1 Anya scans an image into her computer for a school project.

(a) The scanned image is a bitmapped image.

(i) Complete the following table to describe the two terms about graphics.

Term	Description
Pixel	....
File header	....

[2]

(ii) The image is scanned with an image resolution of 1024 × 512 pixels, and a colour depth of 8 bits per pixel.

Calculate an estimate for the file size, giving your answer in mebibytes. Show your working.

Working .....

.....

.....

.....

Answer ..... mebibytes

[3]

(b) The image is compressed using lossless compression.

Identify **one** method of lossless compression that can be used to compress the image **and** describe how the method will reduce the file size.

Lossless compression method .....

Description .....

.....

.....

.....

.....

[3]

(c) One of the colours used in the image has the hexadecimal colour code:

`#FC238A`

`FC` is the amount of red, `23` is the amount of green and `8A` is the amount of blue in the colour.

(i) Convert the hexadecimal code `FC` into denary.

..... [1]

(ii) The amount of green in binary is `00100011`. This has the denary number `15` added to it to create a second colour.

Add the denary number `15` to the binary number `00100011` and give your answer in binary.

Perform the addition in binary. Show your working.

Working .....

.....

.....

.....

.....

Answer (in binary) .....

[3]

(iii) Hexadecimal `23` in two's complement representation is `00100011`. The denary number `10` needs to be subtracted from this value.

Subtract the denary number `10` from the two's complement representation `00100011`.

Give your answer in binary. Show your working.

Working .....

.....

.....

.....

.....

Answer (in binary) .....

[3]

6 A computer uses the ASCII character set.

(a) State the number of characters that can be represented by the ASCII character set and the extended ASCII character set.

ASCII .....

Extended ASCII .....

[2]

(b) Explain how a word such as 'HOUSE' is represented by the ASCII character set.

.....

.....

.....

..... [2]

(c) Unicode is a different character set.

The Unicode value for the character '1' is denary value 49.

(i) Write the hexadecimal value for the Unicode character '1'.

..... [1]

(ii) Write the denary value for the Unicode character '5'.

..... [1]

1 **(a)** Draw **one** line from each binary value to its equivalent (same) value on the right.

Binary value	
8 bits	1 kibibyte
8000 bits	1 gigabyte
1000 kilobytes	1 byte
1024 mebibytes	1 kilobyte
8192 bits	1 gibibyte
	1 megabyte
	1 mebibyte

[5]

(b) **(i)** Perform the following binary addition. Show your working.

10101010

+ 00110111

[2]

(ii) State how an overflow can occur when adding two binary integers.

.....

..... [1]

(c) Convert the hexadecimal value F0 into denary.

.....

..... [1]

7 Bobby is recording a sound file for his school project.

(a) He repeats the recording of the sound several times, with a different sample rate each time.

(i) Describe the reasons why the sound is closer to the original when a higher sample rate is used.

.....

.....

.....

..... [2]

(ii) Describe the reasons why the sound file size increases when a higher sample rate is used.

.....

.....

.....

..... [2]

(b) Bobby wants to email the sound file to his school email address. He compresses the file before sending the email.

(i) Explain the reasons why Bobby compresses the sound file.

.....

.....

.....

..... [2]

(ii) Bobby uses lossless compression.

Describe how lossless compression can compress the sound file.

.....

.....

.....

..... [2]

1 Computers store data in binary form.

(a) State the difference between a tebibyte and a terabyte.

.....

..... [1]

(b) Convert the signed denary value –100 into an 8-bit two's complement binary integer.

Working .....

.....

Answer ..... [1]

(c) Convert the denary number 251 into hexadecimal. Show your working.

Working .....

.....

.....

.....

Answer .....

[2]

(d) Add the following unsigned binary integers.

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

[1]

2 Zak designs a logo for his company. He uses vector graphics software to create the logo.

(a) One of the drawing objects in the logo is a circle.

Identify **four** properties of the circle.

1 .....

2 .....

3 .....

4 .....

[4]

(b) Describe what is meant by a **drawing list** using the logo as an example.

.....

.....

.....

..... [2]

(c) Zak could have used a bitmapped image for the logo.

Describe **two** drawbacks of using a bitmapped image for the logo instead of a vector graphic.

Drawback 1 .....

.....

.....

.....

Drawback 2 .....

.....

.....

.....

[4]

(d) Zak's company holds details about clients in a database.

Give **three** security measures that Zak can implement to make sure that only authorised employees can access the data.

1 .....

2 .....

3 .....

[3]

1 An image can be either a bitmap image or a vector graphic.

(a) Vector graphics are made up of drawing objects and their properties.

(i) State what is meant by a **drawing object**.

.....

..... [1]

(ii) Identify **four** properties of a **drawing object**.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

.....

[4]

(b) Identify **three** items that are stored in a **bitmap** file header.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) A bitmap image needs to be compressed before it can be sent by email.

Describe **one** lossy and **one** lossless method of compressing the image.

Lossy .....

.....

.....

.....

.....

Lossless .....

.....

.....

.....

.....

[4]

2 Joanne wants to record sound files and videos for uploading to a social media website.

(a) The following table contains terms about sound representation and encoding.

Complete the table by writing the definitions for each term.

Term	Definition
Sampling	....
Sampling resolution	....
Sampling rate	....

[3]

(b) Joanne records a short video using interlaced encoding.

Describe what is meant by **interlaced encoding**.

.....

.....

.....

..... [2]

4 A digital camera takes a bitmap image. The image is 2000 pixels wide by 1000 pixels high with a colour depth of 24-bits.

(a) Calculate an estimate of the file size for the image. Give your answer in megabytes. Show your working.

Working .....

.....

.....

.....

.....

Answer ..... MB

[3]

(b) A second image is taken, this time in black and white. It has the same number of pixels, but the file size is smaller.

Explain why the file size is smaller.

.....

.....

.....

..... [2]

(c) The digital camera allows a user to add text to an image. The text is encoded as ASCII values.

The table shows the ASCII denary values for five characters.

Character	ASCII denary value
a	97
b	98
c	99
d	100
e	101

(i) Give the 8-bit binary value for the ASCII character 'b'.

.....

..... [1]

(ii) Complete the table by writing the ASCII denary value for the character 't' **and** its hexadecimal equivalent.

Character	**t**
ASCII denary value	
Hexadecimal value	

[2]

(b) The video of the concert is made up of a sound track and multiple images.

Two successive frames of one section of the video are shown. The pixel colours are represented by letters.

BL	BL	BL	RD	RD	RD
K	K	K	K	K	K
LG	LG	LG	DG	DG	DG
Y	Y	K	Y	Y	K
W	K	W	W	W	DG
P	P	P	P	P	P

Frame 1

BL	BL	BL	RD	RD	RD
BL	BL	BL	RD	RD	RD
LG	LG	LG	DG	DG	DG
BK	BK	BK	BK	BK	BK
W	K	W	W	W	DG
P	P	P	P	P	P

Frame 2

(i) Explain the way in which progressive encoding can be used to transmit Frames 1 and 2.

.....

.....

.....

..... [2]

(ii) Explain, using Frames 1 and 2 as an example, the way in which temporal redundancy can be used to compress a video.

.....

.....

.....

.....

.....

..... [3]

(iii) Give another type of redundancy technique that can be used to compress a video.

.....

..... [1]

(iv) MP4, WMV and AVI are all examples of a type of format that combines sound and image components into a video.

Identify the type of format that combines the sound and image components into a video.

.....

..... [1]

6 **(a)** Convert the following denary number into a 12-bit two's complement binary form.

-245

[1]

(b) Convert the following hexadecimal number into denary.

F0

.....

..... [1]

(c) Convert the following unsigned binary integer into denary.

10101111

.....

..... [1]

(d) Convert the following Binary Coded Decimal (BCD) into denary.

100001010011

.....

..... [1]

7 Anne is downloading a sound file from a web server. She had the choice of a sampling rate of 44.1 kHz or 98 kHz before she downloaded the sound file.

Explain the differences between the two sound files stored on the server.

.....

.....

.....

.....

.....

.....

.....

..... [4]