S15 P12 Q.1

1 (i) Convert the following binary number into hexadecimal.

8421 8421

10111000

B8 .....[1]

(ii) Convert the following denary number into BCD format.

9 7

10010111 .....[1]

(iii) Using two's complement, show how the following denary numbers could be stored in an 8-bit register:

	-128	64	32	16	8	4	2	1
114	0	1	1	1	0	0	1	0
- 93	1	0	1	0	0	0	1	1

[2]

S15 P12 Q.2

2 (a) Sound can be represented in a computer in a digital format.

(i) Give the definition of the term sampling.

Sampling refers to the recording of the amplitudes of the emitted soundwaves at set time intervals, allowing us to construct a digital approximation of the analogue soundwave [1]

(ii) Give **one** reason why 16-bit sampling is used in an audio compact disc (CD).

This is because it provides an even compromise between file size and quality, ie a decent sound quality without a large file size. [1]

(iii) Explain what is meant by the term sampling resolution.

Sampling resolution refers to the number of distinct values available to record the amplitude of the sound / sample at each interval. A higher sampling resolution results in more precise and less distorted audio. [2]

(iv) Give **one** benefit and **one** drawback of using a higher sampling resolution.

Benefit A more precise digital audio track that is closer to the real analogue audio is produced

Drawback It results in a file with a relatively larger file size. [2]

(b) Describe **two** typical features found in software for editing sound files.

1 The ability to trim audio tracks, or to separate/cut one track into multiple, smaller constituent tracks.

2 The ability to alter the amplitude and frequency of the audio. [2]

(c) Explain the difference between *lossless* and *lossy* data compression techniques.

Lossless compression techniques are designed such that none of the data is lost permanently when compressing the file, usually through some form of replacement of repetitive data. Lossy compression techniques are designed to remove unnecessary data in order to reduce file size. Examples of formats of lossy compressed files include .mp3 and .jpeg. [3]

S15 P13 Q.1

3 (a) (i) Using two's complement, show how the following denary numbers could be stored in an 8-bit register:

124	0	1	1	1	1	1	0	0
	-128	64	32	16	8	4	2	1
–77	1	0	1	1	0	0	1	1

[2]

(ii) Convert the two numbers in part (a) (i) into hexadecimal.

124 7C

–77 B3

[2]

(b) Binary Coded Decimal (BCD) is another way of representing numbers.

(i) Write the number 359 in BCD form.

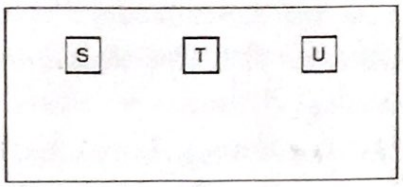
001101011001 [1]

(ii) Describe a use of BCD number representation.

It is used for the digital displays of clocks and scoreboards. [2]

W15 P12 Q.3

4 A touch screen has three squares where a selection can be made:



(a) The x-coordinate of the centre of the three squares is held in three memory locations:

	Address	Memory contents
S	40	0000 1011 0100
T	41	0010 0101 0100
U	42	0100 0110 1100

(i) Give the hexadecimal value of the memory contents for U.

46C

.....[1]

(ii) Convert the denary number 40 into binary.

00101000

.....[1]

(b) Bitmap graphics are used to represent squares S, T and U.

These can be saved in a number of different image resolutions.

(i) Give the number of bits required to store each pixel for a black and white bitmap.

1 bit [1]

(ii) Identify how many bits are required to store each pixel for a 256-colour bitmap.

Explain your answer.

$2^8 = 256$ therefore 8 bits are required. 8 bits give exactly 256 possible unique values, resulting in 256 possible colours and a colour depth of 256. [2]

(c) Images can be compressed to reduce file size.

(i) Describe how lossless compression techniques work.

Lossless compression techniques (ie. RLE) reduce the file size by replacing repetitive adjacent values with two values, one which indicates the number of repetitions, and the other, which represents the value being repeated. [2]

(ii) Describe how lossy compression techniques work.

Lossy compression techniques permanently remove unnecessary data to reduce file size. In context of images, this may mean reducing the image resolution, reducing it's colour depth, or cropping it [2]

W15 P12 Q.4

5 **(a)** Sound can be represented digitally in a computer.

Explain the terms sampling resolution and sampling rate.

Sampling resolution ..... Sampling resolution refers to the number of distinct values available to record the amplitude of a sound/sample at a given interval. A higher sampling resolution results in a more precise and less distorted audio. .....

Sampling rate ..... Sampling rate refers to the number of times the amplitude of the sound is recorded per unit time. A higher sampling rate means more samples are recorded per unit time, resulting in audio of higher quality. .....[4]

(b) The following information refers to a music track being recorded on a CD:

- music is sampled 44 100 times per second
- each sample is 16 bits
- each track requires sampling for left and right speakers

(i) Calculate the number of bytes required to store one second of sampled music.
Show your working.

1 sample = 16 bits = 2 bytes + Stereo Audio .....

44100 × 2 × 2 = 176400 bytes .....

.....

.....[2]

44100
× 4
176400

(ii) A particular track is four minutes long.

Describe how you would calculate the number of megabytes required to store this track.

The number of bytes required to store one second of sampled audio would be multiplied by 240 (seconds in 4min) and then divided by 1024 twice to convert to kilobytes and then to megabytes. .....[2]

(c) When storing music tracks in a computer, the MP3 format is often used. This reduces file size by about 90%.

Explain how the music quality is apparently retained.

Compressing audio into the MP3 utilizes the perceptual music shaping technique, in which sounds with frequencies outside of the audible range are removed and quieter sounds that play at the same time as louder ones are also removed. Removing these sounds allows the compression algorithm to cut down on the file size without significantly affecting the audible quality [3]

W15 P13 Q.8

6 (a) Six computer graphics terms and seven descriptions are shown below.

Draw a line to link each term to its correct description.

Term	Description
Bitmap graphic	Measured in dots per inch (dpi); this value determines the amount of detail an image has
Image file header	Picture element
Image resolution	Image made up of rows and columns of picture elements
Pixel	Image made up of drawing objects. The properties of each object determine its shape and appearance.
Screen resolution	Specifies the image size, number of colours, and other data needed to display the image data
Vector graphic	Number of samples taken per second to represent some event in a digital format [sampling Rate]
	Value quoted for a monitor specification, such as 1024 × 768. The larger the numbers, the more picture elements will be displayed.

[6]






$\frac{512}{8} = 64$ bytes.

64 × 32 = 128, 1920, 2048

(b) (i) A black and white image is 512 pixels by 256 pixels.

Calculate the file size of this image in kilobytes (KB) (1 KB = 1024 bytes).
Show your working.

Res: 512 × 256 pixels = 512 × 256 bits (each pixel = 1 bit)

= 64 × 32 bytes

= 2048 bytes

$\frac{2048}{1024} = 2$ KB

[2]

(ii) Give a reason why it is important to estimate the file size of an image.

It may be important in order to calculate the capacity of some storage device in context of images. (ie. 512 images could fit on a 1MB SD card)

[1]

S16 P12 Q.2

7 (a) Convert the following denary integer into 8-bit binary.

55

128	64	32	16	8	4	2	1
0	0	1	1	0	1	1	1

[1]

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

10000011

83

[1]

(c) Convert the following denary integer into 8-bit two's complement.

-102

-128	64	32	16	8	4	2	1
1	0	0	1	1	0	1	0

[2]

(d) Convert the following hexadecimal number into denary.

4E

01001110

[1]

S16 P12 Q.4

8 A group of students broadcast a school radio station on a website. They record their sound clips (programmes) in advance and email them to the producer.

(a) Describe how sampling is used to record the sound clips.

Sampling is used by recording the amplitude of the sound at set time intervals (sampling rate). The precision to which the analogue sound is recorded as digital audio depends on the sampling resolution. The recorded value of each sample is then encoded into a series of binary digits and stored digitally. [3]

(b) The students use software to compress the sound clips before emailing them.

(i) Circle your chosen method of compression and justify your choice.

Lossy / Lossless

Justification: A typical sound clip contains many sounds which are inaudible to use either because they are out of the human audible frequencies or are drowned out by a simultaneous, louder sound. Also, lossy audio compression (ie to MP3) can reduce the file size by around 90%. [3]

Students also email images to the radio station for use on its website.

These are compressed before sending using run-length encoding (RLE).

(ii) Explain what is meant by run-length encoding.

Run length encoding refers to a lossless compression technique in which identical, adjacent data (ie. a series of pixels of exactly the same colour) are represented by two values (the first indicates the number of repetitions and the second represents the actual value) instead of the value of each repeated piece of data (ie. pixel) being represented individually. [3]

(iii) The following diagrams show:

- the denary colour code that represents each colour
- the first three rows of a bitmap image

Colour symbol	Colour code (denary)
B	153
W	255

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	B	B	B	B	B	B	B	B	B	B	W	W	W	B	B	B
1	B	B	B	B	B	B	B	B	B	W	W	W	W	W	W	B
2	B	B	B	B	B	B	B	W	W	W	W	W	W	W	W	W
...																
95																

Show how RLE will compress the first three rows of this image.

Row 1: 255 10 153 255 3 255 255 3 153

Row 2: 255 9 153 255 6 255 153

Row 3: 255 7 153 255 9 255 [2]

S16 P13 Q.2

9 (a) Convert the following 8-bit binary integer into denary.

01001101

77 [1]

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

82

10000010 [1]

(c) Convert the following two's complement integer number into denary.

11001011

(-128) + 64 + 8 + 2 + 1

= (-128) + 75

= (-53)$_{10}$ [2]

(d) Convert the following denary number into hexadecimal. Show your working.

198

C6 [2]

16 | 198

16 | 12 | 6 ↑

0 | 12

(C)

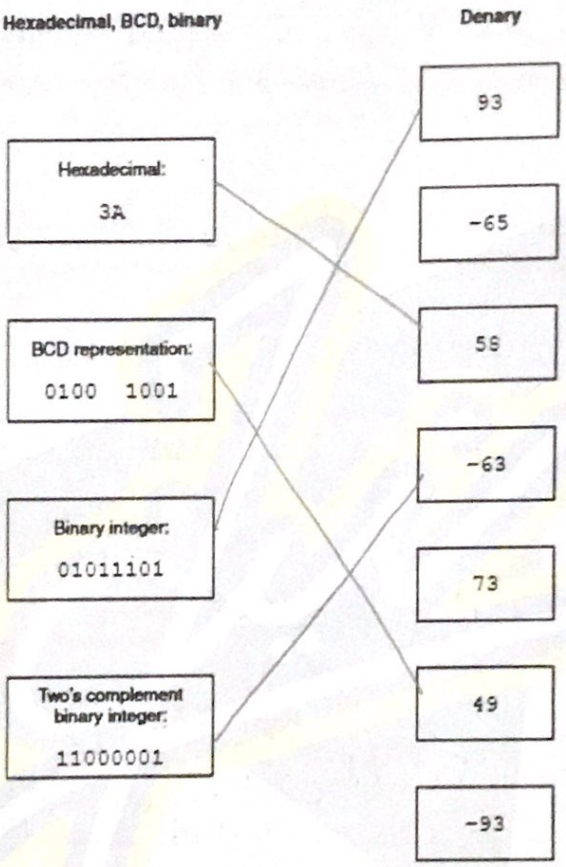





W16 P12 Q.4

10 Hexadecimal, Binary Coded Decimal (BCD) and binary values are shown below.

Draw a line to link each value to its correct denary value.



[4]

W16 P13 Q.3

2 46
2 23 0
2 11 1
2 5 1
2 2 1
2 1 0
0 1

11 (a) (i) Convert the denary number 46 to an 8-bit binary integer.

(00101110)2

.....[1]

(ii) Convert the denary integer −46 to an 8-bit two's complement form.

(11010010)2 02

.....[1]

16 46
16 2 14 E (iii) Convert the denary number 46 into hexadecimal.
0 2 2

(2E)16

.....[1]

(b) Binary Coded Decimal (BCD) is another way of representing numbers.

(i) Describe how denary integers larger than 9 can be converted into BCD.
Give an example in your answer.

For multiple-digit denary integers, conversion into BCD can be carried out by representing each in 4 bits, and concatenating all the bits to one binary number. For example 12 can be written as 1(0001) and 2(0010) so BCD of 12 = (00010010).

.....[2]

(ii) Describe how an 8-bit BCD representation can be converted into a denary integer.
Give an example in your answer.

The 8 bit binary is first split into two 4 bit binary numbers and each 4 bit binary number is then converted into it's denary equivalent. The resulting denary digits are concatenated. For example 00110101 becomes 0011 (3) and 0101 (5) so denary = 35.

.....[2]

(i) Give two disadvantages of using ASCII code.

1 Only English and some other special / drawing characters can be represented using ASCII.

2 Since ASCII codes and tables are not standardised, there can be confusion regarding which character is being represented. [2]

(ii) Describe how Unicode is designed to overcome the disadvantages of ASCII.

Unicode utilizes more bits than ASCII (16 or 32 instead of 7 or 8), allowing for more characters to be represented. Moreover, encoding of characters in Unicode is standardised and thus, unambiguous. [2]

S17 P12 Q.3

12 (a) A computer has a microphone and captures a voice recording using sound editing software.

The user can select the sampling resolution before making a recording.

Define the term **sampling resolution**. Explain how the sampling resolution will affect the accuracy of the digitised sound.

Sampling resolution Sampling resolution refers to the number of distinct values available for the amplitude of a sound wave / sample to be recorded.

Explanation A higher sampling resolution results in more precise audio samples that are closer to the actual analogue sound. [3]

(b) The computer also has bitmap software.

(i) Define the term **image resolution**.

Image resolution refers to the dimensions and size of the image in pixels. [1]

(ii) A picture is drawn and is saved as a 16-colour bitmap image.

State how many bits are used to encode the data for one pixel.

2^4 4 bits [1]

(iii) A second picture has width 8192 pixels and height 256 pixels. It is saved as a 256-colour bitmap.

Calculate the file size in kilobytes.

Show your working.

8192 x 256 pixels = $\frac{(8 \times 8192) \times (8 \times 256)}{8}$ bytes

= 8192 x 256 bytes

= 2097152 bytes

= 2048 KB [3]

(iv) The actual bitmap file size will be larger than your calculated value as a bitmap file has a file header.

State **two** items of data that are stored in the file header.

1 Size of the image

2 Colour depth of the image. [2]

S17 P13 Q.3

13 (a) A computer has a microphone and captures a voice recording using sound recording software.

Before making a recording, the user can select the sampling rate.

Define the term **sampling rate**. Explain how the sampling rate will influence the accuracy of the digitised sound.

Sampling rate Sampling rate refers to the number of times the amplitude of the sound wave / sample is recorded per unit time.

Explanation A higher sampling rate will result in more samples, allowing us to build a more accurate digital replica of the analogue sound wave [2]

(b) The computer also has bitmap software.

(i) Define the terms **pixel** and **screen resolution**.

Pixel ... A pixel is the smallest possible light element of a display. ...

Screen resolution ... Screen resolution is the dimensions of the display in pixels ...

[2]

(ii) A picture has been drawn and is saved as a monochrome bitmap image.

State how many pixels are stored in one byte.

... 8 pixels ... [1]

(iii) A second picture has width 2048 pixels and height 512 pixels. It is saved as a 256-colour image.

Calculate the file size in kilobytes.

Show your working.

2048 x 512 pixels = 2048 x 512 bytes (since 256 colours = 8 bits)

= 1048576 bytes

1024

1048576

1024

= 1024 KB

... [3]

(iv) The actual bitmap file size will be larger than your calculated value.

State another data item that the bitmap file stores in addition to the pixel data.

... The image resolution. ...

... [1]






W17 P13 Q.1

14 (a) Each of the following bytes represents an integer in two's complement form.

State the denary value.

(i) 0111 0111 Denary 119 [1]

64+32+16+4+2+1 = 119

(ii) 1000 1000 Denary -120 [1]

(iii) Express the following integer in two's complement form.

64 32 16 $-\frac{17}{8}$ 4 2 1

1	1	1	0	1	1	1	1

[1]

(iv) State in denary, the range of integer values that it is possible to represent in two's complement integers using a single byte.

Lowest value -128

Highest value 127 [1]

(b) (i) Convert the following denary integer into Binary Coded Decimal (BCD).

653

01100101011 [1]

(ii) A 3-digit BCD representation has been incorrectly copied. It is shown as:

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

State how you can recognise that this is not a valid BCD representation.

The second group of four bits converts to a denary integer of more than 9. [1]

(iii) Describe a practical application where BCD is used.

It's used in the displays of digital clocks and scoreboards. [1]

S18 P12 Q.4

15 **(a)** The Accumulator is a register. The current contents of the Accumulator are:

1	1	0	1	1	0	1	1
128	64	32	16	8	4	2	1

The current contents of the Accumulator represent an unsigned binary integer.

(i) Convert the value in the Accumulator into denary.

128+64+16+8+2+1 = (219)10 ..... [1]

(ii) Convert the value in the Accumulator into hexadecimal.

DB ..... [1]

(iii) The current contents of the Accumulator represent a two's complement binary integer.

Convert the value in the Accumulator into denary.

(-128)+64+16+8+2+1 = (-37) ..... [1]

(b) The binary integer represents a character from the computer's character set.

(i) Define the term **character set**.

A character set is a collection of characters and their corresponding binary and hex codes ..... [1]

(ii) Explain the differences between the **ASCII** and **Unicode** character sets.

ASCII uses 7 or 8 (Extended) bits to encode characters into binary whereas Unicode uses 16 or 32 bits, and thus, significantly more characters can be represented using Unicode. Also, Unicode is standardised whereas ASCII is not. ..... [2]

(iii) The ASCII code for 'A' is 41 in hexadecimal.

Calculate the ASCII code in hexadecimal for 'Z'. Show your working.

Working 41 to decimal ⟶ (16×4)+1 = 65

65+25 = 90 ⟶ Hex = 5A

16 90
16 5 10
0 5

ASCII code in hexadecimal for 'Z' 5A

[2]

S18 P12 Q.5

16 A student has recorded a sound track for a short film.

(a) Explain how an analogue sound wave is sampled to convert it into digital format.

To convert it into digital data, the amplitude of the sound is recorded several times per second (depending on the sampling rate). The precision to which each sample is recorded is called the sampling resolution. All of the recorded amplitudes / samples are encoded into binary and stored digitally. [3]

(b) Explain the effects of increasing the sampling resolution on the sound file.

Increasing the sampling resolution will result in more accurate samples, ie recorded amplitudes will be closer to the actual amplitudes, resulting in higher sound quality, however, the file size will also increase. [2]

(c) The original sound was sampled at 44.1 kHz. The sample rate is changed to 22.05 kHz.

Explain the effects of this change on the sound file.

The decrease in sampling rate from 44.1kHz to 22.05 kHz would result in lower quality and relatively more distorted audio that is farther from the actual, analogue sound as only one sample where previously two samples were being recorded. However, this would also decrease the file size by half as fewer bits are required to store fewer samples. [3]

(d) The student uses sound editing software to edit the sound file.

Name **two** features of sound editing software the student can use to edit the sound file.

Describe the purpose of each feature.

Feature 1 Fade In / Out

Purpose This can be done so that the audio does not begin or end abruptly, which can be useful in many cases in cinematography.

Feature 2 Trim

Purpose The audio file can be trimmed so that only the desired audio remains in the file. This can be used to remove mistakes made while recording.

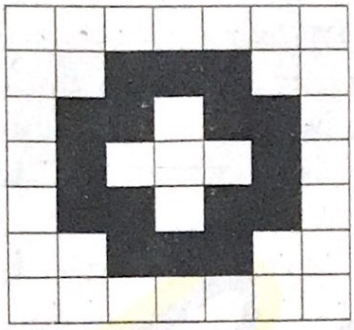
[4]






S18 P13 Q.6

17 A black and white bitmap image is shown.



(a) State the **minimum** number of bits needed to represent each pixel in this image.

1 [1]

(b) Run-length encoding (RLE) is used to store the image with the following colour codes.

Colour	Code
Black	1A
White	3B

Show how run-length encoding is used to store the image.

FF 7 3B FF 2 3B FF 3 1A FF 2 3B 3B FF 2 1A
3B FF 2 1A FF 2 3B 1A FF 3 3B 1A FF 2 3B FF 2 1A
3B FF 2 1A FF 3 3B FF 3 1A FF 9 3B [3]

(c) An image has 30 different colours.

State the **minimum** number of bits needed to represent each pixel in the 30-colour image.

5 bits [1]

(d) When the image is saved, a header is added to the file.

State the purpose of the **file header**. Give **two** examples of the file header contents.

Purpose The file header contains extra data/ metadata about the file that is not stored in the file itself.

Example 1 A file header of an image could contain the image colour depth.

Example 2 A file header could also contain the format of the file. [3]

(e) Graphics software is used to edit a digital photograph.

Give **three** features of graphics software that can be used to edit the photograph.

Describe the effect each has on the photograph.

Feature 1 Cropping

Effect Cropping a digital photograph allows you to remove unwanted content by digitally "cutting" the photograph from it's sides.

Feature 2 Saturation

Effect This allows the user to change how saturated the colours are. If saturation is decreased, the photograph becomes more monochromatic.

Feature 3 Change Image Resolution / Resize

Effect An image can be resized so that all of the same content is represented with fewer pixels, albeit in such a case the quality and resolution of the image will decrease. [6]

W18 P12 Q.1

18 A company is designing a website.

(a) The company creates a 4-colour bitmap image for the website as shown.

Each colour is represented by a letter, for example, G = grey, K = black.

G	R	G	K	W	R
G	R	G	K	W	R
G	R	G	K	W	R
G	R	G	K	W	R
G	G	G	K	K	R
W	W	W	W	K	R

(i) State the minimum number of bits needed to represent each pixel in the image in **part (a)**.

2 bits [1]

(ii) Calculate the minimum file size of the image shown in **part (a)**. Show your working.

Working 1 pixel = 2 bits

6×6 = 36 pixels = 72 bits

File size 72 bits [3]

(b) The company takes a photograph of their office to put on the website. The photograph has a resolution of 1000 pixels by 1000 pixels. Two bytes per pixel are used to represent the colours.

(i) Estimate the file size of the photograph in megabytes. Show your working.

Working 1000 × 1000 pixels = 2000 × 2000 bytes

4000000 bytes

1000000 → since question says "estimate"

= 1 MB

Estimated file size 4MB [4]

390
4000000
1024

3,7,2,9,1
4000
-3072
0928

9280
-9216
0064

23
1024
9216

6400

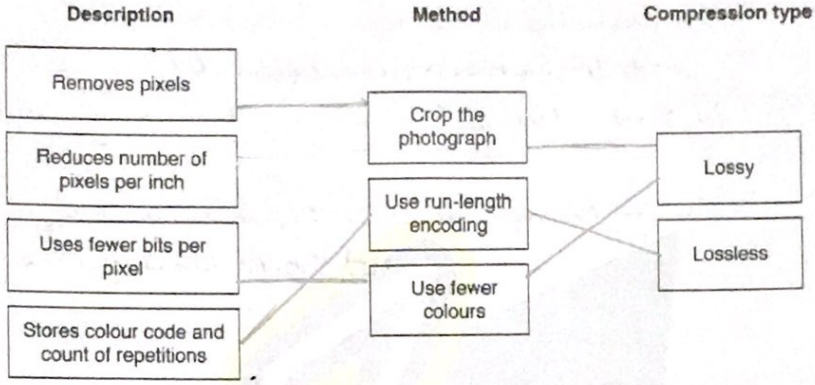





(ii) The file size of the photograph needs to be reduced before it is placed on the website.

Draw lines to link each method of reducing the file size of the image to:

- its description and
- its compression type, where appropriate.



[5]

(c) The company has created a logo for the website. The logo is a vector graphic.

Describe **two** reasons why a vector graphic is a sensible choice for the logo.

Reason 1 A vector graphic is made by using mathematical equations of geometric shapes and is thus, highly scaleable (can be resized without any loss of quality)

Reason 2 A logo is usually an unrealistic graphic consisting primarily of geometric shapes which makes storing the equations of the shapes more feasible (storage wise) than having to store data for each bit

[4]

S19 P11 Q.1d

19 A recording of a concert is stored as a file. The file is compressed using lossy compression before it is streamed to users.

(i) State why this file needs to be compressed.

It needs to be compressed to reduce the file size so that it can be streamed faster and more smoothly to the users [1]

(ii) Define the term **lossy compression**.

lossy compression refers to reducing the size of a file in such a way that some data is lost permanently [1]

(iii) The file could be compressed using lossless compression.

Explain why lossy compression is a more appropriate compression technique than lossless for this file.

lossy compression is capable of reducing the file size by a greater percentage than lossless compression (in most cases). Also, lossy compression will not greatly affect the sound quality since it utilizes perceptual music shaping, thus there is no need for lossless compression. [3]

S19 P11 Q.6d

20 A sound track is recorded for the video.

(i) Describe how a computer encodes the sound track.

The sound track is first sampled, ie the amplitude of the sound waves is recorded at set time intervals (sampling rate). The precision to which the audio is sampled depends on the sampling resolution. The recorded amplitudes/ samples are the encoded into binary and stored digitally. [3]

(ii) Explain how the sampling rate and sampling resolution affect the file size of the sound track.

Sampling rate A higher sampling rate, more samples being recorded per second, would increase the file size.

Sampling resolution A higher sampling resolution, ie more bits being used to store each sample, would also increase the file size. [2]






S19 P12 Q.3d

21 The ASCII character code for 'A' is 65 in denary.

(i) Convert the denary ASCII character code for 'A' into 8-bit binary.

0	1	0	0	0	0	0	1

[1]

(ii) Convert the denary ASCII character code for 'A' into hexadecimal.

41 [1]

(iii) The Unicode character code for 'G' is 0047 in hexadecimal.

State, in hexadecimal, the Unicode character code for 'D'.

0044 [1]

W19 P11 Q.5

22 (a) The bit depth of an image dictates how many different colours can be represented by each pixel.

(i) State the number of different colours that can be represented by a bit depth of 8 bits.

256 colours [1]

(ii) One binary colour is represented by 0100 1110

Convert the unsigned binary number 0100 1110 into denary.

64 + 8 + 4 + 2 = (78)$_{10}$ [1]

(b) Convert the denary number –194 into 12-bit two's complement.

1111010000000 [1]

(c) (i) Convert the Binary Coded Decimal (BCD) value 0110 1001 into denary.

64 2 1

69 [1]

(ii) Identify one practical application where BCD is used.

It is used in the displays of digital clocks and scoreboards [1]

(d) One example of a character set used by computers is ASCII.

Describe how one character is represented in a character set.

For each character in a character set there is a corresponding binary and hexadecimal value that is stored in and understood by the computer. [2]

(e) Data can be compressed using either lossy or lossless compression.

Tick (✓) **one** box in each scenario to identify whether lossy or lossless compression should be used. Justify your choice.

(i) A program written in a high-level language.

Lossy	Lossless
	✓

Justification Lossless compression is required as any permanent loss of data from the written program could result in it becoming corrupt and non-functional. [2]

(ii) A photograph that needs to be emailed to a friend.

Lossy	Lossless
	✓

Justification Run Length Encoding can be used to losslessly compress the file so that it can transmitted easily and the high quality of the image can be maintained. [2]

(iii) You need to upload a video that you have created to a website.

Lossy	Lossless
✓	

Justification A raw video would occupy too much space, which can be changed by using lossy compression methods (ie decreasing resolution) so that it occupies a reasonable amount of space and uploads in a feasible period of time. [2]

W19 P12 Q.6

23 Dominic's tablet captures a video of Dominic to send to other people. The video is made of a sequence of images and a sound file.

(i) Describe how the images and sound are encoded into a digital form.

Images The image is split into a matrix of pixels, and the colour value of each pixel is encoded into binary and stored individually. Extra information, such as image resolution and colour depth is stored in the header.

Sound The sound is first sampled, ie the amplitudes of the soundwaves are recorded several times per second, and then these samples are encoded into binary values and stored digitally. [4]