

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use
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General Certificate of Education  
June 2008  
Advanced Subsidiary Examination



## COMPUTING

CPT1 R

### Unit 1 Computing Systems, Programming and Networking Concepts

Friday 16 May 2008 9.00 am to 10.30 am

**You will need no other materials**  
You may use a calculator.

Time allowed: 1 hour 30 minutes

#### Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

#### Information

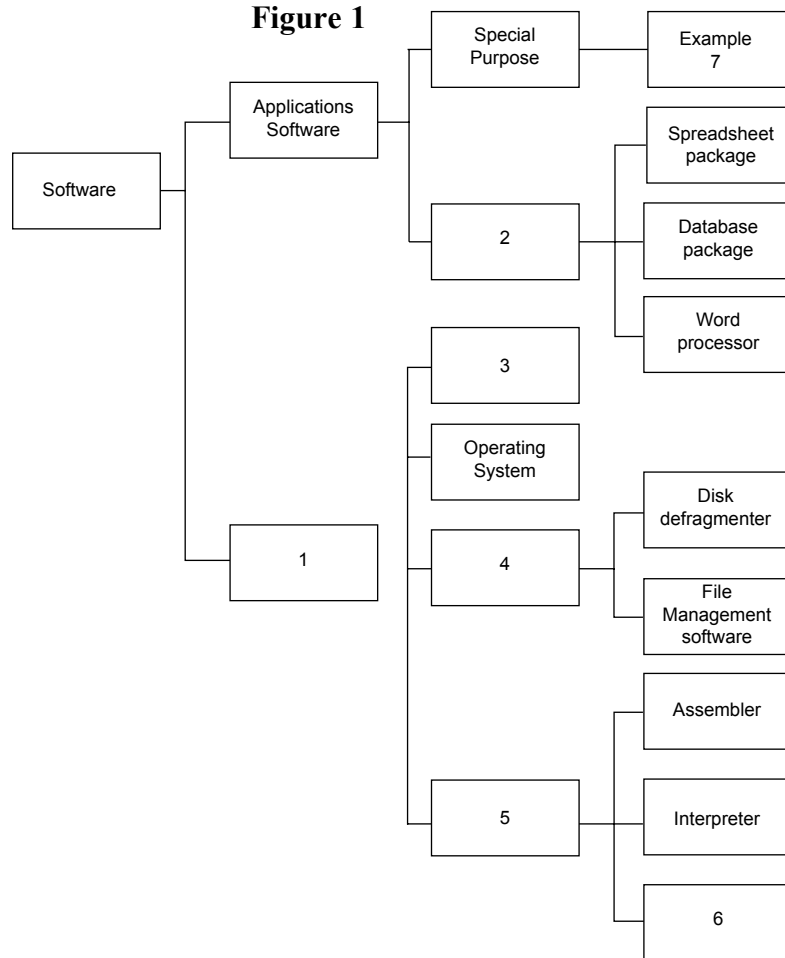
- The maximum mark for this paper is 65.
- The marks for questions are shown in brackets.
- The use of brand names in your answers will **not** gain credit.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3			
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			



Answer **all** questions in the spaces provided.

- 1 The diagram in **Figure 1** shows the classification of various types of software used on a computer system.



- 1 Complete the labelling of **Figure 1** by suggesting labels for 1 to 7 in the diagram.

Software classification:

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

Example:

7 .....

(7 marks)

2 A programmer developing a new application will choose a high level programming language. Typical modern software will provide an 'environment' in which all aspects of the application's development can be done.

2 (a) What feature must all program development environments have for the initial creation of the program code?

.....  
(1 mark)

2 (b) The next stage in the development may use a **compiler**.

Explain what a compiler does, and suggest **one** output which may result from the compilation process, other than the executable code.

.....  
.....

Output: .....  
(3 marks)

2 (c) An alternative to a compiler is an **interpreter**.

Explain how an interpreter attempts to run a program.

.....  
.....  
.....  
(2 marks)

2 (d) The program development environment has *both* a compiler and interpreter.

2 (d) (i) Give **one** advantage of using an interpreter.

.....  
.....  
(1 mark)

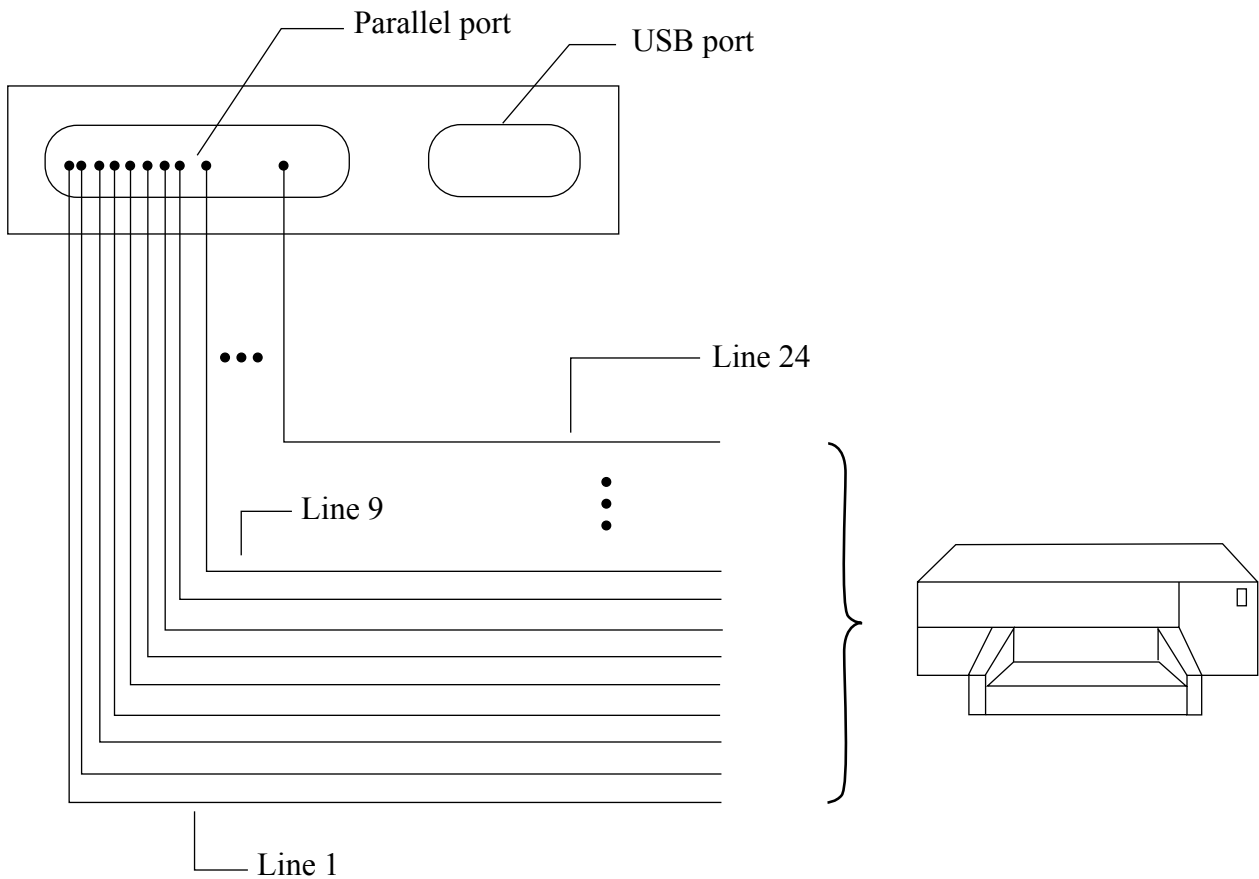
2 (d) (ii) Give **one** advantage of using a compiler.

.....  
.....  
(1 mark)



- 3 **Figure 2** shows two of the ports on the back of a student's home computer. The parallel port is connected to a laser printer.

**Figure 2**



The parallel port has 24 lines.

- Lines 1 to 7 are used for transfer of the data bits, with the byte's most significant bit transferred on line 1.
- Line 8 is used to transfer the parity bit when used.

- 3 (a) Give **one** use for any of the other lines (9 to 24) for the parallel port connection.

.....  
(1 mark)

- 3 (b) (i) Use the ASCII code table shown in **Table 1** to write the **7-bit ASCII binary code** for character 'j'.

.....  
(1 mark)



**Table 1**  
ASCII Code Table (part only)

Character	Decimal	Character	Decimal	Character	Decimal	Character	Decimal
<Space>	32	9	57	j	106	t	116
0	48	a	97	k	107	u	117
1	49	b	98	l	108	v	118
2	50	c	99	m	109	w	119
3	51	d	100	n	110	x	120
4	52	e	101	o	111	y	121
5	53	f	102	p	112	z	122
6	54	g	103	q	113	(	40
7	55	h	104	r	114	)	41
8	56	i	105	s	115	:	58

- 3 (b) (ii) Characters are transmitted as an 8-bit code which includes a **parity bit** (in the most significant bit position of the byte) using **even parity**.

Give the 8-bit binary code for the character 'j'.

.....  
(1 mark)

- 3 (b) (iii) The character 'j' is sent to the laser printer.

Write on **Figure 2** the pattern of bits when this character is transmitted using even parity.  
(3 marks)

- 3 (c) The parallel port uses a protocol called handshaking for the transfer of data.

- 3 (c) (i) What is meant by the term *protocol*?

.....  
.....  
(1 mark)

- 3 (c) (ii) What is meant by the term *handshaking*?

.....  
.....  
.....  
(2 marks)

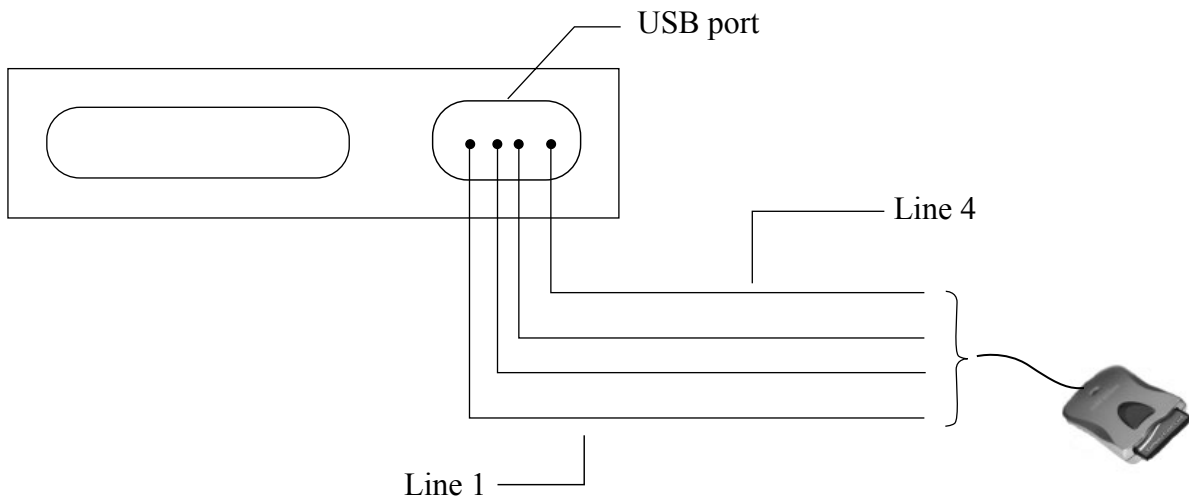
Question 3 continues on the next page

Turn over ►



- 3 (d) The USB port is connected to a card reader for a flash memory card which the student regularly uses to transfer files from the school's computer system to the student's home computer.

**Figure 3**



The **USB connection** uses 4 lines (wires).

- Line 1 is used to transfer data from the card reader to the home computer.
- Line 2 is used to transfer data from the home computer to the card reader.
- The most significant data bit is always transferred first.

- 3 (d) (i) What does USB stand for? .....  
(1 mark)

- 3 (d) (ii) The USB port is currently in use transferring a spreadsheet file from the memory card to the PC.

Write on **Figure 3** the pattern of bits showing the transfer of the character 'j'.  
(2 marks)

- 3 (d) (iii) Define the term bit rate.

.....  
.....  
(1 mark)



4 **Figure 4 and Figure 5 show two different versions of a small section of a program.**

**Figure 4**

Load	113,	R1
Load	114,	R2
Load	115,	R3
Add	R1,	R2
Add	R3,	R2
Store	R2,	160
End		

**Figure 5**

(a) Main memory		
100	10000000	01110001
101	10000001	01110010
102	10000010	01110011
103	11110000	00000000
104	11110011	00000000
105	00010001	10100000
106	00000000	00000000

4 (a) In **Figure 5** the label is missing from the column showing 100 to 106.

What should this label be? ..... (1 mark)

4 (b) What generation of programming language is shown in **Figure 4**?

..... (1 mark)

4 (c) The code as written by the programmer is shown in **Figure 4**. A translator program is needed to produce a version of the code the processor can execute.

4 (c) (i) What is this translator program called?

..... (1 mark)

4 (c) (ii) Following the translation process various outputs will be produced. One output from this translation is the machine code executable file.

Name **one** other possible output ..... (1 mark)

**Question 4 continues on the next page**



- 4 (d) Many digital computers operate on the stored program concept.

Explain the *stored program concept*.

.....

.....

.....

.....

(4 marks)

- 5 **Figure 6** shows the address bar of a web browser.

- 5 (a) This is used to access various websites.

**Figure 6**



- 5 (a) (i) What does 212.219.90.65 represent?

.....

(1 mark)

- 5 (a) (ii) Another way to access a website is to key a **URL** into the address bar.

What does URL stand for?

.....

(1 mark)

- 5 (b) Name and describe **two** features you would expect to find on the browser's menu or toolbar which are specific to browser software.

1. Feature: .....

Description: .....

2. Feature: .....

Description: .....

(2 marks)





- 5 (c) AQA Wanderers are a local soccer club which has a website. The club's players and members frequently access this website using the URL:

<http://www.footyhosting.co.uk/aqawanderers/home.asp>

The club pay an annual subscription to the company Footy Hosting Ltd to host the club's site. The company also hosts the sites for hundreds of other soccer clubs.

- 5 (c) (i) What is the **domain name** of the website being accessed?

..... (1 mark)

- 5 (c) (ii) Explain from the URL shown, how the company may have organised the storage of the pages for all the clubs it manages on its web server.

..... (1 mark)

- 5 (d) The soccer club's own computer is used to manage and upload the page content for AQA Wanderers and is done using a broadband connection.

Select from the list below **the most probable value** for the **transfer rate** of the data using the broadband connection. Put a circle around your answer.

20 MB      1.6 GHz      200 bps (bits/sec)      2 Mbps      128 Kbps  
(1 mark)

- 5 (e) The website for a single soccer club takes up approximately 5GB of storage space.

Footy Hosting Ltd currently has 500 clubs as customers and hopes to double this by the end of 2009.

- 5 (e) (i) What type of secondary storage is used for a web server?

..... (1 mark)

- 5 (e) (ii) Select from the list below **one** value for the minimum size of web server required to host the sites for all clubs (including the proposed expansion in business). Put a circle around your answer.

50 MB      500 MB      20 GB      100 GB      8000 GB  
(1 mark)

- 6 (a) (i) Explain what is meant by a pixel.

.....

.....

(1 mark)

- 6 (a) (ii) How are pixels encoded to form a bitmapped image?

.....

.....

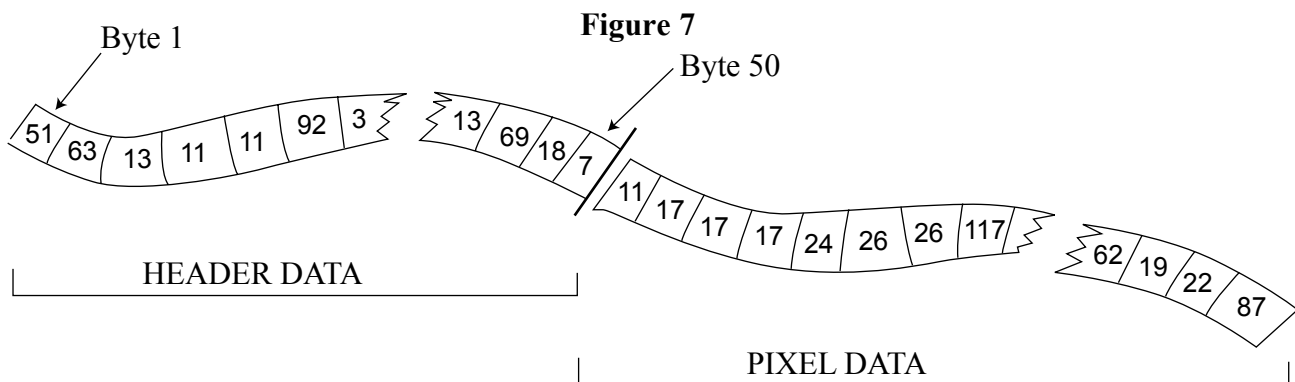
(1 mark)

- 6 (b) Images can be saved in a bitmapped image file as a '**256 colour bitmap**'.

How many bytes are used to store each pixel? .....

(1 mark)

- 6 (c) The first 50 bytes of these bitmapped files are used for **header data**. See **Figure 7**.



Name **two** items of data which should be included and stored in the file header.

1. ....
2. ....

(2 marks)

- 6 (d) A high level programming language has a function `ReadImageByte` which is used to read the contents of a bitmapped image file.

It is defined in the help files as follows:

`Function ReadImageByte : Byte`

The function `ReadImageByte` returns the next byte of data from a bitmapped image.



The pseudo-code that describes the process of reading the contents of the file header data is shown below.

Procedure ReadHeaderData

For Position  $\leftarrow$  1 To 50 Do

CurrentHeader [Position]  $\leftarrow$  ReadImageByte

EndFor

EndProcedure

- 6 (d) (i) Complete the identifier information in **Table 2** for this pseudo-code.

**Table 2**

Variable Identifier	Data Type	Description
Position	Integer	
Current Header		Stores the header data

(2 marks)

The first four bytes of the header data are:

First	Second	Third	Fourth
51	63	13	11

- 6 (d) (ii) What **binary value** will be assigned to variable CurrentHeader[3]?

.....

(1 mark)

**Question 6 continues on the page 13**



**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**



- 6 (e) The width and height of the bitmapped image are stored by variables `ThisWidth` and `ThisHeight`.

A procedure `ReadPixelData` is to read the remaining contents of the bitmap image i.e. the bytes which represent the individual pixels and to organise these as an image grid as shown in **Figure 8**.

**Figure 8**

Byte 51	11	17	17	17	24	26	26	117	Byte 58
Byte 59	19	50	25	96	96	24	24	113	
	18	114	22	87	13	29	31	45	
	81	96	28	87	29	49	45	45	
	39	101	28	28	62	19	22	87	Byte 98

- 6 (e) (i) Complete the gaps in the pseudo-code below.

```

Procedure ReadPixelData
    For X ← 1 To ThisHeight Do
        For Y ← 1 To ..... Do
            ThisByte ← ReadImageByte

            ByteData [ ....., Y] ← ThisByte
        EndFor
    EndFor
EndProcedure

```

(2 marks)

- 6 (e) (ii) What data structure has the programmer used for variable `ByteData`?

.....  
(1 mark)

**Question 6 continues on the next page**



- 6 (f) A graphics studio has produced all the graphic images for a new computing textbook.

The images all need to be 'tidied up' and, rather than edit every one with graphics software, it is suggested that the task be given to a computer programmer who will, for each image:

- remove the top row of pixels, and
- remove all the pixels in the first two columns - see **Figure 9**.

**Figure 9**

Byte 51	255	255	255	255	255	255	255	255	Byte 58
Byte 59	255	25	25	96	96	24	24	113	
	255	114	22	87	13	29	31	45	
	255	96	28	87	29	49	45	45	
	255	101	28	28	27	71	23	23	Byte 98

The ReadPixelData procedure is to be refined so that not all pixels will be retained.

**The enclosed pixels in Figure 9 are those to be retained** and these bytes will be written to an array Final. These pixels, together with the header data bytes, will form the amended bitmapped file.

The test pixel data shown in **Figure 9** are to be used to trace the amended ReadPixelData procedure.

```

1  ThisWidth = 8
2  ThisHeight = 5
3  Call ReadPixelData

```

```

Procedure ReadPixelData
  Counter ← 0
  For X ← 1 to ThisHeight Do
    For Y ← 1 to ThisWidth Do
      ThisByte ← ReadImageByte
      If (X>1 AND Y>2) Then
        Final [Counter] ← ThisByte
        Counter ← Counter + 1
      EndIf
    EndFor
  EndFor
EndProcedure

```



Trace the execution of the pseudo-code **for two iterations only** of the outer loop (the loop controlled by variable X) by completing **Figure 10**.

**Figure 10**

ThisWidth	ThisHeight	Counter	X	Y	ThisByte		Final
8	5					[0]	
						[1]	
						[2]	
						[3]	
						[4]	
						[5]	
						[6]	
						[7]	
						[8]	
						[9]	
						[10]	
						[11]	
						[12]	
						[13]	
						[14]	
						[15]	

(6 marks)

- 6 (g) In this question identifier names have been used in the design for variables and procedure and function names.
- 6 (g) (i) Name **one** other program element for which the programmer would allocate an identifier name.

.....  
(1 mark)

Question 6 continues on the next page

Turn over ►



- 6 (g) (ii) Programming languages impose restrictions about the choice of identifier names; for example a <Space> character cannot be included.

State **two** other restrictions in a programming language with which you are familiar.

.....

.....

(2 marks)

20
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**END OF QUESTIONS**

