Example Candidate Responses

Cambridge O Level

Cambridge O Level Computer Science

2210

Papers 1 and 2

Cambridge Secondary 2

CAMBRIDGE International Examinations

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Version 1.1

Contents

Introduction

The main aim of this booklet is to exemplify standards for those teaching Cambridge O Level Computer Science (2210), and to show how different levels of candidates' performance (high, middle and low) relate to the subject's curriculum and assessment objectives.

In this booklet candidate responses have been chosen to exemplify a range of answers. Each response is accompanied by a brief commentary explaining the strengths and weaknesses of the answers.

The questions, mark schemes and pre-release material used here are available to download as a zip file from Teacher Support as the Example Candidate Responses Files. These files are:

Question Paper 12, June 2015	
Question paper	2210_s15_qp_12.pdf
Mark scheme	2210_s15_ms_12.pdf
Question Paper 22, June 2015	
Question paper	2210_s15_qp_22.pdf
Mark scheme	2210_s15_ms_22.pdf

For each question there are examples of marked candidate responses each with an examiner comment on performance. Comments are given to indicate where and why marks were awarded and how additional marks could have been obtained. In this way, it is possible to understand what candidates have done to gain their marks and what they still have to do to improve.

This document illustrates the standard of candidate work for those parts of the assessment which help teachers assess what is required to achieve marks beyond what should be clear from the mark scheme. Some question types where the answer is clear from the mark scheme, such as short answers and multiple choice, have therefore been omitted.

Other past papers, Examiner Reports and other teacher support materials are available on Teacher Support at **https://teachers.cie.org.uk**

Assessment at a glance

For Cambridge O Level Computer Science, candidates take two components: Paper 1 and Paper 2.

Components	Weighting
Paper 1 Theory 1 hour 45 minutes This written paper contains short-answer and structured questions. All questions are compulsory. No calculators are permitted in this paper. 75 marks Externally assessed.	60%
Paper 2 Problem-solving and Programming 1 hour 45 minutes This written paper contains short-answer and structured questions. All questions are compulsory. 20 of the marks for this paper are from questions set on the pre-release material.[1] No calculators are permitted in this paper. 50 marks Externally assessed.	40%

Teachers are reminded that the latest syllabus is available on our public website at **www.cie.org.uk** and Teacher Support at **https://teachers.cie.org.uk**

Paper 1 – Theory

Question 1

Example candidate response – high

1 (a) Four statements about cookies are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement is true or false.

Statement	True	False
they are a form of spyware		✓
they are used only in advertising		✓
they are used to track browser use	✓	
they act in the same way as a virus		✓

[4]

(b) Five descriptions and five security issues are shown below.

Draw a line to connect each description to the correct security issue.

Description	Security issue
malicious code installed on the hard drive of a user's computer or on the web server; this code will re-direct user to a fake web site without their consent	pharming
software that gathers information by monitoring key presses on a user's computer and relays the information back to the person who sent the software	spyware
program or code that replicates itself and is designed to amend, delete or copy data and files on a user's computer without their consent	virus
the act of gaining illegal access to a computer system without the owner's consent	hacking
creator of code sends out a legitimate-looking email in the hope of gathering personal and financial data; it requires the recipient to follow a link in the email or open an attachment	phishing

[4]

Examiner comment – high

This candidate was able to recognise which statements were true and false about cookies. No incorrect answers were given.

This candidate was able to match all the correct terms to the correct definitions. No terms were incorrectly matched.

Marks awarded for **1(a)** = 4 out of 4
Marks awarded for **1(b)** = 4 out of 4

Total mark awarded= 8 out of 8

Example candidate response – middle

1 (a) Four statements about cookies are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement is true or false.

Statement	True	False
they are a form of spyware		✗
they are used only in advertising	✓	
they are used to track browser use	✓	
they act in the same way as a virus		✗

[4]

(b) Five descriptions and five security issues are shown below.

Draw a line to connect each description to the correct security issue.

Description	Security issue
malicious code installed on the hard drive of a user's computer or on the web server; this code will re-direct user to a fake web site without their consent	pharming
software that gathers information by monitoring key presses on a user's computer and relays the information back to the person who sent the software	spyware
program or code that replicates itself and is designed to amend, delete or copy data and files on a user's computer without their consent	virus
the act of gaining illegal access to a computer system without the owner's consent	hacking
creator of code sends out a legitimate-looking email in the hope of gathering personal and financial data; it requires the recipient to follow a link in the email or open an attachment	phishing

[4]

Examiner comment – middle

This candidate has made a common error in their answer to **1(a)**. It is a common error to think that cookies are only used in advertising. They can be used for many other reasons, such as retaining preferences for websites.

This candidate also managed to match all the correct terms to the definitions.

Marks awarded for **1(a)** = 3 out of 4
Marks awarded for **1(b)** = 4 out of 4

Total mark awarded = 7 out of 8

Example candidate response – low

1 (a) Four statements about cookies are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement is true or false.

Statement	True	False
they are a form of spyware		✓
they are used only in advertising	✓	
they are used to track browser use	✓	
they act in the same way as a virus	✓	

[4]

(b) Five descriptions and five security issues are shown below.

Draw a line to connect each description to the correct security issue.

Description	Security issue
malicious code installed on the hard drive of a user's computer or on the web server; this code will re-direct user to a fake web site without their consent	hacking
software that gathers information by monitoring key presses on a user's computer and relays the information back to the person who sent the software	pharming
program or code that replicates itself and is designed to amend, delete or copy data and files on a user's computer without their consent	phishing
the act of gaining illegal access to a computer system without the owner's consent	spyware
creator of code sends out a legitimate-looking email in the hope of gathering personal and financial data; it requires the recipient to follow a link in the email or open an attachment	virus

[4]

Examiner comment – low

This candidate has made a common error in their answer to **1(a)**. It is a common error to think that cookies are only used in advertising. They also made the mistake of thinking that cookies act like a virus. Cookies are created to collect data, whereas a virus is created to corrupt data.

This candidate matched three definitions incorrectly. They mixed their understanding of the definitions of phishing, pharming and spyware; this is a common mistake to make.

Marks awarded for **1(a)** = 2 out of 4
Marks awarded for **1(b)** = 2 out of 4

Total mark awarded = 4 out of 8

Question 2

Example candidate response – high

2 The majority of mobile phones use touch screens. Three common technologies are used by different mobile phone manufacturers.

Choose one of the following mobile phone technologies:

- resistive
- capacitive
- infrared

Chosen technology Capacitive

(i) Describe how your chosen technology works to allow a user to make selections by touching the screen.

Capacitive has a layer of glass underneath other layers. It creates electrostatic. It can be touched using only your finger.

[2]

(ii) Give **one** benefit and **one** drawback of your chosen technology when used on mobile phone touch screens.

Benefit

It is easy to use in heavy sunlight

Drawback

You can only operate it with your finger. (No gloves ect).

[2]

Examiner comment – high

This candidate chose capacitive as their touch screen technology. They gave a reasonably good answer for **(i)**, stating that capacitive is built up from layers of glass. They appear to have misunderstood the question slightly as they then went onto give a disadvantage of the technology. This is required in the second section.

In section **(ii)** they repeat the disadvantage they gave in section **(i)** and now gain a mark for it. They also provide a good advantage of the technology.

Marks awarded for **2(i)** = 1 out of 2
Marks awarded for **2(ii)** = 2 out of 2

Total mark awarded = 3 out of 4

Example candidate response – middle

2 The majority of mobile phones use touch screens. Three common technologies are used by different mobile phone manufacturers.

Choose one of the following mobile phone technologies:

- resistive
- capacitive
- infrared

Chosen technology ...Infrared.....

(i) Describe how your chosen technology works to allow a user to make selections by touching the screen.

Some infrared rays are sent from the screen and when we touch the screen those rays are blocked which sends a sigmal telling the computer that the user is touching the screen at that particular point. [2]

(ii) Give **one** benefit and **one** drawback of your chosen technology when used on mobile phone touch screens.

Benefit

It is fast and reliable and cheap.

.....

Drawback

The rays can be harmful to us and it may not be very accurate.

[2]

Examiner comment – middle

This candidate provides a good detailed response to part **(i)**. They give two correct points about infra-red touch screen technology, stating that rays are sent across the screen and when we touch the screen we block those rays. They then go on to explain that a signal is sent to the computer in the phone to register where the screen is being touched, from the location of where the beams are broken.

In part **(ii)**, they provide two incorrect answers. Infra-red technology is actually expensive. There is also no reference to what the expense relates to. It should read that it is expensive to manufacture. The rays are also not harmful to us.

Marks awarded for **(i)** = 2 out of 2
Marks awarded for **(ii)** = 0 out of 2

Total mark awarded = 2 out of 4

Example candidate response – low

2 The majority of mobile phones use touch screens. Three common technologies are used by different mobile phone manufacturers.

Choose one of the following mobile phone technologies:

- resistive
- capacitive
- infrared

Chosen technology resistive

(i) Describe how your chosen technology works to allow a user to make selections by touching the screen.

Resistivity is a mobile phone technology which allows user of touch screen devices to have a good accesibility of the device as touching certain part of the screen at a certain force allows the device to be controlled and otherwise not. [2]

(ii) Give **one** benefit and **one** drawback of your chosen technology when used on mobile phone touch screens.

Benefit

Resistive technology allows the screen to detect the differente between a small and long press for the user.

Drawback

Resistivity sometimes alters the devices control sensitivity as it cannot a differentiate our finger's and other parts [2]

Examiner comment – low

In part **(i)**, the candidate has been very vague in their response and has not been able to demonstrate their knowledge of how resistive technology works.

In part **(ii)**, the candidate is also vague in their advantages and disadvantages, not making any specific points about the technology.

Marks awarded for **(i)** = 0 out of 2
Marks awarded for **(ii)** = 0 out of 2

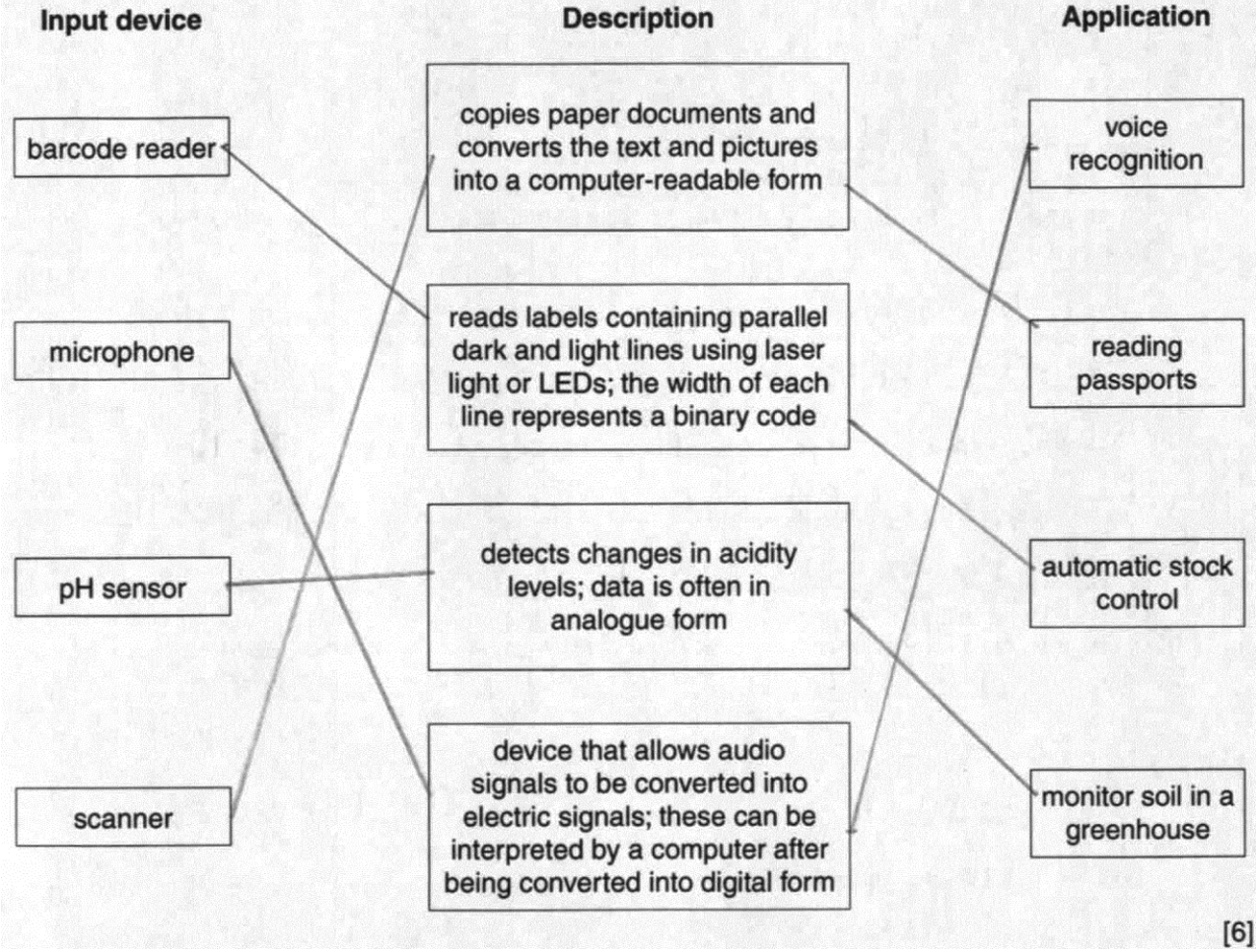
Total mark awarded = 0 out of 4

Question 3

Example candidate response – high

3 Four input devices, four descriptions and four applications are shown below.

Draw a line to connect each input device to its correct description. Then connect each description to its correct application.



[6]

Examiner comment – high

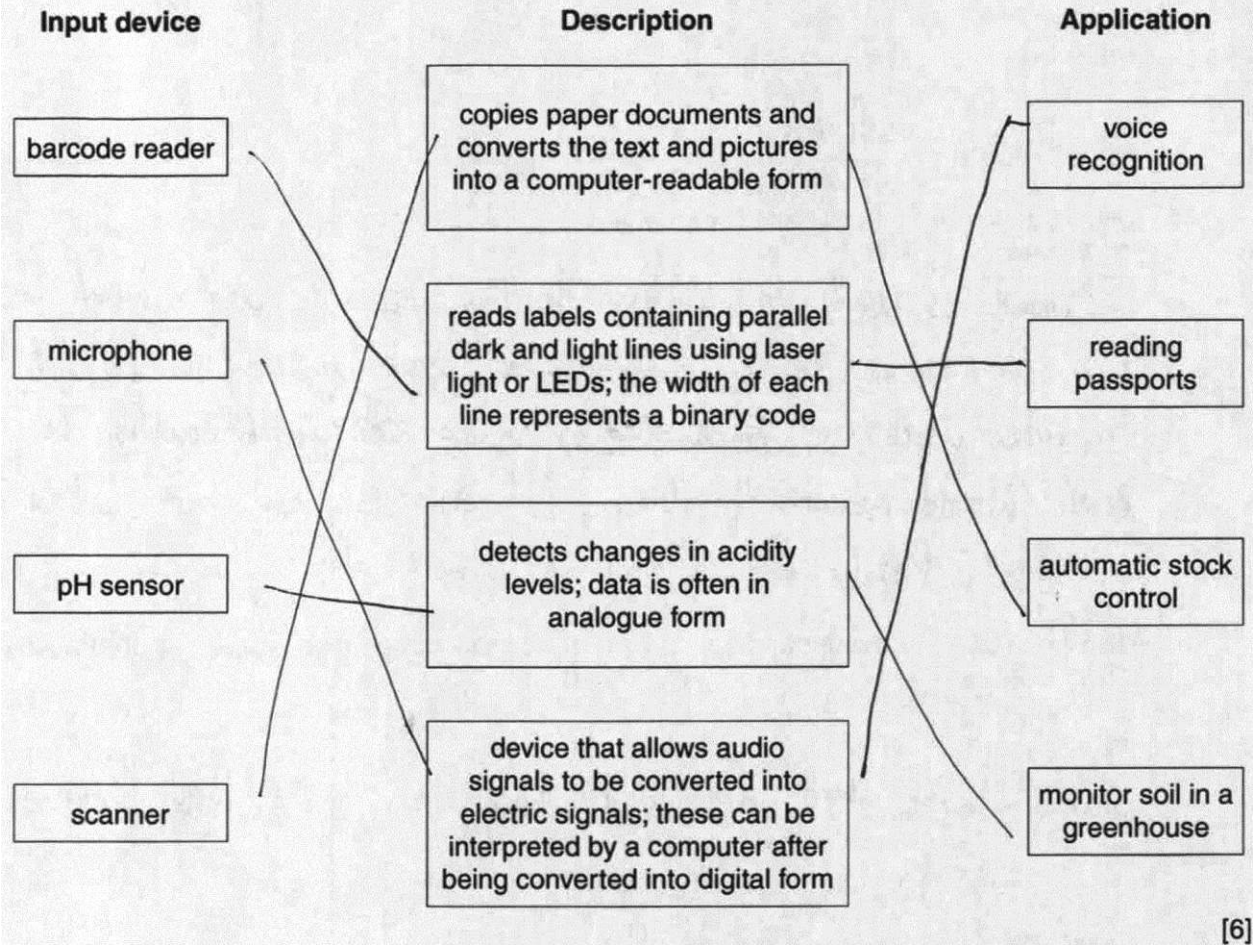
This candidate was able to correctly match all the input devices, descriptions and applications.

Total mark awarded = 6 out of 6

Example candidate response – middle

3 Four input devices, four descriptions and four applications are shown below.

Draw a line to connect each input device to its correct description. Then connect each description to its correct application.



[6]

Examiner comment – middle

This candidate has mixed up two of the applications. They have made the mistake of thinking that barcodes are read from passports. This is not true in the sense of this description, it would be much more applicable to an automatic stock control system, where the barcode is read upon purchase, and the stock level is reduced.

Total mark awarded = 5 out of 6

Question 4

Example candidate response – high

4 **(a)** State what is meant by the term SSL.

Secure Socket Layer is a program which helps users be able to use secure applications on the internet and be able to browse safely/securely [1]

(b) The following stages take place when a user wishes to access a secure website.

Put each stage in sequence by writing the numbers 1 to 6 in the column on the right. The first one has been done for you.

Stage	Sequence number
the encrypted data is then shared securely between the web browser and the web server	6
the web browser attempts to connect to a website which is secured by SSL	1
the web server sends the web browser a copy of its SSL certificate	3
the web browser requests the web server to identify itself	2
the web server will then send back some form of acknowledgement to allow the SSL encrypted session to begin	5
the web browser checks whether the SSL certificate is trustworthy; if it is, then the web browser sends a message back to the web server	4

[5]

Examiner comment – high

In part **(a)** this candidate correctly states that SSL is secure sockets layer.

In part **(b)** they manage to get the correct sequence of events when a person uses a secure website.

Marks awarded for **(a)** = 1 out of 1
Marks awarded for **(b)** = 5 out of 5

Total mark awarded = 6 out of 6

Example candidate response – middle

4 **(a)** State what is meant by the term SSL.

Secure Socket Layer.
Which aware the user that the web pages
are secure. It can be seen in the URL. [1]

(b) The following stages take place when a user wishes to access a secure website.

Put each stage in sequence by writing the numbers 1 to 6 in the column on the right. The first one has been done for you.

Stage	Sequence number
the encrypted data is then shared securely between the web browser and the web server	6
the web browser attempts to connect to a website which is secured by SSL	1
the web server sends the web browser a copy of its SSL certificate	3
the web browser requests the web server to identify itself	4
the web server will then send back some form of acknowledgement to allow the SSL encrypted session to begin	5
the web browser checks whether the SSL certificate is trustworthy; if it is, then the web browser sends a message back to the web server	2

[5]

Examiner comment – middle

In part **(a)** this candidate correctly states that SSL is secure sockets layer.

In part **(b)** they mix up stages 2 and 4 in the sequence. The browser needs the server to identify itself before it can carry out any further stages.

Marks awarded for **4(a)** = 1 out of 1
Marks awarded for **4(b)** = 3 out of 5

Total mark awarded = 4 out of 6

Example candidate response – low

4 **(a)** State what is meant by the term SSL.

Server Security Log

.....[1]

(b) The following stages take place when a user wishes to access a secure website.

Put each stage in sequence by writing the numbers 1 to 6 in the column on the right. The first one has been done for you.

Stage	Sequence number
the encrypted data is then shared securely between the web browser and the web server	4
the web browser attempts to connect to a website which is secured by SSL	**1**
the web server sends the web browser a copy of its SSL certificate	3
the web browser requests the web server to identify itself	2
the web server will then send back some form of acknowledgement to allow the SSL encrypted session to begin	6
the web browser checks whether the SSL certificate is trustworthy; if it is, then the web browser sends a message back to the web server	5

[5]

Examiner comment – low

In part **(a)**, the candidate gives an incorrect response from the definition of SSL. It was a good attempt, but not correct.

In part **(b)**, the candidate starts the sequence correctly but then gets the last three stages in the incorrect order. The web browser needs to check the certificate is trustworthy before it will share the encrypted data.

Marks awarded for **4(a)** = 0 out of 1
Marks awarded for **4(b)** = 2 out of 5

Total mark awarded = 2 out of 6

Question 5

Example candidate response – high

5 Parity checks are often used to check for errors that may occur during data transmission.

(a) A system uses **even parity**.

Tick (✓) to show whether the following three bytes have been transmitted correctly or incorrectly.

Received byte	Byte transmitted correctly	Byte transmitted incorrectly
11001000		✓
01111100		✓
01101001	✓	

[3]

(b) A parity byte is used to identify which bit has been transmitted incorrectly in a block of data.

The word "F L O W C H A R T" was transmitted using nine bytes of data (one byte per character). A tenth byte, the parity byte, was also transmitted.

The following block of data shows all ten bytes received after transmission. The system uses **even parity** and column 1 is the parity bit.

	letter	column 1	column 2	column 3	column 4	column 5	column 6	column 7	column 8
byte 1	F	1	0	1	0	0	1	1	0
byte 2	L	1	0	1	0	1	1	0	0
byte 3	O	1	0	1	0	1	1	1	1
byte 4	W	1	0	1	1	0	1	1	1
byte 5	C	1	0	1	0	0	0	1	1
byte 6	H	0	0	1	0	1	0	0	0
byte 7	A	0	0	1	0	0	1	0	1
byte 8	R	1	0	1	1	0	0	1	0
byte 9	T	1	0	1	1	0	1	0	0
parity byte		1	0	1	1	1	1	1	0

(i) **One** of the bits has been transmitted incorrectly.

Write the byte number and column number of this bit:

Byte number ..... 7 .....

Column number ..... 6. .....

[2]

Example candidate response – high, continued

(ii) Explain how you arrived at your answer for **part (b)(i)**.

Out of the ten bytes, only byte 7 had an odd number of bits with value of 1, and out of the eight columns only column 6 had odd number of bits with value of 1. [2]

(c) Give the denary (base 10) value of the byte: **1 0 1 1 1 1 1 0**

$2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^7 = 2 + 4 + 8 + 16 + 32 + 128 = 190.$

$(190)_{10}$. [1]

(d) A parity check may not identify that a bit has been transmitted incorrectly.

Describe **one** situation in which this could occur.

When an even number of bits are transmitted ~~incorrectly~~ incorrectly, such as in cases a zero and one replaces each other. [1]

Examiner comment – high

In part **(a)**, the candidate demonstrated their knowledge of even parity by correctly identifying which bits were correctly and incorrectly transmitted.

In part **(b)(i)** the candidate identified the correct column and the correct byte for the error.

In part **(b)I(ii)** the candidate correctly states that byte 7 and column 6 had odd parity and it should have been even.

In part **(c)** the candidate has correctly converted the binary number to denary. They have shown the calculation they have used to do this, which is often a good practice to do.

In part **(d)** the candidate has correctly described when an error would occur. Candidates need to make sure they state it would be an even number of bits for the error to go unnoticed.

Marks awarded for **(a)** = 3 out of 3
Marks awarded for **(b)(i)** = 2 out of 2
Marks awarded for **(b)(ii)** = 2 out of 2
Marks awarded for **(c)** = 1 out of 1
Marks awarded for **(d)** = 1 out of 1

Total mark awarded = 9 out of 9

Example candidate response – middle

5 Parity checks are often used to check for errors that may occur during data transmission.

(a) A system uses **even parity.**

Tick (✓) to show whether the following three bytes have been transmitted correctly or incorrectly.

Received byte	Byte transmitted correctly	Byte transmitted incorrectly
11001000		✓
01111100		✓
01101001	✓	

[3]

(b) A parity byte is used to identify which bit has been transmitted incorrectly in a block of data.

The word "F L O W C H A R T" was transmitted using nine bytes of data (one byte per character). A tenth byte, the parity byte, was also transmitted.

The following block of data shows all ten bytes received after transmission. The system uses **even parity** and column 1 is the parity bit.

	letter	column 1	column 2	column 3	column 4	column 5	column 6	column 7	column 8
byte 1	F	1	0	1	0	0	1	1	0
byte 2	L	1	0	1	0	1	1	0	0
byte 3	O	1	0	1	0	1	1	1	1
byte 4	W	1	0	1	1	0	1	1	1
byte 5	C	1	0	1	0	0	0	1	1
byte 6	H	0	0	1	0	1	0	0	0
byte 7	A	0	0	1	0	0	1	0	1
byte 8	R	1	0	1	1	0	0	1	0
byte 9	T	1	0	1	1	0	1	0	0
parity byte		1	0	1	1	1	1	1	0

(i) **One** of the bits has been transmitted incorrectly.

Write the byte number and column number of this bit:

Byte number ..7..

Column number ..7..

[2]

Example candidate response – middle, continued

(ii) Explain how you arrived at your answer for **part (b)(i)**.

~~The ... ~~ This row and column follows odd parity.

[2]

(c) Give the denary (base 10) value of the byte: **1 0 1 1 1 1 1 0**

128 64 32 16 8 4 2 1

190

[1]

(d) A parity check may not identify that a bit has been transmitted incorrectly.

Describe **one** situation in which this could occur.

The bits could be muddled up and sends wrong bit ~~with~~ in wrong transmission because of resistence of the conductors.

[1]

Examiner comment – middle

In part **(a)**, the candidate demonstrated their knowledge of even parity by correctly identifying which bits were correctly and incorrectly transmitted.

In part **(b)(i)**, the candidate identified the correct byte, but not the correct column. They may have identified the column as 7 rather than 6 by including the letter column in the counting of the columns. They needed to refer to the title at the top of the column, this should have been 6.

In part **(b)(ii)**, the candidate was able to gain a mark from stating the row and column followed odd parity, but this was too vague for a second mark, as it did not refer to how the odd parity was identified.

In part **(c)** the candidate gave the correct denary number.

In part **(d)** the candidate is too vague in their answer. They start to possibly explain by saying the bits could be muddled up. But to get a mark they would need to state that it was an even number of bits that were changed.

Marks awarded for **(a)** = 3 out of 3
Marks awarded for **(b)(i)** = 1 out of 2
Marks awarded for **(b)(ii)** = 1 out of 2
Marks awarded for **(c)** = 1 out of 1
Marks awarded for **(d)** = 0 out of 1

Total mark awarded = 6 out of 9

Example candidate response – low

5 Parity checks are often used to check for errors that may occur during data transmission.

(a) A system uses **even parity**.

Tick (✓) to show whether the following three bytes have been transmitted correctly or incorrectly.

Received byte	Byte transmitted correctly	Byte transmitted incorrectly
11001000	✓	
01111100	✓	
01101001		✓

[3]

(b) A parity byte is used to identify which bit has been transmitted incorrectly in a block of data.

The word "F L O W C H A R T" was transmitted using nine bytes of data (one byte per character). A tenth byte, the parity byte, was also transmitted.

The following block of data shows all ten bytes received after transmission. The system uses **even parity** and column 1 is the parity bit.

	letter	column 1	column 2	column 3	column 4	column 5	column 6	column 7	column 8
byte 1	F	1	0	1	0	0	1	1	0
byte 2	L	1	0	1	0	1	1	0	0
byte 3	O	1	0	1	0	1	1	1	1
byte 4	W	1	0	1	1	0	1	1	1
byte 5	C	1	0	1	0	0	0	1	1
byte 6	H	0	0	1	0	1	0	0	0
byte 7	A	0	0	1	0	0	1	0	1
byte 8	R	1	0	1	1	0	0	1	0
byte 9	T	1	0	1	1	0	1	0	0
parity byte		1	0	1	1	1	1	1	0

(i) **One** of the bits has been transmitted incorrectly.

Write the byte number and column number of this bit:

Byte number ..... 5 .....

Column number ..... 8 .....

[2]

Example candidate response – low, continued

(ii) Explain how you arrived at your answer for **part (b)(i).**

In each column if there is number "1" the parity byte is 1, however, in column 8 the parity code is "0".

.....[2]

(c) Give the denary (base 10) value of the byte: **1 0 1 1 1 1 1 0**

54

.....[1]

(d) A parity check may not identify that a bit has been transmitted incorrectly.

Describe **one** situation in which this could occur.

.....

.....

.....[1]

Examiner comment – low

In part **(a)**, the candidate has managed to confuse odd parity with even parity. Therefore they have reversed the answer that should have been given.

In part **(b)(i)**, the candidate has not been able to identify a correct byte or column for the error.

In part **(b)(ii)**, the candidate has mistakenly thought that the parity byte at the bottom of column 8 is incorrect as all the others with 1's in them are 1. They are not able to demonstrate an understanding of odd and even parity.

In part **(c)** they did not give the correct number for the conversion.

In part **(d)** they were not able to provide an answer. Wherever possible, candidates should try and provide some attempt at an answer. If they are able to show some basic knowledge, they may be able to gain a mark.

Marks awarded for **(a)** = 0 out of 3
Marks awarded for **(b)(i)** = 0 out of 2
Marks awarded for **(b)(ii)** = 0 out of 2
Marks awarded for **(c)** = 0 out of 1
Marks awarded for **(d)** = 0 out of 1

Total mark awarded = 0 out of 9

Question 6

Example candidate response – high

6 A gas fire has a safety circuit made up of logic gates. It generates an alarm (X = 1) in response to certain conditions.

Input	Description	Binary value	Conditions
G	gas pressure	1	gas pressure is correct
		0	gas pressure is too high
C	carbon monoxide level	1	carbon monoxide level is correct
		0	carbon monoxide level is too high
L	gas leak detection	1	no gas leak is detected
		0	gas leak is detected

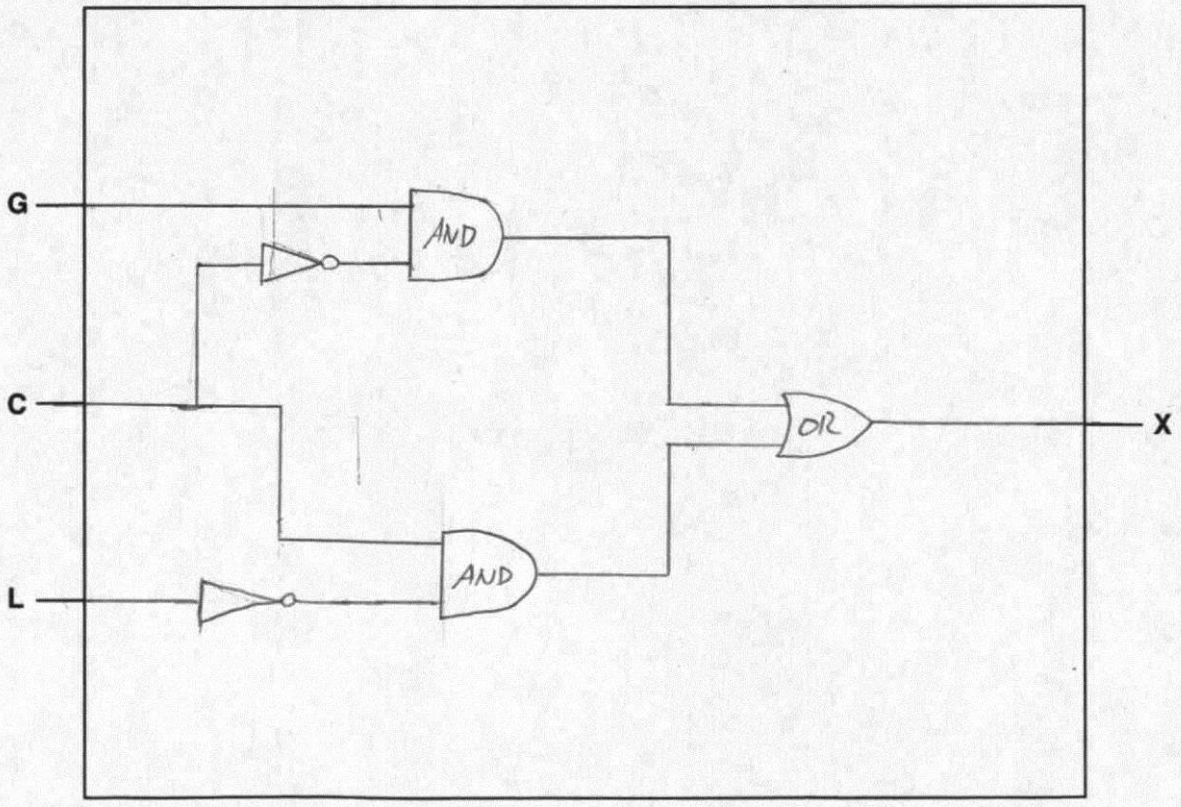
The output X = 1 is generated under the following conditions:

gas pressure is correct **AND** carbon monoxide level is too high

OR

carbon monoxide level is correct **AND** gas leak is detected

(a) Draw a logic circuit for this safety system.



[5]

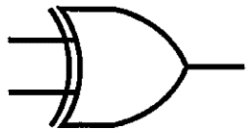
Example candidate response – high, continued

(b) Complete the truth table for the safety system.

G	C	L	Workspace $G \cdot \bar{C}$	Workspace $C \cdot \bar{L}$	Workspace $(G \cdot \bar{C}) + (C \cdot \bar{L})$	X
-0	0	0	0	0	0	0
0	0	1	0	0	0	0
0	1	0	0	1	1	1
0	1	1	0	0	0	0
1	0	0	1	0	1	1
1	0	1	1	0	1	1
1	1	0	0	1	1	1
1	1	1	0	0	0	0

[4]

(c) Complete the truth table for the XOR gate:



A	B	C
0	0	0
0	1	1
1	0	1
1	1	0

[1]

Examiner comment – high

In part **(a)** this candidate has drawn a neat and correct logic circuit. Candidates should make sure that gates are drawn clearly and accurately as this is what is assessed first.

In part **(b)** this candidate has correctly worked out the output for each section in the truth table. They have made good use of the working space available to do this; it is good practice for candidates to do so.

In part **(c)** this candidate has given the correct four outputs for the XOR gate.

Marks awarded for **(a)** = 5 out of 5
Marks awarded for **(b)** = 4 out of 4
Marks awarded for **(c)** = 1 out of 1

Total mark awarded = 10 out of 10

Example candidate response – middle

6 A gas fire has a safety circuit made up of logic gates. It generates an alarm (X = 1) in response to certain conditions.

Input	Description	Binary value	Conditions
G	gas pressure	1	gas pressure is correct
		0	gas pressure is too high
C	carbon monoxide level	1	carbon monoxide level is correct
		0	carbon monoxide level is too high
L	gas leak detection	1	no gas leak is detected
		0	gas leak is detected

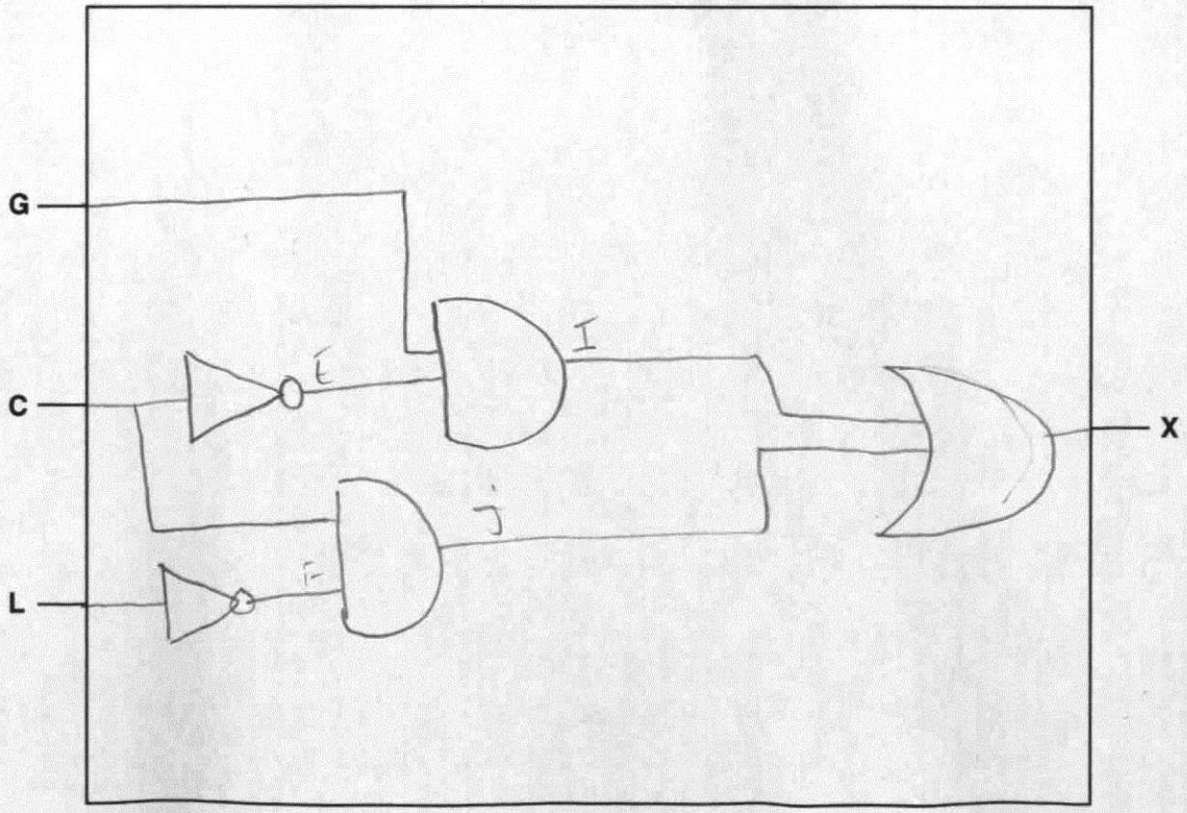
The output X = 1 is generated under the following conditions:

gas pressure is correct **AND** carbon monoxide level is too high

OR

carbon monoxide level is correct **AND** gas leak is detected

(a) Draw a logic circuit for this safety system.



[5]

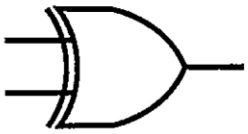
Example candidate response – middle, continued

(b) Complete the truth table for the safety system.

G	C	L	Workspace					X
0	0	0	1	1	0	0	0	0
0	0	1	1	0	0	0	0	0
0	1	0	0	1	0	0	0	0
0	1	1	0	0	0	1	1	1
1	0	0	1	1	0	0	0	0
1	0	1	1	0	0	0	0	0
1	1	0	0	1	1	0	1	1
1	1	1	0	0	1	1	1	1

[4]

(c) Complete the truth table for the XOR gate:



A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

0 1
1 0
1 e
1 0

[1]

Examiner comment – middle

In part **(a)** this candidate has drawn a neat and correct logic circuit. Candidates should make sure that gates are drawn clearly and accurately as this is what is assessed first.

In part **(b)** the candidate starts off well with one correct set of output. After this it appears that they begin to misunderstand the logic and cannot given any further correct sets of outputs.

In part **(c)** the candidate almost gets the correct answer, but is not quite right in their first output, so they do not get a mark.

Marks awarded for **(a)** = 5 out of 5
Marks awarded for **(b)** = 1 out of 4
Marks awarded for **(c)** = 0 out of 1

Total mark awarded = 6 out of 10

Example candidate response – low

6 A gas fire has a safety circuit made up of logic gates. It generates an alarm (X = 1) in response to certain conditions.

Input	Description	Binary value	Conditions
G	gas pressure	1	gas pressure is correct
		0	gas pressure is too high
C	carbon monoxide level	1	carbon monoxide level is correct
		0	carbon monoxide level is too high
L	gas leak detection	1	no gas leak is detected
		0	gas leak is detected

The output X = 1 is generated under the following conditions:

gas pressure is correct **AND** carbon monoxide level is too high

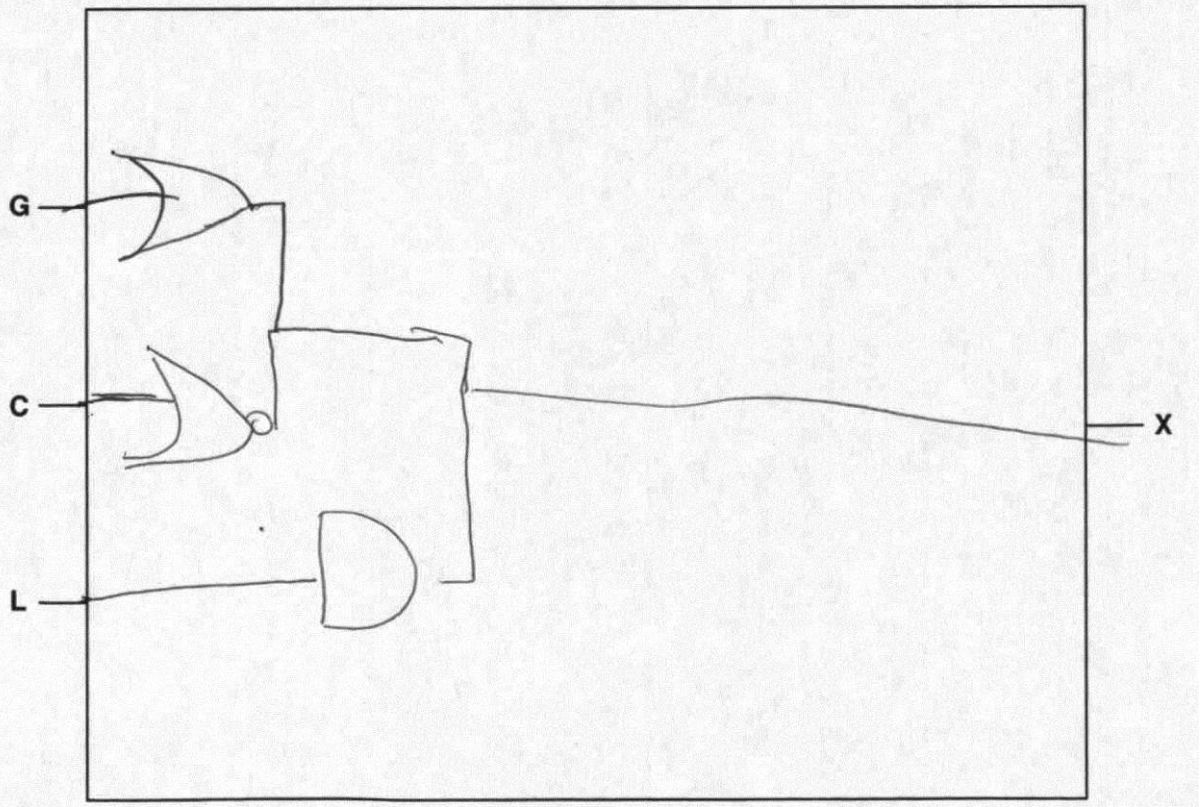
1 0

OR

carbon monoxide level is correct **AND** gas leak is detected

1 0

(a) Draw a logic circuit for this safety system.



[5]

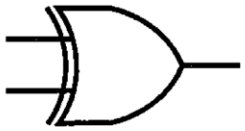
Example candidate response – low, continued

(b) Complete the truth table for the safety system.

G	C	L	Workspace	X
0	0	0		1
0	0	1		0
0	1	0		1
0	1	1		0
1	0	0		1
1	0	1		0
1	1	0		1
1	1	1		0

[4]

(c) Complete the truth table for the XOR gate:



A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

[1]

Examiner comment – low

In part **(a)** the candidate does not draw a logic circuit that will gain any marks. They also make a common error drawing one of their logic gates, the NOT gate. They miss off the small circular part at the tip of the gate, in the first gate. If candidates do this in their answer this cannot be classed as a NOT gate, as it is not drawn correctly.

In part **(b)** the candidate is able to make two sets of correct conversions.

In part **(c)** the candidate makes a common error with the last output. They have forgotten that if both inputs in an XOR gate are 1, the output will be 0 and not 1, like in an OR gate.

Marks awarded for **(a)** = 0 out of 5
Marks awarded for **(b)** = 2 out of 4
Marks awarded for **(c)** = 0 out of 1

Total mark awarded = 2 out of 10

Question 7

Example candidate response – high

7 **(a)** Street lighting is controlled automatically. A light sensor and a microprocessor are used to decide when to switch each street light on or off.

Describe how the sensor, microprocessor and light interact to switch the street light on or off.

Include in your answer how the microprocessor stops the street lights being frequently switched on and off due to brief changes in the light intensity.

The light sensor detects a change in light and sends a signal to a microprocessor. The microprocessor converts this analouge signal into digital using an ADC converter. If the light outside is dimmer ~~that~~ than the preset value ~~is~~ the microprocessor sends a signal to turn the light to outside, turn it on. If the light is brighter than the preset value the microprocessor turns the light off. If the change in light intensity is too high the bulb turns off. If it is ~~too great~~ small, it remains lit. [5]

(b) Name **three** different sensors (other than light and pH) and describe an application for each of these sensors.

A different application is needed for each sensor.

Sensor 1 heat sensor

Application Automated heating or cooling systems, such as in an automated greenhouse.

Sensor 2 gas (LPG) sensors

Application Used to detect gas ~~leak~~ leakages for alarms in gas stations or kitchens.

Sensor 3 proximity sensor (infrared sensors)

Application Detects infrared from emitter which is usually set, to detect nearness. Used in automated doors.

[6]

Examiner comment – high

In part **(a)** this candidate has given a very good answer that is detailed about the process. They missed describing how the process would avoid turning the light on and off with small changes. They would have been awarded the final mark if it had been included.

In part **(b)** this candidate gave three different sensors and three different applications, but only their last two were valid. It is a common error for candidates to refer to a heat sensor, but they need to be more specific about this, for example an infra-red sensor.

Marks awarded for **(a)** = 4 out of 5
Marks awarded for **(b)** = 4 out of 6

Total mark awarded = 8 out of 11

Example candidate response – middle

7 (a) Street lighting is controlled automatically. A light sensor and a microprocessor are used to decide when to switch each street light on or off.

Describe how the sensor, microprocessor and light interact to switch the street light on or off.

Include in your answer how the microprocessor stops the street lights being frequently switched on and off due to brief changes in the light intensity.

The light sensor sends a signal to detect light intensity. The information gathered is converted from Analogue to digital so that the microprocessor can understand. If ~~data~~ light intensity is lower than the stored value, the street light will turn on. If light intensity is within value, then it remains off. This is checked ~~every~~ after every 30 minutes or 1 hour to avoid frequent on and offs. [5]

(b) Name **three** different sensors (other than light and pH) and describe an application for each of these sensors.

A different application is needed for each sensor.

Sensor 1 Heat sensor

Application Used in water tanks to regulate temperature of water for fish.

Sensor 2 ~~PH levels sensor~~ Pressure sensor

Application ~~Used in water tanks to regulate PH level suitable for fish.~~ Used in burglar alarm systems.

Sensor 3 Acoustic sensor

Application detects sounds so it is used in burglar alarm systems to detect noises.

[6]

Examiner comment – middle

In part **(a)** the candidate makes two common errors at the start. A light sensor detects light but it is not aware of the intensity of it, this is something the microprocessor calculates. Second, they refer to what the sensor sends as information; this is incorrect as it is data at this stage because it has not been given any context or meaning. They then go on to make two points that can gain a mark. They attempt to cover what happens to avoid small frequent changes, but are a little too vague in their response to gain a mark, as they put two different suggestions.

In part **(b)** the candidate cannot gain a mark for a heat sensor as they need to be more specific, for example an infrared sensor. They also cannot gain a mark for the application for acoustic sensor. Although it is a valid explanation, it is a repeat of the same application for pressure sensor, and each application must be different.

Marks awarded for **(a)** = 2 out of 5
Marks awarded for **(b)** = 3 out of 6

Total mark awarded = 5 out of 11

Example candidate response – low

7 **(a)** Street lighting is controlled automatically. A light sensor and a microprocessor are used to decide when to switch each street light on or off.

Describe how the sensor, microprocessor and light interact to switch the street light on or off.

Include in your answer how the microprocessor stops the street lights being frequently switched on and off due to brief changes in the light intensity.

When more light falls upon the sensor (i.e. from sunlight), the sensor sends signals to microprocessor. The microprocessor reads these signals and then sends signals back to the street lights to switch off later, when less light falls (as the sun sets), the sensor sends signals to microprocessor, which again reads them and sends signals for street lights to turn on. The microprocessor stops the street lights being frequently switched on and off due to brief changes in light intensity by keeping a range of light intensity values, which it uses to ~~detect back or to light intensity.~~ tell whether the lights are on. [5]

(b) Name **three** different sensors (other than light and pH) and describe an application for each of these sensors.

A different application is needed for each sensor.

Sensor 1 Proximity sensor

Application When people come close to a door, it ~~de~~ senses their presence and ~~et~~ automatically opens the door.

Sensor 2 Switch / Button

Application As someone presses a button, a specific task is to be done.

Sensor 3 Heat sensor

Application When a particular machine becomes too hot, a signal is sent to shut it down.

[6]

Examiner comment – low

In part **(a)** this candidate starts off well gaining a mark in their first sentence. They then become repetitive and vague in their response and cannot gain any further marks as a result.

In part **(b)** they are able to gain two marks for their first sensor and application. Their second suggestion is not a sensor. The pushing of a button may be something a sensor can detect, but is not a senor itself. They make the same mistake stating a heat sensor. This is not specific enough and needs to refer to, for example, an infra-red sensor.

Marks awarded for **(a)** = 1 out of 5
Marks awarded for **(b)** = 2 out of 6

Total mark awarded = 3 out of 11

Question 8

Example candidate response – high

8 Five computing terms are described below.

Write the name of the term being described.

Software that anyone can download for free from the Internet and then use without having to pay any fees. The usual copyright laws apply and a user license is important.

Freeware

Software that gives the user the chance to try it out free of charge before actually buying it. The software is subject to the usual copyright laws. As a rule, not all the features found in the full version are available at this stage.

Shareware

Software where users have freedom to run, copy, change and adapt it. This is an issue of liberty and not of price since the software guarantees freedom and the right to study and modify the software by having access to the actual source code.

Free Software

Set of principles that regulates the use of computers in everyday life. This covers intellectual property rights, privacy issues and the effects of computers on society in general.

Computer Ethics

The taking of somebody's idea or software and claim that the idea or software code were created by the "taker".

Plagiarism

[5]

Examiner comment – high

This candidate managed to give the correct term for all 5 definitions.

Total mark awarded = 5 out of 5

Example candidate response – middle

8 Five computing terms are described below.

Write the name of the term being described.

Software that anyone can download for free from the Internet and then use without having to pay any fees. The usual copyright laws apply and a user license is important.

Free software

Software that gives the user the chance to try it out free of charge before actually buying it. The software is subject to the usual copyright laws. As a rule, not all the features found in the full version are available at this stage.

Shareware

Software where users have freedom to run, copy, change and adapt it. This is an issue of liberty and not of price since the software guarantees freedom and the right to study and modify the software by having access to the actual source code.

Freeware

Set of principles that regulates the use of computers in everyday life. This covers intellectual property rights, privacy issues and the effects of computers on society in general.

Computer ethics/ Laws

The taking of somebody's idea or software and claim that the idea or software code were created by the "taker".

Plagiarism

[5]

Examiner comment – middle

This candidate has made a common error and mixed up the definitions of freeware and free software.

Total mark awarded = 3 out of 5

Example candidate response – low

8 Five computing terms are described below.

Write the name of the term being described.

Software that anyone can download for free from the Internet and then use without having to pay any fees. The usual copyright laws apply and a user license is important.

Free software

Software that gives the user the chance to try it out free of charge before actually buying it. The software is subject to the usual copyright laws. As a rule, not all the features found in the full version are available at this stage.

Shareware

Software where users have freedom to run, copy, change and adapt it. This is an issue of liberty and not of price since the software guarantees freedom and the right to study and modify the software by having access to the actual source code.

Freeware

Set of principles that regulates the use of computers in everyday life. This covers intellectual property rights, privacy issues and the effects of computers on society in general.

Copyright laws

The taking of somebody's idea or software and claim that the idea or software code were created by the "taker".

plagirism

[5]

Examiner comment – low

This candidate has made the common error of mixing up the definitions of freeware and free software. They are also incorrect with Copyright law. This is one part of computer ethics but not the entirety, so it doesn't match the full definition.

Total mark awarded = 2 out of 5

Question 9

Example candidate response – high

9 **(a)** Five statements about interpreters and compilers are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement refers to an interpreter or to a compiler.

Statement	Interpreter	Compiler
creates an executable file that runs directly on the computer		✓
more likely to crash the computer since the machine code produced runs directly on the processor	✓	
easier to debug since each line of code is analysed and checked before being executed	✓	
slow speed of execution of program loops	✓	
it is more difficult to modify the executable code, since it is in machine code format		✓

[5]

(b) State why a compiler or an interpreter is needed when running a high-level program on a computer.

High-level languages must be translated to machine code (binary) to be understood by the computer. This translation is done by either a compiler or an interpreter. [1]

(c) Give **one** benefit of writing a program in a high-level language.

High-level languages are easier to understand and debug for humans. [1]

(d) Give **one** benefit of writing a program in a low-level language.

Specific registers may be accessed which allows the efficient use of memory. [1]

Example candidate response – high, continued

(e) Study the following three sections of code.

A:
```
1 0 1 0 1 1 0 1
1 1 0 0 1 1 1 0
1 0 1 1 0 1 1 1
```

B:
```
LDA X
INC X
STA Y
```

C:
```
FOR x ← 1 TO 10
   READ n
ENDFOR
```

Identify, using the letters A, B or C, which of the above codes is an example of assembly code, high-level language code or machine code:

Assembly code ..... B .....

High-level language code ..... C .....

Machine code ..... A .....

[2]

Examiner comment – high

In part **(a)** this candidate has made a common error in thinking that as an interpreter interprets the code as it goes along it might make the computer crash more easily, but it is the compiler that will in fact do this.

In part **(b)** the candidate gave a good response stating it translates to machine code.

In part **(c)** the candidate has provided a good response. Candidates need to make sure they state who or what the code is easier to understand for, which this candidate did.

In part **(d)** the candidate correctly states it allows access to specific hardware.

In part **(e)** the candidate correctly recognised each part of code.

Marks awarded for **(a)** = 4 out of 5
Marks awarded for **(b)** = 1 out of 1
Marks awarded for **(c)** = 1 out of 1
Marks awarded for **(d)** = 1 out of 1
Marks awarded for **(e)** = 2 out of 2

Total mark awarded = 9 out of 10

Example candidate response – middle

9 **(a)** Five statements about interpreters and compilers are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement refers to an interpreter or to a compiler.

Statement	Interpreter	Compiler
creates an executable file that runs directly on the computer	✓	✓
more likely to crash the computer since the machine code produced runs directly on the processor	✓	
easier to debug since each line of code is analysed and checked before being executed		✓
slow speed of execution of program loops		✓
it is more difficult to modify the executable code, since it is in machine code format	✓	

[5]

(b) State why a compiler or an interpreter is needed when running a high-level program on a computer.

To analyze and debug any errorous code in the high-level program

.....[1]

(c) Give **one** benefit of writing a program in a high-level language.

English-like codes, so easy to run, ~~so i) program oriented~~

.....[1]

(d) Give **one** benefit of writing a program in a low-level language.

Is faster as it doesn't have to be translated

.....[1]

Example candidate response – middle, continued

(e) Study the following three sections of code.

A:
```
1 0 1 0 1 1 0 1
1 1 0 0 1 1 1 0
1 0 1 1 0 1 1 1
```

B:
```
LDA X
INC X
STA Y
```

C:
```
FOR x ← 1 TO 10
   READ n
ENDFOR
```

Identify, using the letters A, B or C, which of the above codes is an example of assembly code, high-level language code or machine code:

Assembly code ..... A .....

High-level language code ..... C .....

Machine code ..... B .....

[2]

Examiner comment – middle

In part **(a)** this candidate was able to correctly recognise all five statements.

In part **(b)** the candidate has got the conversion the wrong way around. It should be from high level language to machine code.

In part **(c)** the candidate has not said who it is easy to understand and read for. This is needed to gain the mark.

In part **(d)** the candidate has given an incorrect response as errors are not executed by low level language.

In part **(e)** the candidate correctly recognised each part of code.

Marks awarded for **(a)** = 5 out of 5
Marks awarded for **(b)** = 0 out of 1
Marks awarded for **(c)** = 0 out of 1
Marks awarded for **(d)** = 0 out of 1
Marks awarded for **(e)** = 2 out of 2

Total mark awarded = 7 out of 10

Example candidate response – low

9 **(a)** Five statements about interpreters and compilers are shown in the table below.

Study each statement.

Tick (✓) to show whether the statement refers to an interpreter or to a compiler.

Statement	Interpreter	Compiler
creates an executable file that runs directly on the computer	✓	
more likely to crash the computer since the machine code produced runs directly on the processor	✓	
easier to debug since each line of code is analysed and checked before being executed		✓
slow speed of execution of program loops	✓	
it is more difficult to modify the executable code, since it is in machine code format	✓	

[5]

(b) State why a compiler or an interpreter is needed when running a high-level program on a computer.

Computers cannot understand commands written in high level language so they need compiler / interpreter to translate / execute them into machine code [1]

(c) Give **one** benefit of writing a program in a high-level language.

Easier to spot errors

[1]

(d) Give **one** benefit of writing a program in a low-level language.

Quicker execution of program

[1]

Example candidate response – low

(e) Study the following three sections of code.

A:
```
1 0 1 0 1 1 0 1
1 1 0 0 1 1 1 0
1 0 1 1 0 1 1 1
```

B:
```
LDA X
INC X
STA Y
```

C:
```
FOR x ← 1 TO 10
   READ n
ENDFOR
```

Identify, using the letters A, B or C, which of the above codes is an example of assembly code, high-level language code or machine code:

Assembly code ..... Code B .....

High-level language code ..... Code C .....

Machine code ..... Code A .....

[2]

Examiner comment – low

In part **(a)** this candidate has mostly confused the role on a compiler and an interpreter and has got most of the statements incorrect as a result. This is a common error that is made.

In part **(b)** the candidate gave a good response stating it translates to machine code.

In part **(c)** the candidate has provided a response that is just about sufficient for a mark, saying it is easier to see errors in high-level language.

In part **(d)** the candidate states that low level language is quicker to execute. This is a common misconception made by candidates and is not always the case.

In part **(e)** the candidate correctly recognised each part of code.

Marks awarded for **(a)** = 1 out of 5
Marks awarded for **(b)** = 1 out of 1
Marks awarded for **(c)** = 1 out of 1
Marks awarded for **(d)** = 0 out of 1
Marks awarded for **(e)** = 2 out of 2

Total mark awarded = 5 out of 10

Question 10

Example candidate response – high

10 Letters from the alphabet are represented in a computer by the following denary (base 10) values:

A = 97
G = 103
I = 105
L = 108
N = 110

The word "**A L I G N**" is stored as: 97 108 105 103 110

(a) Convert each of the five values to binary. The first one has been done for you.

Letter	Denary value 128	64	32	16	8	4	2	1
A (97):	0	1	1	0	0	0	0	1
L (108):	0	1	1	0	1	1	0	0
I (105):	0	1	1	0	1	0	0	1
G (103):	0	1	1	0	0	1	1	1
N (110):	0	1	1	0	1	1	1	0

[2]

(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

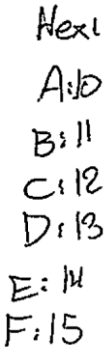
C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

	128	64	32	16	8	4	2	1	hexadecimal
L:	1	1	0	1	1	0	0	0	D8
G:	1	1	0	0	1	1	1	0	CE

[4]

Example candidate response – high, continued



Examiner comment – high

In part **(a)** this candidate converted all four letters correctly

In part **(b)** this candidate managed to perform the bit shift correctly and converted the binary to hexadecimal successfully.

Marks awarded for **(a)** = 2 out of 2
Marks awarded for **(b)** = 4 out of 4

Total mark awarded = 6 out of 6

Example candidate response – middle

10 Letters from the alphabet are represented in a computer by the following denary (base 10) values:

A = 97
G = 103
I = 105
L = 108
N = 110

The word "**A L I G N**" is stored as: 97 108 105 103 110

(a) Convert each of the five values to binary. The first one has been done for you.

Letter	Denary value							
A (97):	0	1	1	0	0	0	0	1
L (108):	0	0	0	1	1	0	1	1
I (105):	0	1	0	0	1	0	1	1
G (103):	0	1	1	1	0	0	1	1
N (110):	0	0	1	1	1	0	1	1

[2]

(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

								hexadecimal
L:	0	0	1	1	0	1	1	0	3 6
G:	1	1	1	0	0	1	1	0	E 6

[4]

Examiner comment – middle

In part **(a)** this candidate was not able to correctly convert any of the letters into binary.

In part **(b)** this candidate did manage to perform the bit shift correctly and converted the binary to hexadecimal successfully. This was done on an initial incorrect binary value from part **(a)**, but as they could demonstrate the skill of a bit shift and convert those values in correct hexadecimal values, they were awarded all four marks.

Marks awarded for **(a)** = 0 out of 2
Marks awarded for **(b)** = 4 out of 4

Total mark awarded = 4 out of 6

Example candidate response – low

10 Letters from the alphabet are represented in a computer by the following denary (base 10) values:

A = 97
G = 103
I = 105
L = 108
N = 110

The word "**A L I G N**" is stored as: 97 108 105 103 110

(a) Convert each of the five values to binary. The first one has been done for you.

Letter	Denary value							
A (97):	0	1	1	0	0	0	0	1
L (108):	0	1	1	0	1	1	0	0
I (105):	0	1	1	0	1	0	0	1
G (103):	0	1	1	0	0	0	1	1
N (110):	0	1	1	0	1	1	1	0

[2]

(b) An encryption system works by shifting the binary value for a letter one place to the left. "A" then becomes:

1	1	0	0	0	0	1	0

This binary value is then converted to hexadecimal; the hexadecimal value for "A" will be:

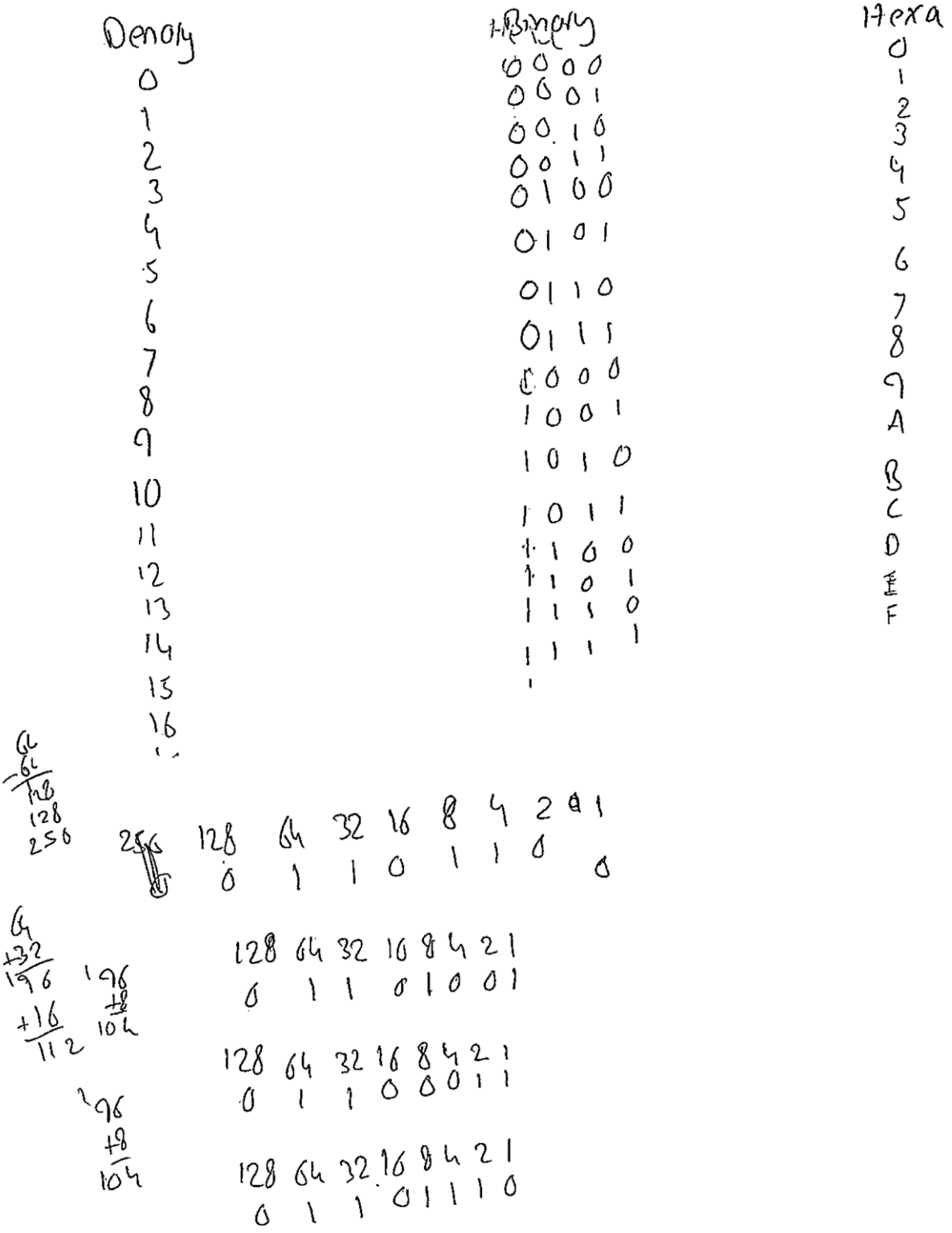
C 2

For the two letters "L" and "G", shift the binary values one place to the left and convert these values into hexadecimal:

								hexadecimal
L:	0	1	1	0	1	1	0	0	....12₁₆....
G:	1	1	1	0	0	0	1	0	....E2....

[4]

Example candidate response – low, continued



Examiner comment – low

In part **(a)** the candidate was able to convert two of the letters correctly for a mark.

In part **(b)** they did not manage to perform the bit shift correctly on either binary number, but they could demonstrate enough skill for one mark in converting one of their binary values to the correct hex value.

Marks awarded for **(a)** = 1 out of 2
Marks awarded for **(b)** = 1 out of 4

Total mark awarded = 2 out of 6

Paper 2 – Problem-solving and Programming

Section A

Question 1(a)

Example candidate response – high

1 **(a)** All variables, constants and other identifiers should have meaningful names.

(i) Declare the array to store the pupils' names.

stdname [1:30] .....[1]

(ii) Declare the array to store the pupils' weights.

stdweight [1:30] .....[1]

(iii) It has been decided to record the weights for the whole school of 600 pupils rather than one class.

Write suitable new declarations for these two arrays.

stdname [1:600]

stdweight [1:600] .....[1]

Examiner comment – high

Meaningful names without spaces were chosen for the arrays in **(i)** and **(ii)**, a correct upper and lower bound was shown for both arrays. For **(iii)** the new declarations used the same names with the new correct upper bound.

Marks awarded for **(i)** = 1 out of 1
Marks awarded for **(ii)** = 1 out of 1
Marks awarded for **(iii)** = 1 out of 1

Total mark awarded = 3 out of 3

Example candidate response – middle

1 **(a)** All variables, constants and other identifiers should have meaningful names.

(i) Declare the array to store the pupils' names.

StdName [1:30] ..... [1]

(ii) Declare the array to store the pupils' weights.

StdWeight [1:30] ..... [1]

(iii) It has been decided to record the weights for the whole school of 600 pupils rather than one class.

Write suitable new declarations for these two arrays.

StdName [1:600]

StdWeight [1:600] ..... [1]

(b) Write an algorithm to complete **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. Use weights for **the whole school.** You should assume that Task 1 has already been completed.

DiffWeight [1:600] , Difference ← 0

count ← 0

For count ← 1 to 600

Print "Enter the weight at the end of term"

Input weight

~~DiffWeight[count] ← weight - StdWeight[count]~~

Difference ← weight - StdWeight[count]

~~DiffWeight[1 to 600] ← Difference~~

DiffWeight[count] ← Difference

Next count

Examiner comment – middle

Meaningful names without spaces were chosen for the arrays in **(i)** and **(ii)**, a correct upper and lower bound was shown for both arrays. For **(iii)** the new declarations did not use the same names therefore the mark was not awarded as the program would need to be rewritten using the new array names.

Marks awarded for **(i)** = 1 out of 1
Marks awarded for **(ii)** = 1 out of 1
Marks awarded for **(iii)** = 0 out of 1

Total mark awarded = 2 out of 3

Example candidate response – low

1 (a) All variables, constants and other identifiers should have meaningful names.

(i) Declare the array to store the pupils' names.

1 : 30 .....[1]

(ii) Declare the array to store the pupils' weights.

~~1 : 2.5~~ 1.2kg .....[1]

(iii) It has been decided to record the weights for the whole school of 600 pupils rather than one class.

Write suitable new declarations for these two arrays.

1 : 600

1 : kg .....[1]

Examiner comment – low

No meaningful names were seen for **(i)** and **(ii)**. Although a correct upper and lower bound was shown for **(i)** this was not sufficient to award a mark. For **(iii)**, although a new correct upper and lower bound was provided, the mark was not awarded because there were no array names.

Marks awarded for **(i)** = 0 out of 1
Marks awarded for **(ii)** = 0 out of 1
Marks awarded for **(iii)** = 0 out of 1

Total mark awarded = 0 out of 3

Question 1(b)

Example candidate response – high

(b) Write an algorithm to complete **Task 2,** using **either** pseudocode, programming statements **or** a flowchart. Use weights for **the whole school.** You should assume that Task 1 has already been completed.

```
difference [1:600]
finalweight [1:600]
for counter = 1 to 600
    input weight
final weight[counter] = weight
    diff = finalweight[counter] - stdweight[counter]
difference[counter] = diff
next counter
```

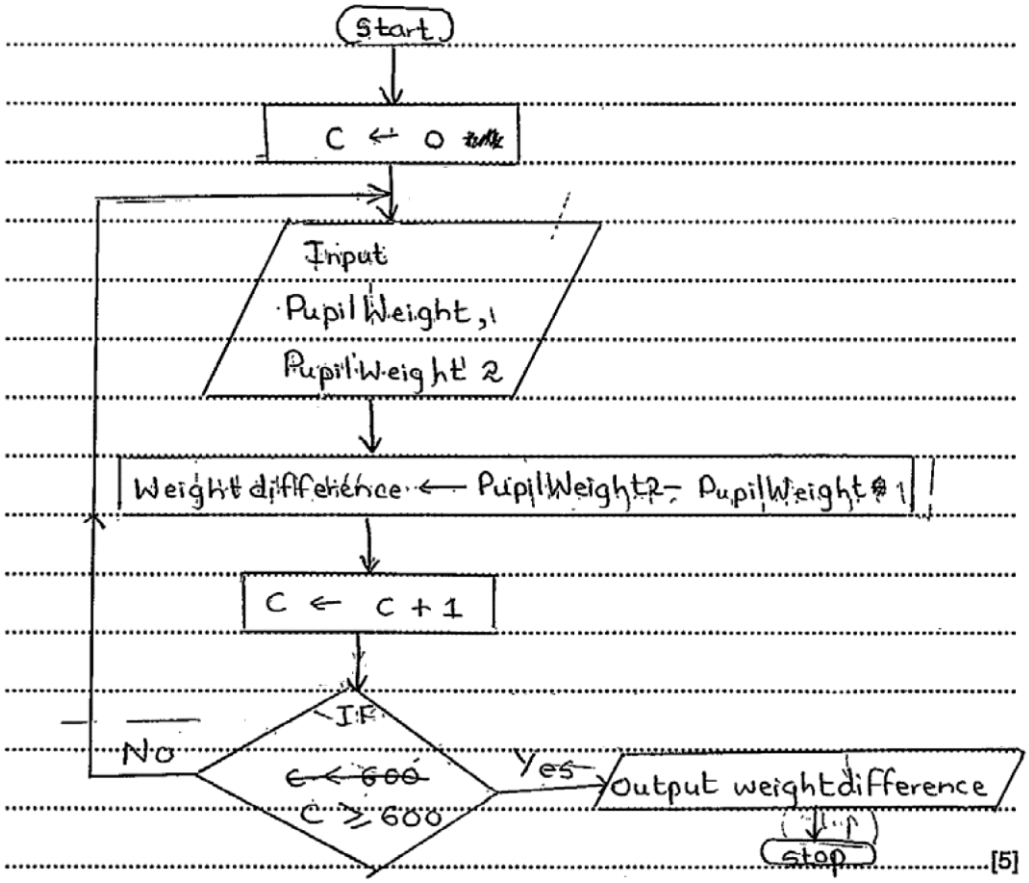
Examiner comment – high

This is an example of an answer with programming statements. There is a FOR ... NEXT loop for all 600 pupils, the final weight is input, the difference is calculated using the start weight previously stored in Task1, then stored in the correct place in the array of differences. This example of programming is worth the full five marks on offer.

Total mark awarded = 5 out of 5

Example candidate response – middle

(b) Write an algorithm to complete **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. Use weights for **the whole school**. You should assume that Task 1 has already been completed.



[5]

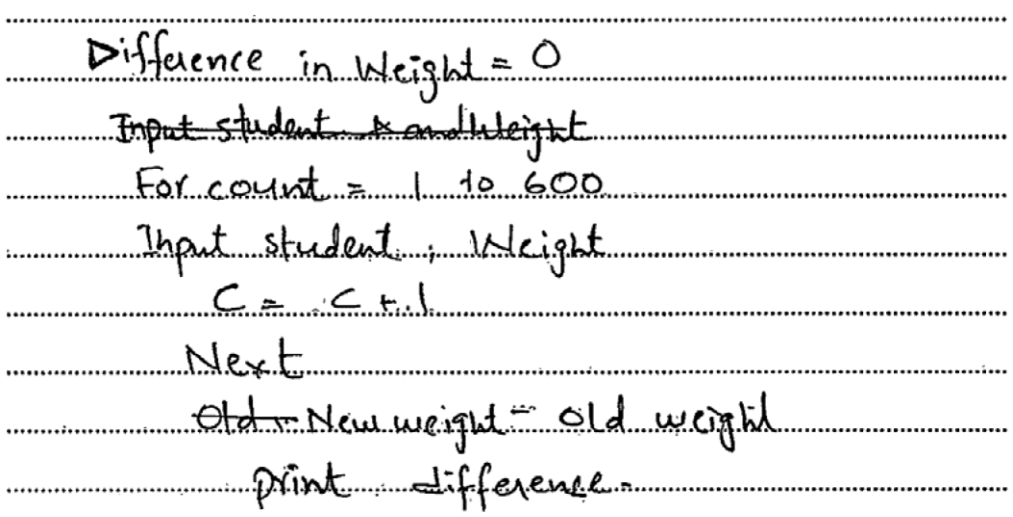
Examiner comment – middle

This is an example of a flowchart answer. The loop control is correct for 600 pupils, the final weight is input, `PupilWeight2`, the difference is calculated but not using the start weight previously stored in task 1. This example is worth the three marks, one for loop control, one for input of final weight and one for calculation of difference.

Total mark awarded = 3 out of 5

Example candidate response – low

(b) Write an algorithm to complete **Task 2**, using **either** pseudocode, programming statements **or** a flowchart. Use weights for **the whole school**. You should assume that Task 1 has already been completed.



Examiner comment – low

This answer could be programming statements or pseudocode. There is a FOR ... NEXT loop for all 600 pupils, the weight is input, but it is unclear whether this is the weight at the start or end of term. The difference is incorrectly set to zero outside the loop. This example is worth one mark for the loop.

Total mark awarded = 1 out of 5

Question 1(c)

Example candidate response – high

(c) (i) Describe suitable validation rules for **Task 1.**

The validation rules for task 1 should be limit check or range check for weights and data type check for both names and weights. The weight limit should be above 15 and less then 100 for students. [2]

(ii) Give **two** pupil weights that you could use to check the validation used in **Task 1.** Explain why you chose each weight.

Weight 1 20

Reason for choice It The value of weight lies within the range and ensures that program works correctly and valid data is accepted

Weight 2 2

Reason for choice It This value of weight is incorrect and it lie outside the range. It ensures that program invalid data is rejected [4]

Examiner comment – high

(i) There are two validation rules described and both descriptions are in the context of Task 1 of the pre-release material. This example is worth full marks.

(ii) There are two different pupil weights, each with a reason why the data chosen would be suitable to check the program's validation in Task 1. This example is worth full marks.

Marks awarded for **(i)** = 2 out of 2
Marks awarded for **(ii)** = 4 out of 4

Total mark awarded= 6 out of 6

Example candidate response – middle

(c) (i) Describe suitable validation rules for **Task 1.**

A range check would be a suitable validation check
for eg: if input weight
if weight > 15 and weight < 80 then
std weight [counter] = weight
endif. [2]

(ii) Give **two** pupil weights that you could use to check the validation used in **Task 1.** Explain why you chose each weight.

Weight 1 – 10

Reason for choice It is because the weight cannot be negative.

Weight 2 250

Reason for choice It is because a schol children cannot have this much weight. [4]

Examiner comment – middle

(i) There is one validation rule described the description is in the context of Task 1 of the pre-release material. This example is worth one mark as a single rule is described.

(ii) There are two different pupil weights; neither reason given relates to the program's validation checks in Task 1. The reasons are general statements about pupils' weights rather than the validation checks. This example is worth two marks for the weights chosen.

Marks awarded for **(i)** = 1 out of 2
Marks awarded for **(ii)** = 2 out of 4

Total mark awarded = 3 out of 6

Example candidate response – low

(c) (i) Describe suitable validation rules for **Task 1.**

If weight <=0 then output "Error"
Next [2]

(ii) Give **two** pupil weights that you could use to check the validation used in **Task 1.** Explain why you chose each weight.

Weight 1 If weight =< 0

Reason for choice No ones weight can be below zero, so it will be an error.

Weight 2 If weight >100.

Reason for choice On an average, no ones weight cannot be more than 100, so it's an error. [4]

Examiner comment – low

(i) There is a sample of code for a validation rule. This example is worth no marks as a description was not included.

(ii) The candidate has not provided two different pupil weights; code for validation checks is not required here. This example is worth no marks as the question has not been answered.

Marks awarded for **(i)** = 0 out of 2
Marks awarded for **(ii)** = 0 out of 4

Total mark awarded = 0 out of 6

Question 1(d)

Example candidate response – high

(d) Explain how you select the pupils with a fall in weight of more than 2.5 kilograms (part of **Task 3**). You may include pseudocode or programming statements as part of your explanation.

we have used the (for-to-next-loop) so that the start weight and end weight of all students is entered. (e.g. For X = 1 to 30)
Then we have calculated the difference of start and end weight of each student (e.g. Difference(x) = endweight(x) − startweight(x))
Then an (if-then-else) condition is applied to compare a rise & or fall in weight of more than 2.5 kg.
In order, to find the fall, we have used:

```
If difference(x) < -2.5 then
    Console.writeline("Student {0} has lost weight by
                       the difference {1}", studentname(x),
                       difference(x))
```

The student's name and difference in weights has then been printed. [6]

Examiner comment – high

The candidate has provided a good explanation of how a pupil would be selected with a fall in weight with sample code to illustrate each part of the explanation.

Total mark awarded = 6 out of 6

Example candidate response – middle

(d) Explain how you select the pupils with a fall in weight of more than 2.5 kilograms (part of **Task 3**). You may include pseudocode or programming statements as part of your explanation.

```
for count ← 1 to 30
Input ~~weight~~ Pupils_names [count]
Input weight_difference [count]
if weight_difference [count] < -2.5
then
output pupils_names [count]
next count
else
next count.
```

Examiner comment – middle

The candidate has not provided an explanation of how a pupil would be selected with a fall in weight, there is some sample code. Only a maximum of four marks could be awarded without an explanation. Marks have been awarded for the loop, checking for a difference in weight, less than -2.5 and outputting the pupil's name.

Total mark awarded = 4 out of 6

Example candidate response – low

(d) Explain how you select the pupils with a fall in weight of more than 2.5 kilograms (part of **Task 3**). You may include pseudocode or programming statements as part of your explanation.

```
If weightdifference > 2.5 kilogram then
"It is a Rise"
Else if
If weight difference < 2.5 kilogram then
"It is a fall"
Endif
Next
```

Examiner comment – low

The candidate has not provided an explanation of how a pupil would be selected with a fall in weight, there is some sample code that incorrectly includes checking for a rise in weight. One mark is awarded for checking the difference in weight.

Total mark awarded = 1 out of 6

Section B

Question 2

Example candidate response – high

2 Read this section of program code that should input 30 positive numbers and then output the largest number input.

```
1  Large = 9999
2  Counter = 0
3  WHILE Counter > 30
4  DO
5    INPUT Num
6    IF Num > Large THEN Large = Num
7    Counter = Counter + 1
8  ENDWHILE
9  PRINT Large
```

There are **four** errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

1 Line 1: The variable 'Large' should be initialised with the lowest non possible value. for eg. it's value should be set to 0.

2 In line 3, the condition set would result in loop not working and it should be 'Counter < 30'

3 In line 6, ~~if the expression~~ the condition "Num < Large" would not give correct value. It should be changed to Num > Large

4 In line 7, counter should be increased by 1. It should be counter = counter + 1. [4]

Examiner comment – high

The candidate has located all the errors correctly using the line numbers. For each error there is a correction given that would work.

Total mark awarded = 4 out of 4

Example candidate response – middle

2 Read this section of program code that should input 30 positive numbers and then output the largest number input.

0 1 2

```
1  Large = 9999
2  Counter = 0
3  WHILE Counter > 30
4  DO
5    INPUT Num
6    IF Num < Large THEN Large = Num
7    Counter = Counter - 1
8  ENDWHILE
9  PRINT Large
```

There are **four** errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

1 line (7), it should be counter = counter + 1.

2 line (3). While counter <= 30

3 line (6). If Num > large then large = Num

4 line (1). large value is set wrong.

.....[4]

Examiner comment – middle

The candidate has located all the errors correctly using the line numbers. For three of the errors there is a correction given, the fourth error has no correction. The corrections for errors 1 and 3 work, the correction for error 2 will give 31 iterations not the 30 required.

Total mark awarded = 2 out of 4

Example candidate response – low

2 Read this section of program code that should input 30 positive numbers and then output the largest number input.

```
1   Large = 9999
2   Counter = 0
3   WHILE Counter > 30
4   DO
5     INPUT Num
6     IF Num < Large THEN Large = Num
7     Counter = Counter - 1
8   ENDWHILE
9   PRINT Large
```

There are **four** errors in this code.

Locate these errors and suggest a corrected piece of code for each error.

1 ~~`Num <`~~ `Large = 9999' should be "large = 1000"`

2 `Counter = counter - 1' should be "counter = counter + 1"`

3 "PRINT large" will come before "ENDWHILE".

4 `IF Num > large THEN large = Num' should be "IF Num < large THEN large = Num'` [4]

Examiner comment – low

The candidate has located two errors correctly by quoting the code. For each error there is a correction given, for error one the correction is wrong, for error two the correction would work. Error three is incorrect. Error four has been misidentified with the error given as the correction. Only error two has been identified and corrected.

Total mark awarded = 1 out of 4

Question 3(a)

Example candidate response – high

Complete a trace table for each of the two sets of input data.

Set 1 5, 2, 4, 3, 1, 5

Set 2 3, 2, 1, 0, 7, 3

Trace table set 1 5, 2, 4, 3, 1, 5

A	B	C	D	E	F	Total	Check	Output
5	2	4	3	1	5	38	5	Accept

Trace table set 2 3, 2, 1, 0, 7, 3

A	B	C	D	E	F	Total	Check	Output
3	2	1	0	7	3	45	1	Reject

[4]

Examiner comment – high

The candidate has completed both trace tables correctly.

Total mark awarded = 4 out of 4

Example candidate response – middle

Complete a trace table for each of the two sets of input data.

Set 1 5, 2, 4, 3, 1, 5

Set 2 3, 2, 1, 0, 7, 3

Trace table set 1 5, 2, 4, 3, 1, 5

A	B	C	D	E	F	Total	Check	Output
5	2	4	3	1	5	38	5	Accept
5	4	12	12	5	5			

Trace table set 2 3, 2, 1, 0, 7, 3

A	B	C	D	E	F	Total	Check	Output
3	2	1	0	7	3	45	01	Reject
3	4	3	0	35	3			

[4]

Examiner comment – middle

The candidate has completed A, B, C, D, E and F in both trace tables correctly, the working out to check the calculation against F has incorrectly been included so the marks cannot be awarded. Total, Check and Output are correct for one mark in each trace table. 01 has been accepted as 1.

Total mark awarded = 2 out of 4

Example candidate response – low

Complete a trace table for each of the two sets of input data.

Set 1 5, 2, 4, 3, 1, 5

Set 2 3, 2, 1, 0, 7, 3

Trace table set 1 5, 2, 4, 3, 1, 5

A	B	C	D	E	F	Total	Check	Output
5	2	4	3	1	5			
5	4	12	12	5	5	38	5	Accept
"	"	"	"	"	"	"	"	Accept

Trace table set 2 3, 2, 1, 0, 7, 3

A	B	C	D	E	F	Total	Check	Output
3	2	1	0	7	3			
3	4	3	0	35	3	45	1	Reject
"	"	"	"	"	"	"	"	Reject

[4]

Examiner comment – low

The candidate has completed A, B, C, D, E and F in both trace tables correctly, the working out to check the calculation against F has incorrectly been included so the marks cannot be awarded. Total and Check are correct, Output is incorrect as both Accept and Reject have been repeated. No marks can be awarded.

Total mark awarded = 0 out of 4

Question 3(b) and 3(c)

Example candidate response – high

(b) State the purpose of the flowchart in **part (a)**.

like in the ISBN Code

It is to check that the check digit sent with data matches the data or not to ensure that correct data is received. [1]

(c) Identify a problem with this flowchart and explain how to correct it.

Problem If ~~remainder = 10 then no~~ remainder = 10 so how would the check digit be represented by 10 in a single digit.

Solution we can use Hexadecimal representations for 10 as used in Hexadecimal. We can represent 10 by A and then keep a condition that if check = 10 THEN Check = A in the program. ~~Also if we can compare it.~~ [3]

Examiner comment – high

The candidate has correctly stated the purpose of the flowchart in **(b)**. The problem when 10 is the remainder has been identified in **(c)** and then a workable solution suggested.

Marks awarded for **(b)** = 1 out of 1
Marks awarded for **(c)** = 3 out of 3

Total mark awarded = 4 out of 4

Example candidate response – middle

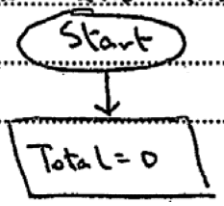
(b) State the purpose of the flowchart in **part (a)**.

Its purpose is to check the check digit ~~of~~ given at the end of sets of data. [1]

(c) Identify a problem with this flowchart and explain how to correct it.

Problem The variable Total has not been initialized by setting it to zero.

Solution Place a process box ~~before the~~ immediately after the start box and inside it write Total = 0



[3]

Examiner comment – middle

The candidate has correctly stated the purpose of the flowchart in **(b)**. The algorithm works without Total being set to zero so this is not a problem to be corrected.

Marks awarded for **(b)** = 1 out of 1
Marks awarded for **(c)** = 0 out of 3

Total mark awarded = 1 out of 4

Example candidate response – low

(b) State the purpose of the flowchart in **part (a)**.

To let the things done step by step. [1]

(c) Identify a problem with this flowchart and explain how to correct it.

Problem The output is constantly rejected

Solution Repeat loop must be added, for the acceptable output.

Examiner comment – low

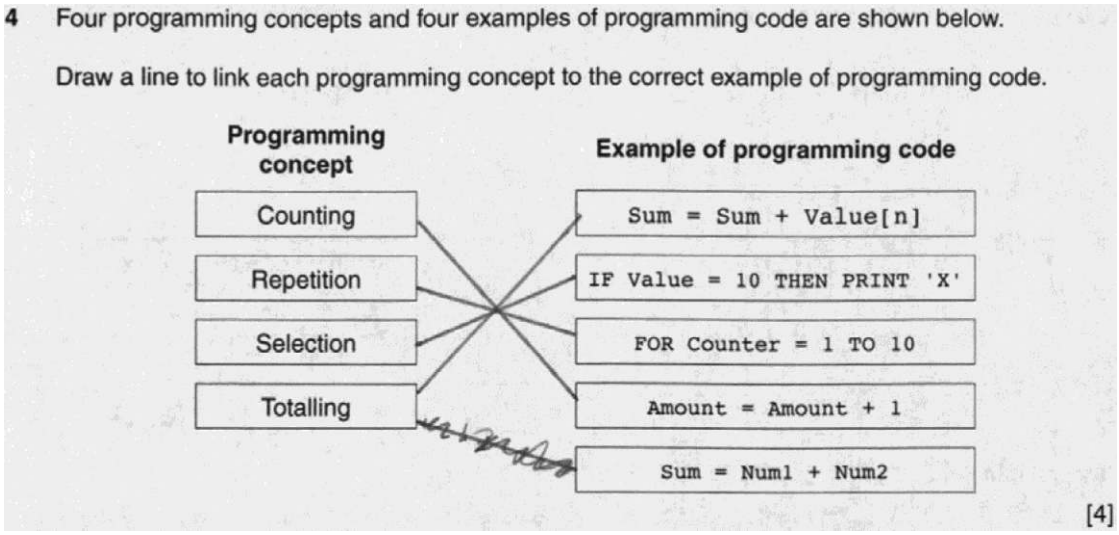
The candidate has not been able to identify the purpose of the flowchart or identify a problem.

Marks awarded for **(b)** = 0 out of 1
Marks awarded for **(c)** = 0 out of 3

Total mark awarded = 0 out of 4

Question 4

Example candidate response – high

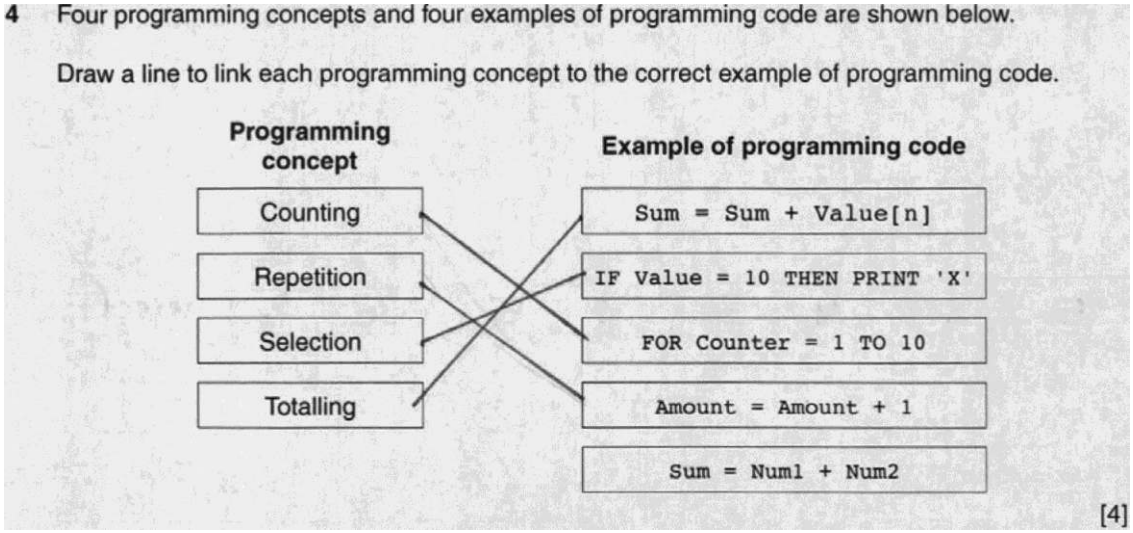


Examiner comment – high

Most of the high-awarding candidates gained full marks.

Total mark awarded = 4 out of 4

Example candidate response – middle



Examiner comment – middle

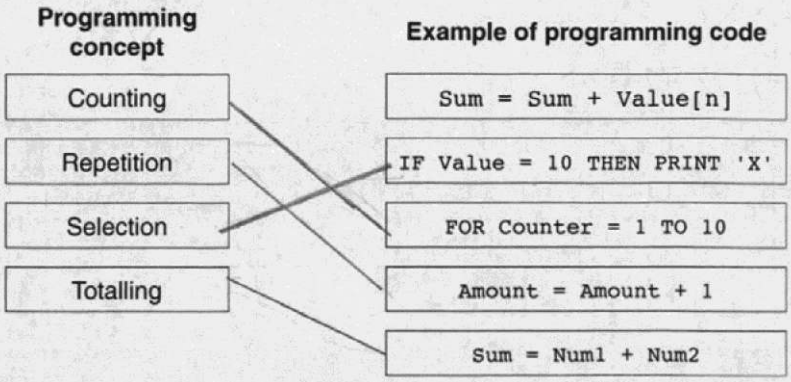
Most of the middle-awarding candidates could identify ‘selection’ and one other programming concept.

Total mark awarded = 2 out of 4

Example candidate response – low

4 Four programming concepts and four examples of programming code are shown below.

Draw a line to link each programming concept to the correct example of programming code.



[4]

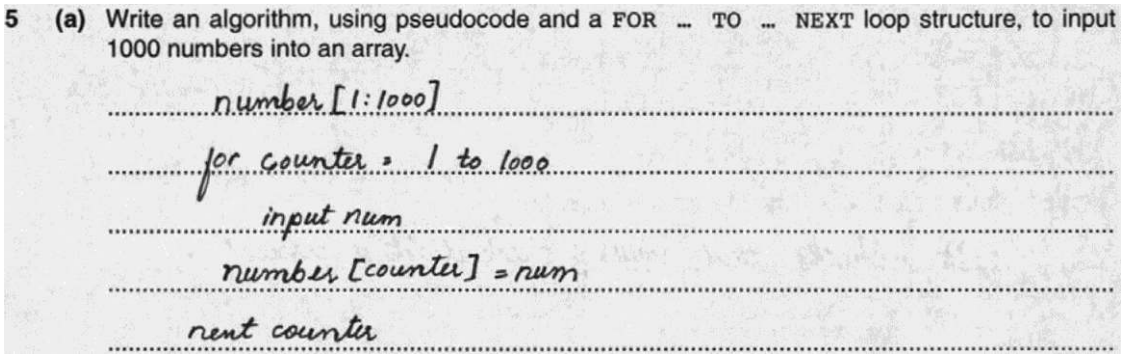
Examiner comment – low

Most of the low-awarding candidates could only identify the programming concept of 'selection'.

Total mark awarded = 1 out of 4

Question 5(a)

Example candidate response – high


5 (a) Write an algorithm, using pseudocode and a FOR … TO … NEXT loop structure, to input 1000 numbers into an array.

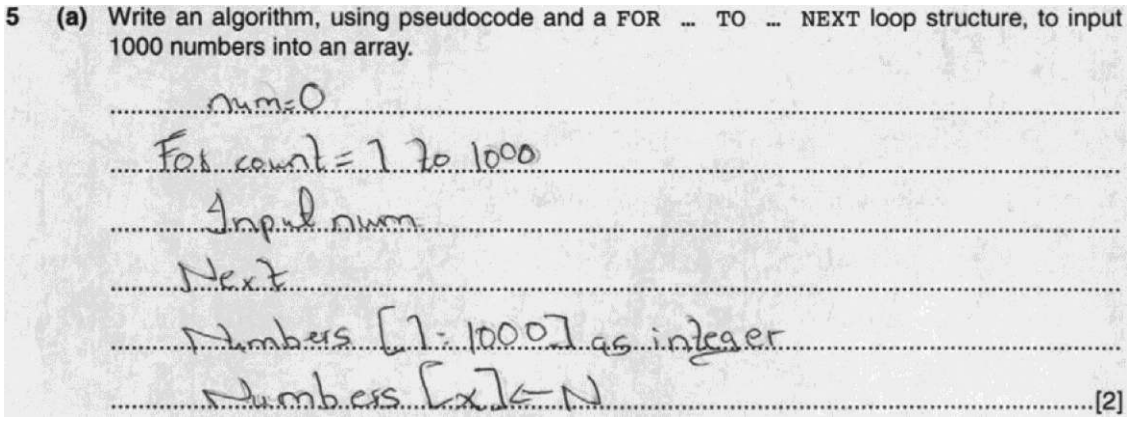
```
number[1:1000]
for counter = 1 to 1000
    input num
    number[counter] = num
next counter
```

Examiner comment – high

A FOR … TO … NEXT loop with correct use of the loop counter for the array index, full marks.

Total mark awarded = 2 out of 2

Example candidate response – middle


5 (a) Write an algorithm, using pseudocode and a FOR … TO … NEXT loop structure, to input 1000 numbers into an array.

```
num=0
For count=1 To 1000
    Input num
Next
Numbers[1:1000] as integer
Numbers[x]<-N
```

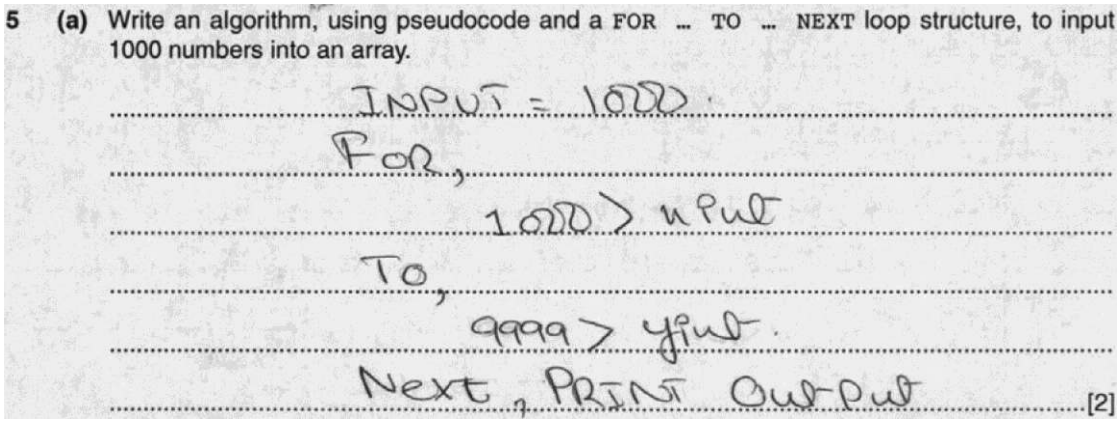
[2]

Examiner comment – middle

A FOR … TO … NEXT loop, there is no attempt to use the loop counter with the array.

Total mark awarded = 1 out of 2

Example candidate response – low



5 (a) Write an algorithm, using pseudocode and a FOR ... TO ... NEXT loop structure, to input 1000 numbers into an array.

INPUT = 1000.
FOR,
1000 > input
TO,
9999 > input.
Next, PRINT Output [2]

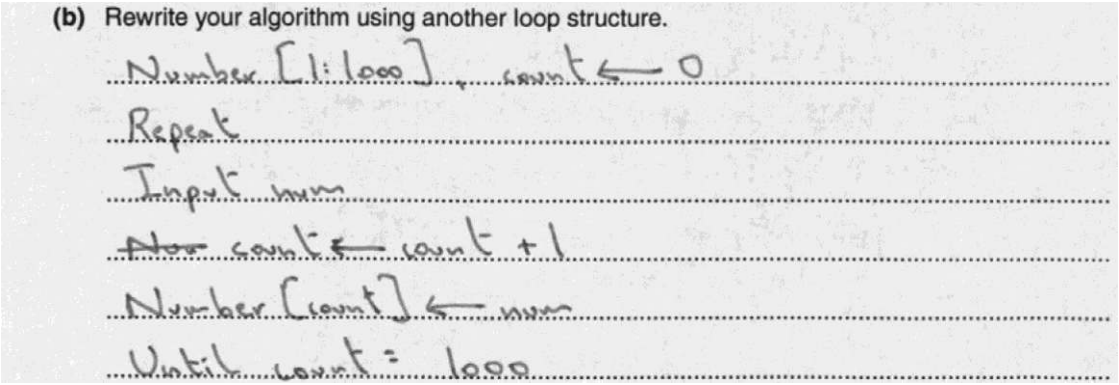
Examiner comment – low

An attempt at a FOR … TO … NEXT loop, there is no loop counter and no use of an array.

Total mark awarded = 0 out of 2

Question 5(b)

Example candidate response – high

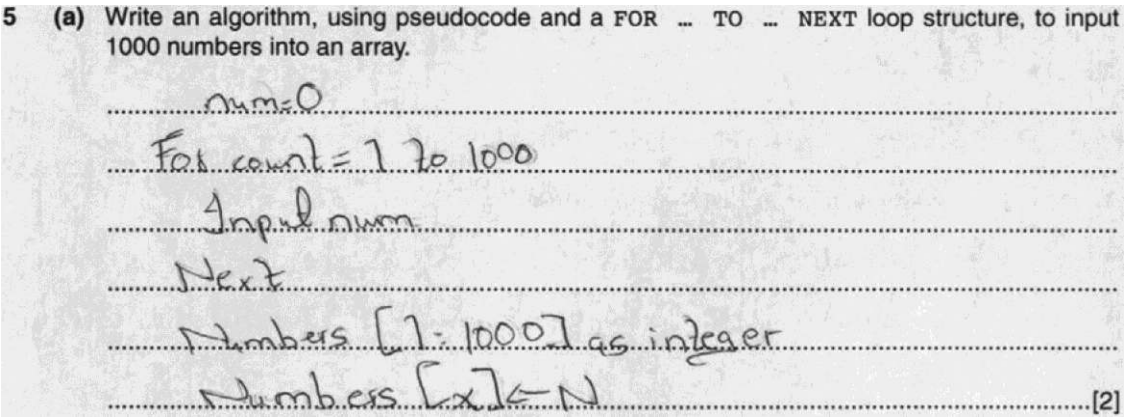


Examiner comment – high

A REPEAT … UNTIL loop, with correct initialisation, updating and testing of the loop counter, full marks. The candidate has used the correct ← symbol as required by the new syllabus. Candidates using = instead of ← were not penalised.

Total mark awarded = 4 out of 4

Example candidate response – middle



Examiner comment – middle

A WHILE … DO … ENDWHILE loop, with some errors. The loop counter has not been initialised, the WHILE statement is missing a variable. The updating of the loop counter is correct and there is an ENDWHILE statement, for two marks.

Total mark awarded = 2 out of 4

Example candidate response – low

(b) Rewrite your algorithm using another loop structure.

```
Numbers = [1 to 1000]
Input number
c = c + 1
Next
If the numbers = 1000 then
print Yes
display number
```

[4]

Examiner comment – low

It is unclear what type of loop is being used here. There is one mark for updating the loop counter.

Total mark awarded = 1 out of 4

Question 6(a)

Example candidate response – high, middle, low

(a) Give the number of fields that are in each record.

7 [1]

Examiner comment

All but the weakest candidates could identify the number of fields in each record.

Total mark awarded = 1 out of 1

Question 6(b)

Example candidate response – high

(b) State which field you would choose for the primary key.

Class ID

Give a reason for choosing this field.

The Class ID of two students cannot be same as it always unique and so this field can be used to identify a record. [2]

Examiner comment – high

Most candidates could identify the field to choose for a primary key, this candidate gave a good explanation of their choice using appropriate database terminology.

Total mark awarded = 2 out of 2

Example candidate response – middle

(b) State which field you would choose for the primary key.

Class ID

Give a reason for choosing this field.

It is because it is a primary key as it provides with Class ID of students [2]

Examiner comment – middle

Most candidates could identify the field to choose for a primary key; sometimes the explanation did not provide enough information to gain a mark. This explanation just repeats the question and does not add any further information.

Total mark awarded = 1 out of 2

Example candidate response – low

(b) State which field you would choose for the primary key.

Student Name

Give a reason for choosing this field.

It is because it is the main field which gives the general information about student. [2]

Examiner comment – low

Weaker candidates sometimes incorrectly identified the Student Name field; this did not gain a mark.

Total mark awarded = 0 out of 2

Question 6(c)

Example candidate response – high

(c) The query-by-example grid below selects all students with more than 60 marks in History or more than 60 marks in Geography.

Field:	Student Name	History	Geography
Table:	MARKS	MARKS	MARKS
Sort:	Ascending		
Show:	☑	☐	☐
Criteria:		>60	
or:			>60

Show what would be output.

Diana Abur

Paul Smith [2]

Examiner comment – high

The answer should be the output, this is completely correct as it shows only the Student Names and they are in ascending order.

Total mark awarded = 2 out of 2

Example candidate response – middle

(c) The query-by-example grid below selects all students with more than 60 marks in History or more than 60 marks in Geography.

Field:	Student Name	History	Geography
Table:	MARKS	MARKS	MARKS
Sort:	Ascending		
Show:	☑	☐	☐
Criteria:		>60	
or:			>60

Show what would be output.

Paul Smith , Diana Abur

Examiner comment – middle

The content of the answer is correct as only the Student Names are shown, the order is incorrect as it is the order the names appear in the database table not in ascending order.

Total mark awarded = 1 out of 2

Example candidate response – low

(c) The query-by-example grid below selects all students with more than 60 marks in History or more than 60 marks in Geography.

Field:	Student Name	History	Geography
Table:	MARKS	MARKS	MARKS
Sort:	Ascending		
Show:	☑	☐	☐
Criteria:		>60	
or:			>60

Show what would be output.

(Paul Smith >60 History) ,(Diana Abur >60 History),..
(Diana Abur >60 Geography). [2]

Examiner comment – low

The candidate appears to know how the query-by-example shown should work, however the question asked has not been answered as the reasoning has been shown rather than the output.

Total mark awarded = 0 out of 2

Question 6(d)

Example candidate response – high

(d) Complete the query-by-example grid below to select and show the student names only of all students with less than 40 marks in both Maths and English.

Field:	Student Name	Maths	English
Table:	MARKS	MARKS	MARKS
Sort:	Ascending		
Show:	☑	☐	☐
Criteria:		< 40	< 40
or:			

[3]

Examiner comment – high

The candidate has selected the correct fields. The Sort row for the Student Name can be left blank or set to Ascending or Descending since there are no instructions about sorting. The show boxes are correctly left unchecked for Maths and English. The < 40 criteria for the Maths and English marks are on the same line as both are required.

Total mark awarded = 3 out of 3

Example candidate response – middle

(d) Complete the query-by-example grid below to select and show the student names only of all students with less than 40 marks in both Maths and English.

Field:	Student Name	Maths	English
Table:	MARKS	MARKS	MARKS
Sort:	Descending		
Show:	☑	☐	☐
Criteria:		< 40	
or:			< 40

[3]

Examiner comment – middle

The candidate has selected the correct fields. The Sort row for the Student Name can be left blank or set to Ascending or Descending since there are no instructions about sorting. The show boxes are correctly left unchecked for Maths and English. The < 40 criteria for the Maths and English marks are not on the same line; this is incorrect as both are required. There is no mark for the English column.

Total mark awarded = 2 out of 3

Example candidate response – low

(d) Complete the query-by-example grid below to select and show the student names only of all students with less than 40 marks in both Maths and English.

Field:	Student Name	Maths	English
Table:	Marks	Marks	Marks
Sort:	descending	descending	descending
Show:	☑	☑	☑
Criteria:		<40	
or:			<40

[3]

Examiner comment – low

The candidate has selected the correct fields. The Sort row for the Student Name can be left blank or set to Ascending or Descending since there are no instructions about sorting. The show boxes are incorrectly checked for Maths and English. The < 40 criteria for the Maths and English marks are not on the same line; this is incorrect as both are required. There is no mark for the Maths column and no mark for the English column.

Total mark awarded = 1 out of 3

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