



(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:

Row 2:

Row 3:[2]

QUESTION 2.

o



- 7 A small company produces scientific magazines. The owner buys some new desktop computers. The computers are used to store thousands of colour images (diagrams and photographs). All the computers have Internet access.

(a) Name **three** utility programs the company would use on all their computers. Describe what each program does.

1

Description

.....

2

Description

.....

3

Description

.....[6]

(b) The images contained in the magazines are produced using either bitmap or vector graphics software.

Give **four** differences between bitmap and vector graphics.

1

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2

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3

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4

.....[4]



- (c) Employees using the new computers receive training. At the end of the training, each employee completes a series of questions.

Three answers given by an employee are shown below.

Explain why each answer is incorrect.

- (i) *“Encryption prevents hackers breaking into the company’s computers.”*

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.....
.....
.....[2]

- (ii) *“Data validation is used to make sure that data keyed in are the same as the original data supplied.”*

.....
.....
.....
.....[2]

- (iii) *“The use of passwords will always prevent unauthorised access to the data stored on the computers.”*

.....
.....
.....
.....[2]

(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.

.....

.....[1]



QUESTION 4.



- 3 (a) A computer has a microphone and captures a voice recording using sound e

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

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Explanation

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[3]

- (b) The computer also has bitmap software.

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

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..... [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.

..... [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.

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..... [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

2 [2]

QUESTION 5.

1 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)**.

..... [1]

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

Working

.....

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.....

File size

[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

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Estimated file size

[4]





(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.

Description	Method	Compression type
Removes pixels	Crop the photograph	Lossy
Reduces number of pixels per inch	Use run-length encoding	Lossless
Uses fewer bits per pixel	Use fewer colours	
Stores colour code and count of repetitions		

[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

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Reason 2

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[4]

QUESTION 6.

1 A product designer is creating a poster.

(a) The designer creates a 6-colour bitmap image for the poster as shown.

Each colour is represented by a letter, for example, R = red, B = blue.

R	R	P	P	P	G
B	R	R	P	G	G
B	W	B	B	O	O
B	W	W	P	P	O
B	B	R	P	G	O
B	R	R	P	G	O

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

.....[1]

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

Working

.....

.....

File size

[3]

(b) (i) The designer takes a photograph to put on the poster. The photograph has a resolution of 50 000 pixels by 50 000 pixels. The colours are represented using 4 bytes per pixel.

Estimate the file size of the photograph in gigabytes. Show your working.

Working

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Estimated file size

[4]



QUESTION 7.



5 Xander creates a presentation that includes images, video and sound.

- (a) The images are bitmap images. A bitmap image can be made up of any number of colours. Each colour is represented by a unique binary number.

Draw **one** line from **each** box on the left, to the correct box on the right to identify the minimum number of bits needed to store each maximum number of colours.

Maximum number of colours

Minimum number of bits

[3]

15
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