AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

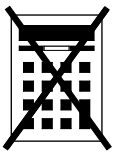
Candidate signature _____

I declare this is my own work.

GCSE
COMPUTER SCIENCE

Paper 2 Computing concepts

Tuesday 21 May 2024 Afternoon Time allowed: 1 hour 45 minutes



Materials
- There are no additional materials required for this paper.
- You must **not** use a calculator.

Instructions
- Use black ink or black ball-point pen. Use pencil only for drawing.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
The total number of marks available for this paper is 90.

Advice

For Examiner's Use	
Question	Mark
1–4	
5–6	
7–8	
9	
10–12	
13	
14–17	
18	
19	
TOTAL	

For the multiple-choice questions, completely fill in the lozenge alongside the appropriate answer.

CORRECT METHOD ⬬ WRONG METHODS ⊗ ⦿ ≈ √

If you want to change your answer you must cross out your original answer as shown. ⬬

If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. ⬬

Answer **all** questions.

Do not write outside the box

0 1 Which statement best describes what computers represent using binary?

Shade **one** lozenge.

[1 mark]

A All data are represented using binary. ⬭

B All data and instructions are represented using binary. ⬭

C Some data and instructions are represented using binary. ⬭

D Some instructions are represented using binary. ⬭

0 2 . 1 Convert the binary number `10110111` into decimal.

[1 mark]

0 2 . 2 Convert the decimal number 112 into hexadecimal.

You should show your working.

[2 marks]

Answer _____

Do not write outside the box

0 3 Add together the following three binary numbers and give your answer in binary.

[2 marks]

```
  0 0 0 0 1 0 1 0
  1 0 0 1 1 0 1 0
+ 0 0 1 1 0 0 0 1
```

0 4 . 1 **Figure 1** shows a bit pattern.

Figure 1

00110011

State the result of applying a left binary shift of **two** to the bit pattern shown in **Figure 1**.

[1 mark]

0 4 . 2 The decimal equivalent of the bit pattern shown in **Figure 1** is 51

State the result of applying a left binary shift of **one** to the bit pattern shown in **Figure 1**.

Give your answer in **decimal**.

[1 mark]

Question 4 continues on the next page

Do not write outside the box

0 4 . 3 Which statement best describes where a single binary shift can be used?

Shade **one** lozenge.

[1 mark]

A Multiply or divide numbers by any even number. ⬭

B Multiply or divide numbers by any number. ⬭

C Multiply or divide numbers by any odd number. ⬭

D Multiply or divide numbers by powers of two. ⬭

9

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 5 **Figure 2** shows four bitmap images.

Figure 2

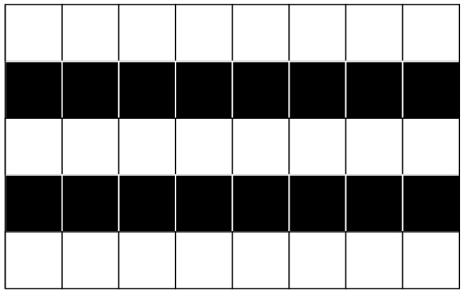

Image A

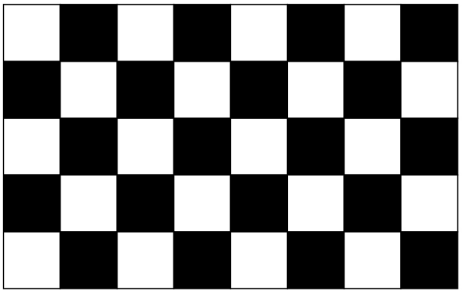

Image B

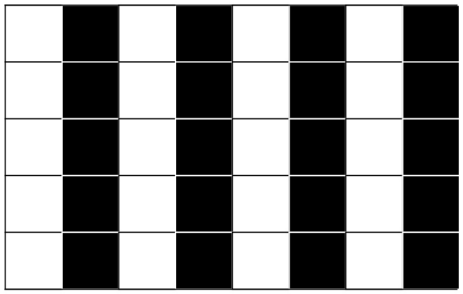

Image C

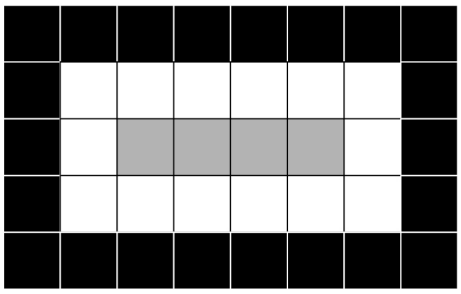

Image D

0 5 . 1 State the number of pixels in **Image A** in **Figure 2**.

[1 mark]

0 5 . 2 State the minimum colour depth required to represent **Image B** in **Figure 2**.

[1 mark]

Do not write outside the box

0 5 . 3 Calculate the minimum amount of storage required to store **Image D** from **Figure 2**.

Give your answer in **bytes**.

Show your working.

[2 marks]

Answer _____ bytes

Question 5 continues on the next page

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Figure 2 has been included again below.

Figure 2

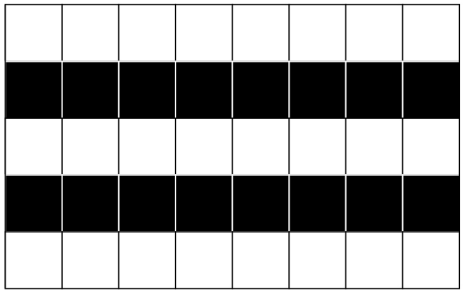

Image A

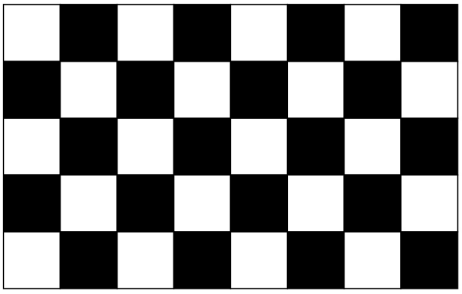

Image B

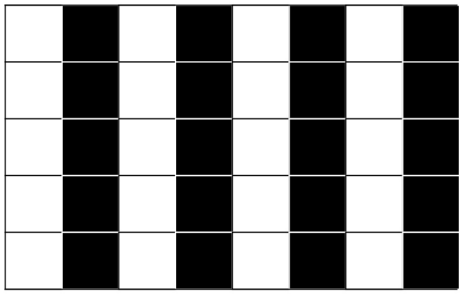

Image C

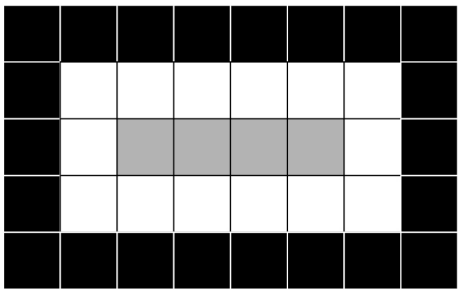

Image D

Do not write outside the box

0 5 . 4 **Figure 3** shows how **Image D** can be represented as binary data.

Figure 3

01	01	01	01	01	01	01	01
01	00	00	00	00	00	00	01
01	00	10	10	10	10	00	01
01	00	00	00	00	00	00	01
01	01	01	01	01	01	01	01

Complete the table to show the binary representation of each colour in **Image D**.

[1 mark]

Colour	**Binary representation**
White	
Black	
Grey	

0 5 . 5 The number of colours used in **Image C** and **Image D** in **Figure 2** are both increased by one.

State the impact of this increase on the minimum file sizes of both **Image C** and **Image D**.

[2 marks]

Image C _____

_____

Image D _____

_____

Turn over ►

0 6 Calculate the number of **bits** in 7 MB.

Show your working.

[2 marks]

Answer _____ bits

9

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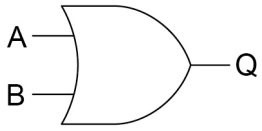
0 7 **Figure 4** shows a logic gate.

Figure 4



0 7 . 1 Which truth table matches the logic gate in **Figure 4**?

Shade **one** lozenge.

[1 mark]

A

A	B
0	1
1	0

B

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

C

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

D

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

Question 7 continues on the next page

0 7 . 2 **Figure 5** shows a truth table.

Figure 5

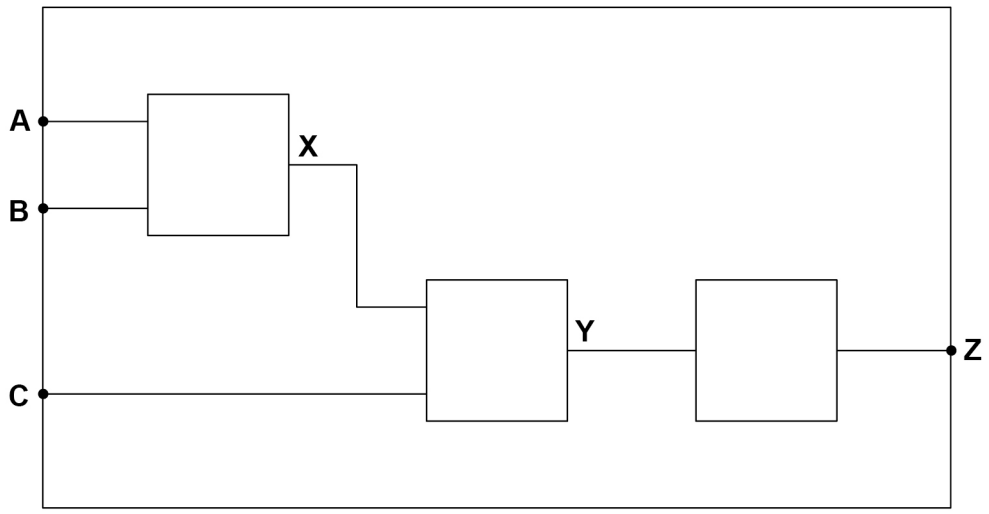
A	B	C	X	Y	Z
0	0	0	0	0	1
0	0	1	0	1	0
0	1	0	0	0	1
0	1	1	0	1	0
1	0	0	0	0	1
1	0	1	0	1	0
1	1	0	1	1	0
1	1	1	1	0	1

Complete the logic circuit by writing the **name** of a logic gate in each empty box.

The completed logic circuit should have the same functionality as the circuit represented by the truth table in **Figure 5**.

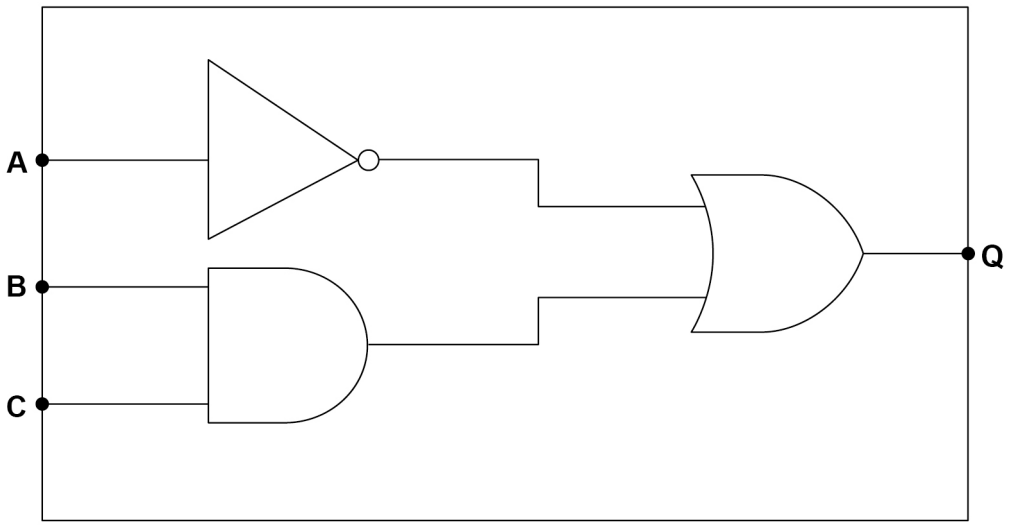
You should write the **name** of **one** logic gate only in each box.

[3 marks]



0 7 . 3 **Figure 6** shows a different logic circuit.

Figure 6



Write a Boolean expression that represents the logic circuit shown in **Figure 6**.

You **must** use the correct symbols for the Boolean operators in your expression.

[3 marks]

Q = _____

_____

Turn over for the next question

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0 8 . 1 Three major components of a Central Processing Unit (CPU) are:

- control unit
- clock
- cache.

Describe the function of **each** of the three components.

[6 marks]

Control unit

Clock

Cache

0 8 . 2 Explain **three** ways to improve the performance of a CPU.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

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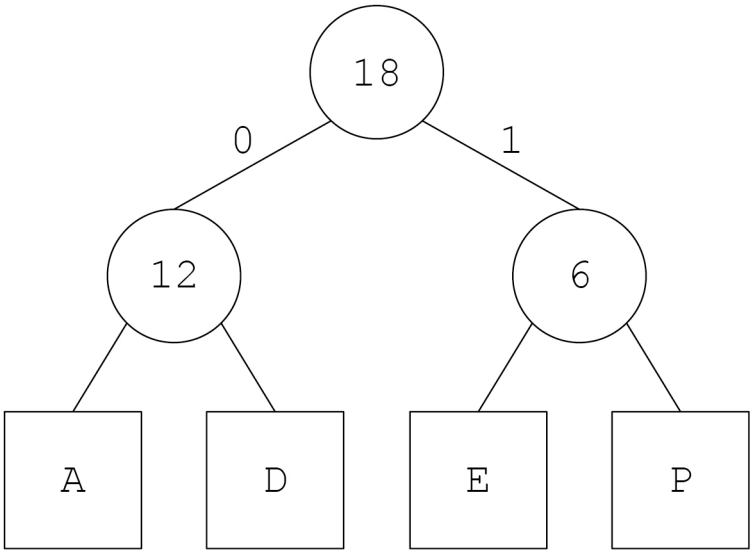
16

Turn over for the next question

0 9 . 1 **Figure 7** contains a Huffman tree.

Figure 7



The Huffman tree in **Figure 7** was used to encode a string, which resulted in the following bit pattern:

0001011001

State the string that this bit pattern represents.

[2 marks]

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0 9 . 2 **Table 1** shows the Huffman codes for the characters used in the string HESELLSSEASHELLASHES

Table 1

Character	Character frequency	Huffman code
S	6	11
E	5	10
L	4	00
H	3	011
A	2	010
	20	

Calculate how many bits would be saved if the string HESELLSSEASHELLASHES was encoded using the Huffman codes shown in **Table 1**, rather than using ASCII.

You should show your working.

[3 marks]

Number of bits saved _____

5

Turn over ►

Do not write outside the box

1 0 Which **two** statements are true about machine code?

Shade **two** lozenges.

[2 marks]

A Machine code is directly executed by the processor. ⬭

B Machine code is easily understood by humans. ⬭

C Machine code is shorter than high-level code. ⬭

D Machine code is similar to English. ⬭

E Machine code is specific to a family of processors. ⬭

F Machine code is translated using a compiler. ⬭

1 1 Describe **three** differences between high-level programming languages and low-level programming languages.

[3 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

3 _____

_____

_____

_____

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1 2 Describe how compilers and interpreters operate.

[6 marks]

11

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1 3 . 1 Define the term **computer network**.

[2 marks]

1 3 . 2 A school has purchased new computers for students and staff to use.

The school is considering installing the computers in a **network**.

Discuss the **advantages and disadvantages** to the school, staff and students of having the computers installed in a network.

[6 marks]

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8

Turn over for the next question

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1 4 SMTP and IMAP are email protocols.

Describe how SMTP and IMAP are used.

[2 marks]

SMTP

IMAP

1 5 Describe how encryption can make the transmission of data more secure.

[2 marks]

1 6 Blagging and phishing are social engineering techniques.

Describe blagging and phishing.

[4 marks]

Do not write outside the box

1 7 Viruses, trojans and spyware are forms of malware.

Describe how **two** of these forms of malware work.

[4 marks]

Name of malware 1 _____

Description _____

_____

_____

_____

Name of malware 2 _____

Description _____

_____

_____

_____

12

Turn over for the next question

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1 8 . 1 Define the term **database**.

[1 mark]

1 8 . 2 Explain what is meant by **data inconsistency** within a database.

[2 marks]

1 8 . 3 Define the term **foreign key**.

[2 marks]

Question 18 continues on the next page

A relational database is being developed to store information about actors and the films they have performed in.

The database contains three tables: **Film**, **Performance** and **Actor**.

Some of the contents of the tables are shown in **Figure 8**.

Figure 8

Film

FilmID	Title	Year
100	Forrest Gump	1994
101	Toy Story 3	2019
102	Back to the Future	1985

Performance

PerformanceID	FilmID	ActorID
52	100	8
53	101	8
54	102	9

Actor

ActorID	Firstname	Lastname
8	Tom	Hanks
9	Lea	Thompson

Do not write outside the box

1 8 . 4 State the identifier of a field from the **Actor** table in **Figure 8**.

[1 mark]

1 8 . 5 A list of all the films from the year 2019 in the database is needed.

The following SQL is run to produce the list:

```
A  FilmID, Title, Year
FROM Film
WHERE  B
```

Some parts of the SQL have been replaced by labels.

State the SQL that should have been written in place of the labels **A** and **B**.

[2 marks]

A _____

B _____

1 8 . 6 The film with the title **Toy Story 3** has been entered incorrectly into the database and should have the title **Toy Story 4**.

Write the SQL to make this change.

[3 marks]

Question 18 continues on the next page

Figure 8 has been included again below.

Figure 8

Film

FilmID	Title	Year
100	Forrest Gump	1994
101	Toy Story 3	2019
102	Back to the Future	1985

Performance

PerformanceID	FilmID	ActorID
52	100	8
53	101	8
54	102	9

Actor

ActorID	Firstname	Lastname
8	Tom	Hanks
9	Lea	Thompson

Do not write outside the box

1 8 . 7 A film called **Gladiator** from the year 2000 is to be added to the database with a `FilmID` of 103

The following SQL is run:

```
INSERT INTO A
B ( C )
```

Some parts of the SQL have been replaced by labels.

State the SQL that should have been written in place of the labels **A**, **B** and **C**.

[3 marks]

A _____

_____

B _____

_____

C _____

_____

14

Turn over for the next question

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1 9 . 1 Define the term **cyber security**.

[2 marks]

1 9 . 2 A website wants to improve its cyber security procedures.

Explain how **CAPTCHA** and **email confirmations** could improve the security of the website.

[4 marks]

CAPTCHA

Email confirmations

6

END OF QUESTIONS

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