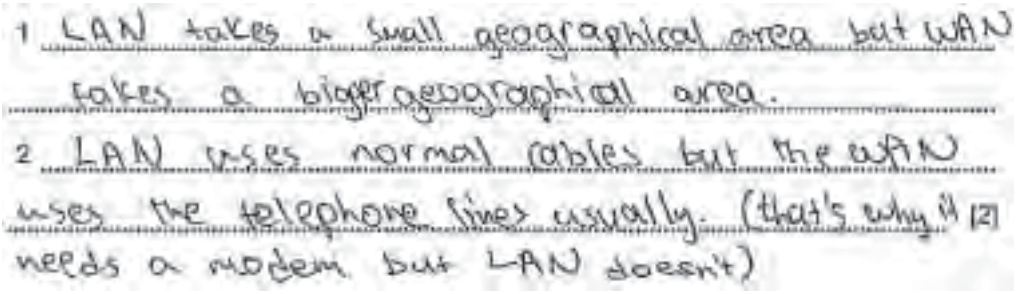
State **two** differences between a local area network (LAN) and a wide area network (WAN).

Mark scheme

- LAN over short distances/buildings/site // WAN geographically remote
- LAN uses own communication medium/WAN uses third party
- LAN more secure/WAN more open to attack

(1 per –, max 2) [2]

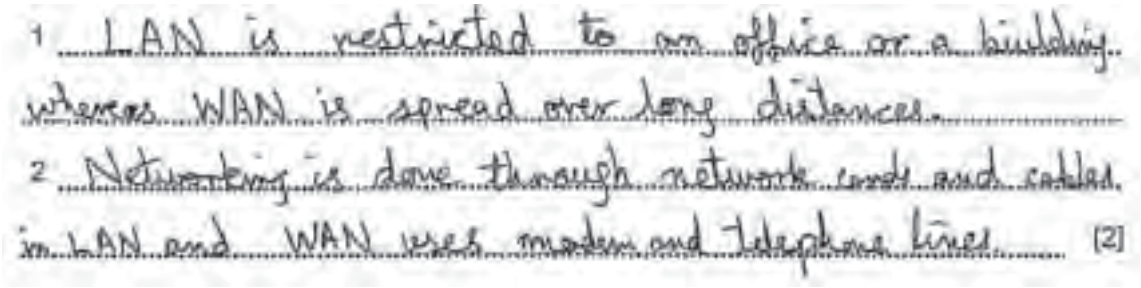
Example candidate response – grade A


1 LAN takes a small geographical area but WAN takes a bigger geographical area.
2 LAN uses normal cables but the WAN uses the telephone lines usually. (that's why it needs a modem but LAN doesn't) [2]

Examiner comment

It was rare to see any good answers for this question with very few getting full marks. Even this answer is not that good. Generally, candidates, even at this level, found it difficult to explain the difference between LAN and WAN and didn't realise that some implication of a huge geographical area was needed in the explanation.

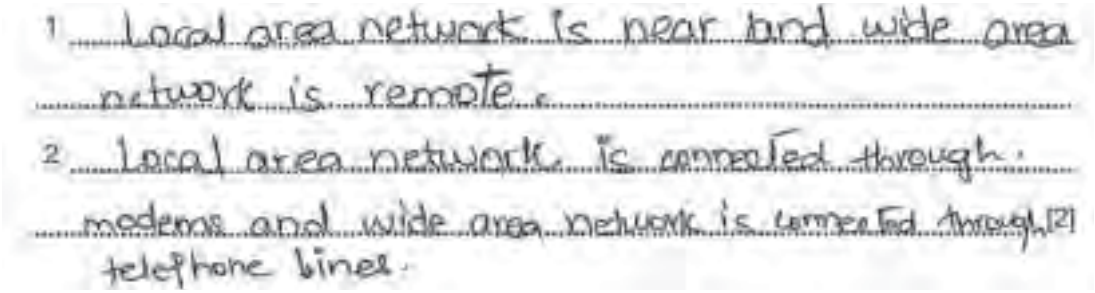
Example candidate response – grade C


1 LAN is restricted to an office or a building whereas WAN is spread over long distances.
2 Networking is done through network cards and cables. in LAN and WAN uses modem and telephone lines [2]

Examiner comment

The same problem occurred with grade C candidates as with grade A candidates. There was a general problem trying to explain the difference between LAN and WAN in geographical terms.

Example candidate response – grade E


1 Local area network is near and wide area network is remote.
2 Local area network is connected through modems and wide area network is connected through telephone lines. [2]

Examiner comment

The same problem occurred here as with grade A and grade C candidates. The problem was further compounded by many candidates at this level confusing WAN with wireless LANs.

Question 8 (b)

State what is meant by each of the following types of data transmission. Give an advantage of each.

(i) Serial

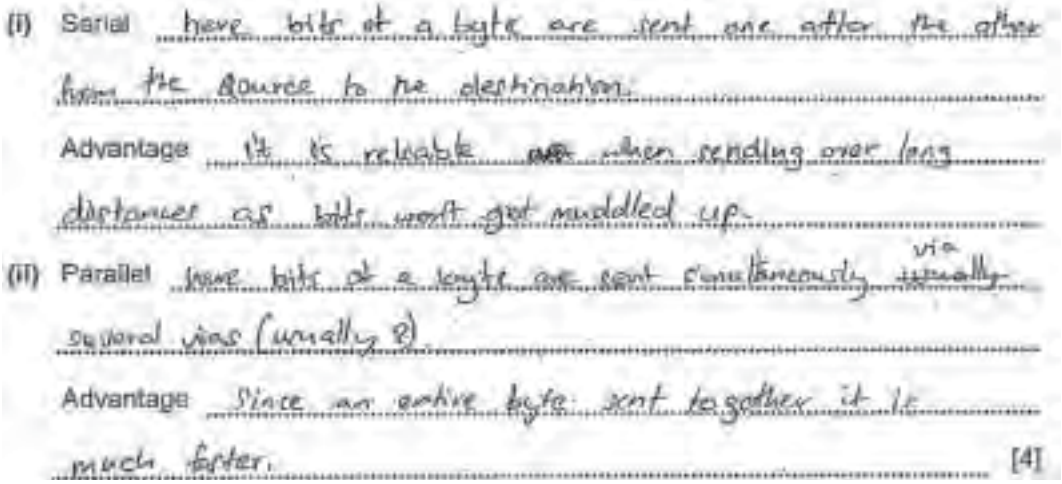
(ii) Parallel

Mark scheme

(i) – Individual bits sent one after another/along single wire
– can be used over long distances
– Less chance of corruption/less chance of bits having order changed [2]

(ii) – a byte is sent simultaneously / at the same time along 8 wires
– Much faster transmission rate [2]

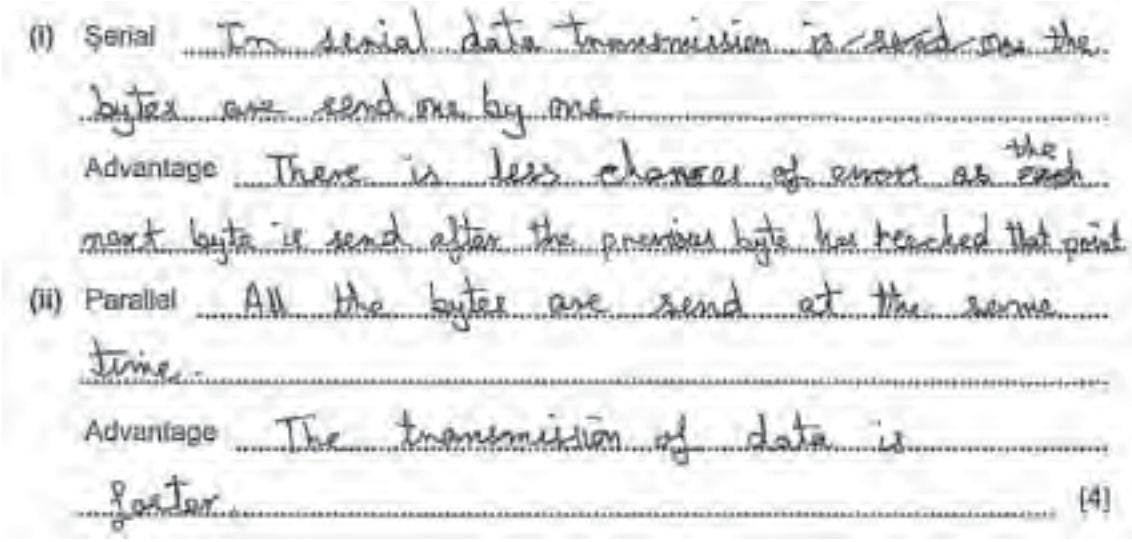
Example candidate response – grade A



Examiner comment

In part **(i)** the explanation of serial was unambiguous and the advantage given was very clear. In part **(ii)**, the explanation and advantage were again very clear; the candidate not only correctly mentioned faster transmission but also said why.

Example candidate response – grade C


(i) Serial In serial data transmission is send one the bytes are send one by one.

Advantage There is less chances of error as the each next byte is send after the previous byte has reached that point

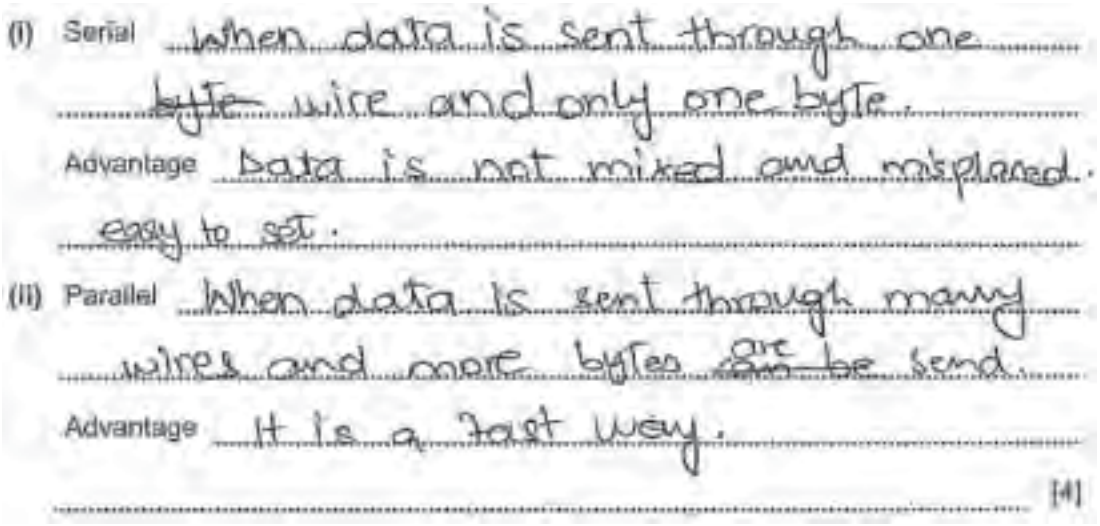
(ii) Parallel All the bytes are send at the same time.

Advantage The transmission of data is faster. [4]

Examiner comment

The candidate has clearly confused bytes with bits in both parts. This makes their answer effectively incorrect. Although in part (ii) the candidate seemed to be aware that parallel data transmission is faster than serial data transmission.

Example candidate response – grade E


(i) Serial When data is sent through one byte wire and only one byte.

Advantage Data is not mixed and misplaced. easy to set.

(ii) Parallel When data is sent through many wires and more bytes are be send.

Advantage It is a fast way. [4]

Examiner comment

There was some confusion here about how bits are transmitted. Bit and byte were also confused. The candidate's answers showed very little depth of understanding e.g. 'it is very fast' in part (ii) (presumably referring to data transfer rate). The candidate has the general idea but has difficulty explaining it without resorting to vague statements like the one above.

Question 8 (c)

The following bytes were received during a data transmission.

01101101 10101010 10111101 10110001

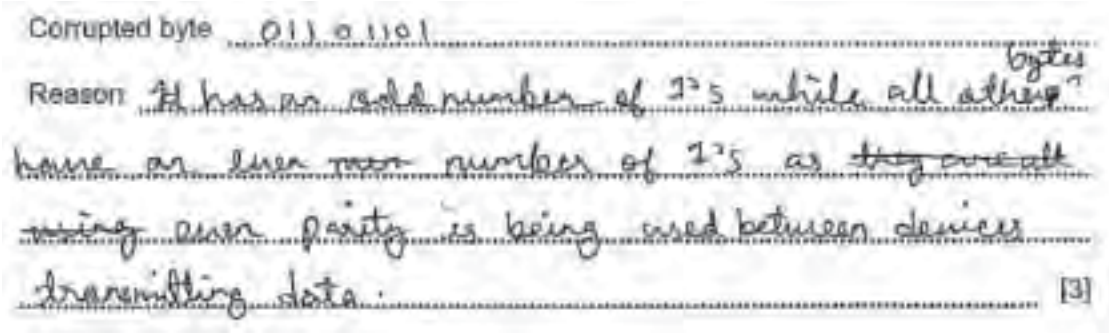
Parity is being used as an error check.
State which **one** of the bytes has been corrupted. Explain why you chose the one that you did.

Mark scheme

– 01101101/First byte
– The other three all have an even number of ones/even parity
– This byte has an odd number of ones [3]

Second and third marks depend on first mark

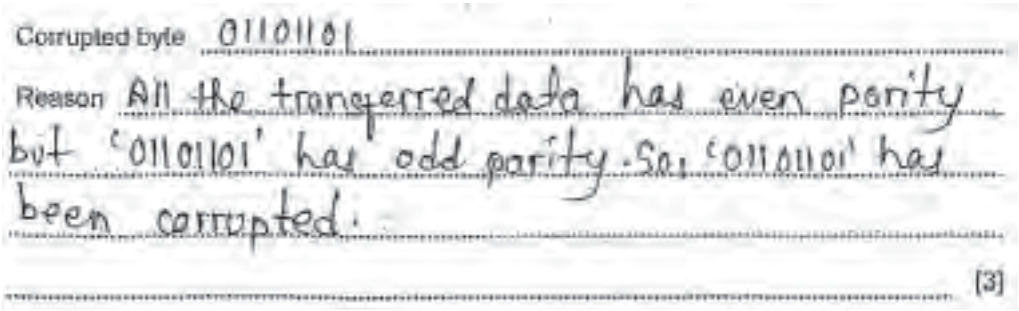
Example candidate response – grade A



Examiner comment

The correct byte was chosen and the candidate clearly indicated why this was the corrupted byte. The meaning of even parity was well explained; also a good explanation of why the chosen byte didn't exhibit even parity, was given.

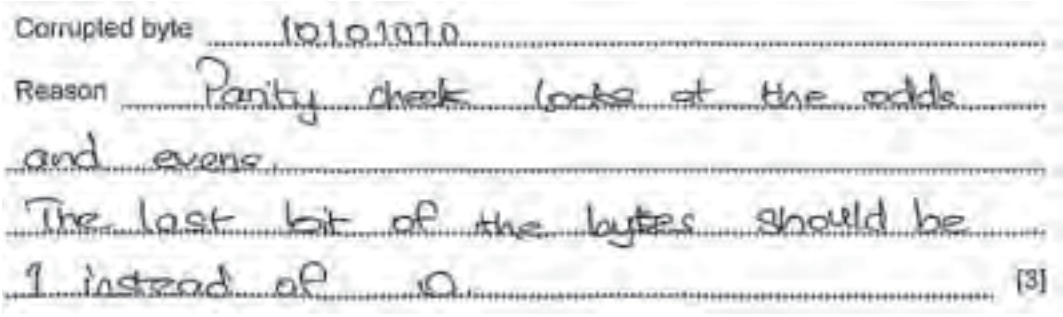
Example candidate response – grade C



Examiner comment

The correct corrupted byte was recognised by the candidate and they were aware that even parity was being used. However, the candidate could not explain properly why 01101101 wasn't even parity and simply indicated it was odd parity. No reason given why.

Example candidate response – grade E



Examiner comment

Grade E candidates just tended to pick out the byte that looked different to the others. Consequently, 10101010 was often chosen because it was the only one that ended in a 0. Little, if any, indication was given whether parity was even or odd; although the "concept" of parity was often mentioned.

Question 9 (a)

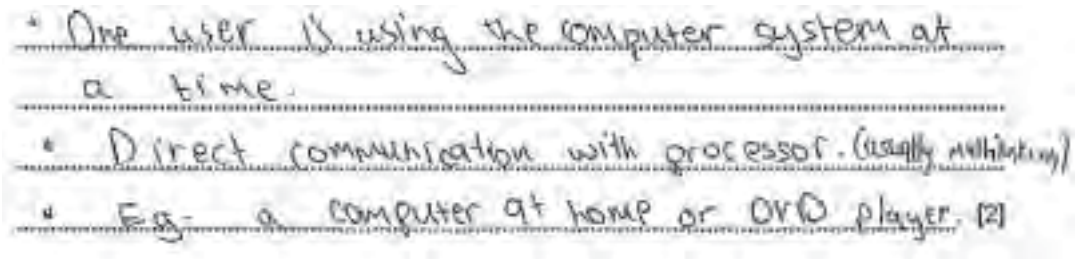
Describe a single-user operating system.

Mark scheme

- OS will only allow one user <u>at a time</u> to use the computer
- Each approved user is identified by a user ID
- multi-tasking
- Provides security for user files/user profiles

(1 per –, max 2) [2]

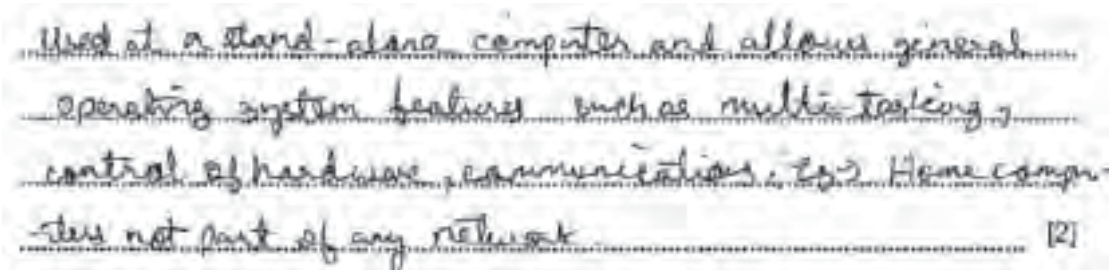
Example candidate response – grade A



Examiner comment

The answer was very clearly laid out using bullet points. The candidate clearly understood what was meant by single user OS.

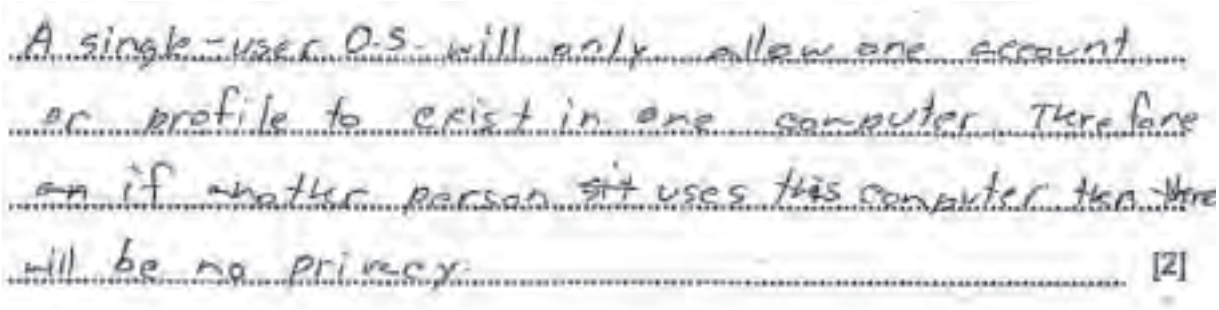
Example candidate response – grade C



Examiner comment

A very general answer was given in this example response. Key words were missing from the answer e.g. 'only one user can work on it' – the candidate omitted the key phrase: *at a time*. Some aspects, such as multitasking, were mentioned by the better grade C candidates.

Example candidate response – grade E



Examiner comment

This candidate knew this probably referred to one user but did not quite show any real grasp of the topics and consequently their explanation lacked sufficient depth to gain marks.

Question 9 (b)

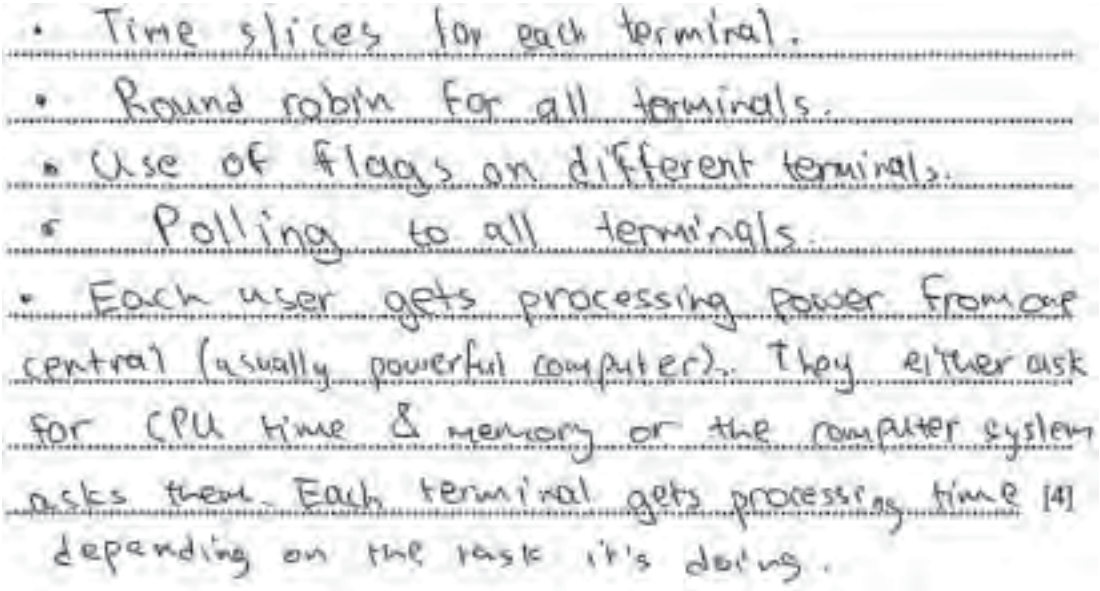
Explain how a multi-user operating system allows many users to use the computer system.

Mark scheme

- Each user given short processor time/time slice
- In turn/so all users serviced in one rotation
- Flags used to stop waste of processor time if terminal has nothing to do
- Priorities used to allow some terminals more regular time slices...
- or longer time slices
- different users' data/programs are stored in different areas of main memory

(1 per –, max 4) [4]

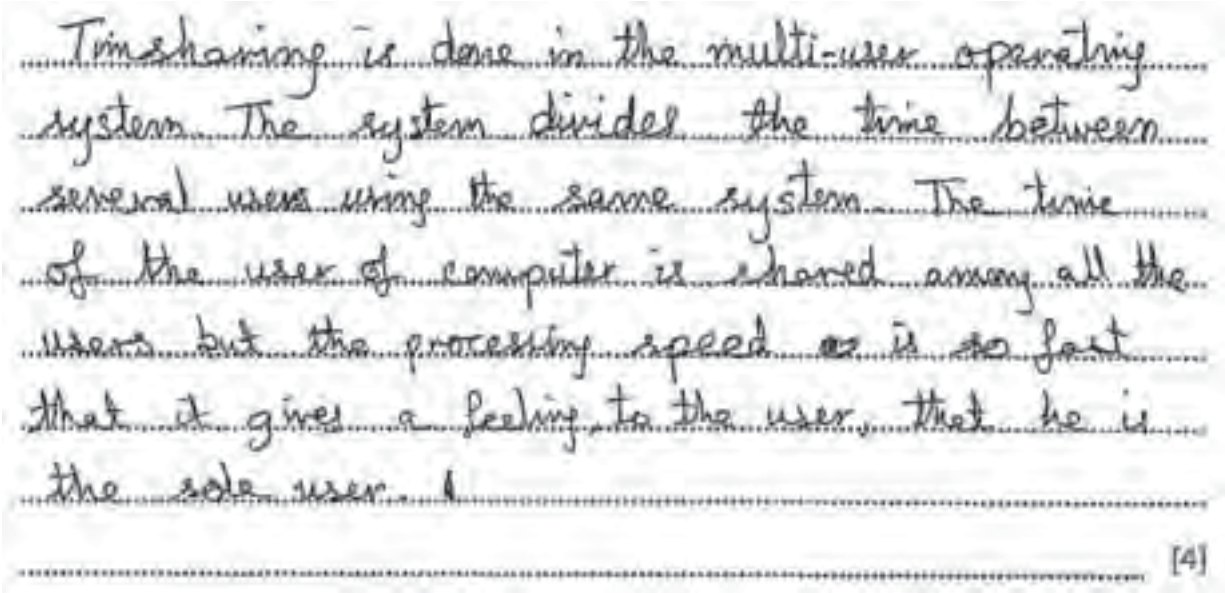
Example candidate response – grade A



Examiner comment

The candidate understood the concept of multi-user systems. The idea of time slices, polling and use of flags was clearly understood. But very few candidates got full marks on this question indicating that this topic is not generally well known.

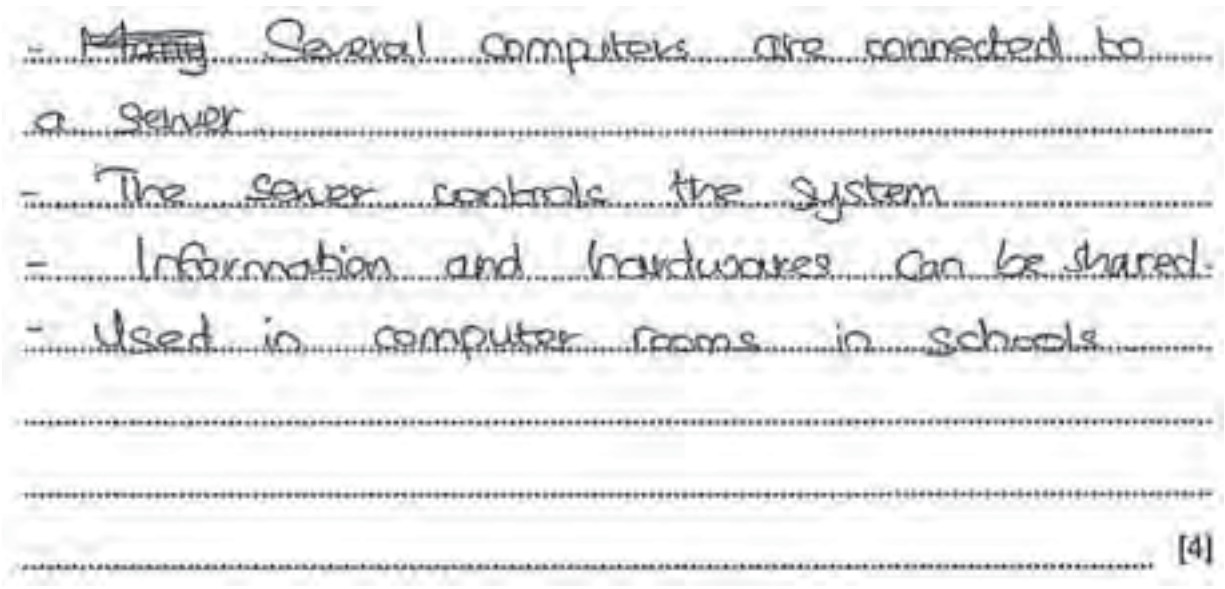
Example candidate response – grade C



Examiner comment

The candidate had some idea about time sharing and that the user was given a time slot. However, they didn't understand how it is actually done using flags, polling, priorities, etc.

Example candidate response – grade E


- Several computers are connected to a server
- The server controls the system
- Information and hardwares can be shared.
- Used in computer rooms in schools

[4]

Examiner comment

Candidates at this level often thought this question referred to networks and gave answers which described servers, sharing of resources and so on.

Paper 2

Question 1 (a)

Ahmed, a designer, stores the following details of each job that he does in a file.

- job ID (a whole number between 1 and 1000 inclusive)
- job description
- price (greater than $10 and not more than $5000)
- expected completion date
- paid (yes/no)

(a) Complete the following table.

Field Name	Data Type	Size of Field (bytes)
JobID		
JobDescription		
Price		
ExpectedCompletionDate		
Paid		

Mark scheme

Field Name	Data Type	Size of Field (bytes)
JobID	Integer	4
JobDescription	String / alphanumeric / text	20–50
Price	Currency / integer / real / decimal / float	8
ExpectedCompletionDate	Date / integer	8
Paid	Boolean	1

1 mark per box
NOT variant (as a data type) [10]

Example candidate response – grade C

Field Name	Data Type	Size of Field (bytes)
JobID	9nteger	4 bytes
JobDescription	"string"	15 bytes
Price	9nteger	4 bytes
ExpectedCompletionDate	Date	8 bytes
Paid	Boolean	1 byte

[10]

Examiner comment

Most candidates got this part correct. This response is by a C grade candidate but A grade candidates' answers were the same.

Example candidate response – grade E

Field Name	Data Type	Size of Field (bytes)
JobID	Integer	4
JobDescription	Text	20
Price	Currency	5
ExpectedCompletionDate	Date	8
Paid	Boolean	3

[10]

Examiner comment

Making the boolean field too large was the most common error in this part.

Question 1 (b)

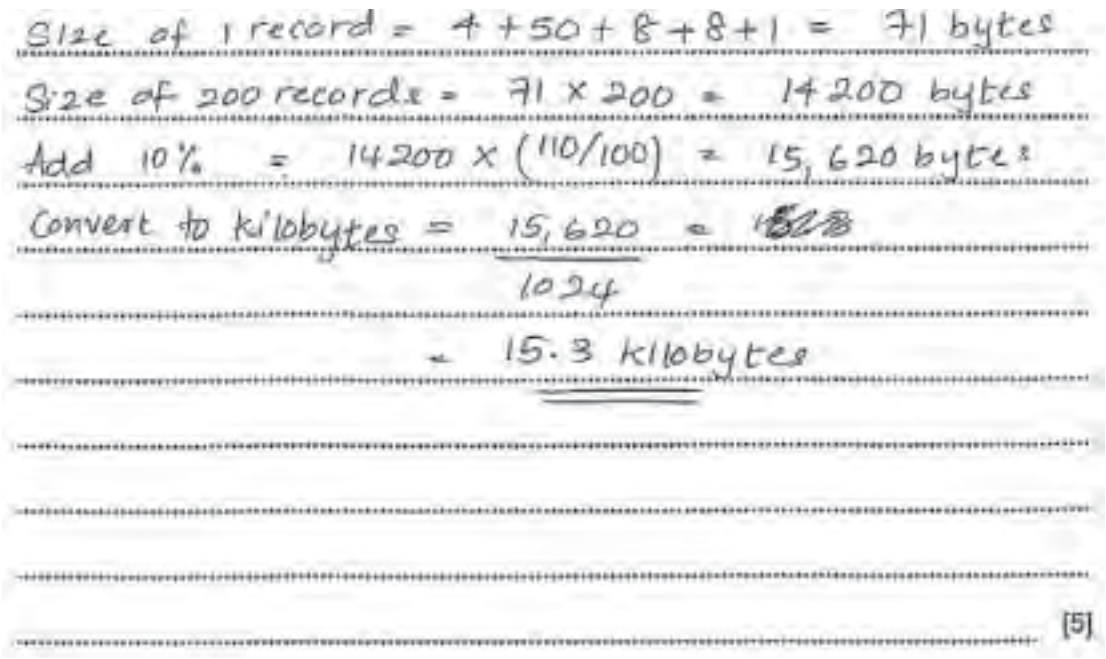
The details of the last 200 jobs are stored in the file.

Estimate the size, in kilobytes, of the file. Show your working.

Mark scheme

- Result (e.g. 4+29+8+8+1=50 – size of 1 record)
- Multiplied by 200 (e.g. 10,000)
- Add (10%) (e.g. 11,000)
- Divided by 1024 (e.g. 11,000 ÷ 1024)
- Result between 6.2 and 59.7KB (e.g. 10.7KB) [5]

Example candidate response – grade A



Examiner comment

The candidate used the file sizes from part **(a)** to calculate the size of one record. Correct multiplication by the number of records and addition of 10% for overheads as well as accurate conversion from bytes to Kilobytes make this an excellent answer. All working is clearly laid out and every step explained.

Example candidate response – grade C

size of each = 4 + 30 + 5 + 10 + 1
= 50

size of 200 jobs = 200 x 50
= 2500

= 2500 kb
1024
= 2.44 kb

[5]

Examiner comment

This candidate calculated the record size and multiplied this by the number of records, but did not add the 10% for overheads. The working is clearly laid out and each step labelled.

Example candidate response – grade E

(8 + 20 + 8 + 6 + 1) = 43 x 200
= 8600

+ 10% overhead = 860
= 9460
1000
= 9.46 kb

[5]

Examiner comment

This candidate correctly calculated the filesize in bytes, but then divided by 1000 rather than 1024 to convert to Kilobytes. The working is clearly laid out but explanation of the steps is minimal.

Question 1 (c)

In a high-level programming language of your choice, write the code to define the record type for the record structure in part **(a)**.

Mark scheme

e.g. Pascal

```
TYPE JobRecord = RECORD
   JobID: Integer;
   JobDescription: String;
   Price: Currency;
   ExpectedCompletionDate: TDateTime;
   Paid: Boolean
END;
```

e.g. VB6

```
Type JobRecord
   DIM JobID AS Integer
   DIM JobDescription AS String
   DIM Price AS Decimal
   DIM ExpectedCompletionDate AS Date
   DIM Paid AS Boolean
END Type
```

e.g. VB 2005

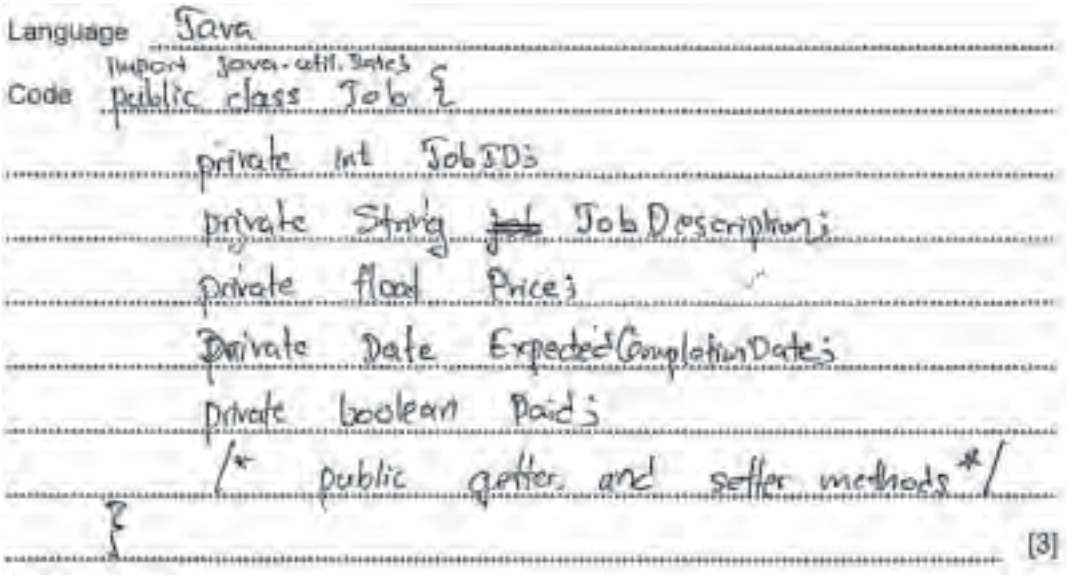
```
STRUCTURE JobRecord
   DIM JobID AS Integer
   DIM JobDescription AS String
   DIM Price AS Decimal
   DIM ExpectedCompletionDate AS Date
   DIM Paid AS Boolean
END STRUCTURE
```

e.g. C#

```
struct jobRecord
{
   public int jobID;
   public string jobDescription;
   public decimal price;
   public datetime expectedCompletionDate;
   public bool paid;
}
```

1 mark for heading
1 mark for structure
1 mark for all 5 fields correct [3]

Example candidate response – grade A


Language Java

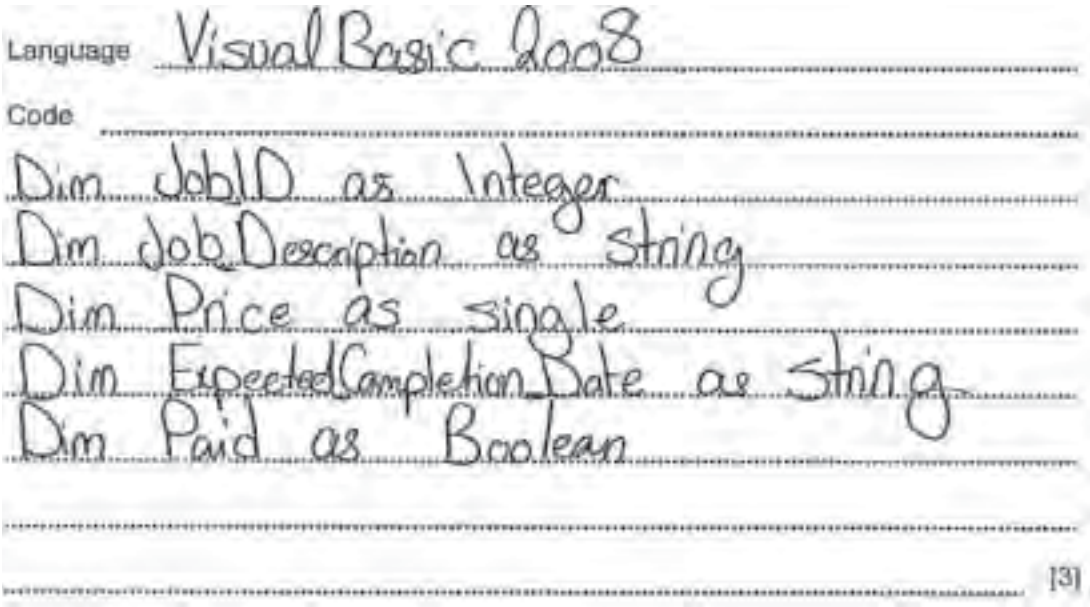
```
Import java.util.Dates
public class Job {
    private int JobID;
    private String ~~Job~~ JobDescription;
    private float Price;
    Private Date ExpectedCompletionDate;
    Private boolean Paid;
    /* public getter and setter methods */
}
```

[3]

Examiner comment

Java is not explicity given in the mark scheme. The answer is correct and the candidate was credited for this. It is very important that the answer matches the language stated.

Example candidate response – grade C


Language Visual Basic 2008

Code

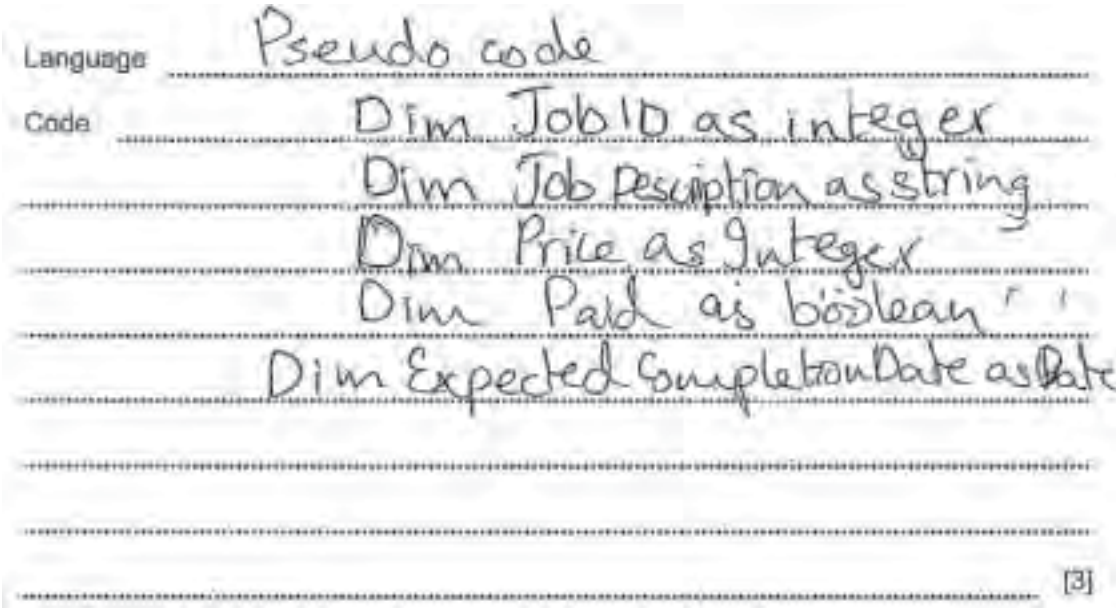
```
Dim JobID as Integer
Dim JobDescription as string
Dim Price as single
Dim ExpectedCompletionDate as String
Dim Paid as Boolean
```

[3]

Examiner comment

This is a common response from a grade C candidate, where just the fields are defined. To gain full marks, the candidate also needs to show how these field definitions need to be enclosed with the correct keywords to declare these fields as a record type.

Example candidate response – grade E



Examiner comment

Quite a number of candidates stated the high-level language to be Algorithm or Pseudocode. This is not appropriate. For questions such as these, candidates need to show evidence of knowledge of a real programming language.

Question 1 (d)

Some data will need to be validated when entered.

(i) State what is meant by validation.

(ii) Describe **two** different validation checks that can be performed on the ExpectedCompletionDate field.

Mark scheme

(i) – to check that data is reasonable / acceptable / follows rules
– to check data is complete [1]

NOT correctness

(ii) – range check explanation
– length check explanation
– format check explanation

Max 2 marks *[2]*
NOT presence check

Example candidate response – grade A

(i) State what is meant by validation.

It's a process done by a check, to make sure that the data entered is valid [1]

(ii) Describe **two** different validation checks that can be performed on the ExpectedCompletionDate field.

1 Range check: A check that makes sure that data entered lies in a specific range of values eg: Date between 1 to 31.

2 Format check: A check that makes sure that data entered is in correct format eg: Integer only in Date. [2]

Examiner comment

This candidate has re-used the words of the question in the first part, but given 2 good answers in the second part; clear and accurate.

Example candidate response – grade C

(i) State what is meant by validation.

Validation is a set of rules that checks wheather the data is vaild or invaild. [1]

(ii) Describe **two** different validation checks that can be performed on the ExpectedCompletionDate field.

1 Lenght check – This validation rules checks wheather that the correct number of data is entered.

2 presence check – This validation rule checks wheather that there is any data entered to the field if the the field is empty the Error message is given [2]

Examiner comment

The answer to the first part is not well expressed, but enough for a mark. Although length check is a type of validation check, the explanation given shows little understanding of what a length check is.

Example candidate response – grade E

(i) State what is meant by validation.

to check that data inserted is the one that was intended to [1]

(ii) Describe two different validation checks that can be performed on the ExpectedCompletionDate field.

1 A file could be typed twice and talyed together.

2 manual checks can be undergone. The soft copy of the data is matched by the hard copy of the data. [2]

Examiner comment

The candidate appears to be writing about verification. This is a common error from grade E candidates.

Question 1 (e)

The logic statement to validate the Price field is (Price > 10) AND (Price <= 5000)

Write a similar logic statement to validate each of the following.

JobID
Paid

Mark scheme

(JobID > 0) AND (JobID <= 1000)

Alternative answers:

(JobID > 0) AND (JobID < 1001)

(JobID >= 1) AND (JobID <= 1000)

(JobID >= 1) AND (JobID < 1001)

Correct brackets 1 mark; correct operator 1 mark

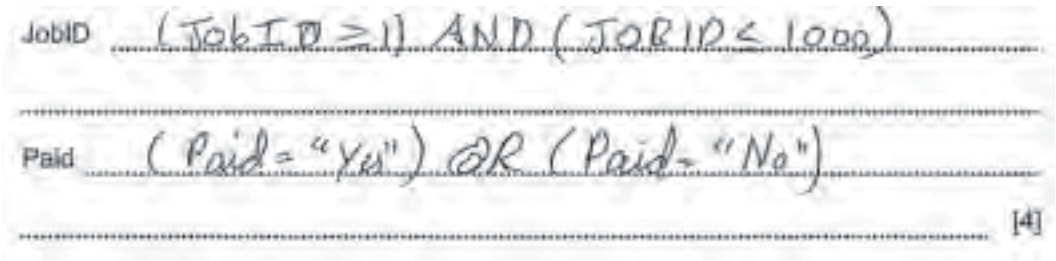
(Paid=True) OR (Paid=False)

Accept (Paid=yes) OR (Paid=no)

Accept (Paid=1) OR (Paid=0)

Correct brackets 1 mark; correct operator 1 mark *[4]*

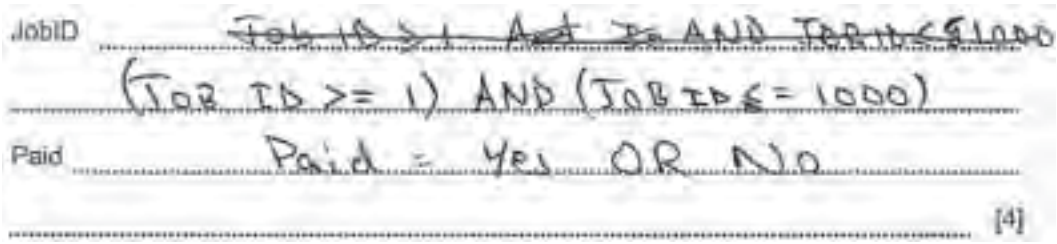
Example candidate response – grade A



Examiner comment

The logic statements are correct. Candidates writing pseudocode should use the programming symbols >= and <= rather than the mathematical symbols ≥ and ≤.

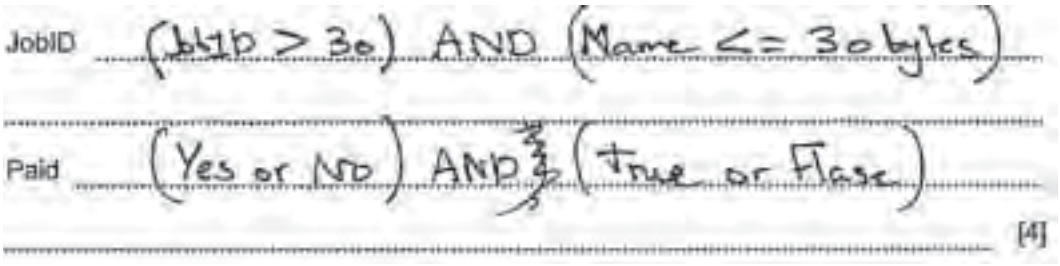
Example candidate response – grade C



Examiner comment

The JobID validation is correct. No separation of the two conditions of Paid show a common mistake grade C candidates make.

Example candidate response – grade E



Examiner comment

This candidate has been awarded a mark for the 'AND'. The remainder of the statements do not make any sense. Evidence such as this show that candidates need more practice at writing boolean expressions in a real programming language as part of simple programs, where execution of the program will quickly show the candidate whether they have constructed the expression correctly.

Question 1 (f)

The code for the validation will have to be tested.

State **four** items of data you would use to test the JobID validation.
State the reasons for using that test data.

Test 1	JobID value	Reason
Test 2		
Test 3		
Test 4		

Mark scheme

Any sensible + reason accepted
e.g. 500 – valid data– within acceptable range / normal
1 – valid data – lower boundary included / extreme
1000 – valid data – upper boundary included / extreme
– 1 – invalid data – below boundary
1001 – invalid data – above boundary

1 mark per data item, 1 mark per matching reason *[8]*

Example candidate response – grade A

	JobID value	Reason
Test 1	105	Not an integer (gives error)
Test 2	-1	Below lowest range (gives error)
Test 3	1001	should not be greater than 1000 (gives error)
Test 4	1000	Standard data (No error)

[8]

Examiner comment

This candidate chose four different types of test data and could also have given 'Boundary value' as the reason for choosing 1000. In questions about test data it is very important to consider different types of test and not give data that essentially test the same thing.

Example candidate response – grade C

	JobID value	Reason
Test 1	123 1/2	testing fractions
Test 2	1000	testing highest boundary
Test 3	-1231	testing negative entry
Test 4	-1001	testing invalid entry.

[8]

Examiner comment

An answer to test fractions was not accepted as it is not normally possible to enter fractions. The last entry in this answer was the same type as the one above it. Grade C candidates often found it difficult to select data values that tested for valid and invalid JobIDs.

Example candidate response – grade E

	JobID value	Reason
Test 1	check weather the ID is valid or no	To know if it valid or no
Test 2	check the valid name.	To know if name is valid or no.
Test 3	check weather the ~~ID~~ is same as	To know if the ~~ID~~ is same
Test 4	check the Job type	To know which his job ~~title~~ type

[8]

Examiner comment

The quesiton required the candidate to specify data values that could be entered to test that the validation check worked accurately. Grade E candidates often found this difficult.

Question 2 (a) (i)

Raul wants to write a program that will count the number of vowels in a word. He starts by writing some pseudocode that will count the number of letter 'a's.

```
1  INPUT Word
2  Count ← 0
3  LOOP FOR Index ← 1 TO length(Word)
4        IF Word(Index)='a'
5         THEN
6            Count ← Count + 1
7        ENDIF
8  ENDLOOP
```

(a) (i) Complete the trace table for this pseudocode using 'banana' as input.

The first seven rows have been filled in.

Word	Count	Index	Word(Index)	Word(Index)='a'
banana				
	0			
		1		
			b	
				false
		2		
			a	

Mark scheme

(a) (i)

Word	Count	Index	Word(Index)	Word(Index)='a'
banana				
	0			
		1		
			b	
				false
		2		
			a	
				true
	1			
		3		
			n	
				false
		4		
			a	
				true
	2			
		5		
			n	
				false
		6		
			a	
				true
	3			

1 mark for each correct column (except Word column)
1 mark for correct sequence
1 mark for readable presentation [6]

Example candidate response – grade A

(a) (i) Complete the trace table for this pseudocode using 'banana' as input.
The first seven rows have been filled in.

Word	Count	Index	Word(Index)	Word(Index)= 'a'
banana				
	0			
		1		
			b	
				false
		2		
			a	
				true
	1			
		3		
			n	
				false
		4		
			a	
				true
	2			
		5		
			n	
				false
		6		
			a	
				true
	3			

[6]

Examiner comment

Clearly laid out trace table with correct values showing for each variable at every stage. The convention of leaving the cell blank when the content has not changed has been followed. This gives a clear indication of correctness.

Example candidate response – grade C

Count	Index	Word(Index)	Word(Index)a
0	1	b	No
1	2	a	Yes
2	3	n	No
3	4	a	Yes
	5	n	No
	6	a	Yes

Line	Word	Count	Index	Word(Index)	Word(Index)= 'a'
1	banana				
2		0			
3			1		
4				b	
5					false
3			2		
4				a	
5					true
6		1			
3			3		
4				n	
5			–		false
3			4		
4				a	
5					true
6		2			
3			5		
4				n	
5					false
3			6		
4				a	
5					true
6		3			
3			7		
8					

[6]

Examiner comment

This candidate also continued the format of entering each changed value in a new row of the trace table. This clearly helped the candidate as they could show which line of the pseudocode was being followed.

Example candidate response – grade E

(a) (i) Complete the trace table for this pseudocode using 'banana' as input.
The first seven rows have been filled in.

Word	Count	Index	Word(Index)	Word(Index)= 'a'
banana	0	1	b	false
	0	2	a	true
	1	1	b	false
	1	1	b	false
	1	1	b	false
	1	2	a	true
	2	2	a	true
	3	3	n	false
	3	3	n	false
	3	4	a	true
	4	5	n	false
	4	6	a	true

[6]

Examiner comment

Grade E candidates often showed evidence that they had not enough understanding of dry-running of code. Setting out the trace table by entering each new value in a new row was intended to aid the candidate to see easily the result from each line of pseudocode.

Question 2 (a) (ii)

(ii) Complete this trace table for the pseudocode using 'Ant' as input.

```
1   INPUT Word
2   Count ← 0
3   LOOP FOR Index ← 1 TO length(Word)
4      IF Word(Index)='a'
5         THEN
6            Count ← Count + 1
7      ENDIF
8   ENDLOOP
```

Word	Count	Index	Word(Index)	Word(Index)='a'
Ant				

Mark scheme

(ii)

Word	Count	Index	Word(Index)	Word(Index)='a'
Ant				
	0			
		1		
			A	
				false
		2		
			n	
				false
		3		
			t	
				false

1 mark for correct Count column
1 mark for correct Word(Index)='a' column (need false only once after A)
1 mark for Index column and Word(Index) column correct *[3]*

Example candidate response – grade A

(ii) Complete this trace table for the pseudocode using 'Ant' as input.

```
1  INPUT Word
2  Count ← 0
3  LOOP FOR Index ← 1 TO length(Word)
4     IF Word(Index)='a'
5        THEN
6           Count ← Count + 1
7     ENDIF
8  ENDLOOP
```

Word	Count	Index	Word(Index)	Word(Index)='a'
Ant				
	0			
		1		
			A	
				false
		2		
			n	
				false
		3		
			t	
				false

Examiner comment

The same layout was adopted for this trace table. Note how the candidate annotated the pseudocode to aid correct completion of the trace table.

Example candidate response – grade C

Line	Word	Count	Index	Word(Index)	Word(Index)='a'
1	Ant				
2		0			
3			1		
4				a	
5					Yes
6		1			
3			2		
4				n	
5					No
3			3		
4				t	
5					No
3			4		
8					

[3]

Examiner comment

Although this candidate continued with a well laid out trace table, lack of attention to detail produced an incorrect response. When checking if a character is 'a' a computer program would not treat 'A' as equivalent to 'a' unless explicitly programmed to do so; as is asked for in part **(b)**.

Example candidate response – grade E

(ii) Complete this trace table for the pseudocode using 'Ant' as input.

```
1  INPUT Word
2  Count ← 0
3  LOOP FOR Index ← 1 TO length(Word)
4     IF Word(Index)='a'
5        THEN
6           Count ← Count + 1
7     ENDIF
8  ENDLOOP
```

Word	Count	Index	Word(Index)	Word(Index)='a'
Ant	0	1	a	true
	1	2	n	false
	0	3	t	false

[3]

Examiner comment

Again, not distinguishing 'A' from 'a' shows lack of attention to detail, often found with grade E candidates.

Question 2 (b)

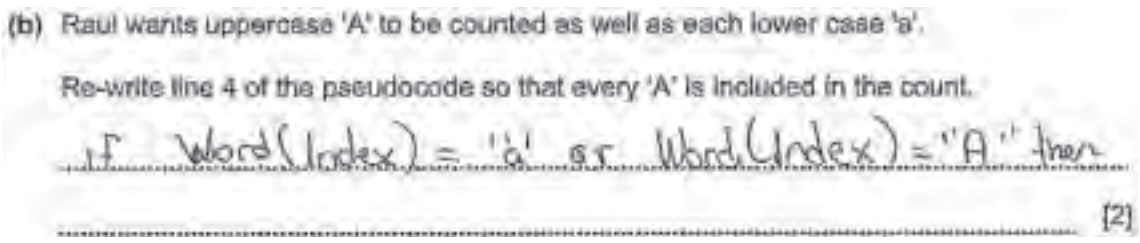
(b) Raul wants uppercase 'A' to be counted as well as each lower case 'a'.

Re-write line 4 of the pseudocode so that every 'A' is included in the count.

Mark scheme

(b) IF (Word(Index) = 'a') OR (Word(Index) = 'A')
1 mark for OR (allow lower case or)
1 mark for separate decisions correct
// 2 marks for If Uppercase(Word(Index))='A'
// 2 marks for If Lowercase(Word(Index))='a'
must reflect existing pseudocode style [2]

Example candidate response – grade A


(b) Raul wants uppercase 'A' to be counted as well as each lower case 'a'.

Re-write line 4 of the pseudocode so that every 'A' is included in the count.

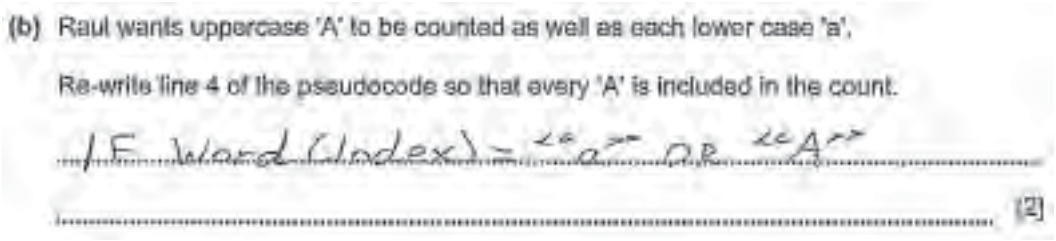
IF Word(Index) = 'a' or Word(Index) = 'A' then

[2]

Examiner comment

This was accepted without the brackets around the two conditions.

Example candidate response – grade C


(b) Raul wants uppercase 'A' to be counted as well as each lower case 'a'.

Re-write line 4 of the pseudocode so that every 'A' is included in the count.

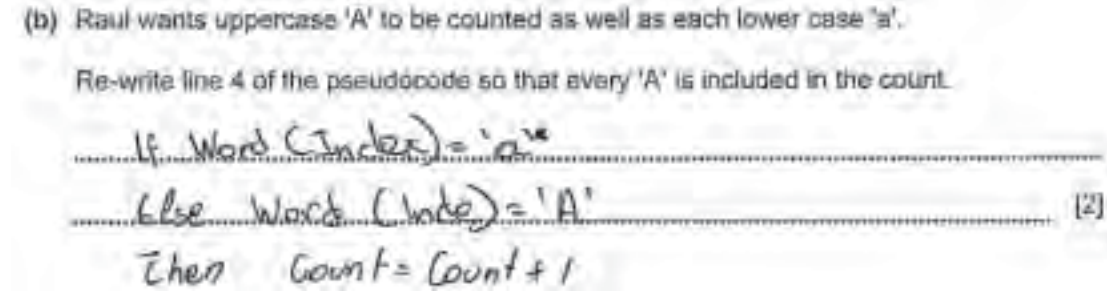
IF Word(Index) = "a" OR "A"

[2]

Examiner comment

A lot of candidates failed to separate the two conditions out, even though they had done so in **1(e)**.

Example candidate response – grade E


(b) Raul wants uppercase 'A' to be counted as well as each lower case 'a'.

Re-write line 4 of the pseudocode so that every 'A' is included in the count.

If Word(Index) = 'a'

Else Word(Index) = 'A' [2]

Then Count = Count + 1

Examiner comment

Using an 'else' in this question was common among grade E candidates.

Question 2 (c)

(i) The pseudocode has features that make it easy to understand. State **two** such features.

Program code is to be produced from the pseudocode.

(ii) State **one** other feature that could be introduced to make the program code easy to understand.

(iii) State **two** reasons why it is important for the program to be easily understood.

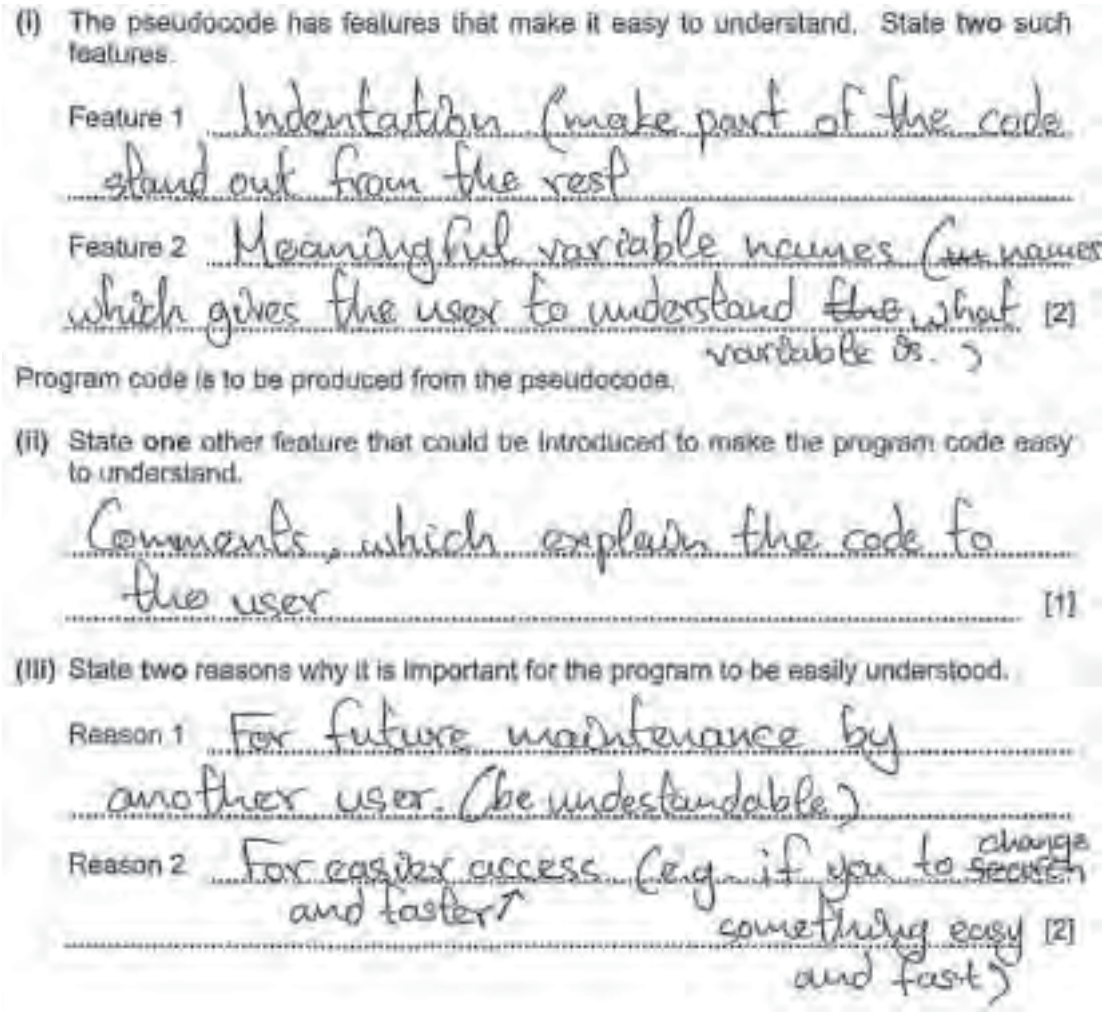
Mark scheme

(i) – meaningful variable names
– indentation/white space
– structured English
– good formatting (lower case, upper case)
– reserved words are capitalised/in capitals [2]

(ii) Annotation/comments [1]

(iii) – to make it easier to find/correct errors
– to make it easier to modify the program / maintenance [2]

Example candidate response – grade A


(i) The pseudocode has features that make it easy to understand. State two such features.

Feature 1 Indentation (make part of the code stand out from the rest

Feature 2 Meaningful variable names (as names which gives the user to understand the what variable is.) [2]

Program code is to be produced from the pseudocode.

(ii) State one other feature that could be introduced to make the program code easy to understand.

Comments, which explain the code to the user [1]

(iii) State two reasons why it is important for the program to be easily understood.

Reason 1 For future maintenance by another user. (be understandable)

Reason 2 For easier access (eg. if you to change and faster) something easy [2] and fast)

Examiner comment

A detailed and correct answer.

Example candidate response – grade C

(i) The pseudocode has features that make it easy to understand. State two such features.

Feature 1 Comment => to explain the code

Feature 2 Intentation => to make the line that goes together [2]

Program code is to be produced from the pseudocode.

(ii) State one other feature that could be introduced to make the program code easy to understand.

Modularity => split the program in modules so it will be easy to understood. [1]

(iii) State two reasons why it is important for the program to be easily understood.

Reason 1 To find easily the wrongs of the program

Reason 2 If other programmer want to change something or maintain the program he can do it easily if it is easily understood. [2]

Examiner comment

There are no comments in the given pseudocode, and modularity when required would already be reflected in the pseudocode. The reasons why program code should be easily understood are appropriate.

Example candidate response – grade E

(i) The pseudocode has features that make it easy to understand. State two such features.

Feature 1 Sensible variable names that uses variable names

Feature 2 Identifications are the lines of the code that go together [2]

Program code is to be produced from the pseudocode.

(ii) State one other feature that could be introduced to make the program code easy to understand.

Modularisation because they are parts of the code that are shorter to be easier to understand them [1]

(iii) State two reasons why it is important for the program to be easily understood.

Reason 1 easier to understand it so workings can happen faster

Reason 2 Input data to be entered easily [2]

Examiner comment

The first feature is acceptable as no explanation was required. However, terminology needs to be quoted correctly (Indentation) although minor spelling errors are acceptable unless they change the meaning. The answer in **(iii)** repeats the words in the question.

Question 2 (d)

Each letter in the alphabet has an ASCII code.

(i) What form does an ASCII code take?

(ii) Describe how ASCII codes can be used to arrange two lower case letters in alphabetical order.

(iii) Describe how two words (lower case letters only) can be arranged in alphabetical order.

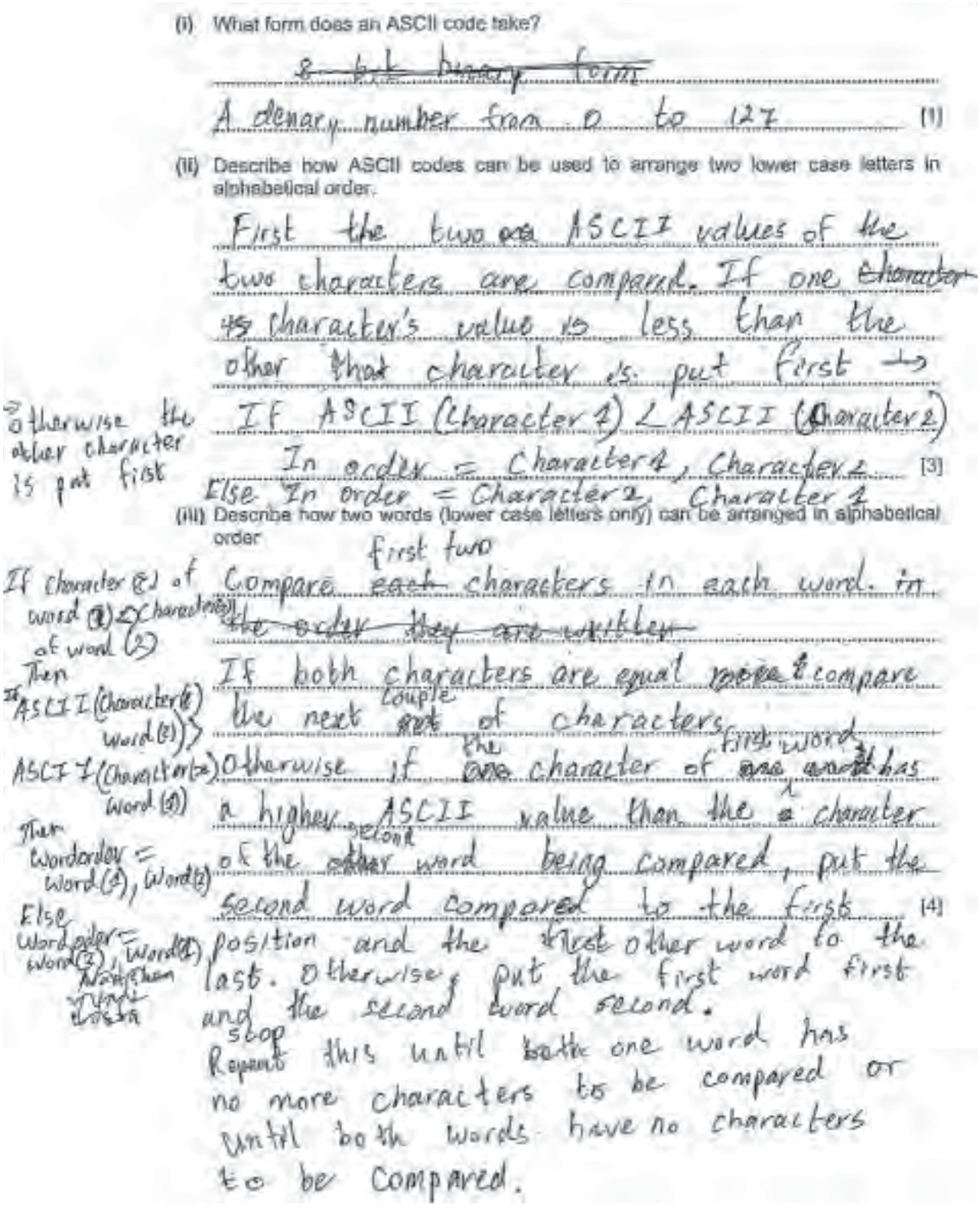
Mark scheme

(i) – numeric/binary (code where each character has a unique value) [1]

(ii) – letters a-z have increasing ASCII codes
– Each character's ASCII value is compared
– the character with the smaller value is the first character/the character with the larger value is the second character/(letters are sorted) [3]

(iii) – characters are compared in turn …
- – from left hand side / start of each word
- – … until two characters are different
- – the lower code value determines the first word
- – if 2 words are the same when one ends …
- – … this is the first word [4]

Example candidate response – grade A



(i) What form does an ASCII code take?

~~8 bit binary form~~

A denary number from 0 to 127 [1]

(ii) Describe how ASCII codes can be used to arrange two lower case letters in alphabetical order.

First the two ASCII values of the two characters are compared. If one ~~character~~ 's character's value is less than the other that character is put first → otherwise the other character is put first

IF ASCII (Character 1) < ASCII (Character 2)
In order = Character 1, Character 2 [3]
Else In order = Character 2, Character 1

(iii) Describe how two words (lower case letters only) can be arranged in alphabetical order

If character (1) of word (1) < character (1) of word (2) Then

Compare first two characters in each word. in ~~the order they are written~~

If both characters are equal move & compare the next couple of characters

If ASCII (character (1) word (1)) < ASCII (character (1) word (2)) Then Word order = word (1), word (2)

Otherwise if the first word has one character of a higher ASCII value than the second character of the other word being compared, put the second word compared to the first [4]

Else Word order = word (2), word (1) Word then word

position and the first other word to the last. Otherwise, put the first word first and the second word second.

Repeat this until ~~both~~ one word has stop no more characters to be compared or until both words have no characters to be compared.

Examiner comment

A very detailed explanation. This candidate is perhaps the only one who realised that something happened in **(iii)** when one word finished before the other. This candidate doesn't say what to do then, but it is one of the most comprehensive answers.

Example candidate response – grade C

(i) What form does an ASCII code take?

ASCII takes the form of an integer in the form of 1s and 0s eg 1001001 [1]

(ii) Describe how ASCII codes can be used to arrange two lower case letters in alphabetical order.

ASCII codes can be arranged in alphabetical order by looking at the code as a whole number eg example 0000100 is smaller than 1011000 therefore it will be higher than 1010000 in the alphabetical order so the computer can compare the value of the two codes and then arrange them in the alphabetical order. [3]

(iii) Describe how two words (lower case letters only) can be arranged in alphabetical order.

The computer would take only the first letter of the word and compare the values but if they are equal values eg 1001001 = 1001001 then the computer will take the next letter in each word and compare the ASCII codes again if one is smaller than that word will be higher in alphabetical order if they are the same again, the computer will simply take the next letters and compare the ascii codes until they are not equal to each other in alphabetical order. [4]

Examiner comment

Part **(i)** is well explained. In part **(ii)** there is evidence of some understanding that ASCII values are compared numerically but the statement of what happens after this comparsion is not clear. Part **(iii)** starts correctly but explanation is not followed through.

Example candidate response – grade E

(i) What form does an ASCII code take?

decimal

[1]

(ii) Describe how ASCII codes can be used to arrange two lower case letters in alphabetical order.

lower case letters will be represented in decimal values therfore the lowest value will have the letter 'a' and the highest will have the value of 'z'. Then If the numbers are arranged in ascending order, the the lower case letters will be in alphabetical order.

[3]

(iii) Describe how two words (lower case letters only) can be arranged in alphabetical order.

Input words

If first words first letter is

Smaller than the first letter in the second word then

~~then~~ first word = first

Else

Second word = first

Repeat until end of words.

[4]

Examiner comment

Part **(i)** hints at some understanding that a numerical code is involved.
Part **(ii)** describes the idea behind the relationship of ASCII codes and letters of the alphabet, but does not describe the use of the ASCII codes in the process.
Part **(iii)** only considers the first letter of each word, and does not deal with the possibility of words that start with one or more letters that are the same (for example: this, that).

Question 3 (a)

Raul writes a program which will keep a tally of the number of times each letter appears in a given text. He uses an array of size 26 to store the totals for each letter. He then initialised each element of the array.

What value should Raul give each element?

Mark scheme

0 (zero) [1]

Example candidate response – grade E

623591760

Examiner comment

This comes from a grade E candidate's paper, but could have come from any graded paper.
It was mainly ungraded candidates who did not answer this correctly.

Question 3 (b)

Define the array and initialise each element of the array using a high-level programming language of your choice.

Mark scheme

e.g. Pascal

```
VAR Letter: ARRAY [1..26] OF Integer;
FOR I := 1 TO 26
   DO
      Letter[i] := 0;
```

Alternative:

```
VAR Letter: ARRAY ['a'..'z'] OF Integer;
FOR l := 'a' TO 'z'
   DO
      Letter[l] := 0;
```

e.g. VB 2005

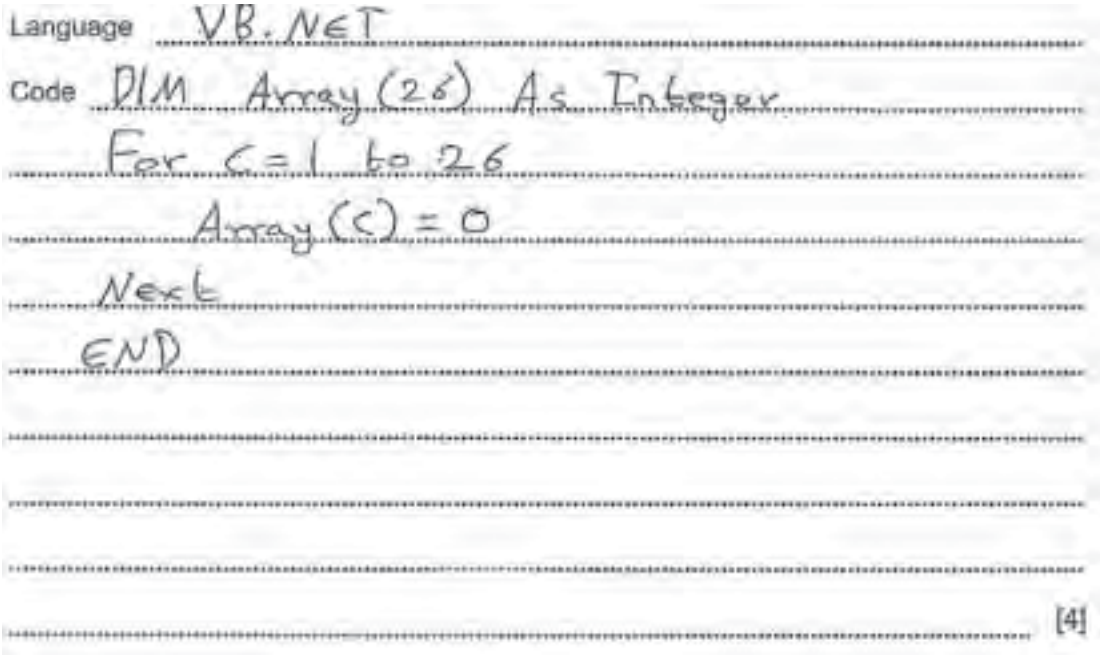
```
DIM Letter(26) AS Integer
FOR i = 1 TO 26
   Letter(i) = 0
NEXT
```

e.g. C#

```
string[] letter = new string[26]
for (int i = 1; i <= 26; i++)
{
   letter[i] = 0
}
```

1 mark for correct declaration range
1 mark for correct data type
1 mark for loop to address full range of array
1 mark for correct assignment *[4]*

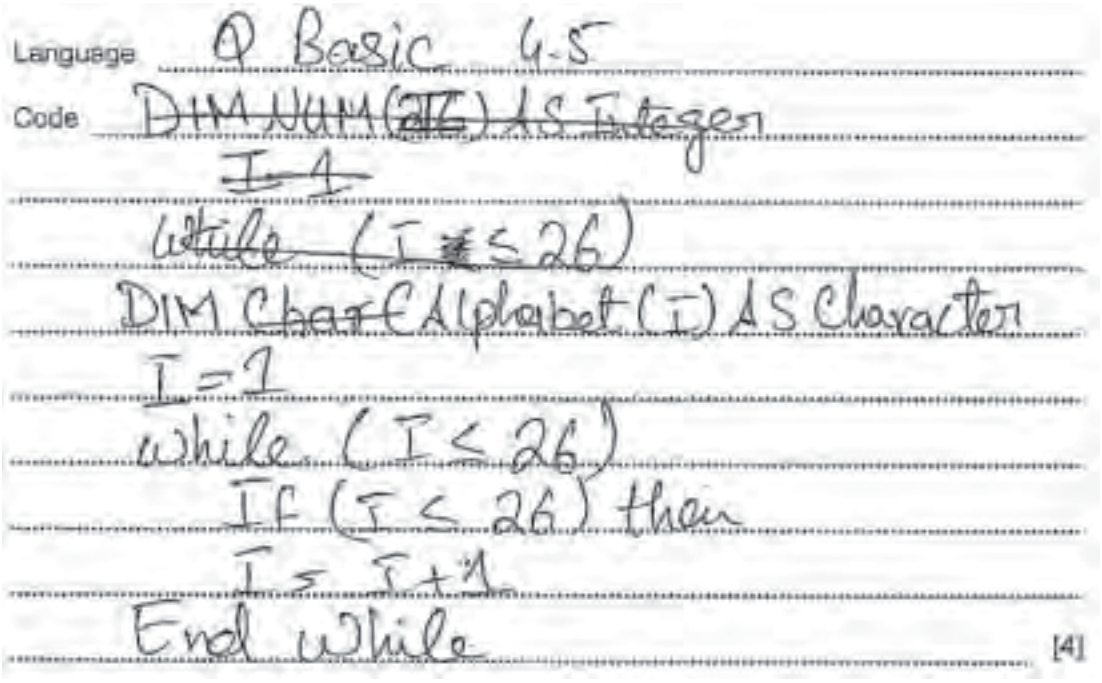
Example candidate response – grade A



Examiner comment

While using *array* as a variable name is not good, this candidate had the programming points that were relevant.

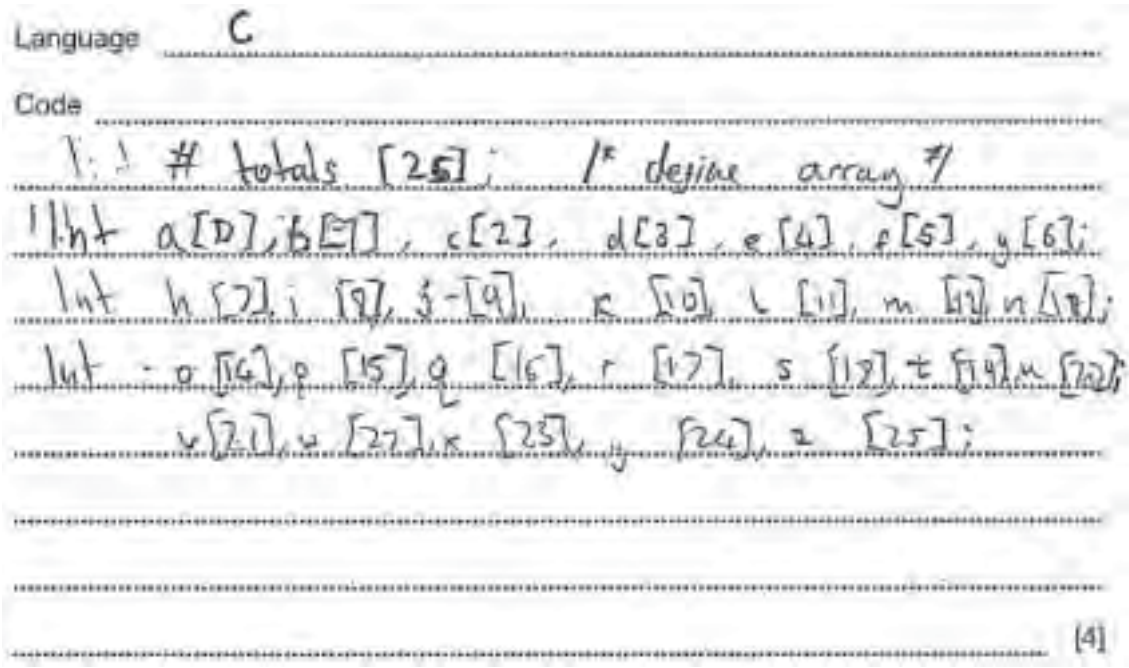
Example candidate response – grade C



Examiner comment

The loop structure is acceptable. The candidate did not recognise that in order to keep a tally (count) the array needs to store integers, not characters. Within the loop there is no attempt at initialising array elements.

Example candidate response – grade E



Examiner comment

In general candidates offering C++ struggled the most to gain programming marks. Grade E candidates often could not see that a loop structure was required to set each array element to an initial value.

Question 3 (c)

Write the statements required to update the array when a letter has been read.

Mark scheme

e.g. Pascal

```
ThisLetterIndex :=
                  ASCII(ThisLetter)-ASCII('a') + 1;
Letter[ThisLetterIndex] :=
                      Letter[ThisLetterIndex] + 1;
```

Alternative: (if character range used for array index)

```
Letter[ThisLetter] := Letter[ThisLetter] + 1;
```

e.g. VB 2005

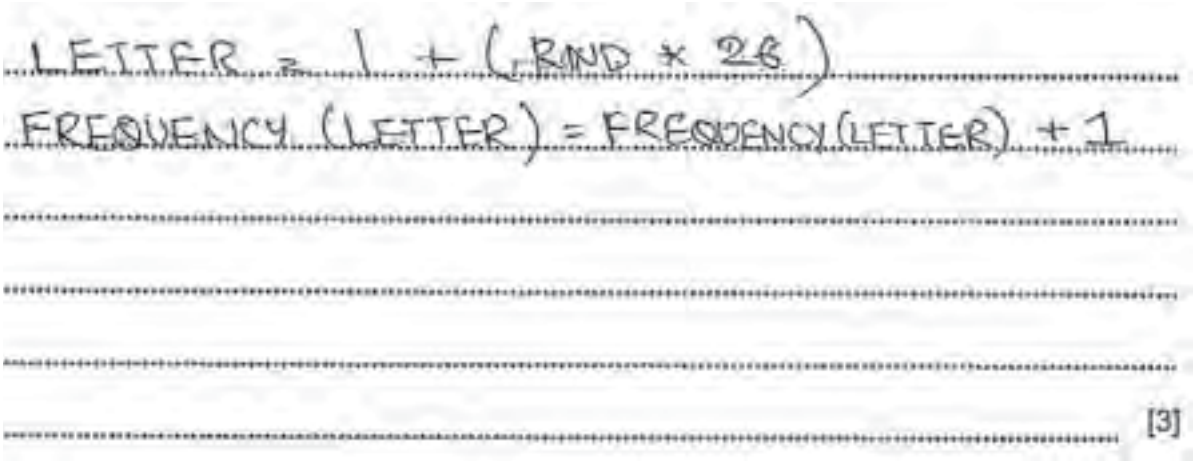
```
ThisLetterIndex = ASC(ThisLetter)-ASC("a") + 1
Letter(ThisLetterIndex) =
                      Letter(ThisLetterIndex) + 1
```

e.g. C#

```
thisLetterIndex = asc(thisLetter) - asc('a') + 1;
letter[thisLetterIndex] =
                      letter[thisLetterIndex] + 1;
```

1 mark for finding correct array element
1 mark for incrementing running total correctly
1 mark for correct overall logic *[3]*

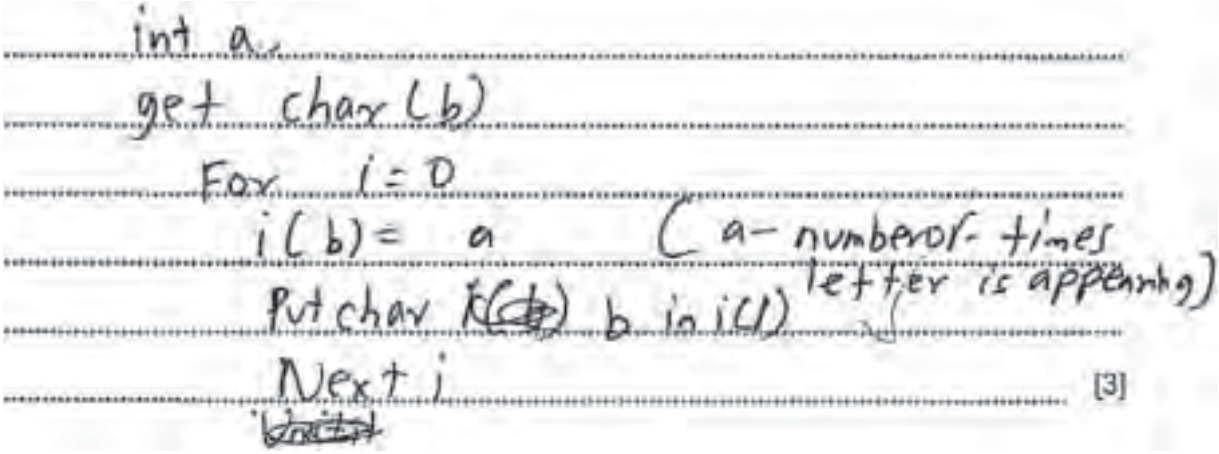
Example candidate response – grade A



Examiner comment

This is the hardest question on the paper. This is one of the few answers that gained a mark. There are several different ways to solve it, depending on the language used. The mark scheme shows the marks for one method. Any other correct method would have received comparable marks. Keeping a tally is a standard exercise in many textbooks. To do well with the more challenging questions in this paper, candidates need plenty of practice at programming short exercises to gain an understanding of the effect of key programming constructs.

Example candidate response – grade C and E



Examiner comment

There is no understanding of how to tackle this problem in this answer. Most did not attempt the question.

Question 4 (a)

The following pseudocode is a recursive function where *n* is an integer.

```
FUNCTION   prod(n)
IF n = 1
   THEN
         prod ← 1
   ELSE
         prod ← n * prod(n-1)
ENDIF
RETURN
```

(i) What value is returned by prod(1)?

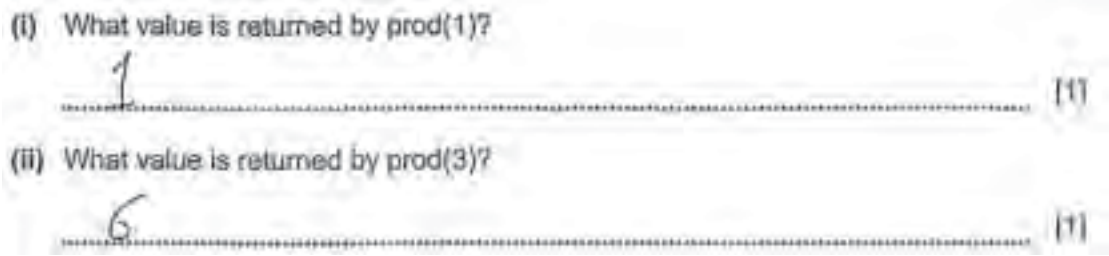
(ii) What value is returned by prod(3)?

Mark scheme

(a) (i) 1 [1]

(ii) 6 [1]

Example candidate response – grade C



Examiner comment

This response is from a grade C candidate. Nearly all candidates, at all grades, answered these two parts correctly.

Question 4 (b)

(i) What happens if the parameter passed is -1?

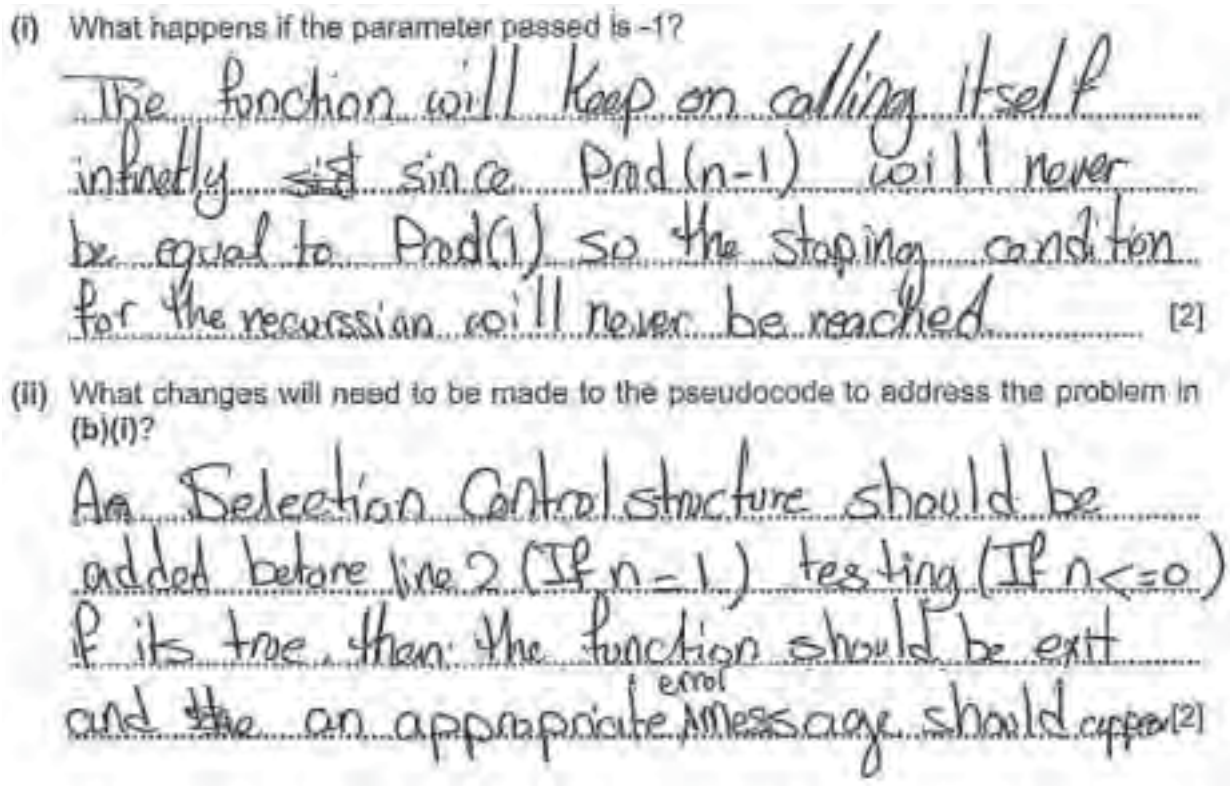
(ii) What changes will need to be made to the pseudocode to address the problem in **(b)(i)**?

Mark scheme

(i) – cannot end
– infinite loop
– produces error message (heap/stack overflow) /'crash' [2]

(ii) – Before second line extra code needs to be added
– … if n<1 (OR if n<0)
– then error (or equivalent) [2]

Example candidate response – grade A


(i) What happens if the parameter passed is -1?

The function will keep on calling itself infinetly since Prod(n-1) will never be equal to Prod(1) so the staping condition for the recurssion will never be reached [2]

(ii) What changes will need to be made to the pseudocode to address the problem in (b)(i)?

A Selection Control structure should be added before line 2 (If n=1) testing (If n<=0) if its true, then the function should be exit and the an appropriate error Message should appear [2]

Examiner comment

Both parts have correct answers that show good understanding of the problem.

Example candidate response – grade C

(i) What happens if the parameter passed is -1?

- This will produce an infinite loop
- The loop will never stop as the condition If n = 1 will never be met and so it will not be excuted [2]

(ii) What changes will need to be made to the pseudocode to address the problem in (b)(i)?

- change the line Prod ← n * prod (n-1) to Prod ← n * prod (n+1)
- change the line If n = 1 to If n = -1 [2]

Examiner comment

There is a good understanding demonstrated in part **(i)**. It seems a pity that the ingenious ideas in **(ii)** will not work, though they show that this candidate does appreciate how the program works.

Example candidate response – grade E

(i) What happens if the parameter passed is -1?

The output will yet be positive because when it reaches the step prod ← n * prod (n-1) it will look like this Prod ← -1 * prod (-2) that will give an answer of 2 which is positive. [2]

(ii) What changes will need to be made to the pseudocode to address the problem in (b)(i)?

Addition of Another step to take any negative values into consideration before the step of Prod ← n* prod (n-1) is executed to prevent any kind of errors. [2]

Examiner comment

This candidate has some idea of what happens in recursion. Many who answered **4(a)** correctly could not answer **4(b)**.

Question 4 (c)

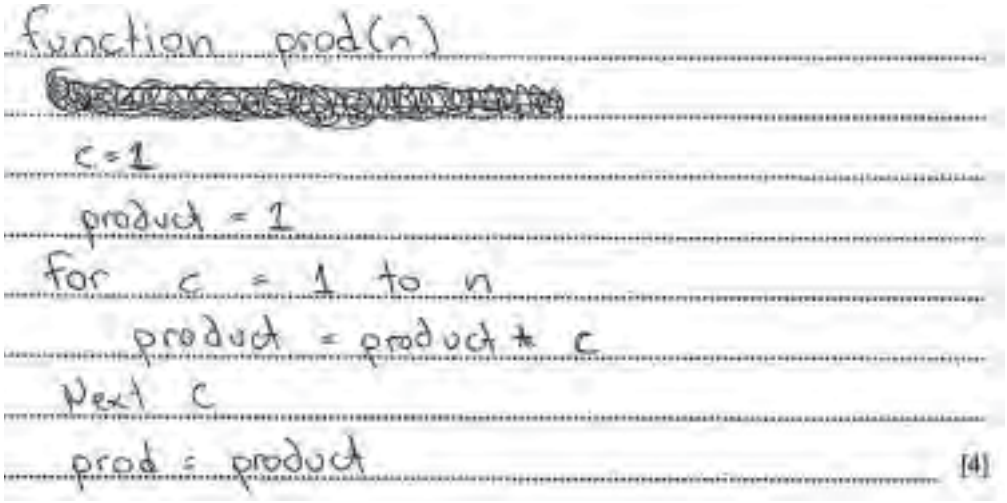
Rewrite this function in pseudocode as an iterative function.

Mark scheme

```
FUNCTION prod(n)
   x ← 1
   FOR i ← 1 TO n
      x ← x * i
   NEXT i
   prod ← x
ENDFUNCTION      // RETURN
```

1 mark for initialisation
1 mark for correct loop from 1 to n
1 mark for multiplying current value by i
1 mark for assigning return value *[4]*

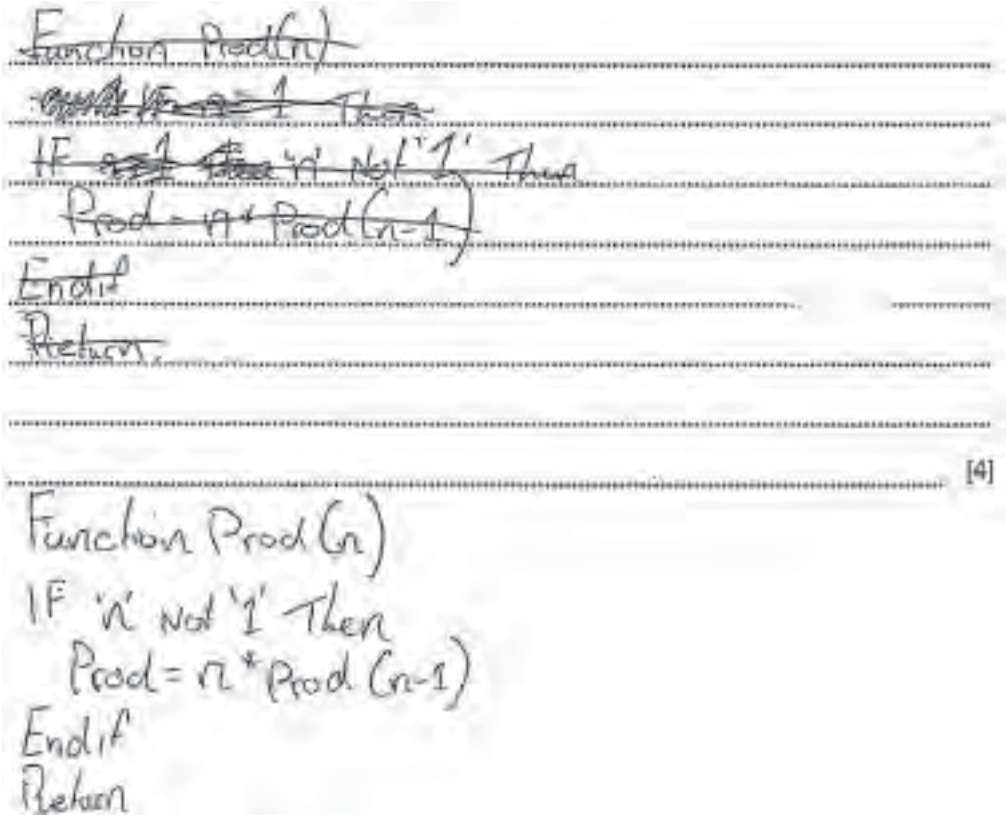
Example candidate response – grade A



Examiner comment

This is a good answer.

Example candidate response – grade C



[4]

Function Prod(n)
IF 'n' Not '1' Then
  Prod = n * Prod(n-1)
Endif
Return

Examiner comment

This was a typical response from a grade C candidate. They have still left a recursive type assignment in their solution.

Grade E candidates produced similar answers or did not respond.