1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

1.2 Text, sound and images				
1	Understand how and why a computer represents text and the use of character sets, including American standard code for information interchange (ASCII) and Unicode			
2	Understand how and why a computer represents sound, including the effects of the sample rate and sample resolution			
3	Understand how and why a computer represents an image, including the effects of the resolution and colour depth			

More Guidance:

1.2 Text, sound and images

Candidates should be able to:	Notes and guidance
1 Understand how and why a computer represents text and the use of character sets, including American standard code for information interchange (ASCII) and Unicode	• Text is converted to binary to be processed by a computer • Unicode allows for a greater range of characters and symbols than ASCII, including different languages and emojis • Unicode requires more bits per character than ASCII
2 Understand how and why a computer represents sound, including the effects of the sample rate and sample resolution	• A sound wave is sampled for sound to be converted to binary, which is processed by a computer • The sample rate is the number of samples taken in a second • The sample resolution is the number of bits per sample • The accuracy of the recording and the file size increases as the sample rate and resolution increase
3 Understand how and why a computer represents an image, including the effects of the resolution and colour depth	• An image is a series of pixels that are converted to binary, which is processed by a computer • The resolution is the number of pixels in the image • The colour depth is the number of bits used to represent each colour • The file size and quality of the image increases as the resolution and colour depth increase

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

1.3 Data storage and compression				
1	Understand how data storage is measured			
2	Calculate the file size of an image file and a sound file, using information given			
3	Understand the purpose of and need for data compression			
4	Understand how files are compressed using lossy and lossless compression methods			

More Guidance:

1.3 Data storage and compression

Candidates should be able to:	Notes and guidance
1 Understand how data storage is measured	• Including: – bit – nibble – byte – kibibyte (KiB) – mebibyte (MiB) – gibibyte (GiB) – tebibyte (TiB) – pebibyte (PiB) – exbibyte (EiB) • The amount of the previous denomination present in the data storage size, e.g.: – 8 bits in a byte – 1024 mebibytes in a gibibyte
2 Calculate the file size of an image file and a sound file, using information given	• Answers must be given in the units specified in the question • Information given may include: – image resolution and colour depth – sound sample rate, resolution and length of track
3 Understand the purpose of and need for data compression	• Compression exists to reduce the size of the file • The impact of this is, e.g.: – less bandwidth required – less storage space required – shorter transmission time
4 Understand how files are compressed using lossy and lossless compression methods	• Lossless compression reduces the file size without permanent loss of data, e.g. run length encoding (RLE) • Lossy compression reduces the file size by permanently removing data, e.g. reducing resolution or colour depth, reducing sample rate or resolution

5 A musician is recording herself playing the music for a song on the piano.

(a) Explain how the analogue sound is recorded and converted to digital.

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..... [5]

(b) State **two** ways that the accuracy of the recording could be increased.

1 .....

2 .....

[2]

(c) The musician compresses the sound file using lossless compression instead of lossy compression.

Explain why the musician would choose to use lossless compression instead of lossy compression.

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..... [3]

(d) The musician types the words for the song into a document.

Two character sets that can be used when converting text to digital are the American standard code for information interchange (ASCII) and Unicode.

Explain the differences between the ASCII character set and the Unicode character set.

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..... [4]

5 A band is recording their new song. They need to consider the sample rate and sample resolution of their recording.

(a) Give **one** benefit of using a higher sample rate to record the song.

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..... [1]

(b) Give **one** drawback of using a higher sample rate to record the song.

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..... [1]

(c) Describe what is meant by sample resolution.

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..... [2]

(d) The band wants to compress the sound file, but they do **not** want any data to be permanently removed.

Identify the compression method that should be used.

..... [1]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

7 A photographer takes an image with a digital camera. The photographer sets the resolution and colour depth for the image.

(a) State what is meant by the image resolution.

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..... [1]

(b) State what is meant by the image colour depth.

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..... [1]

(c) Give **one** benefit of increasing the colour depth of the image.

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..... [1]

(d) The photographer compresses the image using a method that permanently reduces the colour depth and resolution of the image.

Identify which compression method the photographer uses.

..... [1]

(e) One benefit for compressing the image is to reduce the storage space it uses.

Give **two** other benefits of compressing the image.

1 .....

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2 .....

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[2]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

2 A student has a sound file that is too large to be stored on their external secondary storage device. The student compresses the sound file to make the file size smaller.

The compression method used reduces the sample rate and the sample resolution of the sound file.

(a) State what is meant by the sample rate and sample resolution.

Sample rate .....

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Sample resolution .....

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[2]

(b) Identify which type of compression has been used to compress the sound file.

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..... [1]

3 When keys are pressed on a keyboard, the text is converted to binary to be processed by the computer.

(a) Describe how the text is converted to binary to be processed by the computer.

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..... [3]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

(b) Text that is input into a computer can be stored in a text file.

A text file can be compressed using lossless compression.

(i) State what effect this has on the file size.

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..... [1]

(ii) Describe how lossless compression compresses the text file.

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..... [4]

(iii) Give **two** reasons why the text file may have been compressed.

1 .....

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2 .....

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[2]

4 A wildlife photographer stores their digital images on a computer.

(a) Complete the table by defining each term about images.

Image term	Definition
pixel	....
resolution	....

[2]

(b) One of the images has a resolution of 1000 × 1000 and a colour depth of 2 bytes.

Calculate the file size of the image. Give your answer in bytes.

Show your working.

Working space .....

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.....

.....

File size ..... bytes

[2]

(c) The photographer decides to purchase a solid-state storage device to back up their images.

Complete the description of solid-state storage.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

binary denary electrons grid neutrons

non-volatile RAM star transistors virtual volatile

Solid-state storage is ..... . This means that the data is **not** lost when the power is turned off.

Solid-state storage is made of ..... that are laid out in a ..... .

Gates are used to control the flow of the ..... through the transistors. This changes the data in the transistors from 1 to 0, or from 0 to 1.

[4]

(d) The photographer compresses an image file before it is emailed.

Give **one** reason why a file is compressed.

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..... [1]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

3 Jessica wants to store a large number of small thumbnail images on a USB flash memory drive. Each thumbnail image is 16-bit colour and is 100 pixels wide and 100 pixels high.

She has 5 MB of storage space available on her USB flash memory drive.

Calculate how many images she can store in the 5 MB of storage space. Show all your working.

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Number of images .....

[4]

5 An image is stored on a computer. The image is 16-bit colour and is 100 pixels high and 150 pixels wide.

Calculate the file size of the image in bytes. Show all your working.

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Answer ..... bytes

[3]

2 Nadia creates a digital image for a school project.

(a) Give **one** example of an image format.

..... [1]

(b) Describe how a digital image file is stored by a computer.

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..... [3]

(c) Nadia compresses the digital image file before emailing it to a friend.

(i) State what is meant by data compression.

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..... [1]

(ii) Explain why Nadia compresses the digital image file before emailing it.

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..... [2]

5 Sammi works for a finance company and has a laptop that he uses for his work. He has confidential data about his customers stored on his laptop.

Sammi does **not** connect the laptop to any networks.

(a) Sammi is concerned about his customers' confidential data being viewed by other people in his office.

One method he uses to prevent others viewing the data is encryption.

Identify **three** other methods Sammi could use to prevent his customers' confidential data being viewed.

1 .....

2 .....

3 .....

[3]

(b) Sammi creates videos for the finance company website that give customers advice about their finances.

He uses lossy compression to reduce the file size of the videos for the website.

(i) Give **three** ways that lossy compression can reduce the file size of the videos.

1 .....

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2 .....

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3 .....

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[3]

(ii) Give **one** drawback of using lossy compression to reduce the file size of the videos.

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..... [1]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

(c) Sammi could have used lossless compression to compress the videos for the website.

(i) Give **one** reason why he would use lossless compression, rather than lossy compression, for the videos.

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..... [1]

(ii) Give **two** disadvantages of Sammi using lossless compression, rather than lossy compression, for the videos.

Disadvantage 1 .....

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Disadvantage 2 .....

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[2]

1 **(a)** Xia has **three** files stored on her computer.

Tick (✓) **one** box to show which is the largest file size.

File size	Tick (✓)
999 kB	
1 MB	
850 000 bytes	

[1]

(b) Denise has **three** files stored on her computer.

Tick (✓) **one** box to show which is the smallest file size.

File size	Tick (✓)
4000 MB	
2 GB	
2 500 000 kB	

[1]

7 A music company has a website that allows users to stream music. The music is stored in sound files.

(a) The sound files are compressed using lossless compression.

(i) Describe how the sound files are compressed using lossless compression.

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..... [4]

(ii) State **one** reason why the music company would compress the sound files using lossless, rather than lossy, compression.

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..... [1]

(iii) Give **one** benefit, to the user, of the music company compressing the sound files.

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..... [1]

(iv) Give **one** drawback of the music company using lossless, rather than lossy, compression for the sound files.

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..... [2]

1.2 & 1.3 Data Representation - Text, Sound & Images Compression
QUESTIONS

2 Jolene displays videos on her website. She uses lossy compression to reduce the file size of the videos.

(a) Describe how lossy compression reduces the file size of the videos.

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..... [3]

(b) State **two** reasons why Jolene would use lossy rather than lossless compression for the videos.

Reason 1 .....

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Reason 2 .....

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[2]