EDULiTO

Data Representation

Topic Tests

Photocopiable Resources

Terms and Conditions of Use

Topic Test - Data Representation

1(a) Place the following terms in order according to size with the smallest at the top of the table. [2]

Kilobyte, terabyte, nibble, petabyte, byte, gigabyte, megabyte, bit

1(b) (i) Using the binary system, how many **bytes** are there in a Kilobyte? [1]

………

1(b) (ii) Using the binary system, how many **bits** are there in a Kilobyte? [1]

………

1(c) Based on the binary system, convert the following values that represent file sizes into **bits** and show your working. [6]

(i) 8 kB

………

………

(ii) 290 kB

………

………

(iii) 3 MB

………

………

2 Why does data need to be converted into binary format to be processed by a computer? [2]

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3 (a) Convert the following denary whole numbers into 8 bit binary numbers. [4]

(i) 10

………

(ii) 27

………

(iii) 100

………

(iv) 232

………

3(b) Convert the following binary numbers into denary whole numbers. [4]

(i) 00101010

………

(ii) 00001000

………

(iii) 10010011

………

(iv) 10111100

………

4(a) Add the following 8 bit binary integers. [4]

(i) 00001010 + 00001000

………

(ii) 01001001 + 00110011

………

(iii) 00010011 + 00000111

………

(iv) 10111100 +10000001

………

4(b) Using a suitable example explain overflow errors. [2]

………

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………

5 (a) Convert the following denary whole numbers into two digit hexadecimals and show

your working. [8]

(i) 111

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………

(ii) 108

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(iii) 129

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(iv) 244

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5 (b) Convert the following two digit hexadecimals into denary whole numbers and show

your working. [8]

(i) 8A

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(ii) 62

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(iii) F1

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(iv) 9A

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6 (a) Convert the following binary numbers into two digit hexadecimals and show your working. [8]

(i) 01010101

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(ii) 10001111

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(iii) 00011110

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(iv) 11111110

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6 (b) Convert the following two digit hexadecimals into binary numbers and show your working. [8]

(i) 6B

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(ii) 89

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(iii) BB

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(iv) 1D

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7 Explain, using an example, the meaning of the term "check digit". [2]

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8 (a) What is the ASCII character set and how is it used? [2]

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8(b) What is the advantage of using extended ASCII? [1]

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8(c) What is the **Unicode** character set and why is it used? [2]

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9(a) What is a pixel? [1]

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9(b) If one bit is used for each pixel in an image, how many colours can be represented in

the image? [1]

……

9(c) If one nibble is used for each pixel in an image, how many colours can be represented in

the image? [1]

……

9(d) A HD TV has a 30 bit colour depth - How many colours is this? [1]

……

10 List FOUR examples of metadata that can be stored with a photograph. [4]

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11 (a) Fill in the gaps below using the words provided. [6]
bits bytes data uploaded speed transmitted

Data is transmitted across the internet as …………………………… (0s and 1s) and the

……………………………is measured as bits per second. The more bits that are ……………………………

per second the faster the internet connection. How long it takes to send a file to a mobile

phone over a 4G network is determined by the bandwidth. Bandwidth is a measure of how

quickly ……………………………can be downloaded or ……………………………. It is usually measured

as bits per second (bps) or megabits per second (mbps). File sizes are measured in

…………………………… (B) rather than bits (b).

11(b) Answer the questions below.

(i) What piece of equipment is needed to record sound?

……

(ii) Once the sound has been recorded, what is it converted into so that it can be used on a computer?

……

(iii) In relation to digital audio, what is meant by **bit rate**? [1]

……

……

……

(iv) In relation to digital audio, what is meant by **sampling frequency**? [1]

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……

……

 (v) If fewer samples are taken, what usually happens to the quality of the sound recording? [1]

……

……

……

12(a) Sound and image files are often compressed. Explain what is meant by compression? [1]

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……

12(b) In relation to viewing video files on a computer, why is compression important? [2]

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……

12 (c) What is the difference between **lossy** and **lossless** compression? [2]

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Question Number	Answer	Additional Guidance	Mark
1 a	All in the correct order [2] One error [1]		**2**
1 b i	1024 [1]		**1**
1 b ii	8192 [1]		**1**
1 c i	8 x 1024 =8192 Bytes Bits=8192x8=65,536 [2]	1 mark for answer and 1 mark for correct working out.	**2**
1 c ii	290x1024=296,960 Bytes Bits=296,960x8=2,375,680 [2]	1 mark for answer and 1 mark for correct working out.	**2**
1 c iii	3x1024=3,072 Kilobytes 3,072x1024=3,145,728 Bytes 3,145,728x8=25,165,824 Bits [2]	1 mark for answer and 1 mark for correct working out.	**2**
2	Computers use electrical signals that are on (1) or off (0) [1] Computers therefore can only interpret binary numbers. [1]		**2**
3 a i	00001010 [1]	Accept without leading zeros.	**1**
3 a ii	00011011 [1]	Accept without leading zeros.	**1**
3 a iii	01100100 [1]	Accept without leading zeros.	**1**
3 a iv	11101000 [1]	Accept without leading zeros.	**1**
3 b i	42 [1]		**1**
3 b ii	8 [1]		**1**
3 b iii	147 [1]		**1**
3 b iv	188 [1]		**1**
4 a i	00010010 [1]		**1**
4 a ii	01111100 [1]		**1**
4 a iii	00011010 [1]		**1**
4 a iv	100111101 [1]		**1**
4 b	Overflow errors occur when the largest number that a register can hold is exceeded. [1] Suitable example [1]		**2**
5 a i	6F [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 a ii	6C [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 a iii	81 [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 a iv	F4 [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 b i	138 [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 b ii	98 [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 b iii	241 [2]	1 mark for answer and 1 mark for correct working out.	**2**
5 b iv	154 [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 a i	55 [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 a ii	8F [2]	1 mark for answer and 1 mark for correct working out.	**2**

Topic Test - Data Representation **- Mark Scheme**

6 a iii	1E [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 a iv	FE [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 b i	0110 1011 [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 b ii	1000 1001 [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 b iii	1011 1011 [2]	1 mark for answer and 1 mark for correct working out.	**2**
6 b iv	0001 1101 [2]	1 mark for answer and 1 mark for correct working out.	**2**
7	This is used when you want to be sure that a range of numbers has been entered correctly. [1] e.g. ISBN numbering system for books makes use of 'Modulo-11' division. if the remainder returned is incorrect the number entered is incorrect [1]	Any suitable example accepted.	**2**
8 a	ASCII (American Standard Code for Information Interchange) is the most common format for defining characters in computer text files. [1] Each alphabetic, numeric, or special character is represented with a 7 bit binary number (8 bit for extended ASCII) [1]		**2**
8 b	Extended ASCII can code double the number of characters (256) as standard ASCII (128). [1]		**1**
8 c	This is an international encoding standard for use with different languages [1] by which each character is assigned a unique binary value. [1] It can code for 120,000 characters and therefore can store character coding for all languages. [1]		**3**
9 a	Pixels are the building blocks of digital images. [1]		**1**
9 b	2 [1]		**1**
9 c	16 [1]		**1**
9 d	1,073,741,823 (1.073 billion colours)		**1**
10 a	Camera type, GPS co-ordinates, data, time, exposure, Shutter speed	Anything reasonable	**4**
11 a	Data is transmitted across the internet as **bits** (0s and 1s) and the **speed** is measured as bits per second. The more bits that are **transmitted** per second the faster the internet connection. How long it takes to send a file to a mobile phone over a 4G network is determined by the bandwidth. Bandwidth is a measure of how quickly **data** can be downloaded or **uploaded**. It is usually measured as bits per second (bps) or megabits per second (mbps). File sizes are measured in **bytes** (B) rather than bits (b).	One mark for each correct answer	**6**
11 b i	Microphone [1]		**1**
11 b ii	Digital signal [1]		**1**
11 b iii	The bit rate of a file tells us how many bits of data are processed every second. [1]		**1**
11 b iv	The number of audio samples captured every second [1]		**1**
11 b v	The quality of the sound recording deteriorates. [1]		**1**
12 a	Compression is needed for reducing file sizes. When images,		**1**

	sounds or videos are compressed, data is removed to reduce the file size. [1]		
12 b	Videos are compressed when they are streamed. [1] Streaming video requires a high-speed internet connection. Without it, the user would experience buffering and regular drops in quality.[1]		**2**
12 c	Lossless - the audio quality remains the same - it does not get worse. [1] The file can be restored back to its original state [1] Lossy - Permanently removes data. [1] The file cannot be restored. [1]	Max 1 for lossless and 1 for lossy	**2**
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