

1 (a) A student creates sound recordings.

Making changes to a sound recording may impact the accuracy of the resulting sound file or the size of the file.

Draw **two** lines from each change to the impacts it has on the sound file.

Change	Impact
increase the duration of the recording	the file size gets bigger
	no change in the file size
increase the sampling rate	the file size gets smaller
	the accuracy of the sound file improves
decrease the sampling resolution	no change to the accuracy of the sound file
	the accuracy of the sound file worsens

[3]

(b) The file names of the sound recordings are stored using the ASCII character set.

Explain how text is represented by the ASCII character set.

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[2]

(c) Give **two** differences between the ASCII and UNICODE character sets.

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7 A digital video camera records students in a classroom. The data is transferred from the digital video camera over the internet to a server. Artificial Intelligence (AI) is used to analyse the video on the server to identify when students are interacting with the lesson and the teacher.

(a) Describe **one** ethical impact of this use of AI in the classroom.

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[2]

(b) A video is made of many bitmap images called frames. 30 frames are recorded every second.

Each frame is 4000 pixels wide by 3000 pixels high. The video records using 16-bit colour depth.

Calculate an estimate for the file size for **one** second of the video in gigabytes.

Show your working.

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File size gigabytes

[2]

(c) Identify **and** describe **one** method of data verification that can be used when transferring data from the digital video camera to the server.

Method

Description

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(d) Describe **two** reasons why the server that stores the videos uses magnetic hard disks instead of solid state (flash) memory.

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[4]

(e) The table contains three algorithms that perform data validation. The third algorithm uses the functions MID and LENGTH.

The functions MID and LENGTH are defined as follows:

- MID(ThisString : STRING, x : INTEGER, y : INTEGER) RETURNS STRING
returns a string of length y starting at position x from ThisString
- LENGTH(ThisString : STRING) RETURNS INTEGER
returns the integer value representing the length of ThisString

Complete the table to identify the method of data validation for each algorithm. Each method of data validation must be different.

Algorithm	Method of data validation
INPUT x IF x < 1 or x > 26 THEN OUTPUT "Invalid" ENDIF	
INPUT x IF x <> 'R' AND x <> 'G' AND x <> 'B' THEN OUTPUT "Invalid" ENDIF	
INPUT x FLAG ← FALSE FOR INDEX ← 1 TO LENGTH(x) IF MID(x, INDEX, 1) = "@" THEN FLAG ← TRUE ENDIF NEXT INDEX IF NOT FLAG THEN OUTPUT "Invalid" ENDIF	

[3]

3 A computer stores images and text files.

(a) One of the images is a bitmapped image.

Complete the table by writing the answer for each statement.

Statement	Answer
the term for the smallest element that makes up an image	
the largest number of different colours that can be represented with a bit depth of 8 bits	
the term for the dots per inch (dpi) when an image is displayed	

[3]

(b) The text in the files is stored using the Unicode character set.

(i) Give **two** advantages of using the Unicode character set instead of using the ASCII character set.

- 1
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- 2
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[2]

(ii) The Unicode character 'K' has the binary value: 0010 0111 0110 1110

Convert the binary value for the character 'K' into denary.

..... [1]

(iii) The Unicode character 'Σ' has the hexadecimal value 2140

Convert the hexadecimal code for the character 'Σ' into denary.

..... (5) [1]

1 (a) A student paints a picture in an art class.

The student takes a photograph of the picture using a digital camera. The digital camera creates an image with a resolution of 2 million pixels and uses a bit depth of 16 bits.

(i) Calculate the file size of the image created by the digital camera in megabytes (MB).

Show your working.

Working space

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Answer MB

[2]

(ii) The student takes a second photograph with a lower bit depth.

Explain the effect of decreasing the bit depth on the image and on the image file.

Effect on image

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Effect on image file

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[4]

(b) A teacher records an audio file of the student playing the piano during a music lesson.

Complete the table by giving the term for each description about sound representation on a computer.

Description	Term
the number of times the amplitude is measured per time interval	
the number of bits used to store each amplitude measurement	
the type of sound wave before it is recorded by a computer	(6)

(c) The student types a report on a computer in a history lesson.

(i) The computer uses the Unicode character set.

Give **two** characteristics of the Unicode character set.

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[2]

(ii) Some of the school's computers use the extended ASCII character set.

The table gives some characters from the extended ASCII character set, their denary, 8-bit binary and hexadecimal numbers.

Complete the table by filling in the missing numbers.

Character	Denary	8-bit Binary	Hexadecimal
!	33		21
L		01001100	4C
ü	252	11111100	

[3]

7 A student takes a photograph of a science experiment.

(a) The photograph is saved as a bitmapped image.

(i) Define the following bitmap terms.

Colour depth

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File header

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[2]

(ii) Explain why changing the image resolution will affect the image quality and file size.

Image quality

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File size

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[2]

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

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[1]

(b) The student draws a picture on paper that is scanned into the computer and saved as a vector graphic.

Define the vector graphic terms property and drawing list.

Property

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Drawing list

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[2]

2 A computer game is being designed that users will be able to play using a virtual reality (VR) headset.

(a) Complete the description of the principal operation of a VR headset.

A headset can have one or two that output the image to the user. The headset has speakers that output surround sound to give a realistic experience.

The user's head movements are detected using a sensor.

This sensor is a The data is transmitted to a microprocessor that analyses the data to identify the of movement. Some headsets use that record the user's eye movements for analysis.

[4]

(b) The computer uses a buffer when transmitting data to the VR headset.

Explain how a buffer is used when data is transmitted between the computer and the VR headset.

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 [3]

(c) The VR headset has Electrically Erasable Programmable Read Only Memory (EEPROM).

Explain the benefits of using EEPROM instead of other types of Read Only Memory (ROM) in the VR headset.

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 [3]

(d) The computer can transmit a video made from bitmap images and vector graphic animations to the VR headset.

(i) Describe how the data for a bitmapped image is encoded.

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 [3]

(ii) Describe the contents of a vector graphic drawing list.

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 [2]

(iii) The bitmap video is **not** compressed before transmission to the VR headset.

Give **two** reasons why the video does **not** need to be compressed.

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 [2]