

CHAPTER 1 FULL - REVISION WORKSHEET

ANSWERS

1.1 Number systems

0478/11 – JUNE 2019

Question	Answer	Marks																								
1(a)	97 <table><tr><td>1</td><td>0</td><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td></tr></table> 1 mark 1 mark 5C <table><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table> 1 mark 1 mark E1 <table><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr></table> 1 mark 1 mark	1	0	0	1	0	1	1	1	0	1	0	1	1	1	0	0	1	1	1	0	0	0	0	1	6
1	0	0	1	0	1	1	1																			
0	1	0	1	1	1	0	0																			
1	1	1	0	0	0	0	1																			
1(c)	Two from e.g.: • Colour codes // Colour in HTML / CSS • Error messages • Locations in memory • Memory dump // debugging • IP address • ASCII // Unicode • Assembly language • URL	2																								

0478/11 – NOVEMBER 2019

Question	Answer	Marks								
2(a)	One mark for each correct denary value <table><tr><th>Binary</th><th>Denary</th></tr><tr><td>0001001110</td><td>78</td></tr><tr><td>0110110111</td><td>439</td></tr><tr><td>1000000001</td><td>513</td></tr></table>	Binary	Denary	0001001110	78	0110110111	439	1000000001	513	3
Binary	Denary									
0001001110	78									
0110110111	439									
1000000001	513									
2(b)	Two from: ∞ Uses fewer characters // shorter ∞ Easier to read / write / understand ∞ Less likely to make mistakes // less error prone ∞ Easier to debug	2								
2(c)	One mark for each correct hexadecimal value in correct order 2 B 5	3								

0478/12 – NOVEMBER 2019

Question	Answer	Marks								
4(a)	∞ 52	1								
4(b)	<table><tr><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table>	1	1	0	1	0	0	0	0	1
1	1	0	1	0	0	0	0			
4(c)	∞ It is multiplied by 4	1								

0478/12 – MARCH 2020

Question	Answer	Mark						
5(a)	Any two from: • Computer consist of transistors / logic circuits • ... that can only store/process data in two states / as high-low / on-off / 1 and 0	2						
5(b)	1 mark per each correct 8-bit binary value: <table><tr><th>Denary Value</th><th>8-bit binary register</th></tr><tr><td>129</td><td>10000001</td></tr><tr><td>56</td><td>00111000</td></tr></table>	Denary Value	8-bit binary register	129	10000001	56	00111000	2
Denary Value	8-bit binary register							
129	10000001							
56	00111000							

Question	Answer	Mark												
5(c)	1 mark per each correct conversion: <table><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>1</td></tr></table> 1 mark 1 mark 1 mark	0	0	1	1	1	0	1	0	1	0	0	1	3
0	0	1	1	1	0	1	0	1	0	0	1			

5(d)	Any two from: • Represent colours in HTML // HTML colour codes • MAC address • Assembly Language • Error messages • IP address • ASCII values • URL • Memory dump • Memory locations	2
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0478/11 – MARCH 2021

1(b)	– 255	1
1(c)	– 11	1

0478/12 – JUNE 2021

Question	Answer	Marks												
1(a)	One mark per each correct binary value. One mark per each correct hex value. <table border="1"> <thead> <tr> <th>Denary</th><th>Hexadecimal</th><th>8-bit binary</th></tr> </thead> <tbody> <tr> <td>49</td><td>31</td><td>00110001</td></tr> <tr> <td>123</td><td>7B</td><td>01111011</td></tr> <tr> <td>200</td><td>C8</td><td>11001000</td></tr> </tbody> </table>	Denary	Hexadecimal	8-bit binary	49	31	00110001	123	7B	01111011	200	C8	11001000	6
Denary	Hexadecimal	8-bit binary												
49	31	00110001												
123	7B	01111011												
200	C8	11001000												
1(b)	Any two from: – Easier/quicker to read/write/understand – Easier/quicker to identify errors/debug – Takes up less screen/display space – Less chance of making an error	2												

NOVEMBER 2021 (1)

Question	Answer	Marks
1(a)	– Base-2	1

MARCH 2022

1(c)	26	1
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JUNE 2022(1)

Question	Answer	Marks
4(a)	- Computer consist of transistors / logic circuits/gates that can only store/process data in two states / high-low / on-off / 1 and 0	2

JUNE 2023

1(c)	One mark for full method of working e.g. conversion to binary then flipping and adding 1 One mark for correct answer 10110010	2
1(d)	One marks per each correct nibble One mark for correct working in binary (showing 4 correct carries) <pre> 1 1 1 1 0 0 1 1 0 0 1 1 0 1 1 0 0 0 0 1 ----- 10 0 1 0 1 0 0 </pre>	3
1(e)	Two from: - The result of the calculation is greater than 255 // The value generated is larger than can be stored in the register - The result of the calculation would require more than 8 bits to be represented // A register has a predetermined number of bits and there are too many bits for it	2

JUNE 2023 (2)

2(b)(i)	00001111	1
2(b)(ii)	Any one from: - The value becomes incorrect/inaccurate as the right most bits are lost - It is divided by 8	1

JUNE 2023 (3)

1(d)	One mark for each correct nibble One mark for correct carries (or other correct working method) One mark for identification of overflow error <pre> 1 1 1 0001 1111 </pre>	4
1(e)	9	1
1(f)	12	1

NOVEMBER 2023

Question	Answer	Marks
2(a)	One mark for each correct part of the fee, in the correct order: – 17 – 70 (Correct fee \$17.70)	2
2(b)	One mark for each correct binary value: Register 1 – 00001110 Register 2 – 01100010	2

Question	Answer	Marks
2(c)	One mark for each correct hexadecimal value, in the correct order. – A – 0 – 3 – D (Ticket number A03D)	4
2(d)	Two from: – It contains logic gates/switches ... – ... that process the values 1 and 0 // have two states	2

NOVEMBER 2023 (2)

2(d)	One mark for suitable working method e.g. flip and add 1 One mark for correct answer – 10011101	2
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NOVEMBER 2023 (3)

2(d)	One mark for suitable working method e.g. conversion to binary One mark for correct answer – 01111011	2
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JUNE 2024(11)

Question	Answer	Marks
2(a)	C	1
3(b)	D	1
3(c)	One mark for correct working Example: Flip and add One mark for correct answer: -93	2

NOVEMBER 2024(12)

Question	Answer	Marks
3(a)(i)	They are both number systems	1
3(a)(ii)	- Binary is base-2 whereas hexadecimal is base-16 - Binary only uses numbers whereas hexadecimal also uses letters // Binary only uses 0 and 1 whereas hexadecimal uses 0 to 9/A to F	2
3(d)(i)	Any two from: Each/All/Every value/digit/bit in the binary number is shifted/moved to the left - The left most/most significant bit is lost - A 0 is added as the right most/least significant bit	2
3(d)(ii)	The binary integer is multiplied by 2	1
3(e)	Two's complement	1

March 2025(12)

1(a)	1 mark for each completed item The binary number system is base 2 . The smallest denary number that can be represented an 8-bit binary number is 0 . The largest denary number that can be represented an 8-bit binary number is 255 . The hexadecimal number system is base 16 . Each hexadecimal digit is equivalent to 4 bits. The numbers 1 to 9 are used and the number 10 is represented by A . The hexadecimal number system continues up to the number 15, which is represented by F .
1(c)	C

June 2025(11)

(c)(i)	44 267
(c)(ii)	(0)6D 19F
(ii)	Any two from: - Easier/quicker for the customer to understand/read/remember - Takes up less space on the ticket // Shorter representation

1.2 Text, sound and images

MARCH 2023

Question	Answer	Marks
4(a)	One mark each: Pixel: • One square/circle of one colour // the smallest component of the image Resolution: • The number of pixels per set area/cm/inch // the number of pixels wide by the number of pixels high // number of pixels in an image	2

JUNE 2023 (2)

Question	Answer	Marks
3(a)	Any three from: • A character set is used • ... such as Unicode/ASCII • Each character has a unique binary value	3

NOVEMBER 2023

Question	Answer	Marks
5(a)	Any five from: – (The analogue sound is) recorded using a microphone – The sound wave is sampled – ... measuring the height/amplitude – Each amplitude has a unique binary value – The sample rate is set – ... that is the number of samples taken per second – The sample resolution is set – ... that is the number of bits used for each sample – Each sample taken is converted to binary	5
5(b)	Two from: – Increase the sample rate – Increase the sample resolution	2
5(d)	Any four from (MAX 3 for ASCII/Unicode alone): – ASCII has limited/fewer characters // Unicode has a more characters – ASCII covers a limited set of languages/fewer languages – Unicode includes many/more languages/emojis – ASCII requires 7/8 bits per character – Unicode requires up to 16/32 bits per character – ASCII has 128/256 characters – Unicode has 65 536/4 294 967 296 characters // approx. 60/70 thousand/4 billion characters	4

- (b) Any three from:
- Image is made of pixels
 - Each pixel stores **one** colour
 - Image has a set number of pixels wide by pixels high
 - Each **colour** has a **unique** binary value // Each **colour** has a **unique** colour code
 - The colour/binary value of each pixel is stored in **sequence**
 - File contains metadata to identify how the file should be displayed
 - ... metadata can be the colour depth / resolution

NOVEMBER 2023 (2)

Question	Answer	Marks
5(a)	Any one from: – The recording of the song is more accurate/closer to original	1
5(b)	Any one from: – The file size will be increased – The file will require more storage space	1
5(c)	Any two from: – The number of <u>bits</u> that are used per sample – ... that provides the variation in amplitude that can be stored for each sample // defines the number of different amplitudes that can be recorded – ... that determines how quiet/loud the sounds are that can be recorded – Example e.g. 16-bit	2

NOVEMBER 2023 (3)

Question	Answer	Marks
7(a)	– The dimensions of an image // Number of pixels wide by number of pixels high	1
7(b)	– The number of bits used to represent each/a colour	1
7(c)	Any one from: – A greater range of colours can be seen/used – Image will be closer to the actual content of the image/real life – The image will have more detail	1

MARCH 2024(12)

1(b)(i)	A	1
1(b)(iii)	• Unique binary/denary number given/stored for each character • The code for R is stored, then the code for E then D in sequence	2
1(c)(i)	Any two from: • More bits allocated to each amplitude • Amplitudes can be more precise • A wider range of amplitudes can be recorded	2
1(c)(ii)	Increase the sample rate	1

NOVEMBER 2024(13)

2(d)(i)	Character set	1
2(d)(ii)	Any two from: • It can represent more characters • It can represent emojis/symbols • It can represent more languages	2
2(d)(iii)	Each character requires more storage space	1

March 2025(12)

2(b)	1 mark each to max 2 ● The higher the resolution the more pixels ... ● ... the more bits to store ... the larger the file size
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3

One mark for each correct term or definition.

Term	Definition
pixel	It is the smallest component of an image.
resolution	The number of pixels high by the number of pixels wide // The number of pixels in an image
colour depth // bit depth	This is the number of bits that are used to create each colour in an image.
metadata // header	This is additional data that is stored with an image that can provide information such as the time and date the image was taken.

(c)(i)	32 bits are used to represent each/a/one colour in the image // 2^{32} (approx. 4.3 billion) different colours can be used/are available for the image
(c)(ii)	Any two from: • The size of the image file increases. • ... as the number of bits used to represent/store a colour has increased

1.3 Data storage and compression

0478/11 – JUNE 2019

Question	Answer	Marks
5	Five from: • A (compression) algorithm is used • No data is removed in the process // original file can be restored • Repeated words (are identified) // Patterns in the data (are identified) • ... and are indexed/put into a table // by example • ... and are replaced with their index // by example • ... and their positions are stored (in the table) // by example • ... and the number of times the word/pattern appears is stored (in the table) // by example NOTE: Other valid methods of lossless compression can be awarded marks	5

0478/12 – JUNE 2019

4(b)(i)	2 marks for any two correct stages of working, 1 mark for correct answer. – $500 \times 300 \times 10 // 150\,000 \times 10$ – $\times 8$ then $\div 8$ (anywhere in the process) – $1\,500\,000 \div 1024 \div 1024 // 1\,500\,000 \div 1\,048\,576$ – $= 1.43 \text{ MB}$	3
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0478/11 – NOVEMBER 2019

Question	Answer	Marks
6(d)(i)	Two from: ∞ File size is reduced ... ∞ ... so it uses less storage space ∞ ... so faster transmission ∞ ... so quicker to download	2
6(d)(ii)	∝ Lossless	1

0478/12 – NOVEMBER 2019

Question	Answer	Marks															
1	One mark for each correct tick <table><tr><th>Statement</th><th>True (✓)</th><th>False (✓)</th></tr><tr><td>25 kB is larger than 100 MB</td><td></td><td>✓</td></tr><tr><td>999 MB is larger than 50 GB</td><td></td><td>✓</td></tr><tr><td>3500 kB is smaller than 2 GB</td><td>✓</td><td></td></tr><tr><td>2350 bytes is smaller than 2 kB</td><td></td><td>✓</td></tr></table>	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
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		✓															

Question	Answer	Marks
5(a)	Four from: ∞ A compression algorithm is used ∞ Discards any unnecessary sounds ... ∞ ... using perceptual musical shaping ∞ ... such as removing background noise / sounds humans can't hear // or other suitable example ∞ Reduces sample size / resolution // by example ∞ Reduces sample rate // by example ∞ Sound is clipped ∞ The data is permanently removed	4
5(b)(i)	One from: ∞ The file size will be smaller than lossless ∞ Requires less storage space ∞ Requires less time to transmit	1
5(b)(ii)	One from: ∞ The quality of the sound will be reduced ∞ The original file cannot be restored	1

0478/11 – MARCH 2021

Question	Answer	Marks
2(a)	Any three from: – A compression algorithm is used – Data will be lost/deleted permanently // original file cannot be recreated – Reduce the range of colours used / colour depth / bits per pixel – Reduce the number of pixels / image resolution removes data that will not be noticed by the user // removes unnecessary data	3

0478/13 – JUNE 2021

Question	Answer	Marks
2(a)	Any three from: – A compression algorithm is used – Redundant data is removed – Reduce colour depth – Reduce image resolution – Reduce sample rate – Reduce sample resolution – Reduce frame rate – Use perceptual music shaping – Data is permanently removed	3

2(b)	Any two from: – Lossy decreases the file size more – Take up less storage space on webserver/users' computer – Quicker to upload/download – May not need to be high quality – Website will load faster for users – Less lag/buffering when watching – Takes up less bandwidth to download/upload – Uses less data allowance	2
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NOVEMBER 2021 (1)

Question	Answer	Marks
4(a)	Two marks for any two correct workings and one mark for the correct answer. Working: – $100 \times 50 = 5000$ bits – $5000 \times 8 = 40,000$ bits – $40,000 / 8 = 5,000$ bytes – $5,000 \times 10 = 50,000$ bytes – $50,000 / 1024$ Answer: 48.83 kB // 49 kB NOTE: Alternative correct methods of working can be credited. Answer can be given to any number of dp.	3
4(b)	One mark per correct method, two marks per justification. – Lossless – Lossy would remove data permanently // lossless would not remove any data permanently // File could be restored to original ... – ... that could affect the quality (lossy) // ... to maintain the quality (lossless)	3

NOVEMBER 2021 (2)

5(c)(i)	Any one from: – Maintains quality // quality better than lossy – Original file is retained // Data is not permanently lost – A significant reduction in file size is not required	1
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Question	Answer	Marks
5(c)(ii)	Any two from: – Takes more time to transmit file // Takes more time to upload to web server // Takes more time to download to customer // Web page will load slower – Takes up more storage space – Data usage would be increased – Uses more bandwidth	2

MARCH 2022

1(d)	16	1
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Question	Answer	Marks
2(a)	e.g. JPEG	1
2(b)	Any three from: • Image is made of pixels • Each pixel stores one colour • Image has a set number of pixels wide by pixels high • Each colour has a unique binary value // Each colour has a unique colour code • The colour/binary value of each pixel is stored in sequence • File contains metadata to identify how the file should be displayed • ... metadata can be the colour depth / resolution	3

2(c)(i)	Reducing the file size	1
2(c)(ii)	Any two from: • reduces the storage/memory space taken on email server // reduces the storage space taken on her friend's computer when downloaded • sending/receiving email accounts may have restricted file size for attachments • reduces the time taken to transmit/upload/download to destination • reduces amount of bandwidth needed to transmit/download • file will mean less data usage is taken (for mobile clients)	2

MARCH 2023

Question	Answer	Marks
3(a)	One mark each: 8 bytes = 16 nibbles 512 KiB = 0.5 MiB 4 GiB = 4096 MiB 1 EiB = 1024 PiB	4

NOVEMBER 2023 (2)

5(d)	– Lossless	1
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NOVEMBER 2023 (3)

1(c)(i)	– 8	1
1(c)(ii)	– 1024	1

7(d)	– Lossy	1
7(e)	Any two from: – Quicker to transmit/upload/download – Not as much bandwidth needed to transmit file – To fit in limitation of file size on e.g. email	2

JUNE 2024(11)

3(d)	1024	1
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JUNE 2024(12)

Question	Answer	Marks
1(a)	(1) byte	1
1(b)	8192	1
1(c)	(1) Tebibyte // TiB	1
1(d)	One mark for each correct stage of working (max 2): • 512×512 • $262\,144 \times 2$ // multiplied by 16 and divided by 8 • $524\,288/1024$ One mark for the correct answer: 512 (KiB)	3

JUNE 2024(13)

Question	Answer	Marks
1(a)	8	1
1(b)	2048	1
1(c)	nibble	1

Question	Answer	Marks
2(a)	16 bits used to represent each colour in the image	1
2(b)	The file size will decrease	1

NOVEMBER 2024(12)

Question	Answer	Marks
2(a)	bit	1
2(b)	4	1
2(c)	Any two from: • $22\,016 \times 8$ then divided 8 • $22\,016 \times 10$ • $220\,160 / 1024$ One mark for: 215 KiB	3

NOVEMBER 2024(13)

Question	Answer	Marks
1(a)	B	1
2(c)	Any three from: • Data will be permanently removed • ... and that could be important/necessary data • (The report will have text in it and) lossy is not suitable for text files • ... as it will damage/corrupt the file • The report may have images in it and the quality of these will be reduced	3

March 2025(12)

2(c)(i)	1 mark each to max 3 , examples: ● The artist wants to provide a high quality image ● Lossless will reduce the file size but retain all parts of the image // The artist does not want any of the image to be lost when downloaded ● Lossy will reduce the quality // by example for data lost e.g. colour/resolution ● Image may be small in file size anyway ● ... server has enough space to store the image ● ... download time is not excessive
2(c)(ii)	1 mark for naming, max 2 for describing e.g. ● Run-length encoding ● Store consecutive pixels of the same colour as the colour and the number of repetitions

June 2025(11)

1(a)	D
1(b)	2048
1(c)(i)	(Data) Compression
1(c)(ii)	Any one from: • Less bandwidth required to transmit the file • Less storage space needed to store the file • To meet email file size limit • To use less data allowance

June 2025(12)

(b)(i)	3
(b)(ii)	2

2(d)	Any three from: • The size of the file is reduced without permanently removing any data. • A compression algorithm is used. • ... such as Run length encoding/RLE. • Repeating pixels are grouped/identified ... // Patterns are identified ... • ... and stored with the number of times they are repeated. • ... and indexed
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