



Name:

Index:

Reg.no.:

Class:

Date:

1.1 Number systems

Candidates should be able to:

- 1 Understand how and why computers use binary to represent all forms of data
- 2 (a) Understand the denary, binary and hexadecimal number systems
 (b) Convert between
 - (i) positive denary and positive binary
 - (ii) positive denary and positive hexadecimal
 - (iii) positive hexadecimal and positive binary
- 3 Understand how and why hexadecimal is used as a beneficial method of data representation
- 4 (a) Add two positive 8-bit binary integers
 (b) Understand the concept of overflow and why it occurs in binary addition
- 5 Perform a logical binary shift on a positive 8-bit binary integer and understand the effect this has on the positive binary integer
- 6 Use the two's complement number system to represent positive and negative 8-bit binary integers

Notes and guidance

- Any form of data needs to be converted to binary to be processed by a computer
- Data is processed using logic gates and stored in registers
- Denary is a base 10 system
- Binary is a base 2 system
- Hexadecimal is a base 16 system
- Values used will be integers only
- Conversions in both directions, e.g. denary to binary or binary to denary
- Maximum binary number length of 16-bit
- Areas within computer science that hexadecimal is used should be identified
- Hexadecimal is easier for humans to understand than binary, as it is a shorter representation of binary
- An overflow error will occur if the value is greater than 255 in an 8-bit register
- A computer or a device has a predefined limit that it can represent or store, for example 16-bit
- An overflow error occurs when a value outside this limit should be returned
- Perform logical left shifts
- Perform logical right shifts
- Perform multiple shifts
- Bits shifted from the end of the register are lost and zeros are shifted in at the opposite end of the register
- The positive binary integer is multiplied or divided according to the shift performed
- The most significant bit(s) or least significant bit(s) are lost
- Convert a positive binary or denary integer to a two's complement 8-bit integer and vice versa
- Convert a negative binary or denary integer to a two's complement 8-bit integer and vice versa

- 1 Hexadecimal is used for MAC addresses.

Part of a MAC address is given:

97 – 5C – E1

Each pair of digits is stored as binary in an 8-bit register.

- (a) Show what the binary register stores for each pair of the given digits.

97							
5C							
E1							

[6]

- (c) Give **two** other examples where hexadecimal can be used.

Example 1

.....

Example 2

.....

[2]

- 2 An electronic guessing game compares denary integer values input by a user with pre-stored values. The pre-stored values are held in 10-bit binary format.

- (a) Convert the binary values in the table to denary.

Binary	Denary
0001001110	
0110110111	
1000000001	

[3]

- (b) When planning the game, the designer decided to use hexadecimal notation to represent the binary values.

Explain why the designer used hexadecimal notation.

.....

.....

..... [2]

- (c) State the hexadecimal equivalent of the binary value 1010110101

..... [3]

0478/12 – NOVEMBER 2019

- 4 An 8-bit binary register contains the value:

0	0	1	1	0	1	0	0
---	---	---	---	---	---	---	---

- (a) Convert the binary value to denary.

.....

..... [1]

- (b) The contents of the register shifted one place to the right would give the result:

0	0	0	1	1	0	1	0
---	---	---	---	---	---	---	---

The contents of the register shown at the start of question 4 are shifted two places to the left.

Show the contents of the register after this shift has taken place.

--	--	--	--	--	--	--	--

[1]

- (c) State the effect this shift has on the denary value in **part (a)**.

.....

..... [1]

- 5 Programmers can use denary and hexadecimal values. These values are stored in a computer system using binary.

(a) Explain why binary is used to store data in a computer system.

.....

.....

.....

..... [2]

(b) Complete the table to show how the denary value would be stored as binary in an 8-bit register.

Denary value	8-bit register
129	
56	

[2]

Working space

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(c) Complete the table to show how the hexadecimal value **3A9** would be stored as binary in a 12-bit register.

--	--	--	--	--	--	--	--	--	--	--	--

[3]

(d) Identify **two** uses of hexadecimal values in computer science.

1

2

[2]

- (b) Give the largest denary value that can be stored in the 8-bit binary register.

..... [1]

- (c) The hockey club wants to increase the number of people that can watch each match to 2000. The 8-bit binary register may no longer be able to store the value.

Give the smallest number of bits that can be used to store the denary value 2000.

..... [1]

Working space

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.....

- 1 A denary value can be converted into hexadecimal and binary.

- (a) Complete the table to show the hexadecimal and 8-bit binary values of the given denary values.

Denary	Hexadecimal	8-bit binary
49		
123		
200		

[6]

Working space

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.....

(b) Give **two** benefits, to users, of converting binary values to hexadecimal.

Benefit 1

.....

Benefit 2

.....

[2]

NOVEMBER 2021 (1)

1 Binary is a number system that is used by computers.

(a) Tick (✓) **one** box to show whether binary is a base-2, base-10 or base-16 number system.

Tick (✓)

☐

Base-2

☐

Base-10

☐

Base-16

[1]

MARCH 2022

(c) Convert the hexadecimal number 1A to denary.

..... [1]

Working space

.....

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JUNE 2022(1)

4 All data needs to be converted to binary data so that it can be processed by a computer.

(a) Explain why a computer can only process binary data.

.....

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..... [2]



- (c) Binary numbers are stored in registers.

Negative denary numbers can be represented as binary using two's complement.

Complete the binary register for the denary number –78

You must show all your working.

Working space

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Register:

--	--	--	--	--	--	--	--

[2]

- (d) Two 8-bit binary numbers are given.

Add the **two** 8-bit binary numbers using binary addition.

Give your answer in binary. Show all your working.

$$\begin{array}{r} 00110011 \\ + 01100001 \\ \hline \end{array}$$

[3]

- (e) Two binary numbers are added by a computer and an overflow error occurs.

Explain why the overflow error occurred.

.....

.....

.....

..... [2]

JUNE 2023 (2)

- (b) A value is stored as a binary number in a register.

0	1	1	1	1	0	1	0
---	---	---	---	---	---	---	---

A logical right shift of **three** places is performed on the binary number.

- (i) Complete the binary register to show its contents after this logical right shift.

--	--	--	--	--	--	--	--

[1]

- (ii) State **one** effect this logical shift has on the binary number.

.....
..... [1]

JUNE 2023 (3)

- (d) Add the **two** 8-bit binary numbers 11101110 and 00110001 using binary addition.

Give your answer in binary. Show all your working.

.....
.....
.....
.....
.....
..... [4]

- (e) The denary number 301 needs to be stored.

Calculate the least number of bits that can be used to store the denary number 301.

..... [1]

Working space

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.....
.....

- (f) The hexadecimal number A4D needs to be stored.

Calculate the least number of bits that can be used to store the hexadecimal number A4D.

..... [1]

Working space

.....

.....

.....

NOVEMBER 2023

- 2 A car park has a payment machine that allows a customer to pay for their parking.

The cost of parking is displayed as a denary number on a screen on the payment machine.

The cost of parking is stored in two 8-bit binary registers.

For the parking cost of \$10.50:

- register 1 stores the denary value 10 as binary
- register 2 stores the denary value 50 as binary.

- (a) Give the parking cost that would be displayed on the payment machine when the registers store:

- register 1: 00010001
- register 2: 01000110

Parking cost displayed \$ [2]

Working space

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.....

- (b) The parking cost of \$14.98 is displayed on the payment machine.

Give the 8-bit binary numbers that are stored in the registers to display the parking cost.

Register 1

Register 2

[2]



- (c) The payment machine gives the customer a ticket when they have paid their parking cost. Each ticket has a 4-digit hexadecimal ticket number that is stored as binary.

The binary number 1010000000111101 is stored for a customer's ticket number.

Give the hexadecimal ticket number that would be displayed on this customer's ticket.

Hexadecimal ticket number [4]

Working space

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.....

- (d) Explain why data input into the payment machine needs to be converted to binary.

.....

.....

.....

..... [2]

NOVEMBER 2023 (2)

- (d) The negative denary number -99 needs to be stored in the register.

Complete the register to show the binary number that would be stored, using two's complement. Show all your working.

Working space

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.....

.....

Register:

--	--	--	--	--	--	--	--

[2]

- (d) Convert the positive denary number 123 to 8-bit binary using two's complement.

Show all your working.

.....

.....

.....

..... [2]

JUNE 2024(11)

- 2 Hypertext markup language (HTML) colour codes can be represented as hexadecimal.

- (a) Tick (✓) **one** box to show which statement about the hexadecimal number system is incorrect.

- | | | |
|---|---|--------------------------|
| A | It uses the values 0 to 9 and A to F. | ☐ |
| B | It can be used as a shorter representation of binary. | ☐ |
| C | It is a base 10 system. | ☐ |
| D | It can be used to represent error codes. | ☐ |

[1]

- (b) Tick (✓) **one** box to show which statement about a logical left shift of **two** places is correct.

- | | | |
|---|---|--------------------------|
| A | It would divide the binary number by 2. | ☐ |
| B | It would multiply the binary number by 2. | ☐ |
| C | It would divide the binary number by 4. | ☐ |
| D | It would multiply the binary number by 4. | ☐ |

[1]

- (c) 10100011 can be stored as a two's complement integer.

Convert the two's complement integer 10100011 to denary. Show all your working.

.....

.....

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..... [2]

- 3 A user enters data that is hexadecimal into a computer system. The data is converted to binary to be processed by the computer.

(a) (i) Give **one** similarity between hexadecimal and binary.

.....
..... [1]

(ii) Give **two** differences between hexadecimal and binary.

1
.....
2
..... [2]

(d) A binary integer that is stored in a register in the computer has a logical left shift performed on it.

(i) Describe the process of the logical left shift that is performed on the binary integer.

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

(ii) State what effect this will have on the binary integer.

.....
..... [1]

(e) A negative binary integer needs to be stored in a register in the computer.

Give the name of the number system that can be used to represent negative binary integers.

..... [1]

1 (a) Complete the sentences about number systems.

Use the items from the list.

Some of the items in the list will **not** be used. You should only use an item once.

A	B	C	D	E	F	G
H	W	X	Y	Z	0	1
2	4	8	10	16	127	128
255	256					

The binary number system is base The smallest denary number that can be represented as an 8-bit binary number is The largest denary number that can be represented as an 8-bit binary number is

The hexadecimal number system is base Each hexadecimal digit is equivalent to bits. The numbers 1 to 9 are used and the number 10 is represented by The hexadecimal number system continues up to the number 15, which is represented by

[7]

(c) Binary addition can result in overflow.

Tick (✓) **one** box to show the correct definition of overflow in binary addition.

A The answer has created a negative number that cannot be represented in binary addition.

☐

B The answer is the result of a logical shift that cannot be performed in binary addition.

☐

C The answer is too large to represent in the number of bits available.

☐

D The answer is too small to represent in the number of bits available.

☐

[1]

(c) The ticket numbers could also be represented as denary.

(i) Convert the **two** ticket numbers from hexadecimal to denary.

02C

10B [2]

(ii) Convert the **two** denary numbers into hexadecimal.

109

415 [2]

Working space

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.....

.....

(ii) Give **two** reasons why the ticket number is displayed as hexadecimal instead of binary.

1

.....

2

..... [2]

1.2 Text, sound and images

Candidates should be able to:

- 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

Notes and guidance

- 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
- 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
- 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 increase as the resolution and colour depth increase

MARCH 2023

- 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]

JUNE 2023 (2)

- 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.

.....

.....

.....

.....

.....

..... [3]

NOVEMBER 2023

- 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.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

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

1

2 [2]



- (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.

.....

.....

.....

.....

.....

.....

.....

..... [4]

March 2022(12)

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

.....

.....

.....

.....

.....

..... [3]

NOVEMBER 2023 (2)

- 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.

.....

..... [1]



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

.....
..... [1]

(c) Describe what is meant by sample resolution.

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

NOVEMBER 2023 (3)

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.

.....
..... [1]

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

.....
..... [1]

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

.....
..... [1]

MARCH 2024(12)

(b) One form of data is characters.

The American standard code for information interchange (ASCII) denary number for the character 'N' is 78.

(i) Tick (✓) **one** box to identify the ASCII denary number for the character 'Q'.

- | | | |
|---|----|--------------------------|
| A | 81 | ☐ |
| B | 80 | ☐ |
| C | 79 | ☐ |
| D | 77 | ☐ |

[1]



(iii) Explain how the word 'RED' is represented using a character set.

.....

.....

.....

..... [2]

(c) Sound can be represented as binary.

(i) Explain why recording sound with a higher sampling resolution creates a more accurate recording.

.....

.....

.....

..... [2]

(ii) Give **one** other way that the accuracy of a sound recording can be improved.

.....

..... [1]

NOVEMBER 2024(13)

(d) When the employee enters the email address, the computer uses Unicode to convert the email address to binary.

(i) State what Unicode is an example of.

..... [1]

(ii) Give **two** advantages of the computer using Unicode instead of American standard code for information interchange (ASCII).

1

.....

2

.....

[2]

(iii) Give **one** disadvantage of the computer using Unicode instead of ASCII.

.....

..... [1]



March 2025(12)

- (b) Describe the relationship between the resolution of the image and the file size of the image.

.....

.....

.....

..... [2]

June 2025(11)

- 3 An image is converted to binary to be represented by a computer.

Complete the table with the missing terms and definition about representing an image.

Term	Definition
.....	This is the smallest component of an image.
resolution	
.....	This is the number of bits used to create each colour in an image.
.....	This is additional data that is stored with an image that can provide information such as the time and date the image was taken.

[4]

June 2025(12)

- (c) The image file has a colour depth of 32 bits.

- (i) State what is meant by a colour depth of 32 bits.

.....

..... [1]



- (ii) The colour depth of the image file is changed to 64 bits.

Explain what effect this change has on the image file.

.....

.....

.....

..... [2]

1.3 Data storage and compression

Candidates should be able to:

Notes and guidance

- | | |
|--|--|
| 1 Understand how data storage is measured | <ul style="list-style-type: none">• Including:<ul style="list-style-type: none">– 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.:<ul style="list-style-type: none">– 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 | <ul style="list-style-type: none">• Answers must be given in the units specified in the question. Calculations must use the measurement of 1024 and not 1000• Information given may include:<ul style="list-style-type: none">– image resolution and colour depth– sound sample rate, resolution and length of track |
| 3 Understand the purpose of and need for data compression | <ul style="list-style-type: none">• Compression exists to reduce the size of the file• What the impact of this is, e.g.:<ul style="list-style-type: none">– less bandwidth required– less storage space required– shorter transmission time |
| 4 Understand how files are compressed using lossy and lossless compression methods | <ul style="list-style-type: none">• Lossy compression reduces the file size by permanently removing data, e.g. reducing resolution or colour depth, reducing sample rate or resolution• Lossless compression reduces the file size without permanent loss of data, e.g. run length encoding (RLE) |



5 The following text is stored as a text file:

She sells sea shells on the seashore. The shells that she sells are sea shells I am sure.

Explain how lossless compression would compress this file.

[5]

(b) (i) Marley also needs to store ten 8-bit colour images in a file for his project.

Each image is 500 pixels wide and 300 pixels high.

Calculate the total file size in megabytes (MB) for all Marley's images.

Show all your working.

[illegible]

File size MB

[3]

(d) The program files for the games are compressed before they are published on the Internet.

(i) Describe **one** benefit of compressing the program files.

.....

.....

.....

..... [2]

(ii) State whether **lossy** or **lossless** compression should be used.

..... [1]

1 Computer memory size is measured in multiples of bytes.

Four statements about computer memory sizes are given in the table.

Tick (✓) to show if the statement is **True** or **False**.

Statement	True (✓)	False (✓)
25 kB is larger than 100 MB		
999 MB is larger than 50 GB		
3500 kB is smaller than 2 GB		
2350 bytes is smaller than 2 kB		

[4]

5 Audrey wants to send a sound file to Nico using email.

The file is too large to attach to an email so Audrey decides to compress the file.

She uses lossy compression to reduce the size of the sound file.

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

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Nico asks Audrey why she used lossy compression rather than lossless.

- (i) State **one** advantage Audrey could give of using lossy rather than lossless to compress the sound file.

.....
..... [1]

- (ii) State **one** disadvantage Nico could give of using lossy rather than lossless to compress the sound file.

.....
..... [1]

0478/11 – MARCH 2021

- 2 Gurdeep takes high definition photographs using a digital camera. She has set up a website where users can view thumbnails of her photographs. A thumbnail is a small version of the high definition photograph.

- (a) Gurdeep compresses the high definition photographs to create the thumbnails. She uses lossy compression.

Describe how lossy compression creates the thumbnails.

.....
.....
.....
.....
.....
..... [3]

0478/13 – JUNE 2021

- 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.

.....
.....
.....
.....
..... [3]



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

Reason 1

.....

Reason 2

.....

[2]

NOVEMBER 2021 (1)

- 4 Georgia is a wedding photographer. She wants to store 10 photographs on a USB flash memory drive for a customer. Each photograph is 100 pixels wide and 50 pixels high.

The photographs are 8-bit colour photographs.

- (a) Calculate the total file size, in kilobytes (kB), of all the photographs. For this calculation, you may use the unit of measurement of 1024 or 1000.

Show all your working.

.....

.....

.....

.....

.....

.....

.....

Answer kB

[3]

- (b) Georgia compresses photographs to store them on the USB flash memory drive. It is important that the compression does **not** affect the quality of the photographs in any way.

State which type of compression is the most suitable. Justify your choice.

Compression type

Justification

.....

.....

.....

[3]



NOVEMBER 2021 (2)

(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.

.....
..... [1]

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

Disadvantage 1

Disadvantage 2

[2]

MARCH 2022

(d) Binary numbers can be stored as bytes.

State how many bits are in **two** bytes.

..... [1]

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.

.....
.....
.....
.....
.....
..... [3]



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

(i) State what is meant by data compression.

.....
..... [1]

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

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

MARCH 2023

3 A new computer comes with primary and secondary storage.

(a) Data storage is measured using binary denominations.

Complete each conversion.

8 bytes = nibbles

512 kibibytes (KiB) = mebibytes (MiB)

4 gibibytes (GiB) = mebibytes (MiB)

1 exbibyte (EiB) = pebibytes (PiB)

[4]

Working space

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.....
.....
.....

NOVEMBER 2023 (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]

NOVEMBER 2023 (3)

(c) The data storage in the mobile telephone can be measured using different units of measurement.

(i) State how many bits are equal to a byte.

..... [1]

(ii) State how many kibibytes (KiB) equal a mebibyte (MiB).

..... [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]

JUNE 2024(11)

(d) The binary number is measured as a byte because it has 8 bits.

State how many bytes there are in a kibibyte (KiB).

..... [1]

JUNE 2024(12)

1 Data can be measured in bits.

(a) Give the name of the data storage measurement that is equal to 8 bits.

..... [1]

(b) State how many bits there are in a kibibyte (KiB).

..... [1]

(c) Give the name of the data storage measurement that is equal to 1024 gibibytes (GiB).

..... [1]



(d) A 16-bit colour image has a resolution of 512 pixels wide by 512 pixels high.

Calculate the file size of the image in kibibytes (KiB). Show all your working.

.....

.....

.....

.....

.....

Answer KiB

[3]

JUNE 2024(13)

1 The size of a file can be measured in different units.

(a) State how many bits there are in a byte.

..... [1]

(b) State how many kibibytes (KiB) there are in 2 mebibytes (MiB).

..... [1]

(c) Identify the unit of data that is equal to 4 bits.

..... [1]

2 An image has a 16-bit colour depth and a resolution of 1000 × 1750 pixels.

(a) State what is meant by a 16-bit colour depth.

.....

..... [1]

(b) The resolution of the image is changed to 750 × 1500 pixels.

Give the effect this will have on the file size of the image.

.....

..... [1]



NOVEMBER 2024(12)

2 Data storage can be measured using different units of measurement.

(a) Identify the name of the smallest unit of measurement of data.

..... [1]

(b) State how many nibbles there are in 2 bytes.

..... [1]

(c) A 10 second sound effect is recorded for a movie.

It is recorded with a sample rate of 22,016 Hz and a sample resolution of 8 bits.

Calculate the file size of the sound effect in kibibytes (KiB). Show all your working.

.....

.....

.....

.....

.....

.....

Answer KiB

[3]

NOVEMBER 2024(13)

1 Data can be measured using different units of storage.

(a) Tick (✓) **one** box to show which of the following is the largest unit of data storage.

A tebibyte (TiB)

☐

B pebibyte (PiB)

☐

C mebibyte (MiB)

☐

D gibibyte (GiB)

☐

[1]

2 An employee has a report that they need to email to their employer.

The employee compresses the report file before emailing it.

(c) The employee decides to use lossless compression to compress the file.

Explain why lossy compression is **not** suitable.

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..... [3]

March 2025(12)

(c) The artist compresses the image file before uploading it to their website. Users can download the image file from the website to print as a poster.

The image file is compressed using lossless compression.

(i) Explain the reasons why the artist chose lossless compression instead of lossy compression to compress this image file.

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..... [3]

(ii) Identify **one** lossless method of compressing an image.

Describe your chosen method.

Method

Description

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..... [3]

1 The size of a file can be measured using different data storage units.

(a) Tick (✓) **one** box to show the smallest data storage unit.

A byte

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B gibibyte (GiB)

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C kibibyte (KiB)

☐

D nibble

☐

[1]

(b) State how many tebibytes (TiB) are equal to 2 pebibytes (PiB).

..... [1]

Working space

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(c) The size of a file needs to be reduced.

(i) Give the name of the process that is used to reduce the size of a file.

..... [1]

(ii) One reason the size of a file may need reducing is so that it has a shorter transmission time.

Give **one** other reason why the size of a file may need reducing.

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..... [1]

(b) The size of the image file is 3072 bytes.

(i) Give the size of the image file in kibibytes (KiB).

..... [1]

(ii) State the number of nibbles in 1 byte.

..... [1]

(d) The student uses lossless compression to compress the image file.

Explain how the image file is compressed using lossless compression.

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..... [3]

