OCR
RECOGNISING ACHIEVEMENT

SPECIMEN

GCSE COMPUTING

A451/01

A451/01 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, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB oencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure that you know what you have to do before starting your answer.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks 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 (*).

For Examiner's Use		
	Max	**Mark**
1	**8**	
2	**4**	
3	**4**	
4	**9**	
5	**9**	
6	**6**	
7	**8**	
8	**6**	
9	**14**	
10	**5**	
11	**7**	
TOTAL	**80**	

1 A city has many libraries. Each library has several computers.

(a) All the computers in a library are connected to each other through a local area network (LAN) and the libraries are connected through a wide area network (WAN).

In the table below, tick **one** box in each row to show whether the statements are true for the LAN only or for both LAN and WAN.

	LAN only	**Both LAN and WAN**
This can be used to check the books in another library.		
This can be used to send messages between the libraries.		
This will include a printer where users can print results of a search.		
Protocols are needed to allow the computers to communicate.		

[4]

(b) Some computers are available for public use.
Explain why the libraries need the following security measures.

User access levels

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

Firewalls

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

2 Data stored in computers can be measured in bits, bytes and kilobytes.

(a) State what is meant by

(i) a bit

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

(ii) a byte

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

(b) A file contains 5120 bytes. Calculate the size of the file in kilobytes.
You must show your working.

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

3 A shopkeeper needs software to manage the accounts of her shop. She decides to use off-the-shelf software instead of custom written software.

Describe **two** advantages to the shopkeeper of off-the-shelf software, compared to custom written software

Advantage 1

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Advantage 2

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

4 Debbie has a program on her mobile phone, which calculates the cost of the calls she has made.

(a) The program uses the following variables.

State the most appropriate data type for each variable.

Variable name	Purpose	Data type
Network	The name of the mobile phone network operator used (e.g. Toki Weka)	
CallLength	The length of a call made. (e.g. 1.5 for one and a half minutes)	
SameNetwork	Whether a call was made to a phone on the same network	
TotalCalls	The total number of calls made (e.g. 10)	
RunningCost	The calculated cost of all calls (e.g. £12.00)	

[5]

(b) The algorithm to update the data when a new text call is made is shown below

```
PROCEDURE Update
    TotalCalls = TotalCalls + 1
    IF SameNetwork = TRUE THEN
       RunningCost = RunningCost + 0.01
    ELSE
       RunningCost = RunningCost + (CallLength * 0.10)
    END IF
END PROCEDURE Update
```

So far TotalCalls = 10 and RunningCost = £12.00

(i) Debbie makes a 3 minute call to a phone on the same network.

State the values of TotalCalls and RunningCost after they have been updated using this algorithm.

TotalCalls =.....

RunningCost =..... **[2]**

(ii) Debbie now makes a 5 minute call to a phone on a different network.

State the values of TotalCalls and RunningCost after they have been updated using this algorithm.

TotalCalls =.....

RunningCost =..... **[2]**

5 A television set top box contains a database of television channels and programmes.

(a) Describe what is meant by a database.

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

Data about television channels are stored in the CHANNEL table. Part of this table is shown below.

ChannelID	ChannelName	ChannelType	Broadcaster	HD
346	ETV News	News	ETV	False
347	Screen One	Movies	ETV	True
349	BLING one	General	Bling	True
350	Vivo	Documentary	ETV	False
351	Nature	Documentary	Bling	False
355	Screen One	Movies	Bling	True

(b) State the primary key for the CHANNEL table and give a reason for your choice

Primary Key ..... **[1]**

Reason

.....

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

(c) Data about programmes that will be broadcast are stored in the PROGRAMME table. The data about each programme includes the channel on which it would be broadcast.

(i) Explain how a foreign key can be used to connect the PROGRAMME table to the CHANNEL table.

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

(ii) Explain why the programme data is stored in a separate table from the channel data.

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

6* The traffic lights in a town are controlled by a computer system. The town's council is concerned about the reliability of the system.

Explain, using examples from the traffic light system, what is meant by reliability and why the town needs the system to be reliable.

The quality of written communication will be assessed in your answer to this question.

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.... **[6]**

7 (a) The table below contains statements about the functions of the CPU.

Tick **one** box in each row to show whether the statement is true or false.

	TRUE	FALSE
It performs arithmetic operations on data.		
If fetches and executes instructions		
Input and output devices are plugged into it		
It moves data to and from memory locations.		

[4]

(b) Some CPUs have cache memory.

(i) Describe what is meant by cache memory.

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(ii) Explain why cache memory is needed.

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

8 Vimal is writing a program to convert the time from the 24 hour clock to the 12 hour clock.

Here is an extract from his program. This extract contains **two** errors.

```
IF (hours > 12) ADN (hours < 24) THEN
  hours = hours + 12
END IF
```

(a) Explain why there is an error in the **first** line, and state what type of error this is.

Explanation

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Type of Error:..... **[3]**

(b) Explain why there is an error in the **second** line, and state what type of error this is.

Explanation

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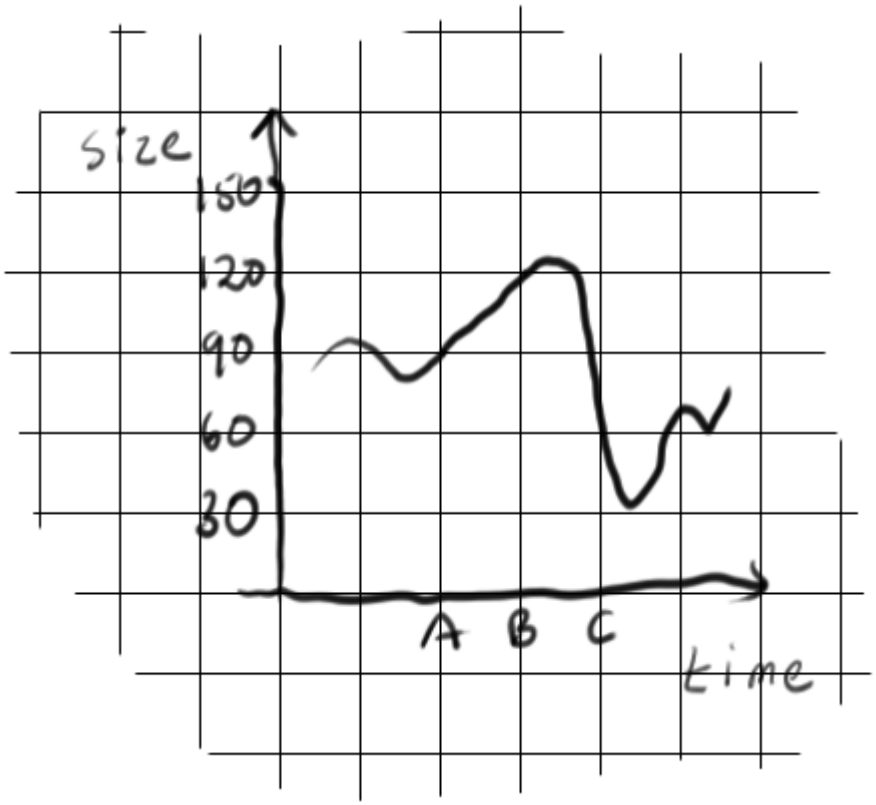
Type of Error:..... **[3]**

9 An artist is recording sound using a computer. The graph below represents the pressure wave of the sound being recorded.



(a) At point A on the graph, the size of the sound wave is 90. This is stored digitally using the binary value of 0101 1010 (or 5A in Hex).

Complete the table below to show how points B and C are stored:

	Point A	**Point B**	**Point C**
Size	90		
Binary Value	0101 1010		
Hex Value	5A		

[6]

(b)* Explain how sampling intervals and compression can affect the size of a sound file and the quality of its playback.

The quality of written communication will be assessed in your answer to this question.

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.... **[8]**

10 (a) Explain why a program written in a high level language needs to be translated before it can be executed.

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

(b) A compiler and an interpreter are two different types of translator.

Describe **one** difference between a compiler and an interpreter.

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

11 Zak is writing a program that uses an array called WordList. This array contains 10 foreign words in alphabetical order. The contents of the array are shown below.

WordList (1)	akesi
WordList(2)	esun
WordList(3)	jaki
WordList(4)	kala
WordList(5)	lipu
WordList(6)	mama
WordList(7)	nasa
WordList(8)	olin
WordList(9)	taso
WordList(10)	walo

(a) The value of WordList(1) is “akesi”.

Complete the following statements.

(i) The value of WordList(6) is ……

(ii) The value of WordList(.....) is “taso

[2]

Zak needs to write a routine that:

- allows the user to input a word
- goes through the items in the array WordList in turn, starting from the WordList(1)
- if it finds the word that the user has input, it outputs “Word found”.

(b) Write an algorithm for this routine in pseudocode.

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

Paper Total [80]

END OF QUESTION PAPER

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MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 80

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1</td><td>(a)</td><td></td><td>One mark per correct row
<table>
<tr><th></th><th>LAN Only</th><th>Both LAN and WAN</th></tr>
<tr><td>This can be used to check the books in another library.</td><td></td><td>✓</td></tr>
<tr><td>This can be used to send messages between the libraries.</td><td></td><td>✓</td></tr>
<tr><td>This will include a printer where users can print results of a search.</td><td>✓</td><td></td></tr>
<tr><td>Protocols are needed to allow the computers to communicate.</td><td></td><td>✓</td></tr>
</table></td><td>4</td></tr>
<tr><td></td><td>(b)</td><td></td><td>eg
User access levels
• Different users only have permissions to files/areas/services of the network ...
• ... which they actually need
• eg the public should only be able to search
• eg only employees should issue books
• eg only managers can look at pay records
• to prevent malicious or accidental corruption of parts of the network
Firewalls
• Stops all access to/from the WAN
• ... unless it has been authorised
• eg requests from other libraries/
• Prevents hackers
• ... from compromising the system
Max of 2 per measure</td><td>4</td></tr>
</table>

Question			Answer	Marks
2	(a)	(i)	A (single) binary digit/1 or 0	1
		(ii)	• A group of 8 bits Accept "the number of bits used to represent a character	1
	(b)		• Divide by 1024 5 kilobytes	2
3			eg • Immediately available... • ... so the shopkeeper can start using it straightaway • Tried and tested ... • ... and so less likely to have errors • No development costs... • ... as this has already been borne by the developer • More support available... • ... many other users who can provide help/third party help books, help lines or web sites available (marks in pairs)	4

Question			Answer	Marks
4	(a)		• Network: string/text/alphanumeric • CallLength: real/float/single/double • SameNetwork: Boolean • TotalCalls: integer • RunningCost :currency/real	5
	(b)	(i)	• TotalCalls = 11 • ... RunningCosts = 12.01	2
		(ii)	• TotalCalls = 12 (allow FT) • ... Running costs =12.51 (allow FT)	2
5	(a)		• A set of data ... • ... organised ... • ... as a set of records... • ... in one or more files.	2
	(b)		• Primary key: ChannelID • It is a unique identifier/Two channels can have the same ChannelName but they cannot have the same ChannelID 1 for primary key + any other 2 bullet points	2
	(c)	(i)	• ChannelID/The primary key of the CHANNEL table • ... is stored in the PROGRAMME table • ... where it is a foreign key	2
		(ii)	• Less data entry required • ...because programme and channel details are stored once • Avoids redundancy/don't have to repeat channel details for every programme on that channel • Avoids inconsistency (when channel data changes)	3

Question			Answer	Marks
6			High Level Response (5-6): A good discussion including both an explanation of reliability using relevant examples, and justifying the need for it. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. Medium Level Response (3-4) clear understanding of reliability and some attempt to provide examples and/or justify its importance. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. Low level response (0-2): There may be an attempt to define reliability, but the answer contains factual errors. Information will be poorly expressed and there will be a limited, if any, use of technical terms. Errors of grammar, punctuation and spelling may be intrusive. Points may include: • Reliability - Consistent performance - e.g. hardware performs as well under all weather conditions - Robustness - system does not crash easily/often • Importance of reliability - Traffic in the town will be affected - Potential danger/hazards - Consequential effects (eg loss of income for people in the town/the council becomes unpopular)	6

Question			Answer	Marks
7	(a)		• TRUE • TRUE • FALSE • TRUE (1 mark per answer, in the right order)	4
	(b)		Describe: • A small block of very high speed memory... • ... acting as a buffer • ... between the CPU and the main memory • Stores data/instructions which are used frequently by the CPU Explain • So the CPU does not have to access the main memory... • Which is slower than the cache	4
8	(a)		• The keyword AND has been misspelled • The symbol ADN will not be recognised • This breaks the rules of the language • Type of error: syntax error (1 mark for type of error, + any other 2)	3
	(b)		• it is adding instead of subtracting • it will produce the wrong result / answer will be bigger than 24 • Type of error: logic error	3
9	(a)		Point A: • Size: 120 • Binary: 0111 1000 • Hex: 78 Point B • Size: 60 • Binary: 0011 1100 • Hex: 3C	6

Question			Answer	Marks
	(b)		High Level Response (6–8): A detailed explanation of both sampling rate and compression. Their effect on sound quality is also explained. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. Medium Level Response (3–5): A clear understanding of either sampling rate or compression, with some of their effects explored. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. Low level response (0–2): They may be an attempt to explain sampling rate and/or compression, but the explanation is incomplete and/or contains significant factual errors; Information will be poorly expressed and there will be a limited, if any, use of technical terms. Errors of grammar, punctuation and spelling may be intrusive. Points may include: • Sampling Rate - how close together the samples are taken - the closer together, the more numbers need to be stored (and therefore larger file) - but the sound that is created is closer to the original analogue - mention of variable bit rates • Compression - use algorithms to make the file smaller (eg for transmitting over Internet) - and then recreated to be played - can be lossy (eg mp3) and the recreated file is of poorer quality - or lossless (eg flac) and the recreated file is exactly the same as it was before compression	**8**

Question			Answer	Marks
10	(a)		• High level language(HLL) is understood by humans • Computers/the CPU can only execute machine code instruction. • The translator converts a program in the HLL to an equivalent program in machine code	3
	(b)		• A compiler translates the entire program before execution • An interpreter translates one line, executes that line and then translates the next line • A compiler creates a list of errors after compilation • An interpreter stops after the first error • A compiler produces an independent executable file • An interpreted program needs the interpreter each time it is run • A compiled program is translated once • An interpreted program is translated each time it is run Marks in pairs, max 1 pair.	2
11	(a)	(i)	• mama	1
		(ii)	• 9	1

Question			Answer	Marks

	(c)		EXAMPLE:
			`INPUT SearchWord`
			`I = 0`
			`REPEAT`
			`I = I + 1`
			`IF WordList(I) = SearchWord THEN`
			`OUTPUT "Word Found"`
			`END IF`
			`UNTIL I = 10`
			`[Add FOR LOOP]`
			
			• input a word
			• Code contains a loop starting from item 1
			• … compares the word searched to the current item
			• … outputs "Word Found" if there is a match
			• loop stops when you get to item 10
			• … or when the item has been found
			• … or when the current word is higher in alphabet than the searchword.
				5

Question		AO1	AO2	AO3	Total
1	a	0	4	0	4
1	b	4	0	0	4
2	a	2	0	0	2
2	b	0	2	0	2
3		2	2	0	4
4	a	5	0	0	5
4	b	0	4	0	4
5	a	2	0	0	2
5	b	1	1	0	2
5	c	0	2	3	5
6*		0	0	6	6
7	a	4	0	0	4
7	b	2	2	0	4
8	a	1	2	0	3
8	b	1	2	0	3
9	a	6	0	0	6
9*	b	0	0	8	8
10	a	0	3	0	3
10	b	2	0	0	2
11	a	0	2	0	2
11	b	0	5	0	5
Totals		**32**	**31**	**17**	**80**