Fundamentals of data representation – GCSE Computer Science Paper 2

1. No.1

0 1 . 1 The number base 2 is called **binary**.

Shade **one** lozenge to show which number base is called **hexadecimal**.

[1 mark]

A 6 ⬭

B 8 ⬭

C 10 ⬭

D 16 ⬭

0 1 . 2 Shade **two** lozenges to show the statements that are true about hexadecimal.

[2 marks]

A Hexadecimal can represent a greater range of numbers than binary. ⬭

B Hexadecimal is easier for people to read than binary. ⬭

C Hexadecimal is faster for a computer to process than binary. ⬭

D Hexadecimal is more accurate than binary. ⬭

E Hexadecimal takes less space in RAM than binary. ⬭

F Hexadecimal takes less time to type than binary. ⬭

2. No.2

0 2 . 1 Convert the decimal number 171 into binary.

[1 mark]

0 2 . 2 Convert the hexadecimal number 2D into binary.

You should show your working.

[2 marks]

Answer _____

3. No.3

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

[2 marks]

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

4. No.4

Convert 16 000 000 bits to megabytes (MB).

You should show your working.

[2 marks]

Answer _____ MB

5. No.5

Describe the binary shift that would be used to divide a binary number by four.

[1 mark]

6. No.6

0 6 . 1 When a sound wave is converted to a digital form it is sampled. The sampling rate is measured in hertz (Hz).

Define the term **hertz**.

[1 mark]

0 6 . 2 A sampling rate of 20 000 Hz and a sample resolution of four bits is used to make a digital recording of a sound that lasts 50 seconds.

What is the minimum file size of the recording in megabytes (MB)?

You should show your working.

[3 marks]

Answer _____ MB

7. No.7

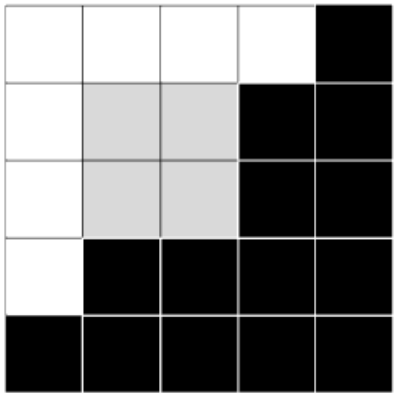
0 7 . 1 The term pixel is short for Picture Element.

Define the term **pixel**.

[1 mark]

0 7 . 2 **Figure 1** shows a 5 pixel x 5 pixel image. A minimum colour depth of two bits is needed to store the image.

Figure 1



Explain how the image in **Figure 1** can be represented as a bitmap.

[3 marks]

0 7 . 3 A 10 pixel x 10 pixel image contains five different colours.

Calculate the minimum file size, in bits, of this image when represented as a bitmap.

You should show your working.

[2 marks]

Answer _____ bits

0 7 . 4 A black and white image has been compressed using run length encoding (RLE).

The first bit in each byte of the bit pattern represents the colour and the remaining seven bits of the byte represent the number of pixels in the run.

The image has a run of 60 black pixels followed by a run of 30 white pixels and is represented by the bit pattern shown in **Figure 2**.

Figure 2

0	0	1	1	1	1	0	0	1	0	0	1	1	1	1	0

Using the same RLE method, give the bit pattern for a black and white image that has a run of 64 white pixels followed by a run of 15 black pixels.

Write your answer in **Table 1**.

[2 marks]

Table 1

8. No.8

0 8 . 1 Define the term **hardware**.

[1 mark]

0 8 . 2 Describe the role of each of the following components of a CPU:

[3 marks]

Clock

Control unit

Register

0 8 . 3 Give **one** reason why a CPU with **two** cores might perform faster than an equivalent CPU with only one core.

[1 mark]

0 8 . 4 Define the term **non-volatile memory**.

[1 mark]

0 8 . 5 Give **one** example of a type of **volatile** memory in a computer system.

[1 mark]

0 8 . 6 Explain why secondary storage is required in a computer system.

[2 marks]