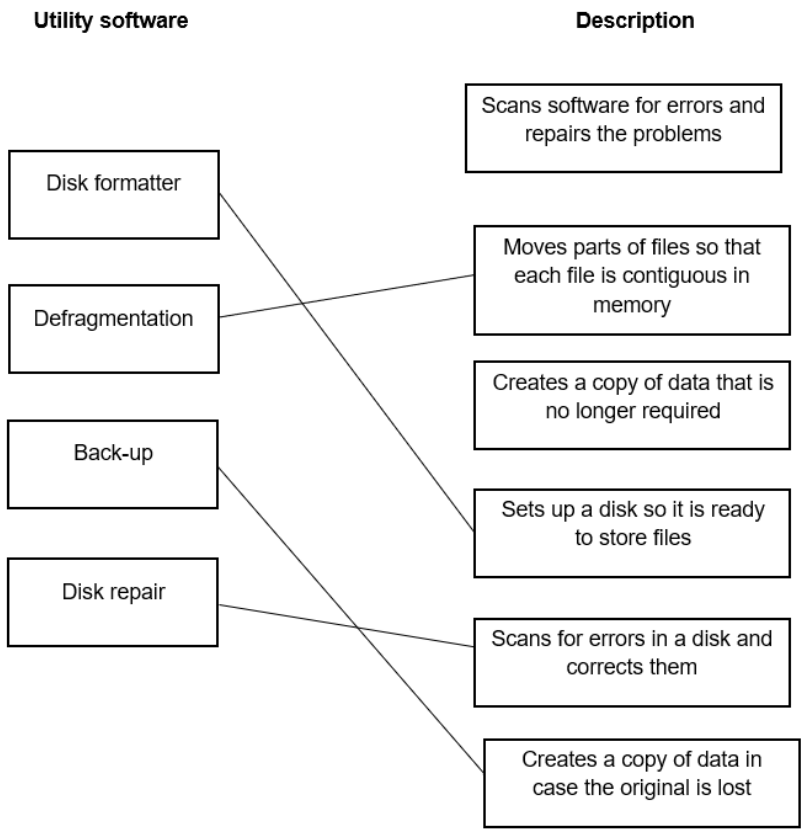
Question	Answer	Marks
1(a)(i)	**1 mark** for each description Pixel: • A single square of one colour • The smallest addressable element in an image File header: • Data about the bitmap image (e.g. number of colours)	**2**
1(a)(ii)	**1 mark** per bullet point for working, **1 mark** for answer Working: • 1024 × 512 = 524 288 pixels/bytes • 524288 / 1024 / 1024 Answer: 0.50 mebibytes	**3**
1(b)	**1 mark** for naming method, **1 mark** per description to **max 2** • Run-length encoding • Replace **sequences** of the **same colour** pixel • … with colour code and number of identical pixels	**3**
1(c)(i)	252	**1**

1(c)(ii)	**1 mark** per bullet point
	
	• Converting 15 to binary `0000 1111`
	• Method for addition
	• Final answer
	`  0010 0011`
	`+ 0000 1111`
	`  0011 0010`
	`     1  111`
		3

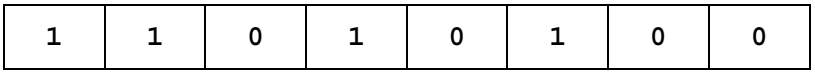
1(c)(iii)	**1 mark** per bullet point
	
	• Converting −10 to two's complement binary `1111 0110`
	• Adding values
	• Final answer `0001 1001`
	10 = `0000 1010`
	–10 = `1111 0110`
	
	`  0010 0011`
	`+ 1111 0110`
	`  0001 1001`
	`  11   11`
		3

Question	Answer	Marks
1(d)	**1 mark** per bullet point to **max 2** • The **formal and legal rights** to ownership // intellectual property rights • Protects against **unauthorised** reproduction of work • Provides for legal right of redress	**2**

Question	Answer	Marks
2(a)	**1 mark** for each correct line  	**4**
2(b)	**1 mark** per bullet point to **max 4** • memory management • file management • security management • hardware / device / peripheral / resources management • input/output management • process management • error checking and recovery • provision of a platform for software • provision of a user interface	**4**

Question	Answer	Marks
3(a)	**1 mark** for each completed statement The **Program Counter** holds the address of the next instruction to be loaded. This address is sent to the **Memory Address Register**. The **Memory Data Register** holds the data fetched from this address. This data is sent to the **Current Instruction Register** and the Control Unit decodes the instruction's opcode. The **Program Counter** is incremented.	**5**
3(b)	**1 mark** for each shaded set of values	**6**

Instruction address	ACC	Memory address				IX	Output
		365	366	367	368		
		1	3	65	66	0	
200	1						
201							
202							
203	2						
204		2					
205						2	
206	65						
207							A
208							
200	2						
201							
202							
203	3						
204		3					
205						3	
206	66						
207							B
208							
200	3						
201							
202							
209							

Question	Answer	Marks
3(c)(i)		1
3(c)(ii)	**1 mark** for correct answer The number is divided by 8 (and only whole number retained)	1

Question	Answer	Marks
4(a)	**1 mark** per bullet point to **max 2** • All computers are of equal status • Each computer provides access to resources and data // data is distributed • Computers can communicate and share resources • Each computer is responsible for its own security	2
4(b)	**1 mark** per bullet point to **max 2** per drawback • Reduced security // no central management of security • … only as secure as the weakest computer on the network • … each computer is at risk from viruses from other computers • No central management of backup • ... if the data from one computer is not backed up it is lost to all of them • No central management of files/software • … consistency may be difficult to maintain • … each computer may have different software from the others • Individual computers may respond slower • … because they are being accessed by other computers • In order to share files etc. all the computers involved need to be switched on • ... so the files etc. may not be always available	4

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(c)(i)</td><td>1 mark for first 2 ticks, 1 mark for last 2 (shaded)

<table>
<tr><th>Task</th><th>Performed by router</th><th>Not performed by router</th></tr>
<tr><td>Receives packets from devices</td><td>✓</td><td></td></tr>
<tr><td>Finds the IP address of a Uniform Resource Locator (URL)</td><td></td><td>✓</td></tr>
<tr><td>Directs each packet to all devices attached to it</td><td></td><td>✓</td></tr>
<tr><td>Stores the IP and/or MAC address of all devices attached to it</td><td>✓</td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>4(c)(ii)</td><td>1 mark per bullet point for justification up to max 3

No mark for identification of wired/wireless

Wired
• Faster connection // higher bandwidth
• …. needed as she is downloading/streaming large files
• … less time waiting / less latency / fewer delays
• More reliable / stable connection
• … is less susceptible to issues with distance/walls/interference
• More secure

Wireless
• Freedom of movement
• … can move between different rooms with a mobile device and still receive/transmit data
• … no need of a physical connection
• Easily expanded if friends want to access the same network
• Less cabling / expertise is needed
• ... making the initial setup less expensive</td><td>3</td></tr>
<tr><td>4(d)</td><td>1 mark for identifying that she is using both.
1 mark per bullet point for justification

• using internet because sending data on the infrastructure
• using WWW because accessing a website (that is stored on a web server operated by the webmail) that is part of the WWW</td><td>3</td></tr>
</table>

Question	Answer	Marks
5(a)	**1 mark** per bullet point to **max 2** • Definition: Microprocessor/microcontroller within a **larger system** // microprocessor/microcontroller that performs **one specific task** • Example: e.g. Embedded system in washing machine only controls the programs for the washing cycle // it is part of the washing machine but does not perform any other function within it	**2**
5(b)	**1 mark** for RAM, **1 mark** for ROM RAM: • **Store** the choices/wash program the user has entered // **stores** the data read from the sensors // **stores** the time left in the program // by example ROM: • **Store** the start-up instructions (for the washing cycles)	**2**
5(c)	**1 mark** per bullet point • The system uses feedback • The system causes the temperature to change // produces an action	**2**

Question	Answer	Marks
6(a)	Range (check)	**1**
6(b)	Presence (check)	**1**
6(c)	Existence (check)	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)</td><td>1 mark per bullet point to max 3

• Flat-file has more data redundancy
• … because the same data is stored many times // data is stored in different tables which are linked

• There is program-data dependence with flat-files
• ... because any changes to the structure of the data means the programs that access that data have to be re-written

• Flat-file has more data inconsistency // worse data integrity
• ... because duplicated data might be stored differently //…because when data is updated in one place, it is not updated everywhere

• It is not easy to perform complex searches /queries
• … because a new program has to be written each time

• Flat files could have a lack of privacy
• … as user views cannot easily be implemented</td><td>3</td></tr>
<tr><td>7(b)(i)</td><td>1 mark for each correct example

one-to-one
• e.g. customer to payment details // customer to login details
one-to-many
• e.g. customer to order
many-to-many
• e.g. order to product // customer to product</td><td>3</td></tr>
<tr><td>7(b)(ii)</td><td>1 mark

<table><tr><th>Relationship</th><th>Tick (✓)</th></tr><tr><td>one-to-one</td><td></td></tr><tr><td>one-to-many</td><td></td></tr><tr><td>many-to-many</td><td>✓</td></tr></table></td><td>1</td></tr>
<tr><td>7(b)(iii)</td><td>1 mark

<code>CREATE DATABASE SHOPORDERS;</code></td><td>1</td></tr>
<tr><td>7(c)</td><td>1 mark per item to max 3

• table name
• field name // attribute
• data type
• type of validation
• Primary Key
• Foreign Key
• relationships</td><td>3</td></tr>
</table>

Question	Answer	Marks
8	**1 mark** per correct row	**3**

Statement	AND	NAND	NOR	XOR	OR
The output is 1 only when both inputs are 1	✓				
The output is 1 only when both inputs are different				✓	
The output is 1 only when both inputs are 0			✓		