Write your name here

Surname	Other names

Pearson Edexcel
Level 1/Level 2
International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Computer Science

Paper 1: Principles of Computer Science

Sample assessment material for first teaching
September 2017
Time: 2 hours

Paper Reference
4CP0/01

You must have:
A pseudocode reference

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- You are not allowed to use a calculator.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Marks will not be awarded for using product or trade names in answers without giving further explanation.

Turn over ▶

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1/1

S 5 4 9 6 3 A 0 1 2 2

Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 Characters, numbers and colours are examples of data that can be represented in a computing device.

(a) Give **one** limitation of the ASCII character set.

(1)

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.....

(b) Complete the table to show the results of applying a Caesar cipher.

(3)

Plain text	Shift	Cipher text
WINDOW	+4	
	-3	AOFSB
CACHE		ECEJG

(c) Here is a string of data.

S S S S B W W

Convert the string using a run-length encoding algorithm.

(1)

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.....

.....

(d) Identify the 8-bit binary equivalent of the denary number 77.

(1)

- ☒ **A** 01001101
- ☒ **B** 01101100
- ☒ **C** 11000111
- ☒ **D** 10110010

(e) One characteristic of lossy compression is that it makes files smaller.

Give **one** other characteristic of lossy compression.

(1)

.....

.....

(Total for Question 1 = 7 marks)

2 Networks are composed of hardware components arranged in topologies. They use protocols and addresses to make sure that data can be exchanged between nodes.

(a) This is an example of an IPv4 address: 192.168.1.253

The expression for the maximum number of IPv4 addresses is $2^8 \times 2^8 \times 2^8 \times 2^8$

An example of an IPv6 address is 2001:2a4c:9d38:6abd:1820:43fc:3f57:febc

Construct an expression for the maximum number of IPv6 addresses.

(2)

.....

.....

.....

(b) An IPv6 address can be represented in hexadecimal and binary.

(i) Identify the binary equivalent of the hexadecimal number C4.

(1)

- ☒ **A** 11000011
- ☒ **B** 11010100
- ☒ **C** 11000100
- ☒ **D** 11010011

(ii) Identify the result of a logical shift left by 2 when applied to 00011011.

(1)

- ☒ **A** 01101111
- ☒ **B** 00011100
- ☒ **C** 00101100
- ☒ **D** 01101100

(c) A ring is a type of network topology.

Give **one** reason why there are no collisions on a ring network.

(1)

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.....

(d) A simplified TCP/IP model can be represented using four layers.

(i) Three of the layers are Data Link, Transport and Network.

State the order of these layers from the highest to the lowest.

(1)

1 .....

2 .....

3 .....

(ii) A web browser sends a request to a web server.

State the name of the TCP/IP layer that first handles this request.

(1)

.....

.....

(Total for Question 2 = 7 marks)

3 A team of researchers are studying urban wildlife, such as foxes, mice, and birds. The team collect data during the day and night. Sometimes, they work in an office.

(a) The team:

- use a range of hardware, including laptops, tablets, and smartphones
- use different operating systems and applications
- communicate with each other using smartphones or tablets
- store and share data, including images, audio recordings and videos
- work collaboratively on research documents.

Identify the secondary storage medium most suitable for the team and justify why it best meets their needs.

Write your answer on the next page. You do not need to use all of the space.

(6)

Answer to question 3(a)

(b) The team communicate using their smartphones.

Identify the type of network they use when making calls via the cellular/mobile phone network.

(1)

- ☒ **A** WAN
- ☒ **B** LAN
- ☒ **C** PAN
- ☒ **D** VPN

(c) Give **two** drawbacks of using a cellular/mobile phone network such as 3G, 4G, or 5G.

(2)

1 .....

.....

2 .....

.....

(d) The team analyse the data when they are in the office. They have to log on to the office network using a username and password to access the data.

State the type of network usage model they use.

(1)

.....

.....

(e) The team use a software application and the data they have collected to create a **model** of urban wildlife in order to understand more about the environment wildlife live in.

Examples of data collected:

- number and type of animals seen each hour
- number of newborn animals
- daily weather conditions
- type and amount of food available.

Describe **one** way the team could use the model to help them to research the urban wildlife environment.

(2)

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(Total for Question 3 = 12 marks)

4 In a computing device, the software is executed by the hardware.

Figure 1 is a diagram of the inside of a computer.

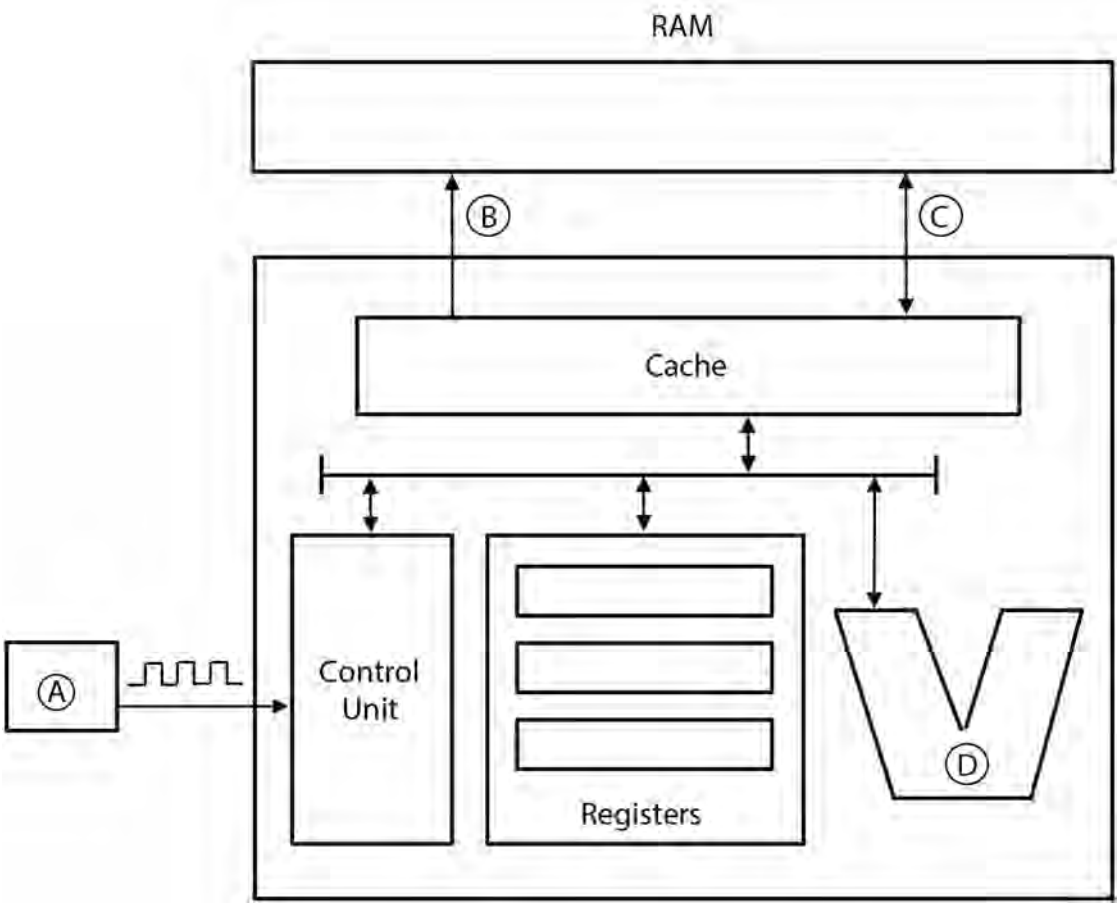

Figure 1

(a) Use the information in Figure 1 to answer these questions.

(i) Name the items labelled A, B, C, and D.

(4)

A .....

B .....

C .....

D .....

(ii) Describe **one** function of the cache.

(2)

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(b) Tom has just bought a computer. He opened an executable email attachment from someone he did not know. Since then, all of his email contacts have reported receiving hoax emails from his email address.

State **two** actions that Tom can take to resolve this problem using utility software.

(2)

1 .....

.....

2 .....

.....

(c) The Internet of Things (IoT) is a networking development where everyday objects, such as cars and shipping crates, can send and receive data.

(i) Identify the name for this type of system.

(1)

☒ **A** Decomposed

☒ **B** Agent-based

☒ **C** Embedded

☒ **D** Optimised

(ii) Golf balls can now be part of the IoT. One manufacturer uses an RFID (radio-frequency identification) tag for this purpose.

Describe how the functionality of these new golf balls could be used.

(2)

(Total for Question 4 = 11 marks)

5 Some research has shown that the use of technology promotes a sense of belonging. This type of research is usually supported by the use of online questionnaires.

(a) Describe **one** way in which the use of technology makes us a more inclusive society.

(2)

(b) All the 15-year-old students in a school have completed questionnaires about the number of computing devices they can access.

Data is coded **S** for smartphone, **T** for tablet and **L** for laptop.

(i) Complete the truth table to show the result of each expression.

(2)

S	T	NOT S	NOT S OR T
0	0		
0	1		
1	0		
1	1		

(ii) Construct a Boolean logic statement to show that a student has a tablet or a smartphone, as well as a laptop.

(1)

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(iii) The questionnaire asks for the number of smartphones a student can access.

One student enters -38 (negative) in error.

Convert -38 to two's complement. Use 8-bit binary. Show your working.

(3)

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(Total for Question 5 = 8 marks)

6 Music, photographs and videos are some of the most popular items stored on computing devices.

(a) Photographs are made up of tiny blocks of colour.

Identify the name given to each block of colour.

(1)

- ☒ **A** Resolution
- ☒ **B** Pixel
- ☒ **C** RGB
- ☒ **D** Bitmap

(b) An image has a colour depth of 2 bits.

Describe how a colour depth of 2 bits limits the number of colours that can be represented.

(2)

(c) A 4 mebibytes audio recording is stored on a hard disc.

Construct an expression to show how to convert 4 mebibytes to bits.

(3)

(d) An analogue sound is never fully reproducible in a digital format.

Explain why this statement is true.

(4)

(Total for Question 6 = 10 marks)

7 Algorithms can be designed using pseudocode or flowcharts. Then, they need to be translated into code that a computing device can execute.

Figure 2 shows the pseudocode for an algorithm.

```
# This is the pseudocode for an algorithm
SET inNum TO 0
SET result TO 1
SET i TO 0

SEND "Enter a number: " TO DISPLAY
RECEIVE inNum FROM (INTEGER) KEYBOARD

IF (inNum < 0) THEN
   SEND "Invalid input" TO DISPLAY
ELSE
    IF (inNum = 0) THEN
        SEND "Answer is 1" TO DISPLAY
    ELSE
        FOR i FROM 1 TO inNum DO
            SET result TO result * i
        END FOR
        SEND "The answer is " & result TO DISPLAY
    ENDIF
ENDIF
```

Figure 2

(a) Use the information in Figure 2 to answer these questions.

(i) Complete the table to show the output for the given input.

(3)

Input	Output message
0	
-12	
5	

(ii) State the purpose of this algorithm.

(1)

.....

.....

.....

.....

(b) A bus company sets fares for different groups of passengers.

The fares are:

- a child fare for passengers 15 years old and younger
- a senior fare for passengers 65 years old and older
- a full fare for all other passengers.

Construct a flowchart of an algorithm that will determine the fare for one passenger when an age is input.

No validation of input is required.

(5)

(c) Complete the table, indicating with a (✓), to show the characteristics of program language translators.

You may select more than one translator per characteristic.

(3)

	Translators		
Characteristic	**Compiler**	**Interpreter**	**Assembler**
An error in the source code is highlighted as soon as it is encountered during execution.			
Translates low-level programming languages.			
Translates high-level programming languages.			
Generates a single executable file.			
One line of source code is translated to one line of machine code.			

(Total for Question 7 = 12 marks)

8 Security is a big concern when using computers. It is also an important consideration as new applications are developed.

(a) Identify the software which protects against unauthorised access to a networked computer.

(1)

- ☒ **A** HTTPS
- ☒ **B** Antivirus
- ☒ **C** Anti-spyware
- ☒ **D** Firewall

(b) Explain why a person attempting to gain unauthorised access to a networked computer can sometimes benefit the owner of the network.

(2)

(c) Users are forced to change their passwords every 28 days. This requires an algorithm that reports the days in any given month.

The algorithm must report the number of days in a month based on a number entered (e.g. 1 = January, 2 = February etc.).

This pseudocode algorithm does not produce accurate results. These are the test results.

Input	Expected behaviour	Actual behaviour
2	The month is February and it has 28 days.	The month is March and it has 31 days.
13	The month number 13 is not valid.	Potential runtime error: index out of range.
-4	The month number -4 is not valid.	Potential runtime error: index out of range.

Figure 3 shows the errors are on lines 12, 13, and 14.

```
1
2  SET monthNames TO ["January", "February", "March", "April",
3                     "May", "June", "July", "August", "September",
4                     "October", "November", "December"]
5
6  SET monthDays TO [31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31]
7
8  SEND "Enter the month number.  0 to exit." TO DISPLAY
9  RECEIVE number FROM (INTEGER) KEYBOARD
10
11 WHILE NOT (number = 0) DO
12     IF (number > 1) OR (number < 12) THEN
13         SET month TO monthNames[number]
14         SET days TO monthDays[number]
15
16         SEND "The month is " & month & " and it has " & days & "days."
17     ELSE
18         SEND "The month number: " & number & " is invalid."
19     ENDIF
20
21     SEND "Enter the month number.  0 to exit." TO DISPLAY
22     RECEIVE number FROM (INTEGER) KEYBOARD
23
24 END WHILE
```

Figure 3

Write the corrected replacement codes for lines 12, 13, and 14.

(4)

Line 12 .....

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Line 13 .....

.....

Line 14 .....

.....

(d) A group of programmers is developing a software application that will be used over a network. It is very important that the software application has no security vulnerabilities.

Discuss how the programmers could minimise security vulnerabilities during development.

(6)

(Total for Question 8 = 13 marks)

TOTAL FOR PAPER = 80 MARKS