Chhetri Academy

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GCSE COMPUTER SCIENCE

2.3

Edexcel 1CP2 | Specification point 2.3.1

That data storage is measured in binary multiples (bit, nibble, byte, kibibyte, mebibyte, gibibyte,...

Untiered

Past paper question booklet

5	2015-2025	Untiered
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

3 John has decided to set up a website to promote the local youth football club.

(a) Bit-mapped images of the club uniform are taken with a digital camera and put on the website.

Complete these statements.

(i) ..... are the smallest elements of a bit-mapped image and the smallest element that can be displayed on a screen.

(1)

(ii) The ..... of an image is based on the number of elements used to represent the full image. The higher the number of elements for a given size, the better the quality of the image.

(1)

(iii) ..... indicates the number of bits used to represent the colour of a picture element. The higher the number of bits used, the greater the range of colours.

(1)

(b) Files for the website are stored on secondary storage media.

Complete this table with the name of the category of secondary storage described in each row.

(3)

Category of secondary storage	Description
	Uses metal platters coated in iron oxide. The platters rotate at high speeds.
	Small pits are burned in patterns onto a flat surface. A laser can be used to interpret light reflected from the flat or pitted surface.
	No moving parts; data is stored as an electrical charge.

(c) Network protocols break the files into packets before transmission.
Three fields in a network packet are source, destination, and check sum.

Give **two** additional fields found in a network packet.

(2)

1 .....

2 .....

(d) State the purpose of a check sum.

(1)

.....

.....

(e) John needs to convert the file sizes from megabytes (MB) to gigabytes (GB).

State how John could convert 4096MB to GB.

(1)

.....

.....

(f) The end user will use a browser to view the club's website.

Describe **one** difference between the Internet and the World Wide Web.

(2)

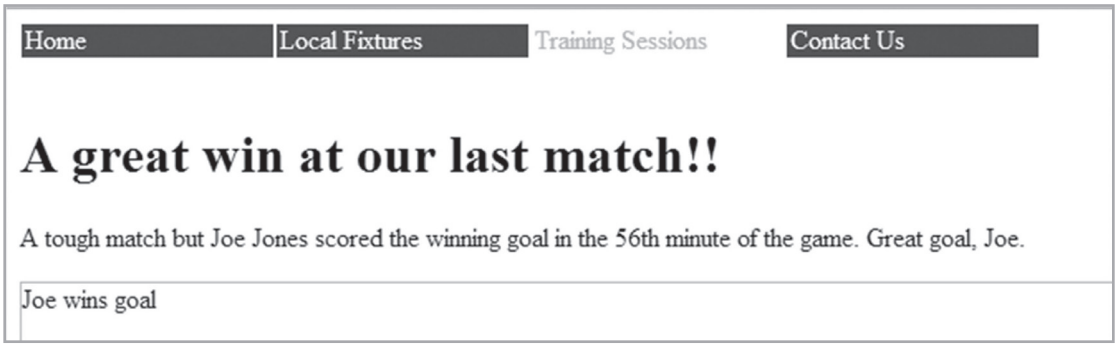
.....

.....

.....

.....

(g) John has created a sample page for the website. Here is the page displayed in a browser together with the code for the page.




```
1  <html>
2  <head>
3  <title>Local Football Club</title>
4  <style>
5      ul { list-style-type:none; margin:0; padding:0;}
6      a { display:block; width:150px; background-color:blue;
7          color:white; text-decoration: none; padding-left:2px;
8          border:2px; border-color:black; cursor:pointer; }
9      a:hover { color: orange;  background-color: white; }
10     li { display:inline; float:left; margin:1px;}
11 </style>
12 </head>
13 <body>
14     <ul>
15         <li><a href="home.html">Home</a></li>
16         <li><a href="local_fix.html">Local Fixtures</a></li>
17         <li><a href="training.html">Training Sessions</a></li>
18         <li><a href="contact.html">Contact Us</a></li>
19     </ul>
20 <br/><br/>
21 <h1>A great win at our last match!!</h1>
22 <p>A tough match but Joe Jones scored the winning goal in
23     the 56th minute of the game.  Great goal, Joe.</p>
24 <img src="thegoal.jpg" width="700" height="500" alt="Joe wins goal">
25 </body>
26 </html>
27
```

(i) State the **line numbers** that show Cascading Style Sheet information.

(1)

.....

(ii) Here is line 18 of the code.

Contact Us

Explain how it is connected to the Cascading Style Sheet information.

(1)

.....

.....

(h) Audio interviews with the club's coach are converted to a digital format.

(i) State the aspect of the analogue signal that must be sampled and stored as binary data during the analogue to digital conversion.

(1)

.....

(ii) State how increasing the **sampling frequency** affects the digital representation of the original audio.

(1)

.....

.....

(i) The club has a simple black and white logo. The image is compressed using a lossless, run-length encoding (RLE) algorithm.

Explain how a run-length encoding algorithm works.

(2)

.....

.....

.....

.....

(Total for Question 3 = 18 marks)

2 Charles is a computer programmer for a company that sells digital products through the Internet.

He must be aware of the ethical and legal issues arising from the use of computers.

(a) Identify the legislation that applies in each situation.

(3)

Situation	EU Cookie Law (e-Privacy Directive)	Computer Misuse Act	Copyright, Designs and Patents Act
A teenager was given a computer game for her birthday. She gives a copy of the game to her friend.	☒	☒	☒
A university student tries to gain access to government computers, even though he is not a registered user.	☒	☒	☒
A company has been storing small files on users' computers to track the use of its website, but is not telling them.	☒	☒	☒

(b) Charles is writing program code for the IT department to use.

(i) Identify the type of programming language **most** suitable for each situation.

(4)

Situation	High-level programming language	Low-level programming language
Keeping a list of computers that need fixing.	☒	☒
Increasing the speed of part of a computer program so that it runs in 1 hour instead of 20 hours.	☒	☒
Keeping track of how many users log into the company's file servers each day.	☒	☒
Writing a program for a new computer processor.	☒	☒

Here is some pseudocode.

```
10  SET aNum TO 0
11  SET userNum TO 0
12
13  WHILE userNum = 0 DO
14      SEND "Enter a number:" TO DISPLAY
15      RECEIVE userNum FROM (INTEGER) KEYBOARD
16  END WHILE
17
18  IF userNum < 10 THEN
19      SET aNum TO cubeNum (userNum)
20  ELSE
21      SET aNum TO userNum
22  END IF
23  SEND aNum TO DISPLAY
24
25  FUNCTION cubeNum (aNum)
26  BEGIN FUNCTION
27      SET total TO aNum * aNum * aNum
28      RETURN total
29  END FUNCTION
```

(ii) State the coding technique that Charles could use to make the pseudocode easier to understand.

(1)

(iii) State the name of the subprogram shown in the pseudocode.

(1)

(iv) State the range of line numbers that show a selection statement.

(1)

(v) State a line number on which the variable `aNum` is a local variable.

(1)

(vi) State a line number on which the variable `aNum` is a global variable.

(1)

(c) Charles is preparing to write program code.

(i) Complete the table to show the place value of the 1s to the right of the decimal in this binary real number.

(3)

Place value	4	2	1	•					
	0	1	0	•	1	1	0	0	0

Convert this binary real number to denary.

(ii) State the number of bits in a nibble.

(1)

(iii) Write an arithmetic expression to show the time needed to transmit a 10 KB file at 10 Mbps.

(2)

(Total for Question 2 = 18 marks)

1 A car park uses a number plate recognition system.

(a) Identify the reason why unsigned integers should be used to record the number of cars entering and leaving the car park, rather than signed integers.

(1)

- ☒ **A** Unsigned integers are more accurate
- ☒ **B** Unsigned integers cannot have overflow errors
- ☒ **C** Unsigned integers store more positive values
- ☒ **D** Unsigned integers do not use a parity bit

(b) The system uses a hard disc to store images of car number plates.

One kilobyte is 1024 bytes.

Construct an expression that calculates how many bytes there are in **four** terabytes of disc storage.

You do not need to carry out the calculation.

(2)

(c) Customers pay online in advance to use the car park. Members of staff do not have to pay.

When a car arrives at the exit barrier, the system checks **three** conditions:
1) The number plate (P) has been recorded by the system.
2) Enough time (T) has been paid for.
3) The car belongs to a member of staff (S).

Construct a Boolean logic statement, using P, T and S, to represent the conditions necessary for the system to raise the exit barrier.

(2)

(d) The ASCII code for the character 'R' is 82 in denary.

Derive the ASCII code for the character 'D' in 8-bit binary.

(2)

(e) Explain why the car park system encrypts the data it stores.

(2)

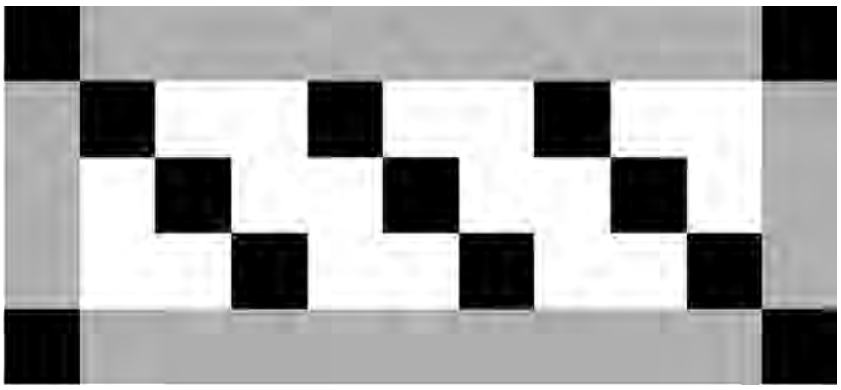
(Total for Question 1 = 9 marks)

5 Data

(a) Describe **one** effect of using lossy compression to reduce the size of a file.

(2)

(b) Here is an original image.



There is one bit available to represent each pixel.

Explain **one** reason why the image cannot be accurately represented using one bit for each pixel.

(2)

(c) Shifts are performed on binary patterns.

A **logical** shift right is performed on a pattern.

An **arithmetic** shift right is performed on the same original pattern.

Describe the reason the results will be different.

(2)

(d) Binary, denary and hexadecimal patterns represent numbers.

(i) Convert the binary pattern 0100 0010 to denary.

(1)

(ii) Convert the binary pattern 0101 1011 to hexadecimal.

(2)

(e) Data storage is measured in bits and bytes.

(i) State the number of unique values that can be represented with 6 bits.

(1)

(ii) A file format uses a 100 × 600 table of 32-bit integers.

The file uses 1 kibibyte of additional data.

Construct an expression to show the number of **bytes** of storage needed to store the file.

(3)

(f) An analogue sound is represented in digital form.

The sound is one second long and is sampled at 10 Hz.

The digital representation has a bit depth of 5 and is stored in two's complement.

Sound data:

00000 11111 11111 11111 11111

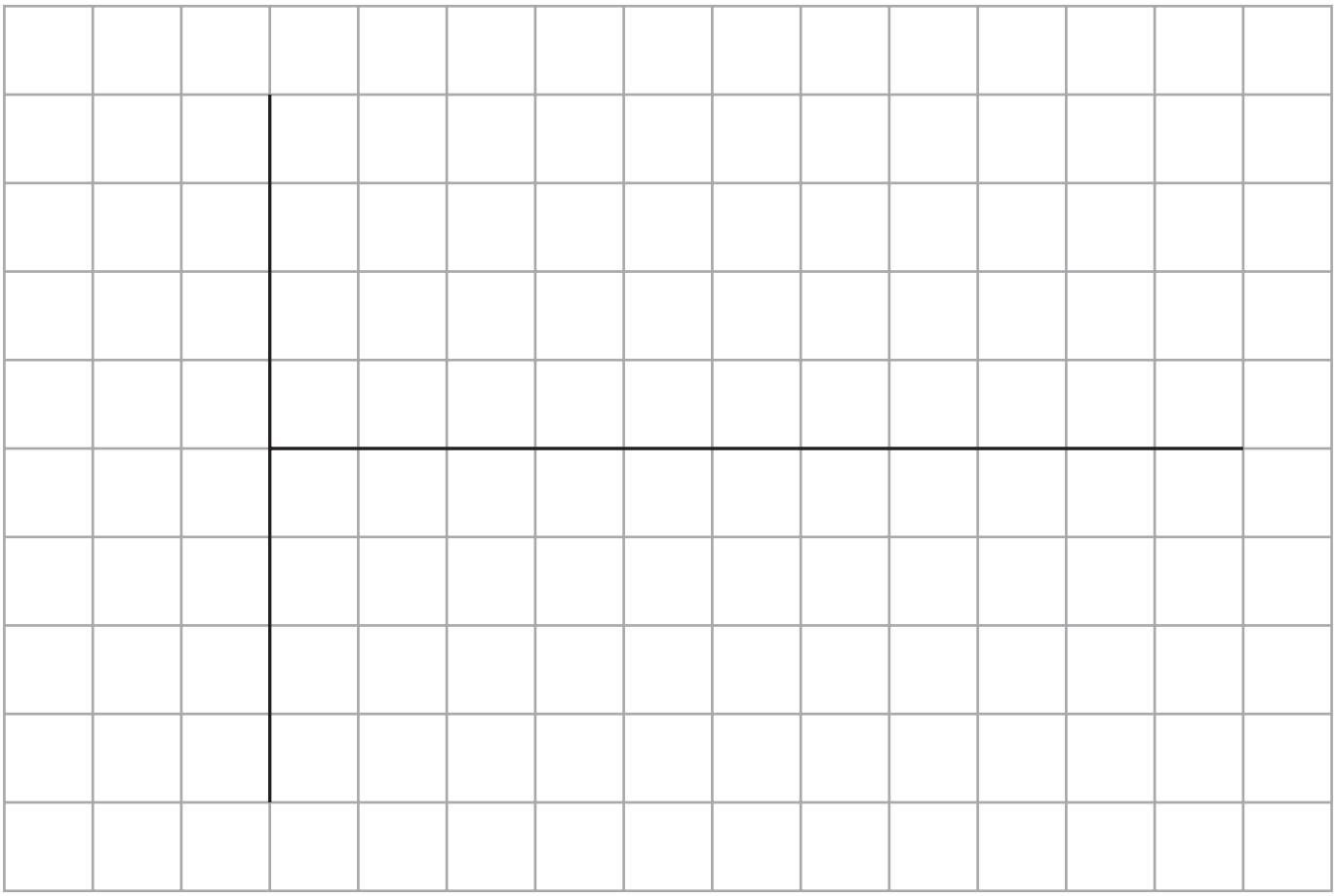
00000 00000 00001 00001 00001

Draw a graph to represent the data sampled.

You must include:

- labels for the x and y axes
- values for the x and y axes
- each sample plotted as an ×
- samples joined up to show the digital form.

(6)



(Total for Question 5 = 19 marks)

1 Data

(a) Binary patterns consist of groups of bits.

(i) Identify the largest unit of measurement.

(1)

☒ **A** Gibibyte

☒ **B** Kibibyte

☒ **C** Mebibyte

☒ **D** Nibble

(ii) State the number of unique values that can be represented with 7 bits.

(1)

.....

.....

.....

(iii) The denary ASCII code for **D** is 68.

Give the denary ASCII code for **G**.

(1)

.....

.....

(b) Hexadecimal is used to represent memory addresses.

(i) Give **two** characteristics of hexadecimal notation.

(2)

1 .....

.....

2 .....

.....

(ii) Explain **one** reason why programmers use hexadecimal to specify memory addresses.

(2)

(c) Audio and image files store data in binary.

(i) Explain **one** reason why lossy compression is used to reduce the size of an audio file.

(2)

(ii) An image is 315 pixels wide, 923 pixels high and has a colour depth of 7 bits.

Complete the expression to show the minimum file size in bytes.

You do not have to do the calculation.

(3)

$$\frac{\square \times \square \times \square}{\square}$$

(d) Computer systems manipulate bit patterns.

(i) Identify the result of applying an arithmetic shift right by two to the binary pattern 0110 1100

(1)

- ☒ **A** 0001 1100
- ☒ **B** 1101 1000
- ☒ **C** 0001 1011
- ☒ **D** 1011 0000

(ii) Convert the denary number 25 to 8-bit binary.

(2)

(iii) Convert the denary number –13 to 8-bit binary using two's complement.

(2)

(Total for Question 1 = 17 marks)