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 ▶

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 Computers are made up of both hardware and software components.

(a) Computers use a three-step computational model.

Complete the diagram with the names of the **three** steps.

(3)

```
┌─────────────┐        ┌─────────────┐        ┌─────────────┐
│             │  ───▶  │             │  ───▶  │             │
└─────────────┘        └─────────────┘        └─────────────┘
```

(b) Identify the hardware component responsible for controlling the fetch-decode-execute cycle.

(1)

☒ **A** Cache

☒ **B** Central processing unit

☒ **C** ROM

☒ **D** Address bus

(c) Von Neumann developed the stored program concept that permits two different types of item to reside in memory.

Name these **two** types.

(2)

1 ....

....

2 ....

....

(d) Some computers use virtual memory.

Explain how virtual memory works.

(2)

....

....

....

....

(e) An optical storage device writes data onto a CD or DVD.

Describe how data is stored physically on optical media.

(2)

....

....

....

....

(f) A disc-formatting program is an example of a type of software.

Identify the type.

(1)

☒ **A** Security software

☒ **B** Application software

☒ **C** Translation software

☒ **D** System software

(Total for Question 1 = 11 marks)

2 Zafer and Robert work for a company that makes washing machines.

(a) Zafer writes user manuals for the washing machines.

He stores these documents in the cloud.

Zafer and the cloud storage provider share responsibility for data security.

State **one** area of responsibility for each of them.

(2)

Zafer

....

....

Cloud storage provider

....

....

(b) Robert programs the robots that make the parts for the washing machines.

Zafer writes the user manuals.

Robert and Zafer have different levels of access to folders and files on the company network.

The different levels of access are Read, Write, Execute and None.

Complete the table to show the levels of access that each has.

(2)

	Robert	**Zafer**
Washing machine design drawings		
A folder of manuals for new machines		

(c) Zafer uses a browser to view pages on Pearson's website by typing a uniform resource locator into a browser. This is shown in **Figure 1**.
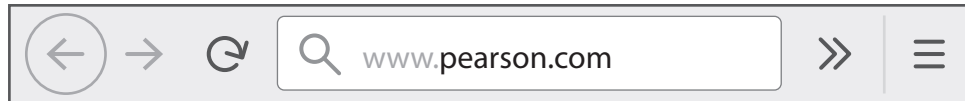
| ← | → | ⟳ | 🔍 www.pearson.com | » | ≡ |

Figure 1

Pearson's machine	Zafer's machine
MAC address: 03-57-00-EC-4B-30	MAC address: 00-15-00-BC-9A-90
IPv4 address: 2.20.38.113	IPv4 address: 192.168.1.78
IPv4 Subnet Mask: 255.255.0.0	IPv4 Subnet Mask: 255.255.255.0
Website domain: www.pearson.com	Web browser
Main web page: https://www.pearson.com/uk/	Uniform resource locator: www.pearson.com

A domain name server is used in this process.

Identify the input to and the output from the domain name server.

(2)

Input

....

....

Output

....

....

(d) Zafer can use a desktop or a tablet computer to connect to the internet.

Only the tablet has wireless capabilities.

The diagram shows the components used to connect to the internet.

Complete the diagram to show how the desktop and the tablet are connected to the internet.

(6)

Desktop	Modem
Tablet	Switch	Internet Service Provider
	Router	Rest of internet
	Wireless Access Point (WAP)	
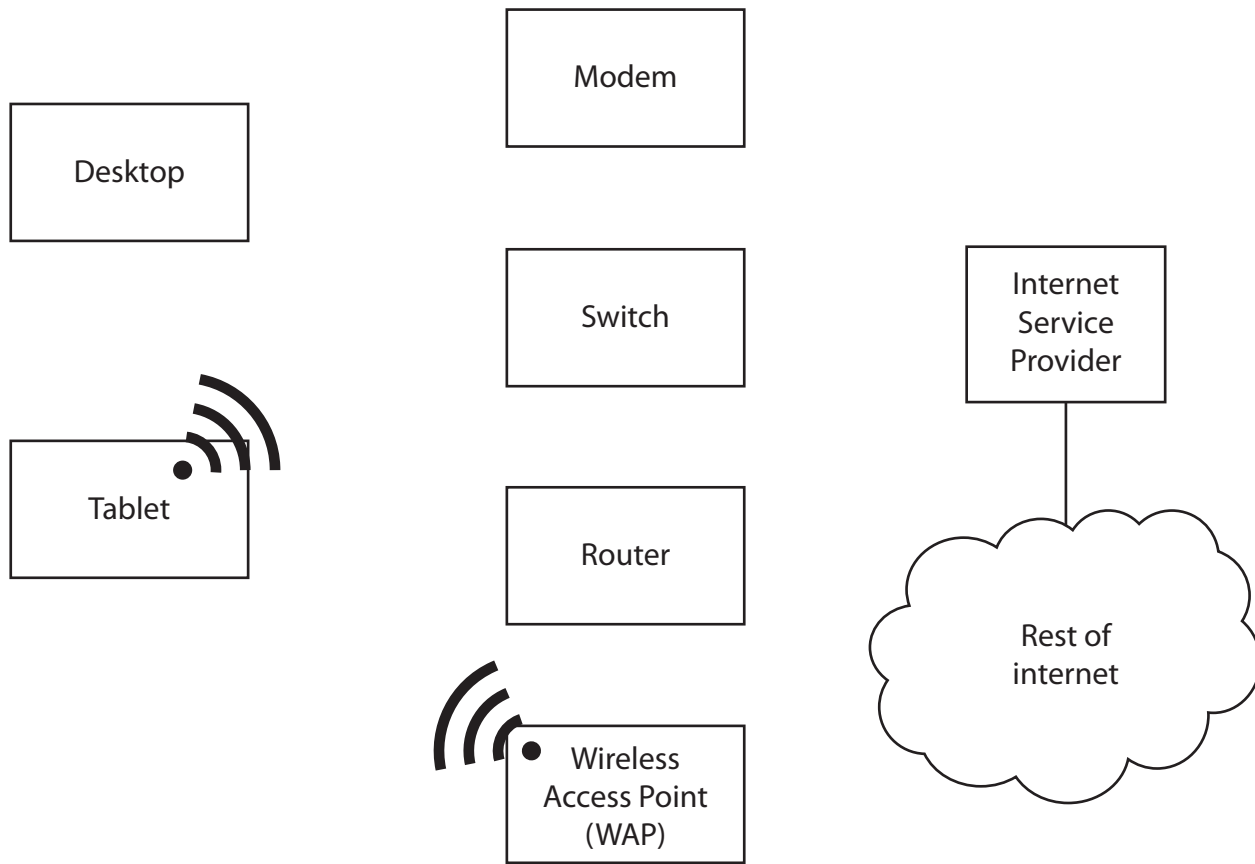
(Total for Question 2 = 12 marks)

3 Isra works in an office building where she has access to different types of network.

(a) Isra uses different types of networks for different tasks.

(i) Name the type of network she uses to print a document on the printer in the office next door.

(1)

....

....

(ii) Name the type of network she uses to order stationery from an online supplier.

(1)

....

....

(b) Identify the measurement used for network data speeds.

(1)

☒ **A** Megabits per second

☒ **B** Megapixels per second

☒ **C** Mebicycles per second

☒ **D** Mebihertz per second

(c) Isra uses her tablet computer and smartphone to access email.

She wants to set up a new email account.

State the email protocol she should use.

Justify your choice.

(3)

Email protocol

....

....

Justification

....

....

....

(d) The table describes characteristics of different network topologies.

Complete the table to match each characteristic to **one** network topology.

(4)

Characteristic	Bus	Ring	Star	Mesh
Network performance degrades as more devices are added.	☒	☒	☒	☒
All devices are directly connected to all others.	☒	☒	☒	☒
Each node has a physical attachment to a routing device.	☒	☒	☒	☒
There are no data collisions, because packets travel in the same direction.	☒	☒	☒	☒

(e) Information sent across networks is represented in bit patterns.

(i) The bit pattern 1101 0001 uses sign and magnitude representation.

Convert this bit pattern to a denary number.

(2)

....

....

....

....

(ii) Convert the denary number 75 to 8-bit binary.

(2)

....

....

....

....

P 6 1 8 8 0 A 0 9 2 4

(iii) The addition of these two 8-bit binary patterns generates an error condition.

0	1	1	0	1	1	0	1	
1	1	0	0	0	0	0	0	+
0	0	1	0	1	1	0	1	

Explain this error condition.

(2)

....

....

....

....

(Total for Question 3 = 16 marks)

P61880A01024

4 One function of an operating system is file management.

(a) Both kibibyte and kilobyte can be used as measures of file size.

Compare kibibyte and kilobyte.

(2)

....

....

....

....

(b) An image is 2322 pixels high and 4128 pixels wide.

The image is stored with a 16-bit colour depth.

The metadata for the image is 975 bytes.

Construct an expression to show how the file size, in megabytes, is calculated.

You do **not** need to do the calculation.

(4)

(c) Operating systems often include compression software for reducing file sizes.

(i) Give **two** reasons for reducing file sizes.

(2)

1 ....

....

2 ....

....

(ii) Give **two** drawbacks of using compression software.

(2)

1 ....

....

2 ....

....

(d) A text file is stored on a hard disc.

The file holds information from one side of a sheet of paper.

The sheet of paper is represented as a grid, 80 columns wide and 66 rows long.

Each cell in the grid contains a single 2-byte Unicode character.
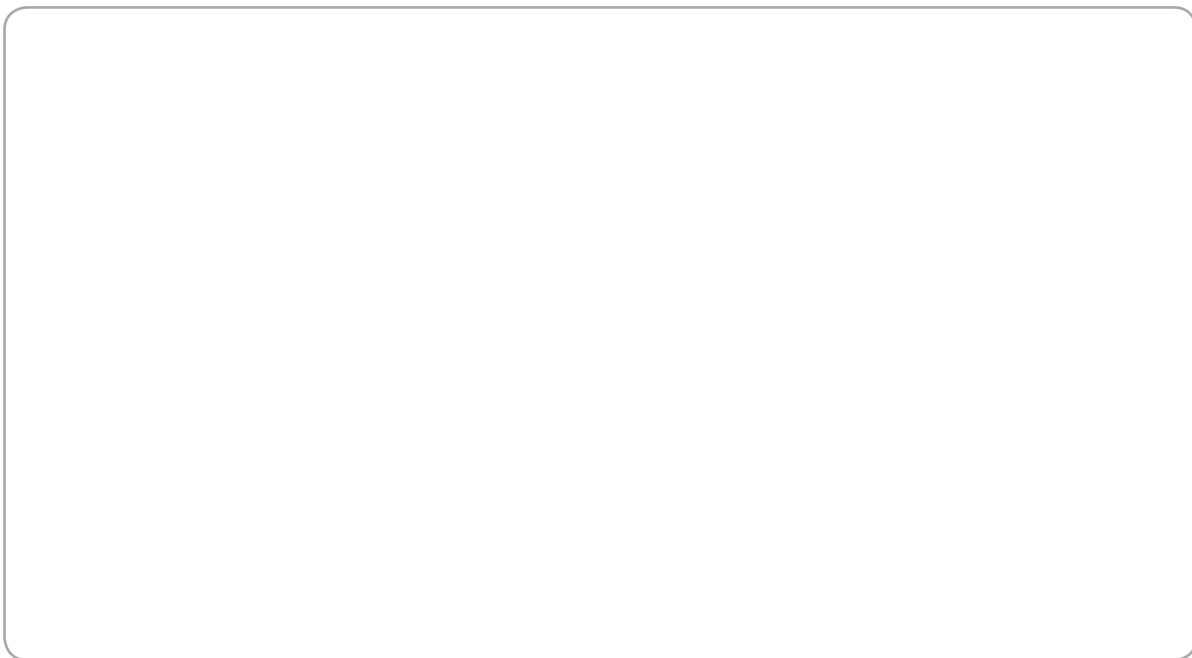
The file also contains 40 characters of metadata.

The hard disc allocates space in blocks of 1024 bytes.

Construct an expression to show the number of blocks required to store the file.

You do **not** need to do the calculation.

(4)

(Total for Question 4 = 14 marks)

5 Ships carry cargo around the world in containers.

(a) Containers come in two sizes.

Figure 2 shows an algorithm written using flowchart symbols.

Figure 2

(i) Complete the table to show the output for each cargo item.

(3)

Cargo item			Output
width	**length**	**height**	
4	4	2	
2	2	2	
3	8	5	

(ii) State the purpose of the algorithm in **Figure 2**.

(1)

....

....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Each ship is registered to a state.

Figure 3 shows a partially completed algorithm written in pseudocode.

The completed algorithm must:

- print each state to the display on a new line

- count the number of states

- create a message as a single string (e.g. there are *number* states)

- print the message to the display.

Complete the algorithm in the space provided in **Figure 3**.

(4)

```
SET numStates TO 0

SET states TO ["France", "Singapore", "Malta", "Panama", "Greece", "Italy"]




FOR EACH state FROM states DO









END FOREACH
```
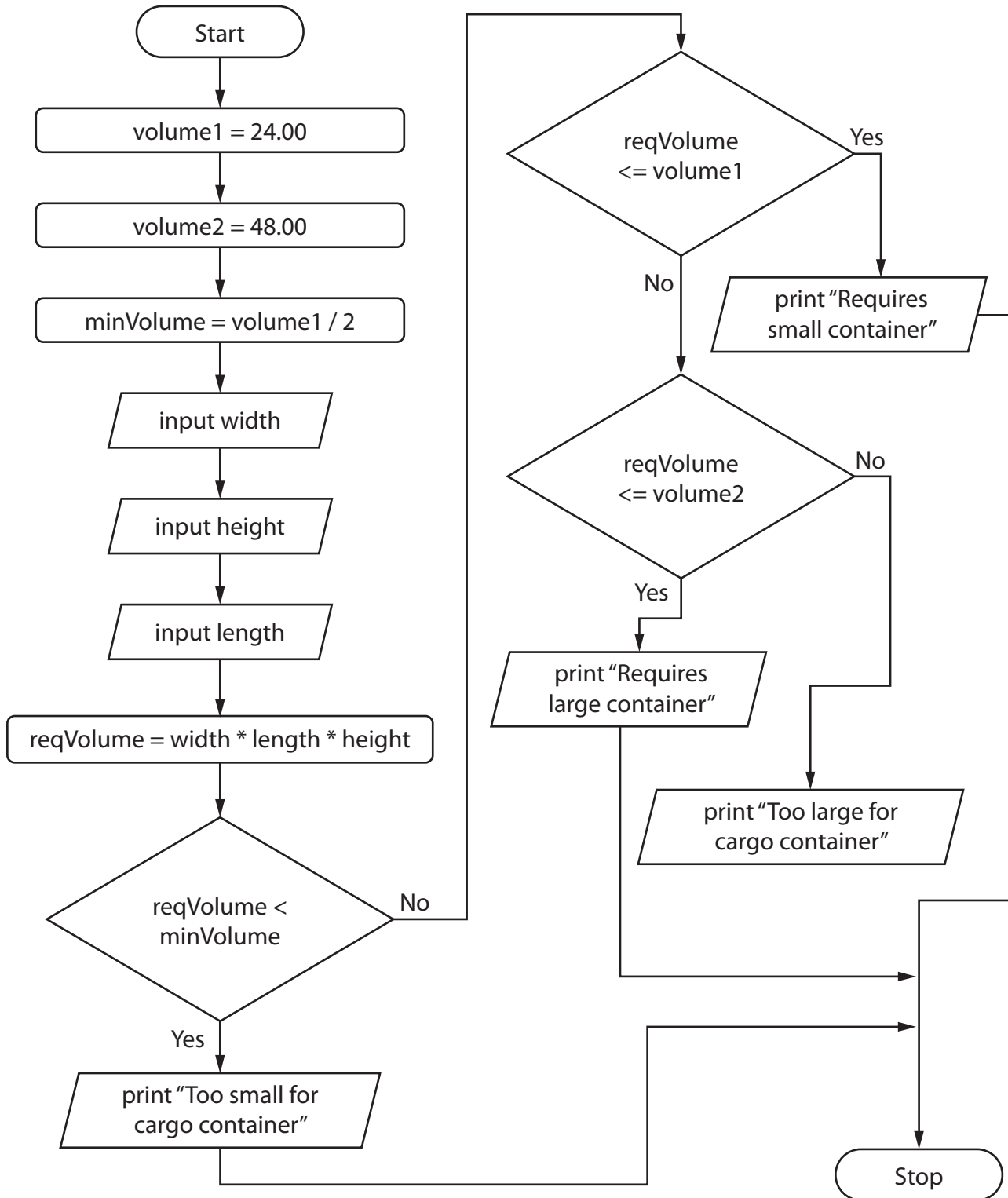
Figure 3

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Cargo ships have maximum weight loads.

Figure 4 shows an algorithm written using pseudocode.

The algorithm should identify the size of cargo ship required for any load.

There is an error on line 9.

```
2    SET loadWeight TO [20000, 28000, 40000, 50000]
3    SET index TO 0
4    SET found TO FALSE
5
6    SEND "Enter cargo weight" TO DISPLAY
7    RECEIVE target FROM (INTEGER) KEYBOARD
8
9    WHILE (NOT found) DO
10        IF (loadWeight [index] >= target) THEN
11            SEND loadWeight [index] TO DISPLAY
12            SET found TO TRUE
13        ELSE
14            SET index TO  index + 1
15        END IF
16   END WHILE
17
18   IF (NOT found) THEN
19        SEND "No ship available" TO DISPLAY
20   END IF
```

Figure 4

(i) Trace tables are used to identify errors in algorithms.

Complete the trace table for an input of 50500 to show what happens due to the error on line 9 in the pseudocode in **Figure 4**.

You may not need to fill in all the rows in the table.

(2)

target	found	index	loadWeight[index]
50500	FALSE	0	

(ii) Construct a single line of pseudocode to correct line 9.

(2)

....

....

....

....

(Total for Question 5 = 12 marks)

6 A train company uses ticket vending machines at each station.

(a) The machines use embedded systems.

(i) Explain **one** benefit of using an embedded system in these machines.

(2)

....

....

....

....

(ii) Customers use a touch screen to select their destination. They can pay by cash or bank card. Their tickets and a receipt are printed.

The touch screen is controlled by an embedded system.

Give **two** other hardware components in the ticket machine that are controlled by embedded systems.

(2)

1 ....

....

2 ....

....

(iii) The ticket machine uses data encryption when a customer pays using a bank card.

State why data encryption is used in this case.

(1)

....

....

(b) Compare **four** features of high-level and low-level programming languages.

(4)

P 6 1 8 8 0 A 0 2 1 2 4

(c) Artificial intelligence (AI), in many forms, has an increasing impact on our lives.

Discuss this statement considering characteristics, uses and ethical issues.

(6)

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

(Total for Question 6 = 15 marks)

TOTAL FOR PAPER = 80 MARKS

BLANK PAGE

BLANK PAGE