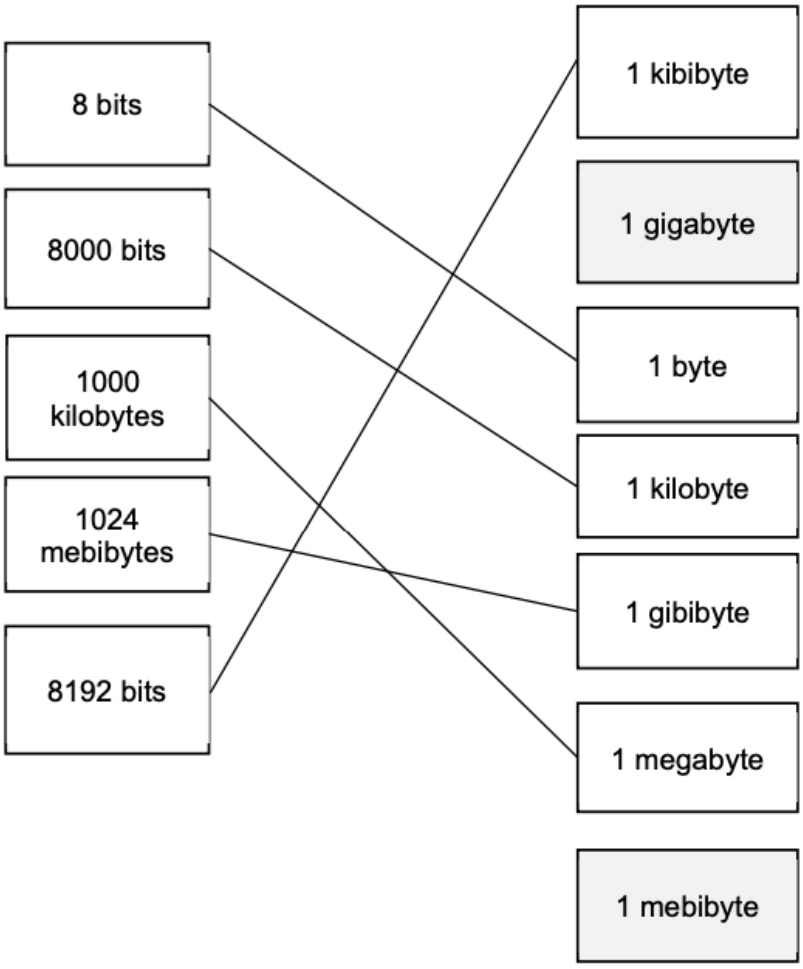
Question	Answer	Marks
1(a)(i)	**1 mark** for each description Pixel: • A single square of one colour • The smallest addressable element in an image File header: • Data about the bitmap image (e.g. number of colours)	**2**
1(a)(ii)	**1 mark** per bullet point for working, **1 mark** for answer Working: • 1024 × 512 = 524 288 pixels/bytes • 524288 / 1024 / 1024 Answer: 0.50 mebibytes	**3**
1(b)	**1 mark** for naming method, **1 mark** per description to **max 2** • Run-length encoding • Replace **sequences** of the **same colour** pixel • … with colour code and number of identical pixels	**3**
1(c)(i)	252	**1**

1(c)(ii)	**1 mark** per bullet point
	
	• Converting 15 to binary `0000 1111`
	• Method for addition
	• Final answer
	`0010 0011`
	`+ 0000 1111`
	`0011 0010`
	`1 111`
		3

1(c)(iii)	**1 mark** per bullet point
	
	• Converting −10 to two's complement binary `1111 0110`
	• Adding values
	• Final answer `0001 1001`
	10 = `0000 1010`
	–10 = `1111 0110`
	
	`0010 0011`
	`+ 1111 0110`
	`0001 1001`
	`11 11`
		3

Question	Answer	Marks
6(a)	1 mark for each correct answer ASCII = 128 // 2^7 Extended ASCII = 256 // 2^8	**2**
6(b)	**1 mark** per bullet point to **max 2** • Each character has its own **unique** code • Each character in the word is **replaced** by its code • The codes are stored **in the order in the word**	**2**

Question	Answer	Marks
6(c)(i)	31	1
6(c)(ii)	53	1

Question	Answer	Marks
1(a)	**1 mark** for each correct line  	**5**
1(b)(i)	**1 mark** for answer **1 mark** for working e.g. 1010 1010 0011 0111 **1110 0001** 1 1 1 1 1 1 1	**2**
1(b)(ii)	The result is a larger number than can be stored in the given number of bits. // The result is greater than 255	**1**
1(c)	240	**1**

Question	Answer	Marks
7(a)(i)	**1 mark** per bullet point • Smaller time gaps between the samples • Makes the **digital** sound **wave** more accurate • Smaller quantisation errors	**2**
7(a)(ii)	**1 mark** per bullet point • More samples/data are taken/recorded • … so more bits are stored altogether	**2**
7(b)(i)	**1 mark** per bullet point • Reduces the file size • Faster to transmit/download • Original file is too large for email storage/attachment	**2**
7(b)(ii)	**1 mark** per bullet point to **max 2** e.g. • Reduce amplitude to only the range used • … limited amplitudes mean fewer bits per sample • Run-length-encoding • … Where consecutive sounds are the same record the binary value of the sound and number of times it repeats • Record the changes instead of the actual sounds	**2**

Question	Answer	Marks
1(a)	**1 mark** for: one tebibyte is 1024 gibibytes **and** one terabyte is 1000 gigabytes	**1**
1(b)	1001 1100	**1**
1(c)	**1 mark** for working e.g. • Dividing by 16 // converting to binary (11111011) **1 mark** for answer FB	**2**
1(d)	1000 1110	**1**

Question	Answer	Marks
2(a)	**1 mark** per bullet point to **max 4** • The position/coordinate of the centre of the circle • Radius • Line width • Line colour • Line style • Fill colour	**4**
2(b)	**1 mark** per bullet point • A list that stores each separate object in the logo // a list that stores the command/description required to draw each object • Each shape has its own drawing list • Example related to logo, e.g. Three triangles, one square and one circle	**2**
2(c)	**1 mark** per drawback, **1 mark** for expansion (**max 2 each**) • A bitmap file is likely to take up more storage space • …because the colour of each pixel needs to be stored • A bitmap image cannot be enlarged // difficult to use in different types of document • …without the image pixelating • A bitmap would be more difficult to edit • …because each pixel would need to be edited separately	**4**

Question	Answer	Marks
2(d)	**1 mark** per bullet point to **max 3** • Password • Biometrics • Access rights • Swipe cards • Physical access measures, e.g. security guards • Implement a firewall/proxy to monitor remote access requests • Two-step authentication	**3**

Question	Answer	Marks

1(a)(i)	An individual shape (in a vector graphic)
	// a shape defined using mathematics/geometry
	// a distinct element within an image
	// possible to alter without affecting the other objects within the image
		1

1(a)(ii)	**One mark** per bullet point to **max 4** E.g. • Line colour • Line width • Fill colour • Shape • Outline style • Dimensions / size • Position	4
1(b)	**One mark** per bullet point to **max 3** E.g. • Dimensions e.g.100 × 100 pixels // image size • File size • Colour depth // bit depth • Location/offset of data within the file • Compression type • Confirmation that it is a bitmap // filetype • Image resolution • Colour palette	3
1(c)	**One mark** per bullet point to **max 2** for each method. Lossy • Reduce the resolution • …fewer pixels per unit measurement • …fewer pixels / binary numbers are stored • Reduce the colour depth • …reduce the number of bits per colour • …each pixel has fewer bits Lossless • RLE (Run Length Encoding) • ...looks for runs of consecutive **pixels** of the same colour • ...stores the colour value once and the number of times it occurs	4

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>One mark per correct definition

<table><tr><th>Term</th><th>Definition</th></tr><tr><td>Sampling</td><td>Measuring the amplitude of the wave at regular/set time intervals</td></tr><tr><td>Sampling resolution</td><td>The number of bits used to represent each sample</td></tr><tr><td>Sampling rate</td><td>The number of samples taken per unit of time</td></tr></table></td><td>3</td></tr>
<tr><td>2(b)</td><td>One mark per bullet point to max 2

• The data from a single frame are encoded as two separate fields
• One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines
• The image is rendered by alternating between the even field and the odd field (of each successive frame)
• The viewer sees data from two frames simultaneously
• The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate)
• Produces what appears to the eye to be a high refresh rate
• Halves the transmission bandwidth requirements</td><td>2</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(a)</td><td>1 mark per bullet point

• 2000 * 1000 * 24 = 48 000 000 bits
• 48 000 000 / 8 / 1024 / 1024
• = 6 MB or 5.7 MB</td><td>3</td></tr>
<tr><td>4(b)</td><td>1 mark per bullet point to max 2

• Only 1 bit needed to store the colour of each pixel ...
• ... so number of pixels * bit depth is 2000 * 1000 * 1 (rather than 2000 * 1000 * 24)
• ... so the calculation (in part 4(a)) results in smaller figure for file size</td><td>2</td></tr>
<tr><td>4(c)(i)</td><td>0110 0010</td><td>1</td></tr>
<tr><td>4(c)(ii)</td><td>1 mark for each correct line

<table><tr><th>Character</th><th>t</th></tr><tr><th>ASCII denary value</th><td>116</td></tr><tr><th>Hexadecimal value</th><td>74</td></tr></table></td><td>2</td></tr>
</table>

5(b)(i)	**1 mark** per bullet point to **max 2** • Each complete frame is transmitted/scanned each time • All the pixels in frame 1 will be transmitted • Then all the pixels in frame 2 will be transmitted	**2**

Question	Answer	Marks
5(b)(ii)	**1 mark** per bullet point to **max 3** • If a pixel in frame 2 has the same colour value as the pixel **in the same position** in frame 1 then • …it is not necessary to send the pixel again • For example, the first row is / rows 1, 3, 5 and 6 on both frames are the same // only rows 2 and 4 change • … so does not need to be replicated // only rows 2 and 4 need to be resent	**3**
5(b)(iii)	Spatial redundancy	**1**
5(b)(iv)	Multimedia container format	**1**

Question	Answer	Marks
6(a)	1111 0000 1011	1
6(b)	240	1
6(c)	175	1
6(d)	853	1

Question	Answer	Marks
7	**1 mark** per bullet point to **max 4** • 98 kHz has a larger file size • …because it is recording more samples per second • …meaning more binary values being stored per second • ...will take more time to download • 98 kHz – Sound will be closer to the original • …because the samples will be closer together • …because of smaller quantization errors	**4**