Assessment Schedule – 2023

Digital Technologies: Demonstrate understanding of compression coding for a chosen media type (91887)

Assessment Criteria

Achievement	Achievement with Merit	Achievement with Excellence
*Demonstrating **understanding** of compression coding for a chosen media type* involves: • identifying reasons for compressing files • showing how the chosen media type can be represented using bits in an uncompressed form • showing how a lossless compression method works • giving examples of when lossy compression is appropriate.	*Demonstrating **in-depth understanding** of compression coding for a chosen media type* involves: • exploring the relationship between lossy compression and human perception of the medium • evaluating lossy and lossless compression methods.	*Demonstrating **comprehensive understanding** of compression coding for a chosen media type* involves: • evaluating how real-world applications are enabled by relevant representations including lossy, lossless, compressed or uncompressed.

Evidence

N1	N2	A3	A4	M5	M6	E7	E8
Demonstrates very little understanding.	The report is produced by the candidate but demonstrates little understanding and part of the response may be missing.	For the chosen media type, demonstrates understanding of reasons to compress, identifies when they have used compression, and how lossless compression works. Some descriptions may be weak or partial.	For the chosen media type, demonstrates clear understanding of reasons to compress, identifies when they have used compression, and how lossless compression works.	Evaluates as required to show in-depth understanding of the relationship between lossy and lossless compression and how this affects human perception. Some descriptions may be weak or partial.	Evaluates as required to clearly show in-depth understanding of the relationship between lossy and lossless compression and how this affects human perception.	Demonstrates a comprehensive understanding of real-world applications of compression in the context of the selected media type for a specific output. Some aspects may be partial or weak.	Clearly demonstrates comprehensive understanding of real-world applications of compression in the context of the selected media type for a specific output.

N0 = No response; no relevant evidence.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 2	3 – 4	5 – 6	7 – 8

Sample evidence

Question	Achievement	Achievement with Merit	Achievement with Excellence
	Requires 2 out of 3 of (a), (b) and (c), and either (d)(i), (d)(ii), (e)(i), (e)(ii), (f)(i), or (f)(ii).	Requires 2 out of 3 of (b)(ii), (c)(ii), and either (d)(iii), (e)(iii), or (f)(iii).	Requires at least one of (b) and (c) to be strong, or understanding demonstrated across the two questions.
(a)	Gives reasons why files of their chosen media type might be compressed. *Files should be compressed so that they take up less space. This means people can fit more files on their computers or phones and not run out of room.*		
(b)(i) and (ii)	Identifies one time when they have used lossy compression and one time when they have used lossless compression.		
(iii)	Identifies why it was appropriate to use lossy or lossless compression in each case. *I use lossy compression when taking photos on my phone, as they are automatically saved in JPG format.* *I used lossless compression when saving a logo as a PNG on the website I made in class this year.*	Clearly explains why it was appropriate to use lossy or lossless compression in each case. May refer to how the choice of compression affects the user, for example loading times or image quality. *JPG is the default file type on my phone because it takes up less space, meaning I can store more photos. I can also upload them to* Instagram *or share them with my friends quickly. However, an advantage of JPG is that it can be set to compress at different rates, meaning you can reduce file size without affecting quality too much. This is important if you are sharing images.* *Because phone screens are small, most people will prioritise speed over quality, and lossy compression such as JPG compresses files by a lot, meaning they will be faster to send.*	Compares and contrasts the method(s) they used against other methods for both examples. Response clearly relates to a real-world context. *If the photos weren't compressed, the files would be huge and it would take a long time to upload or share them. Because lossy compression removes data, images will decrease in quality if over-compressed. Lossless compression does not compress the files by as much as lossy because it doesn't remove any data, it just represents the information in a different way. In some cases, the files can even become larger than the original uncompressed images. Because I am sharing images from my phone with friends who will view them on their own phones, it is important that the image file sizes are made smaller so that they load quickly and we don't use up all of our data. JPG is a great way of doing this as it can compress the files a lot without affecting the quality too much.*

(c)	Selects one of the media types and recommends a compression approach. Answer includes some aspects of how this approach would affect the output from the perspective of the end-user. Response may be weak or partial. *Media type: images* *Approach: lossy compression for all files* *By using lossy compression for all files, my friend can use JPG, which will make the files a lot smaller. This will make the webpages load faster, which will make users happier. So long as the images aren't over-compressed, they will still look okay and show the products in a good light.*	Selects one of the media types and recommends a compression approach. Answer includes some aspects of how this approach would affect the output from the perspective of the end-user. *Media type: audio* *Approach: lossy compression for all files* *I recommend that they use lossy compression for the audio recordings, as these files can be very large and slow down the loading times of the webpages if they aren't compressed. By using a method like MP3, the audio recordings can be compressed down to much smaller sizes without losing too much quality. MP3 is great as you can choose different levels of compression. MP3 works by approximating the original file, and the greater the bit depth or sample rate, the better the approximation. The lower the bit depth and sample rate, the worse the approximation is and the worse the quality will be. When compressing you need to balance file size with quality. If an audio file is over-compressed it can result in distortion and lack of quality, which make the file sound terrible. I would recommend that they use lossy and MP3 to reduce the file sizes, but be careful to avoid the loss of sound quality.*	Selects one of the media types and recommends a compression approach. Answer includes some aspects of how this approach would affect the output from the perspective of the end-user. Explains why this approach is best by comparing it to another method. *Media type: images* *Approach: a combination of both lossy and lossless compression* *There could be a variety of image types on the website, so I recommend that they use a combination of lossy and lossless compression. Lossy compression, such as JPG, works well for photos, and because it allows you to adjust the amount of compression, it could reduce the file sizes of large images while still maintaining good quality. This will not work, however, for flat-colour images such as logos, or any images with text or graphs. This is because JPG works by approximating the image in 8x8 squares. As a result, whenever colours change abruptly, such as in a logo or text, blurring can occur. This will result in poor-quality images. For images such as the logo or text, a lossless format like PNG or GIF would be better, as these work by representing the data in a more efficient way, reducing the file size while maintaining perfect quality. This will improve the loading time of the website and maintain high image quality, impressing users. I would not recommend they use lossless for all images, particularly any large photos, as it does not reduce file size as much as lossy. This would result in longer loading times, which is what they are trying to avoid.*

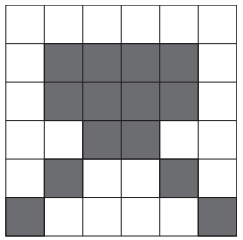
(d)(i)	Decodes the message correctly. *See appendix*.		
(ii)	Encodes the message correctly. *See appendix.*		
(iii)	Correctly identifies `FIFTH SINGING FISH SIGHING` as being compressed by more. Provides a weak explanation as to why. OR Correctly identifies `POSH TROOPS POSE FOR PHOTOS` as being compressed by more. Provides a weak explanation as to why.	*The phrase 'FIFTH SINGING FISH SIGHING' will be compressed by more as it has more characters near the top of the Huffman tree. This means each will require fewer bits to represent them. This is because in the text used to generate the Huffman tree, letters such as G, F, I and N were more common.* OR *The phrase 'POSH TROOPS POSE FOR PHOTOS' will be compressed by more as it has more characters near the top of the Huffman tree. This means each will require fewer bits to represent them. This is because in the text used to generate the Huffman tree, letters such as S, O, P and H were more common.*	
(e)(i)	Encodes the image correctly. *See appendix*.		
(ii)	Decodes the image correctly. *See appendix*.		
(iii)	Correctly identifies that the 15x15 image will result in a smaller file size when encoded using run-length encoding, but provides a weak explanation as to why.	Demonstrates a deep understanding of how a lossless compression method works. *See appendix.*	
(f)(i)	Encodes the lyrics correctly. *See appendix.*		
(ii)	Decodes the message correctly. *See appendix.*		
(iii)	Identifies how the dictionary can be improved, but explanation is weak.	Demonstrates a deep understanding of how a lossless compression method works. *See appendix.*	

Appendix

Paper A

Task part	Evidence
(d)(i)	Decodes the message as: `GREEN`
(ii)	Encodes `SPINE` as: `0100110 010010 011 110 1111`

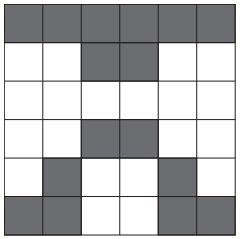
(e)(i)	Encodes the image as:
	`0, 6`
	`6`
	`2, 2, 2`
	`2, 2, 2`
	`1, 4, 1`
	`0, 1, 4, 1`

(ii)	Decodes the image as: 
(iii)	*The image will result in a smaller file size when compressed by run-length encoding. Run-length encoding compresses by representing runs of a colour as one number and separating them with commas. This image has many long runs of one colour.* *For example, in the first row, rather than repeating 1, 1, 1… 15 times for the 15 white pixels, with run-length encoding it can be compressed into the number 15, a saving of 13 characters.* *The worst row would be row 3, which would be written as 2, 1, 2, 1, 3, 1, 2, 1, 2, which is 17 characters, only slightly above the 15, meaning it will only have a minimal impact on file size.*

Paper B

Task part	Evidence
(d)(i)	Decodes the message as: `SHORE`
(ii)	Encodes `FORGE` as: `0111111 010 11110 0111110 11111`

(e)(i)	Encodes the image as:
	`0, 1, 4, 1`
	`1, 1, 2, 1, 1`
	`2, 2, 2`
	`2, 2, 2`
	`1, 4, 1`
	`0, 6`

(ii)	Decodes the image as: 
(iii)	*The image will result in a smaller file size when compressed by run-length encoding. Run-length encoding compresses by representing runs of a colour as one number and separating them with commas. This image has many long runs of one colour.* *For example, in the first row, rather than repeating 1, 1, 1… 15 times for the 15 white pixels, with run-length encoding it can be compressed into the number 15, a saving of 13 characters.* *Similarly, the second row can be written as 2, 11, 2, which is less than 15 characters.* *The worst row would be row 4, which would be written as 0, 1, 3, 2, 3, 2, 3, 1, which is 15 characters, meaning that it would not change size from the original.*

(f)(i)	Encodes the lyrics as:
	`0 8 1 2 3 8 4`
	`0 8 1 2 3 8 5`

(ii)	Decodes the message as: `Alright, everybody sing it, everybody rock`
(iii)	*Changing 'We will' to 'We will,' with the comma attached, as the only time We will ever appears is with a comma after it.* *Or, combining 1, 2, and 3 into one entry in the dictionary, creating 'we will rock you' as the entries 'we will', 'rock' and 'you' only ever appear together.* *This change will reduce the number of entries in the dictionary and also reduces the size of the compressed message.*

(f)(i)	Encodes the lyrics as:
	`0 1 2 3 4 5 4 9 4 5 4 9 4 5 4`
	`0 1 2 3 4 5 4 9 8`

(ii)	Decodes the message as: `The round wheels on the bus go swish all day long`
	Combining 4 5 4 into one entry, creating 'round and round', as the word round never occurs by itself. This also appears four times so would be reused often. *Another change could be combining 0 1 2 3 into one entry, and 0 6 2 3 into another, creating 'The wheels on the bus go' and 'The wipers on the bus go.' Again, these words only ever appear together so it makes sense to create a single dictionary entry for them.* *These changes will reduce the number of entries in the dictionary and also reduces the size of the compressed message.*