OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

GENERAL CERTIFICATE OF SECONDARY EDUCATION

COMPUTING **A451**

Unit A451: Computer systems and programming

Candidates answer on the Question Paper

OCR Supplied Materials
- None

Other Materials Required:
- None

Duration: 1 hour 30 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES
- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do not write outside the box bordering each page.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

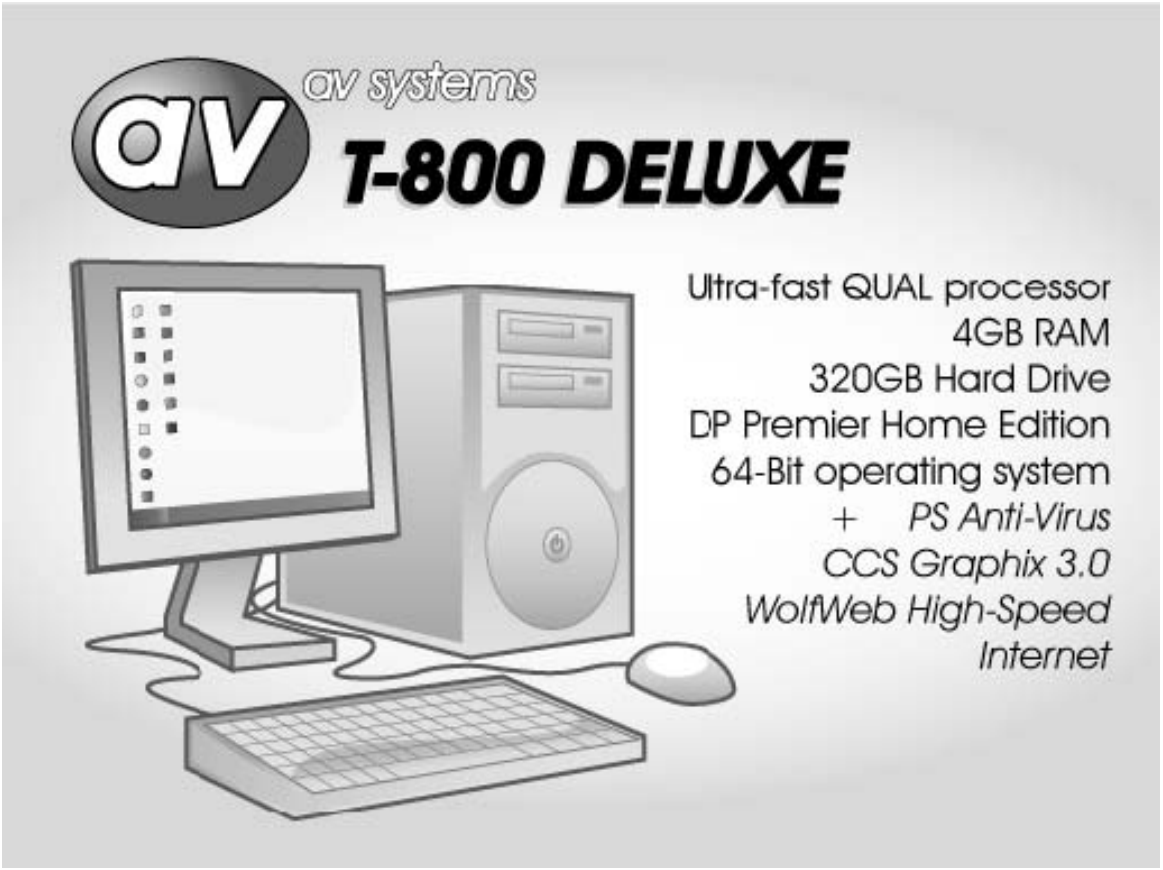
INFORMATION FOR CANDIDATES
- The number of marks for each question is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **80**.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).

Examiner's Use Only:			
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	
Total			

[QAN/.500/8291/7]
SP (SLM) T12103

[Turn over

1 An advertisement for a personal computer is shown below.



(a)

(i) What is software?

.....

..... **[1]**

(ii) Give **one** example of software from the advertisement.

.....

..... **[1]**

(b) The table below contains a list of hardware devices.

Tick **one** box in each row to show what type of device it is.

The first one has been done for you.

Hardware device	Input	Output	Processing	Storage	Communication
Monitor		✓			
CPU					
Mouse					
DVD-Drive					
Speakers					

[4]

2 Mary's computer has an 800MHz CPU and 1GB of RAM.

(a) Describe the purpose of the CPU.

.....

.....

.....

..... **[2]**

(b) Mary wants to upgrade this computer so that she can play the latest games.

Explain **two** ways by which the computer can be upgraded to improve its performance.

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..... **[4]**

(c)* A computer shop tells Mary that she would be better off buying a new computer, than upgrading the computer that she already has. However, Mary wants to consider the environmental impact as well as the cost.

Discuss the advantages and disadvantages of buying a new computer instead of upgrading and advise Mary on what she should do. You should focus on the environmental impact and the cost.

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..... **[6]**

3

(a) Convert the denary number 106 into an 8 bit binary number.

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..... **[2]**

(b) Convert the denary number 106 into Hexadecimal.

.....

.....

.....

..... **[2]**

4 Peter takes a high resolution picture with a digital camera. The picture is stored in a bitmap file.

(a) Describe how a picture is stored in a bitmap file.

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..... **[3]**

(b) Peter wants to send the picture as an email attachment.

State **two** methods for reducing the size of the picture file so that it is suitable for sending as an email.

Method1

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Method 2

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..... **[2]**

5 Ali's new computer uses a single-user, multi-tasking operating system.

(a) What is a **single-user** operating system?

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..... **[2]**

(b) What is a **multi-tasking** operating system?

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..... **[2]**

Ali wants to know which utility programs he will need to keep his computer secure and running smoothly.

(c)* Discuss the utility programs Ali will need, justifying why he needs them.

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..... **[6]**

6 A classroom in a primary school has 6 stand alone computers. The school decides to connect them to form a LAN.

(a) What is a LAN?

.....

..... **[1]**

(b) State **two** advantages of connecting the computers into a LAN.

Advantage 1.....

.....

Advantage 2.....

..... **[2]**

(c) The school decides to use the star topology to create the LAN.

Describe what is meant by a star topology. You may use a diagram.

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..... **[2]**

(d) Explain, with reasons, what additional hardware will be required to connect the computers into a LAN

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..... **[4]**

7 Davinder is a music student. She needs to take her files from her home computer into college.

Identify a method of storage which is suitable for taking her music files into college.

.....

.....

State why this method is suitable.

.....

..... **[2]**

8 A program includes the following code.

```
If A > B Then
   A = B
   B = A
End If
```

(a) The code uses the variables A and B.

Describe what is meant by a variable.

.....

.....

.....

..... **[2]**

(b) State the final values of the variables A and B if the values at the beginning of the code are

A = 4 B = 9

Final value of A = ...
Final value of B =.....

A = 6 B = 2

Final value of A = ...
Final value of B =.....

[2]

(c) The intention of lines 02 and 03 is to swap the contents of the variables A and B. This does not work.

Rewrite the code so that the contents of the variables are swapped correctly.

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..... **[3]**

9 A gym has many different types of exercise equipment. To use any equipment, members need to enter an individual 4-digit number. A computer system records how long each member has spent on each type of equipment and uses this information to charge the members.

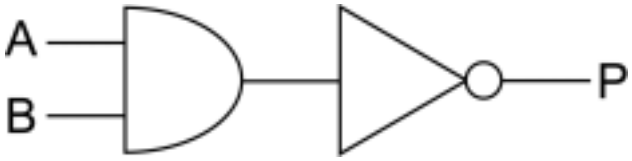
Complete the table below with two input values which could be used to test that the computer system correctly checks that the member has entered their number correctly. For each item of test data

- Explain why it is used
- State the expected outcome

Test data	Reason for test	Expected outcome

[6]

10 The following logic circuit can be written as **P** = NOT (**A** AND **B**)



(a) State the output (P) of the circuit if the inputs are:

(i) A = 1 B = 0

P = …….. **[1]**

(ii) A = 1 B = 1

P = …….. **[1]**

(b) Draw the logic circuit for P = (A OR B) AND C

[2]

11 A dentist uses a database to store the details of patients and their appointments.

(a) A database management system (DBMS) is used which includes forms, queries and reports.

Tick **one** box in each row to show whether each of the following statements best describes a form, a query or a report.

	Form	Query	Report
This can be used to print out all the appointments that the dentist has booked.			
This can be used to enter a patient's details when the patient registers with the dentist.			
This can be used to find out all the appointments that a certain patient has made.			

[3]

(b) When a patient makes an appointment, the start time of the appointment needs to be validated.

State **two** validation checks which can be carried out on the start time of the appointment.

Check 1.....

.....

Check 2.....

..... **[2]**

(c) Justify the use of separate entities to store the patient and appointment data.

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..... **[3]**

12 A display board can show a flashing message of up to 20 characters.

(a) A program allows users to input the message to be displayed and the number of times it should flash.

State the data type of each item of the input data.

Message ..... **[1]**

Number of flashes ..... **[1]**

(b) Write an algorithm for the program which:

- Allows the user to input the message and the number of flashes
- Rejects the message if it is longer than 20 characters and stops
- Otherwise it repeatedly displays the message and clears the display for the correct number of times.

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..... **[5]**

Paper Total [80]

END OF QUESTIONS

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OXFORD CAMBRIDGE AND RSA EXAMINATIONS

General Certificate of Secondary Education

COMPUTING A451

Unit A451: Computer systems and programming

Specimen Mark Scheme

The maximum mark for this paper is 80.

This document consists of **14** printed pages.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Max Mark</th></tr>
<tr><td>1(a)(i)</td><td>An advertisement for a personal computer is shown below.
What is software?
• Programs (which can be run on the computer)</td><td>[1]</td></tr>
<tr><td>1(a)(ii)</td><td>Give <u>one</u> example of software from the advertisement.
• Suitable example, eg PS Anti-virus</td><td>[1]</td></tr>
<tr><td>1(b)</td><td>The table below contains a list of hardware devices.
Tick <u>one</u> box in each row to show what type of device it is.
The first one has been done for you.
<table>
<tr><th>Hardware Device</th><th>Input</th><th>Output</th><th>Processing</th><th>Storage</th><th>Communication</th></tr>
<tr><td>Monitor</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
<tr><td>CPU</td><td></td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>Mouse</td><td>✓</td><td></td><td></td><td></td><td></td></tr>
<tr><td>DVD-Drive</td><td></td><td></td><td></td><td>✓</td><td></td></tr>
<tr><td>Speakers</td><td></td><td>✓</td><td></td><td></td><td></td></tr>
</table>
[1 mark per row. Do not award mark if more than one box ticked per row]</td><td>[4]</td></tr>
<tr><td>2(a)</td><td>Mary’s computer has an 800MHz CPU and 1GB of RAM.
Describe the purpose of the CPU.
e.g.
Controls the operations of the computer (1). Fetches (1) and executes instructions (to allow software to run) (1)
Max 2.</td><td>[2]</td></tr>
</table>

Question Number	Answer	Max Mark
2(b)	**Mary wants to upgrade this computer so that she can play the latest games.** **Explain <u>two</u> ways by which the computer can be upgraded to improve its performance.** • Higher processor speed (1) to increase the number of instructions the processor can carry out in a given time (1) • CPU with more cores (1) which share the load of running the game (1). • More RAM (1) to increase the number of programs/amount of data that the computer can handle at the same time (1) 2 marks per bullet. Max 4	**[4]**
2(c)*	**A computer shop tells Mary that she would be better off buying a new computer, than upgrading the computer that she already has. However, Mary wants to consider the environmental impact as well as the cost.** **Discuss the advantages and disadvantages of buying a new computer instead of upgrading and advise Mary on what she should do. You should focus on the environmental impact and the cost.** 0 = No response or response not worthy of credit. Level 1 (1-2 marks) Some advantages and/or disadvantages are stated, with limited explanations. A recommendation may be given, with limited justification. There is limited use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive. Level 2 (3-4 marks) Some advantages and disadvantages are explained, showing why they should be considered in arriving at a clear final recommendation. This final recommendation is stated and suitably follows from the considerations given. Specialist teams are in the most part used correctly. The information is presented for the most part in a structured format. There may be occasional errors in spelling, punctuation and grammar. Level 3 (5-6 marks) Advantages and disadvantages are clearly analysed with a strong evaluation of their relative merits. There is an effective comparison of the arguments on both sides leading to a recommendation. The counter arguments to this recommendation are addressed. Specialist terms will consistently be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.	

Question Number	Answer	Max Mark
2(c)* cont	Indicative content: • Cost: Only have to buy the few components needed(adv). However, can cost more in the long run, because of continued lack of future-proofing (disadv). Also, components compatible with outdated hardware e.g. older motherboards, may be more expensive(disadv). Technology tends to get cheaper. Buying a new computer may allow Mary to sell the older computer or have a second computer for another purpose(adv). • Environmental impact: New computer is wasteful (disadv) whereas upgrading encourages reuse. However upgrading means components are wasted and disposed of whereas new computer can allow the old computer to still be used for a different purpose(adv). New computers are generally built to higher environmental standards(adv) although they are usually more powerful and consume more power (disadv).	**[6]**
3(a)	**Convert the denary number 106 into an 8 bit binary number.** 0110 1010 (1 mark per nibble)	**[2]**
3(b)	**Convert the denary number 106 into Hexadecimal.** 6A (1 mark per digit)	**[2]**

Question Number	Answer	Max Mark
4(a)	**Peter takes a high resolution picture with a digital camera. The picture is stored in a bitmap file.** **Describe how a picture is stored in a bitmap file.** • The picture is split into dots/pixel • Each pixel is given a binary code (which says what colour it is) • The bitmap file contains the list of pixels • ... and header/meta information on how to display them (e.g. height and width, resolution, colour depth) (1 mark for each bullet, Max 3)	**[3]**
4(b)	**Peter wants to send the picture as an email attachment.** **State <u>two</u> methods for reducing the size of the picture file so that it is suitable for sending as an email.** Any 2 from: • Resize the image/picture to reduce the number of pixels • Reduce the colour depth to reduce the number of bits needed to store each pixel • Compress the file	**[2]**
5(a)	**Ali's new computer uses a single-user, multi-tasking operating system.** **What is a single-user operating system?** • Only one user... • ... can use the computer <u>at any given time</u>	**[2]**
5(b)	**What is a multi-tasking operating system?** The computer can (appear to) run several programs (1) at the same time (1). A Suitable example (e.g. word processing while playing music) (1) Max 2.	**[2]**

Question Number	Answer	Max Mark
5(c)*	**Ali wants to know which utility programs he will need to keep his computer secure and running smoothly.** **Discuss the utility programs Ali will need, justifying why he needs them.** 0 = No response or response not worthy of credit. Level 1 (0-2 marks) Some relevant utilities are listed with limited justification or reference to security and smooth running. There is limited use of specialist terms. Answers may be ambiguous or disorganised. Errors of spelling, punctuation and grammar may be intrusive. Level 2 (3-4 marks) The candidate partially covers both security and smooth running or over emphasises one of these; correct utilities are identified supported by limited facts. Specialist terms are used in the most part correctly. The information will be presented for the most part in a structured format. There are occasional errors in spelling, punctuation and grammar. Level 3 (5-6 marks) The candidate has identified utilities for both security and smooth running, with a full justification of why they are needed. Specialist terms are consistently used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar. Indicative content: Security: • Antivirus/Anti-spyware – regularly checks computer for programs designed to harm the system / gather information and deletes / disables them – such software is easily acquired from the Internet and could result in significant damage / financial loss / identity theft etc… if not removed. • Firewall – controls access to the computer through the network to prevent hackers • Definitions need to be updated regularly– because new viruses and spyware programs are produced all the time. • Keep computer running smoothly: • Disk maintenance o defragmenting - reorganise files so that they are stored in blocks next to each other – because file access quicker and may free up space o Disk cleanup - search for and delete files which are no longer needed – because this frees up space which can be used for other programs	

Question Number	Answer	Max Mark
5(c)* cont	• System maintenance o system cleanup - search the computer for settings which are no longer needed – programs which are slowing down the computer – because this improves performance o system update - search on the Internet for updated versions of the software on the computer and downloading/installing the updates – because this ensures that the computer always has the latest version including any fixes for known problems / security issues.	**[6]**
6(a)	**A classroom in a primary school has 6 stand alone computers. The school decides to connect them to form a LAN.** **What is a LAN?** Local Area Network / A network which covers a small area like a building	**[1]**
6(b)	**State <u>two</u> advantages of connecting the computers into a LAN.** • Can share files • Can share resources (e.g. printer) • Computers can be managed/controlled centrally • Users/computers can communicate with each other (1 mark for each bullet. Max 2 marks)	**[2]**
6(c)	**The school decides to use the star topology to create the LAN.** **Describe what is meant by a star topology. You may use a diagram.** A hub / server at the centre of the network (1).All computers attached to the hub/server (1). Resources (e.g. printer) can also be attached to hub/server (1) An appropriate diagram to represent this information is also acceptable. Max 2.	**[2]**
6(d)	**Explain, with reasons, what additional hardware will be required to connect the computers into a LAN.** • The star topology requires all workstations to be connected to a central point (1) so a hub/switch is needed (1) • The computers need to be physically or wirelessly connected to the hub (1) so cables and network interface cards (1) or a wireless access point and WiFi adapters (1) will be needed [max 2 marks per bullet]	**[4]**

Question Number	Answer	Max Mark
7	**Davinder is a music student. She needs to take her files from her home computer into college.** **Identify a method of storage which is suitable for taking her music files into college. State why this method is suitable.** 1 from: • Flash storage/USB stick/MP3 player(1)... small and convenient to carry(1) / plug and play(1) • Optical storage / CD-ROM) / CD – RW(1)…convenient to carry(1) / cheap(1) / music can be stored in a format which can be played by e.g. HiFis(1). • External hard drive (1)...plug and play on either computer(1) / large capacity for music files(1) [max 2 marks per bullet]	**[2]**

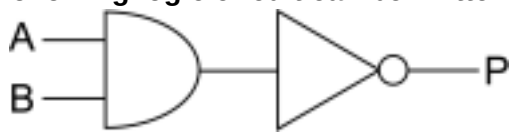
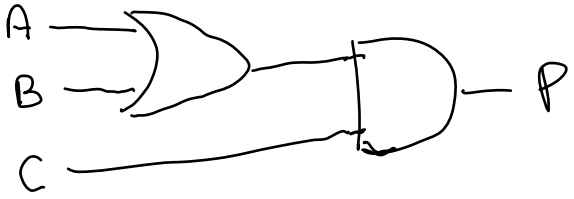
8(a)	**A program includes the following code.**
	`If A > B Then`
	`  A = B`
	`  B = A`
	`End If`
	The code uses the variables A and B.
	Describe what is meant by a variable.
	A name (1) which is used to identify a (memory) location (1) used to store a value which can change (1)
	Max 2
		[2]

8(b)	**State the final values of the variables A and B if the values at the beginning of the code are** **A = 4 B = 9** **Final value of A = 4** **Final value of B = 9** **A = 6 B = 2** **Final value of A = 2** **Final value of B = 2**	**[2]**

8(c)	**The intention of lines 02 and 03 is to swap the contents of the variables A and B. This does not work.**
	Rewrite the code so that the contents of the variables are swapped correctly.
	Example:
	If A > B Then
	Temp = A
	A = B
	B = Temp
	End If
	
	Award Marks for:
	• Contents of one variable stored in a temp variable
	• Second variable swapped into first
	• Temp variable used to update second variable
	(accept solutions with 2 temp variables)
	Max 3.
		[3]

<table>
<tr><th>Question Number</th><th>Answer</th><th>Max Mark</th></tr>
<tr><td>9</td><td>
A gym has many different types of exercise equipment. To use any equipment, members need to enter an individual 4-digit number. A computer system records how long each member has spent on each type of equipment and uses this information to charge the members.
Complete the table below with input values which could be used to test that the computer system correctly checks that the member has entered their number correctly. For each item of test data
o Explain why it is used
o State the expected outcome

Possible test cases include:
<table>
<tr><th>Test data</th><th>Reason for test</th><th>Expected outcome</th></tr>
<tr><td>298</td><td>To see if numbers shorter than 4 digits are rejected</td><td>Error message: The number entered is too short.</td></tr>
<tr><td>Exactly 4 digits (and in the member file)</td><td>To confirm that it works</td><td>Success</td></tr>
<tr><td>More than 4 digits</td><td>To see if numbers longer than 4 digits are rejected</td><td>Error message: The number entered is too long.</td></tr>
<tr><td>Input missing</td><td>To see if input is required</td><td>Error message: No number has been entered</td></tr>
<tr><td>Non numeric characters</td><td>To see if non numeric characters are accepted</td><td>Error message: The data contains non numerical characters</td></tr>
<tr><td>A PIN which does not exist in the customer file (accept any test data with explanation)</td><td>To see if any 4 digit number can be entered</td><td>Error message: The number entered does not exist in the customer file.</td></tr>
</table>
Do not allow marks if the reason for test is repeated (e.g. two tests for numbers shorter than 4 digits).
[Award 1 mark per box]
</td><td>[6]</td></tr>
</table>

Question Number	Answer	Max Mark
10(a)(i)	**The following logic circuit can be written as P = NOT (A AND B)**  **State the output(P) of the circuit if the inputs are:** **A = 1 B = 0** • P = 1	**[1]**
10(a)(ii)	**A = 1 B = 1** • P = 0	**[1]**
10(b)	**Draw the logic circuit for P = (A OR B) AND C** Example:  • A and B OR'ed in the circuit • The output is AND'ed with C	**[2]**

11(a) **A dentist uses a database to store the details of patients and their appointments.**
A database management system (DBMS) is used which includes forms, queries and reports.
Tick <u>one</u> box in each row to show whether each of the following statements best describes a form, a query or a report.

	Form	Query	Report
This can be used to print out all the appointments that the dentist has booked.			✓
This can be used to enter a patient's details when the patient registers with the dentist.	✓		
This can be used to find out all the appointments that a certain patient has made.		✓	

1 mark per row **[3]**

11(b) **When a patient makes an appointment, the start time of the appointment needs to be validated.**
State <u>two</u> validation checks which can be carried out on the start time of the appointment.

Two from:
- The time is in the correct format / hh:mm
- The time is within the dentist's working day
- The hours are in the range 1 – 12 / 0 – 24
- The minutes are in the range 0 – 59

Accept other correct validation checks. **[2]**

11(c) **Justify the use of separate entities to store the patient and appointment data.**
- The patient's data does not have to be repeated for each appointment…
- … as the patient ID can be stored with the appointment to link the two entities
- Allows the patient (and appointment data) to be manipulated independently e.g. if the name of the patient changes.
- Avoids the possibility of the patient data becoming inconsistent due to being stored multiple times

(1 mark for each bullet. Max 3 marks) **[3]**

Question Number	Answer	Max Mark
12(a)	**A display board can show a flashing message of up to 20 characters.** **A program allows users to input the message to be displayed and the number of times it should flash.** **State the data type of each item of the input data.** • Message: String • Number of flashes: Integer	 **[1]** **[1]**

12(b)	**Write an algorithm for the program which:**
	• Allows the user to input the message and the number of flashes
	• Rejects the message if it is longer than 20 characters and stops
	• Otherwise it repeatedly displays the message and clears the display for the correct number of times.
	EXAMPLE
	Begin
	  Input Message
	  Input NumberOfFlashes
	  If length(Message) > 20 Then
	    Output “This message is too long”
	  Else
	    For i = 1 to NumberOfFlashes
	      Display Message
	      Wait
	      Clear Message
	      Wait
	    Next
	  End If
	End
	
	Award marks for an algorithm which:
	• Inputs message and number of flashes
	• If length of message > 20, output error message and stop
	• Otherwise <u>run a loop</u> which will
	• ... flash the message
	• ... for the correct number of times
	Max 5.
		[5]

	Paper Total	**[80]**

Assessment Objectives Grid (includes QWC)

Question		AO1	AO2	AO3	Mark
1	(a)	1	1		2
	(b)	4			4
2	(a)	2			2
	(b)	2	2		4
	(c)*		2	4	6
3	(a)	1	1		2
	(b)	1	1		2
4	(a)	3			3
	(b)	2			2
5	(a)	2			2
	(b)	2			2
	(c)*	2	2	2	6
6	(a)	1			1
	(b)	2			2
	(c)	2			2
	(d)	2		2	4
7		1	1		2
8	(a)	2			2
	(b)		2		2
	(c)	1	2		3
9		2	2	2	6
10	(a)		2		2
	(b)		2		2
11	(a)	3			3
	(b)		2		2
	(c)		1	2	3
12	(a)	2	0		2
	(b)	0	5		5
Totals		**40**	**28**	**12**	**80**