

Questions

Q1.

There are ethical and legal issues with the collection and use of personal data.
Complete the table with the ethical or legal issue for each situation.
One row has been completed for you.

(2)

Situation	Ethical or legal issue
An online learning platform publishes data about how students answer questions.	Consent
A teacher uses another teacher’s login to change student grades.	
A school displays closed-circuit television (CCTV) screens in a public area.	

(Total for question = 2 marks)

Q2.

Large amounts of water are used to manufacture computer chips.
Describe **one** way this impacts the environment.

(2)

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(Total for question = 2 marks)

Q3.

Computer worms are a type of malware.

Describe **one** way that a worm can move from machine to machine.

(2)

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(Total for question = 2 marks)

Q4.

Police forces use algorithms to help decide how many officers to deploy and where to send them.

Discuss how algorithmic bias can affect the decisions police forces make.

Your answer should consider:

- the cause of algorithmic bias
- the impact on individuals and communities of algorithmic bias
- the methods available to reduce the risk of algorithmic bias.

(6)

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(Total for question = 6 marks)

- the rights of data subjects

- the responsibilities of the travel company.

(6)

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(Total for question = 6 marks)

Q6.

Computer programs control some aeroplane landings.

Explain **one** reason computers are **not** capable of safely controlling all aeroplane landings.

(2)

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(Total for question = 2 marks)

Q7.

Issues and impact

People use spoken commands to interact with digital assistants.

Explain **one** ethical concern associated with digital assistant technologies.

(2)

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(Total for question = 2 marks)

Q8.

Explain **one** reason why files should be backed up regularly.

(2)

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(Total for question = 2 marks)

Q9.

Explain **one** reason why software should be patched regularly.

(2)

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(Total for question = 2 marks)

Q10.

Explain **one** way that a patent protects intellectual property (IP).

(2)

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(Total for question = 2 marks)

Q11.

Issues and impact

Students are asked to sign an acceptable use policy.

Explain **one** way that an acceptable use policy helps to protect student data.

(2)

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(Total for question = 2 marks)

Q12.

Issues and impact

Explain **one** reason why an employee who is logged on to the company network should not click on a link in an email from an unknown source.

(2)

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(Total for question = 2 marks)

Q13.

Consent must be obtained before organisations can use personal data.

Give **two** pieces of information that organisations must tell people when requesting consent to use their personal data.

(2)

1

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2

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(Total for question = 2 marks)

Q14.

Data protection legislation sets out principles that organisations must follow.

Give **two** of these principles.

(2)

1

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2

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(Total for question = 2 marks)

Q15.

Issues and impact

Identify the ethical issue associated with the use of artificial intelligence.

(1)

- ☐ **A** Acceptable use policies
- ☐ **B** Algorithmic bias
- ☐ **C** Logic errors
- ☐ **D** Unpatched software

(Total for question = 1 mark)

Q16.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

A backup of a server is made each night. Only the files changed that day are backed up.

Identify the name of this type of backup.

(1)

- ☐ **A** Fragmented
- ☐ **B** Full
- ☐ **C** Incremental
- ☐ **D** Lossy

(Total for question = 1 mark)

Q17.

Identify the **two** types of malware that replicate their code.

(2)

- ☐ **A** Key logger
- ☐ **B** Ransomware
- ☐ **C** Trojan
- ☐ **D** Virus
- ☐ **E** Worm

(Total for question = 2 marks)

Q18.

Issues and impact

This notification appears on a computer screen.

Thank you for clicking our link.
Your important files are no longer accessible.

Can I get access to my files?
Yes, you can. Simply send your payment as described below.

How long do I have?
14 days.

How do I pay?
Send £500 in Bitcoin to abc123def456ghi789.



(i) Name the type of malware used in this cyberattack.

(1)

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(ii) Explain **one** way that digital systems may be vulnerable
to cyberattacks when users do not properly maintain their software.

(2)

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(Total for question = 3 marks)

Q19.

The source code of a software application is automatically copyrighted.

State **one other** method of intellectual property protection to control who can use a software application.

(1)

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(Total for question = 1 mark)

Q20.

Issues and impact

State **one** way **users** could reduce the environmental impact of digital technology.

(1)

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(Total for question = 1 mark)

Q21.

Issues and impact

State **two** environmental issues associated with the disposal of digital technology.

(2)

1

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2

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(Total for question = 2 marks)

Q22.

Issues and impact

State **two** methods of protecting intellectual property.

(2)

1

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2

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(Total for question = 2 marks)

Q23.

State **two** ways that a user can increase the useful life of a smartphone rather than throwing it away.

(2)

1

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2

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(Total for question = 2 marks)

Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark						
	Award one mark for each correct cell: <table><tr><th>Situation</th><th>Ethical or legal concern</th></tr><tr><td>A teacher uses another teacher's login to change student grades</td><td>Misuse (1) Hacking (1) Unauthorised access/changing/editing/modification (1)</td></tr><tr><td>A school displays closed-circuit television (CCTV) screens in a public area</td><td>Privacy (1) Consent/Permission (1) Data Protection / GDPR / General Data Protection Regulations (1)</td></tr></table>	Situation	Ethical or legal concern	A teacher uses another teacher's login to change student grades	Misuse (1) Hacking (1) Unauthorised access/changing/editing/modification (1)	A school displays closed-circuit television (CCTV) screens in a public area	Privacy (1) Consent/Permission (1) Data Protection / GDPR / General Data Protection Regulations (1)		(2)
Situation	Ethical or legal concern								
A teacher uses another teacher's login to change student grades	Misuse (1) Hacking (1) Unauthorised access/changing/editing/modification (1)								
A school displays closed-circuit television (CCTV) screens in a public area	Privacy (1) Consent/Permission (1) Data Protection / GDPR / General Data Protection Regulations (1)								

Q2.

Question Number	Answer	Additional Guidance	Mark
	Award up to two marks for a linked description, such as: • The land/rivers/seas will be polluted (1) if contaminated/uncleaned waste water is released (1) • Homes/businesses/agriculture/wildlife/people may not have enough water (1) if too much is taken from the rivers/reservoirs (1) • Water is polluted/contaminated (during the manufacturing process) (1) and could pose a health risk (1) • Large amounts of energy is required (to extract/clean water) (1) resulting in more use of CO₂ / CO₂ contributes to global warming (1)	For both marks, the expansion must associate with the statement. Do not accept responses that refer to global warming due to the use of water without implying associated energy use.	(2)

Q3.

Question Number	Answer	Additional Guidance	Mark
	Award up to two marks for a linked explanation, such as: • Worms make copies of themselves (1) and send them to everyone in the computer's email contacts list / send them via previous connections used by the computer (1) • Worms can spread (themselves) through emails (1) and do not need a user to unknowingly distribute/execute them (1) • Worms self-replicate (1) and spread without the need for a host file (1)	For both marks, the expansion must associate with the statement. Do not accept: Worms spread through links in emails.	(2)

Q4.

Question Number	Indicative content	Additional Guidance	Mark
	Discuss how algorithmic bias can affect the decisions police forces make. Causes of algorithmic bias - Machine learning having been trained using insufficient/inappropriate data - Human bias leading to discrimination and a lack of fairness - Poor design of the algorithm Impacts on individuals and communities of algorithmic bias - Deploying officers to the wrong areas - Individuals may feel as though they are being monitored/targeted/subjected to unfair treatment as a result of the output of a biased algorithm deploying too many officers / too few officers - Discrimination/equality (e.g. resourcing police more heavily in particular communities) - Feedback loops (if a model predicting crime rates based on historical arrest data is used to prioritise police resources, then arrests in high risk areas could increase further, reinforcing the imbalance) Methods available to reduce the risk of algorithmic bias - Human oversight and 'sense checking' and confidence/error ratings of predictions - Governance (anticipating and managing risks and make sure legal requirements are adhered to) - Auditing to enable identification and mitigation of systematic bias - Open to scrutiny / transparent - Involvement of communities during development - Improve the training data		6

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Q5.

Question Number	Indicative content
	Discuss the legal and ethical issues associated with the company's collection and use of data. Legal responsibilities of the travel company • Purpose of the data being collected must be revealed to the subject, e.g. personal/passport data used to book international travel • Data should only be used for the purpose specified and not be disclosed to third parties without permission, e.g. use of data to pass to third-party marketing companies (car hire / hotels / airlines) • Data collected must not be excessive, e.g. data must have some relevant connection to travelling • Data held must be accurate and up to date, so the company must check customers' personal details regularly • Ensure data must not be kept longer than necessary e.g. past one year on from last customer contact • Because the company supports travellers from other countries, they cannot transfer data to countries without adequate protection and should check that their own laws are comparable with those countries from which travellers originate and to which they will travel/share data • Data must be stored securely and prevent unauthorised access e.g. use of effective data security measures including policies and network practices. Legal rights of data subjects • Right for data to be processed appropriately (as outlined above) • Right to access data held about them to check and update it Ethical responsibilities of the travel company Where data subjects consent to wider uses, the company must • Consider how the data will be used, e.g. automated decision making to find the best/cheapest/environmentally friendly routes/destinations • Ensure that individuals' needs are considered, e.g. those with disabilities / different age groups / families • Anonymise data used for statistical analysis so that individuals cannot be identified

Level	Mark	Descriptor
	0	No rewardable content.
Level 1	1–2	Basic, independent points are made, showing elements of understanding of key concepts/principles of computer science. (AO1) The discussion will contain basic information with little linkage between points made or application to the context. (AO2)
Level 2	3–4	Demonstrates adequate understanding of key concepts/principles of computer science. (AO1) The discussion shows some linkages and lines of reasoning with some structure and application to the context. (AO2)
Level 3	5–6	Demonstrates comprehensive understanding of key concepts/principles of computer science to support the discussion being presented. (AO1) The discussion is well developed, with sustained lines of reasoning that are coherent and logically structured, and which clearly apply to the context. (AO2)

Q6.

Question Number	Answer	Additional Guidance	Mark
	Award up to two marks for a linked explanation, such as: - The landing program may crash / display incorrect data / not deal with extreme scenarios (weather / wind / animal / visual / emergency) (1) because: - the system could be out of date / have errors / bugs / not been tested enough - the scenario is beyond the range of what it has been programmed to respond to (1) - A computer's input may be wrong/compromised (1) because of a sensor/hardware/mechanical error (1) - A computer cannot make moral/ethical judgements (1) because it is only capable of following instructions (1)	For both marks, the expansion must associate with the statement.	(2)

Q7.

Question number	Answer	Additional guidance	Mark
	Award 1 mark for the identification of an ethical concern (1) with a linked justification/exemplification (1), up to a maximum of 2 marks. • The data may no longer be private (1) because companies may share it (1). • People may not realise their data is analysed (1) because it is unclear who owns the data (1). • People are willing to sacrifice (some) privacy (1) in return for access to services (1). Accept any other appropriate response.		(2)

Q8.

Question Number	Answer	Additional Guidance	Mark
	A linked explanation such as: • It helps prevent loss of data (1) because malware could deliberately delete data / because data can be deleted/corrupted accidentally (1) • It helps minimise disruption following a system failure (1) because data can be restored (1) • Data can be restored (1) because physical hazards (fire/flood) (can damage storage devices) (1)		2

Q9.

Question Number	Answer	Additional Guidance	Mark
	An explanation to include two from: It helps prevent unauthorised access to data (1) - because security issues could be missed in development (1) - because there could be interactions with other software (1) - because a malicious user could have published a vulnerability on the web (1) - because sometimes vulnerabilities only become apparent after code has been released to the public (1)		2

Q10.

Question number	Answer	Additional guidance	Mark
	A patent prevents someone copying/using/selling an invention (1) because it gives the inventor the exclusive right to reproduce/use/sell it for 20 years (1) A person/organisation that infringes a patent can be prosecuted (1), because it gives the inventors the legal protection to defend their exclusive right (1)		2

Q11.

Question number	Answer	Additional guidance	Mark
	Award 1 mark for the identification of a way (1) with a linked justification/exemplification (1), up to a maximum of 2 marks. - Students are deterred from unsafe practices (1) because consequences are clarified (1). - People follow safe/good practices (1) because permitted activities are defined/set out (1). Accept any other appropriate response.		(2)

Q12.

Question Number	Answer	Additional Guidance	Mark
	An explanation to include two from: It increases the risk to data / reduces cybersecurity (1) because the sender could be using social engineering techniques / the link could lead to a malicious website / could download malware (1)		2

Q13.

Question Number	Answer	Additional Guidance	Mark
	Any two from: • That they are giving consent • That they can say no / refuse • That they are not denied service, if they say no • What the data is being collected for • What processing will be done on their data/purpose of the processing/how data will be processed • That they can withdraw consent at any time • That the data will be shared (with third parties) • How long it will be stored • That the data will be stored securely		2

Q14.

Question number	Answer	Additional guidance	Mark
	One mark each for a maximum of 2 • Lawfulness (1) • Fairness and transparency (1) • Purpose limitation (1) • Data minimisation (1) • Accuracy (1) • Storage limitation (time kept) (1) • Integrity and confidentiality (security) (1) • Accountability (1)	• Award examples that fit a category	2

Q15.

Question Number	Answer	Additional Guidance	Mark
	B Algorithmic bias <i>A is not correct because AUPs are not an ethical issue associated with the use of artificial intelligence</i> <i>C is not correct because logic errors are not an ethical issue associated with the use of artificial intelligence</i> <i>D is not correct because unpatched software is not an ethical issue associated with the use of artificial intelligence</i>		1

Q16.

Question number	Answer	Additional guidance	Mark
	C incremental • A fragmented - this is what happens to secondary storage devices after prolonged reading and writing • B full - this backup happens when all the files are backed up, whether they have been changed or not • D lossy - this is a type of data compression		1

Q17.

Question Number	Answer	Additional Guidance	Mark
	D Virus E Worm <i>A is not correct because keyloggers record keystrokes and send them to a third party</i> <i>B is not correct because Ransomware prevents access to a system, or files</i> <i>C is not correct because a Trojan is malware disguised as legitimate software</i>		2

Q18.

Question number	Answer	Additional guidance	Mark
(i)	Ransomware		(1)
Question number	Answer	Additional guidance	Mark
(ii)	Award 1 mark for the identification of a way (1) with a linked justification/exemplification (1), up to a maximum of 2 marks. - Software may contain security bugs (1) because it is unpatched (1). - Anti-malware may not identify an attack (1) because the virus definitions are out of date (1). Accept any other appropriate response.		(2)

Q19.

Question Number	Answer	Additional Guidance	Mark
	Award one mark for: Licensing (1)		(1)

Q20.

Question Number	Answer	Additional Guidance	Mark
	Any one from: • Reduce use • Responsible Disposal (to prevent leaking chemicals) • Recycling • Reuse • Replace devices less frequently • Use power-saving options (such as black screen)		1

Q21.

Question number	Answer	Additional guidance	Mark
	Any two issues from: • Waste materials end in landfill (1) • Dangerous toxins are released into the ground/water (1) • Waste is transported overseas (carbon emissions) (1).		(2)

Q22.

Question Number	Answer	Additional Guidance	Mark
	Any two from: • Copyright • Patents • Trademarks • Licensing • Non-disclosure agreement • Limit access to sensitive information • Awareness training for employees		2

Q23.

Question number	Answer	Additional guidance	Mark
	One mark each for a maximum of 2 • Use it as long as possible/don't replace it (1) • Sell/give it to a company that will recondition it (1) • Give it away to a friend or charity (1) • Repair it if it breaks (1) • Keep the software updated (1)	• Do not award responses indicating recycling, because the focus is on extending its use as a phone	2