International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

Digital society

Higher and Standard level

Specimen papers 1, 2 and 3

For first examinations in 2024

CONTENTS

**Digital society
Higher level
Paper 1**

Specimen paper

2 hours 15 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Section A: answer two questions.
- Section B: answer one question.
- The maximum mark for this examination paper is **[52 marks]**.

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Section A

Answer **two** questions from this section. Each question is worth [20 marks].

1. **Monitoring online activity**

   Adults are increasingly using digital services to monitor the online activities of young people. The goal of these services is to provide useful data that will protect young people from online threats and dangers.

   Companies that develop these services often promote the following features, which may be adjusted and personalized by those monitoring young people:
   • Restricting internet browsing by denying access to websites that may contain objectionable content.
   • Background monitoring that sends an alert when specific words or phrases appear in social media posts and private messages.
   • A searchable history of online activity, including access to all texts, website visits and application (app) usage on a young person's mobile device, tablet or computer.

   Many of these services are invisible to young people and other users, so they do not always know they are being monitored.

   (a) (i) Identify **two** types of data that might be collected by these digital services. [2]

   (ii) Describe **two** contexts in which collecting data about online activity may lead to privacy concerns for young people. [4]

   (b) (i) Suggest a security measure that these digital services might implement to protect the data that they collect. [3]

   (ii) Explain **one** possible impact for young people associated with these digital services. [3]

   (c) To what extent is it acceptable for adults to use digital services to monitor the online activities of young people? [8]

2.   **Natural disasters and computer models**

In 2017, Hurricane Irma was a catastrophic natural disaster. Many computers did not accurately predict the course of the storm, including its direction of travel. This put populated areas in a great risk of danger. Predicting the course of a hurricane is critical for protecting life and property.

The potential courses that Hurricane Irma could have taken are shown in **Figure 1**.

Figure 1

Older and less accurate computer models for predicting the course of the hurricane relied on data gathered from a few stationary weather balloons. One newer approach by the Panasonic Weather Service (PWS) relied on real-time weather data collected from over 3500 aircraft every day.

The PWS model used privately developed machine-learning algorithms to process the collected data. Details about these algorithms, however, were not shared with governmental and public weather organizations: PWS stated that doing so would compromise its commercial interests.

The PWS model was more accurate in forecasting the course of Hurricane Irma four to seven days in advance.

(This question continues on the following page)

(Question 2 continued)

(a) (i) Outline **three** ways in which data is different from information. [3]

(ii) Describe **one** reason why visualizations are used to represent data and information. [3]

(b) Data about weather variables, such as wind speed and temperature, are needed to predict the course of a hurricane.

(i) Suggest **one** reason to support the frequent collection of weather data in a hurricane. [2]

(ii) Explain **two** reasons why the PWS model may have been more accurate in predicting the course of Hurricane Irma. [4]

(c) With reference to the real-world example provided, discuss whether companies should be required to share details about privately developed algorithms used to predict natural disasters. [8]

3. **Automated journalism**

Online content is sometimes created by software that uses algorithms and natural-language generators to turn facts and trends into news stories. News organizations often rely on automated journalism software to provide coverage of important topics, and experts predict that automated journalism will generate up to 90 % of all online news articles by 2026.

Automated journalism is most effective when generating routine news stories on repetitive topics for which clean, accurate, and easily accessible data are available. It is less effective when addressing topics that are new or that require human judgment and expertise.

According to the Tow Center for Digital Journalism at Columbia University, the key drivers of automated journalism are an ever-increasing availability of data and the aim of news organizations to cut costs and increase the quantity of content and news. Some people argue that automated journalism makes human journalists available for more important work. Others disagree and think that all news stories should be written by humans.

(a) (i)   Identify **two** characteristics of an algorithm.   [2]

(ii) Describe **two** real-world examples for which automated journalism would not be effective at generating news content.   [4]

(b) The developers of automated journalism software need to understand how human journalists work. Two methods for gathering this information are:
   • observations and interviews with journalists
   • conducting large-scale surveys involving journalists.

   Explain how each of these methods may provide insight into how human journalists work.   [6]

(c) An online news organization has decided to exclusively use automated journalism to provide coverage for a major upcoming political election.

   Evaluate this decision with reference to **one** course concept.   [8]

4. **Artificial intelligence (AI) and criminal sentencing**

Some governments are using artificial intelligence (AI) to assist judges in their work.

Judges are responsible for deciding the type and duration of punishment when a person is found guilty of a crime. One factor used by judges to make this decision is the likelihood that a criminal will re-offend or commit another crime in the future.

Some applications of AI claim to predict the likelihood of criminal re-offense with great accuracy, and research has indicated that AI software is often, but not always, more reliable than human judges in predicting who is likely to re-offend.

Some critics, however, have observed that AI is frequently as biased as human intelligence. These critics argue that fully automated judgments should not be made for such important decisions.

(a) (i) Identify **three** types of artificial intelligence (AI). [3]

　　(ii) Identify **three** characteristics of a real-world example of artificial intelligence (AI). [3]

(b) Explain **two** reasons that a human rights activist might disagree with the use of artificial intelligence (AI) in criminal sentencing. [6]

(c) The European Union (EU) has passed a law that allows citizens to challenge decisions made using artificial intelligence (AI) in the criminal justice system.

　　Evaluate this decision with reference to **one** course concept. [8]

Section B

Answer **one** question from this section. Each question is worth [12 marks].

5. **The future of work**

   Digital innovations are disrupting the nature of work in many organizations and companies.

   Discuss a real-world example in which the benefits of digital innovation are outweighed by the negative impacts for employees. In your response, refer to **one** real-world example **and one** of the following concepts:
   • Change
   • Power
   • Space

6. **Diversity and discrimination**

   The internet and social media help people connect and communicate with others whose backgrounds and experiences may be different from their own.

   Examine the claim that social media fosters greater understanding of diverse backgrounds and experiences. In your response, refer to **one** real-world example within **one** of the following contexts:
   • Cultural
   • Political
   • Social

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References:

Figure 1   BPH-MIK, 2017. Cresce la preoccupazione per l'Uragano Irma, potrebbe generare una nuova catastrofe! *Blue Planet Heart*, [blog] 4 September. Available at: <http://www.blueplanetheart.it/2017/09/cresce-la-preoccupazione-luragano-irma-generare-nuova-catastrofe/> [Accessed 13 August 2021].

Markscheme

Specimen paper

Digital society

Higher level

Paper 1

General marking guidance

Please note that session marking guidance may be presented differently than guidance found here. For example, lists may be used in place of tables.

Expect a range of approaches in candidate responses
Examination questions encourage independent thinking on the part of candidates. Expect a range of appropriate responses. Examiners should be aware that in some cases, candidates may take a different approach that, if appropriate, should be rewarded. If in doubt, check with your team leader.

Marking accurate and relevant knowledge and examples
For some questions, there is no one "correct" response, but several possible. Examiners must be prepared to award full marks to answers which demonstrate accurate and relevant knowledge.

For example, bulleted lists in this markscheme indicate likely points that candidates may include in their answer: they are not exhaustive, and examiners should credit other valid points not listed. Additionally, in cases where a question asks for a certain number of items, read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

Supporting critical and creative thinking
In their responses, particular phrases often signal critical and/or creative thinking on the part of candidates. Such phrases, when they appear in response to appropriate command terms, may help examiners determine the proper marks to award. For example:

Sample command term	Possible signal phrase
Explain	Because, as a result of, due to, therefore, consequently, for example
Analyse	Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas
Evaluate	My opinion, overall, although, despite, on balance, weighing up

About extended responses
It should be recognized that, given time constraints, answers for part c are not intended to reflect fully polished extended responses that address the full range of possible examples, issues and topics possible. Use the provided markbands in conjunction with the marking notes to award marks for these questions.

The markbands on page 3 should be used where indicated in the markscheme.

SL and HL Paper 1, part c	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–2	• The response shows limited understanding of the demands of the question. • There is limited relevant knowledge. The response is descriptive and consists mostly of unsupported generalizations. • The response has limited organization or is only a list of items.
3–4	• The response shows some understanding of the demands of the question. • Some relevant knowledge is demonstrated, but this is not always accurate and may not be used appropriately or effectively. • The response moves beyond description to include some analysis, but this is not always sustained or effective. • The response is partially organized.
5–6	• The response shows adequate understanding of the demands of the question. • Response demonstrates adequate and effective analysis supported with relevant and accurate knowledge. • The response is adequately organized.
7–8	• The response is focused and demonstrates an in-depth understanding of the demands of the question. • Response demonstrates sustained evaluation and synthesis that is effectively and consistently supported with relevant and accurate knowledge. • The response is well-structured and effectively organised.

The markbands on page 4 should be used where indicated in the markscheme.

HL Paper 1, Section B	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–3	• The response shows a limited understanding of the demands of the question. • There is limited relevant knowledge. The response is descriptive and consists mostly of unsupported generalizations. • Counter-claims are not considered or addressed. • The response has limited organization.
4–6	• The response shows some understanding of the demands of the question. • Some relevant knowledge demonstrated but this is not always accurate and may not be used appropriately or effectively. The response is primarily descriptive with some analysis, but this is not sustained. • Counter-claims are considered but only partially addressed. • The response is partially organized.
7–9	• The response shows adequate understanding of the demands of the question. • Response demonstrates adequate and effective analysis supported with relevant and accurate knowledge. • Counter-claims are adequately addressed. • The response is adequately organized.
10–12	• The response is focused and shows an in-depth understanding of the demands of the question. • Response demonstrates sustained evaluation and synthesis that is effectively and consistently supported with relevant and accurate knowledge. • Counter-claims are effectively addressed in the response. • The response is well-structured and effectively organised.

Section A

1. (a) (i) Identify **two** types of data that might be collected by these digital services. **[2]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Personal data, such as name, age, gender
- Geographical and/or location-based data
- Data about incoming and outgoing messages, calls and communication
- Online activity and usage data
- Data involving online searches, messaging and social media posts
- Time and duration of use data
- Private pin codes and passwords
- Metadata related to online activities.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying types of data, up to a maximum of **[2]**.

(ii) Describe **two** contexts in which collecting data about online activity may lead to privacy concerns for young people. **[4]**

"Describe" is a command term that requires a more detailed account than simply listing an item. The use of context in this question indicates that responses should be grounded in one of the course's contexts.

There are many possible correct responses, including the following, which correspond to the course's prescribed contexts:
- <u>Cultural</u>, such as details about membership within online communities or forums; messages and communications related to cultural heritage and customs; information specific to hobbies, gaming or pastimes.
- <u>Economic</u>, such as banking details, data about purchases and transactions; messages and communication related to money, employment and/or a young person's economic resources.
- <u>Health</u>, such as personal medical and/or health information; web and search histories involving medical information and/or consultation; messages and communication related to health and/or medical issues.
- <u>Human knowledge</u>, such as the collection and use of data about young children within education and/or through educational technologies and platforms.
- <u>Political</u>, such as data on political activities and/or advocacy; messages and communication related to political issues. Also, data that poses privacy concerns related to the political situation and/or laws where the young person is located.
- <u>Social</u>, such as data related to demographics, gender, gender expression and sexuality and/or ability status; data about online activities related to religious beliefs and practices; messages and communication related to family structures and/or relationships.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[2]** for each description of a relevant context, up to a maximum of **[4]**.

(b) (i) Suggest a security measure that these digital services might implement to protect the data that they collect. **[3]**

"Suggest" is a command term that requires the candidate to propose a possible solution. Of note, this question is asking the candidate to suggest measure for the services to employ, not the users of the services themselves. There are many possible correct responses, including:
- Adequately encrypting collected data
- Regularly erasing collected data
- Anonymising and/or masking collected data
- Restricting access to collected data from other vendors and/or services
- Securely storing data in ways that avoid potential hacking threats or data loss
- Only using data for approved purposes in line with terms of service and good practice
- Restricting the ability to transfer collected data

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for naming a possible solution and **[2]** for providing detail in the response about this solution, up to a maximum of **[3]**.

(ii) Explain **one** possible impact for young people associated with these digital services. **[3]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. Note that impacts may be positive and/or negative. There are many possible correct responses, including the following:
- Impacts involving family structures, relationships and practices
- Impacts involving online activity and behaviour, including changing personal practices on social media, reducing cyber-bullying, and/or attempt
- Impacts involving future consequences related to schooling, employment and/or reputation
- Impacts involving psychological and social factors including trust, authority, and privacy erosion

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for naming a possible impact and **[2]** for providing reasons and causes related to this impact, up to a maximum of **[3]**.

(c)   To what extent is it acceptable for adults to use digital services to monitor the
       online activities of young people?   **[8]**

       *Part c is assessed with the markbands on page 3 in conjunction with these
       marking notes.*

       "To what extent" is a command term that requires candidates to consider the
       merits of an argument or concept. Opinions and conclusions should be presented
       clearly and supported by evidence and a sound argument.

       The markbands for this question additionally note that evaluation and synthesis is
       to be supported with relevant and accurate knowledge from the course and
       responses well-structured and organized.

       In their responses, candidates may indicate the acceptability or unacceptability of
       the use of these services or a more nuanced response. Some possible reasoning
       may include:

       Acceptable:
       - Adult responsibility to protect young people from threats and danger.
       - To ensure the health and well-being of young people.
       - To effectively manage the time of young people.
       - Legal requirements for supervision of legal minor.
       - Limited maturity and/or cognitive/emotional development on the part of young
         people to fully understand consequences of decisions.

       Unacceptable:
       - Young people's privacy is important to respect.
       - Monitoring may provide a distorted or unrepresentative understanding of
         online behaviour.
       - Monitoring may not accurately record or present online activities.
       - Monitoring apps may share data in unacceptable ways and/or with unforeseen
         consequences.
       - Monitoring might restrict access to important information for young people.

2. (a) (i) Outline **three** ways in which data is different from information. **[3]**

"Outline" is a command term that requires a brief account or summary. There are many possible correct responses, including the following:
- Data are raw facts or figures that may not be ordered, whereas information is ordered.
- Data are raw facts or figures that may not be processed, whereas information has been processed.
- Data are raw facts or figures that may not be analysed, whereas information is analysed.
- Data are raw facts or figures that may not have context, whereas information has been contextualized.
- Data are raw facts or figures that may not have discernible meaning or significance, whereas information typically does have meaning and significance.
- Data is often an input into a digital system, whereas information is typically an output.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for each correct response, up to a maximum of **[3]**.

(ii) Describe **one** reason why visualizations are used to represent data and information. **[3]**

"Describe" is a command term that requires a more detailed account than simply listing an item. There are many possible correct responses, including the following:
- Visualizations organise data and information in a way that is more understandable such as images and charts.
- Visualizations can be presented to audiences who may not have the specialist knowledge required to understand the data and information.
- Visualizations can help synthesise data and information so that they can be used to make decisions or come to a conclusion.
- Visualizations can indicate potential trends and future developments related to the presented data and information.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for a response that identifies a reason why visualizations might be used and **[2]** for details of that reason, up to a maximum of **[3]**.

(b)   (i)   Suggest **one** reason to support the frequent collection of weather data in a hurricane.   **[2]**

"Suggest" is a command term that requires the candidate to propose a possible solution, hypothesis or other possible answer. Suggest here is indicating to the candidate to apply critical thinking to the question proposed. There are many possible correct responses, including the following:
- Wind speed is the critical and rapidly changing variable in the hurricane therefore, it needs to be sampled as regularly as possible to be able to monitor the possible trends
- Sampling the wind speed frequently enables the track of the hurricane and its effects to be predicted more accurately.
- Temperature data can also change rapidly and therefore frequent sampling is desirable.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a reason and **[1]** for a development of that reason, up to a maximum of **[2]**.

(ii)   Explain **two** reasons why the PWS model may have been more accurate in predicting the course of Hurricane Irma.   **[4]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. There are many possible correct responses, including the following:
- The PWS model was newer than other approaches, and may have been more refined or developed as a consequence.
- The PWS model used real-time data that may have been more accurate than that collected in the other models.
- The PWS model used data collected from more sources than other models.
- The algorithms used in the PWS model may have been more effective at processing the collected weather data.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a reason and **[1]** for the development of that reason, up to a maximum of **[4]**.

(c) With reference to the real-world example provided, discuss whether companies should be required to share details about privately developed algorithms used to predict natural disasters. **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"Discuss" is a command term that requires a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organised. In their responses, candidates may indicate an affirmative, negative or more balanced reply to the question. Some possible reasoning linked to the stimulus example includes:

Yes, should be required:
- The PWS model is more effective and should be required to share details that could help governments prepare for natural disasters.
- Sharing details might prevent the loss of life and property which outweighs the needs of one private company.
- Hurricanes occur regularly and may have devastating consequences, so in such a situation of crisis, governments should have the power and the right to use the PWS model and approach as needed.
- Sharing details will allow governments, organizations and other companies to develop equally effective models and, if not, refine them into better ones.
- Sharing details about the model should not involve the loss of individual/personal privacy or confidentiality (only corporate), so this is not a case where the government would infringe on people's rights or liberty.

No, should not be required:
- The company that developed the PWS model invested a lot of money and other resources so it is not fair towards the owners, shareholders and workers that a government gets access to the model without adequate payment.
- If governments believe there is an urgent need for effective models such as the PWS mode, they should develop such programmes of weather predictions, rather than rely on private companies to do so at their own cost.
- As a principle, governments should respect the private nature of data that belongs to independent companies, otherwise this could open the gate to many other cases in scientific research (e.g., with pharmaceutical drugs) where the governments overstep their boundaries and their rights.
- If the PWS model does not continue to perform as effectively for future hurricanes, leading to loss of life and property, who is accountable?

3. (a) (i) Identify **two** characteristics of an algorithm. **[2]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Unambiguous. An algorithm is generally clear and unambiguous. Each of its steps (or phases), and their inputs/outputs should be clear and must lead to only one meaning.
- Well-defined inputs and/or outputs. An algorithm should have well-defined inputs and outputs.
- Finiteness. Algorithms terminate after a finite number of steps.
- Feasibility. An algorithm should be feasible with the available resources.
- Independent. An algorithm should have step-by-step directions, which should be independent of any programming code.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a characteristic of algorithms, up to a maximum of **[2]**.

(ii) Describe **two** real-world examples for which automated journalism would not be effective at generating news content. **[4]**

"Describe" is a command term that requires a more detailed account than simply listing an item. The real-world example should be detailed enough to indicate why automated journalism would be effective. There are many possible correct responses, including the following:
- Examples involving sporting events and results.
- Examples involving cultural events and/or offerings that do not require in-depth or original reviews.
- Examples that involve collating pre-existing descriptions, reviews and/or ratings into news content.
- Examples involving statistical information and/or performance such as for markets, medical issues, agriculture or manufacturing.
- Examples that involve condensing longer form reporting into shorter, concise summaries.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[2]** for each description, up to a maximum of **[4]**.

(b) The developers of automated journalism software need to understand how human journalists work. Two methods for gathering this information are:
   • observations and interviews with journalists
   • conducting large-scale surveys involving journalists.

Explain how each of these methods may provide insight into how human journalists work.   **[6]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. There are many possible correct responses to this question, including the following:

Observations and interviews
• Allow direct observation and documentation of processes, tools and resources used by journalists.
• Allow in-depth discussion about the nature of work as a journalist. This may allow the reasons behind the decisions made to be explored in more depth.
• May reduce the time required to carry out the investigation as the discussion is synchronous.
• May be able to discuss aspects of work that is not available through other means, such as internet searches or in publications.

Surveys
• Can allow for anonymity that may lead to more honest responses.
• Allow for a greater number of responses within a standardised format for analysis.
• Allow for potentially more diverse set of responses targeted to particular contexts and cohorts.
• Allow for the collection, processing and analyse of numerical and/or statistical data useful for developing automated software.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[2]** for each explanation of up to a maximum of **[6]**. Responses that only provide an explanation for one method versus both cannot score higher than **[4]**.

(c)   An online news organization has decided to exclusively use automated journalism to provide coverage for a major upcoming political election.

Evaluate this decision with reference to **one** course concept.   **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"Evaluate" is a command term that requires an appraisal that weighs up strengths and limitations, in this case a specific decision. The question instructs candidates to integrate a course concept into their response.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organised. In their responses, candidates must indicate both strengths and limitations of the decision. Some possible reasoning follows below.

Strengths of the decision
- Many more news articles can be generated using this method. Content can be generated faster – this is important for breaking news.
- Audiences may not trust human generated content due to perceived bias.
- This may give human reporters more time to do in-depth analysis.
- This may provide background information for human-based news stories.
- This can eliminate some of the more mundane/boring jobs and allow reporters to focus on more thought-provoking stories – this may improve the quality of their writing.

Limitations of decision
- It takes time and money to train the software.
- Audiences may not trust the automated content.
- Automated content may not include authentic analysis.
- Can't provide the human perspective that makes articles interesting.
- Automated software may not be able to discover news stories; they are restricted to generating content from pre-existing materials.
- Bias may be built into the automated software in ways that are not immediately transparent or accountable.
- Journalists may lose jobs.

The question instructs candidates to reference one course concept. There are several ways a relevant course concept might be integrated into responses, including but not limited to:

Concept	Possible uses / relevance
Change	Understanding change involves considering people, ideas, objects and forces that shape the world: past, present and future. This is central to the coverage of an important political election.
Expression	Expression brings people and communities together but can also have the opposite effect. Political coverage can be a form of expression that does either or both.
Identity	Political coverage is often tailored to specific groups and/or identities.
Power	Power includes the ability to influence the beliefs and behaviours of others. This understanding of power is important to consider in relation to political content and this decision.
Systems	Changes in a system may lead to unintended consequences. This is especially relevant in this case.
Values and ethics	Values and ethics involve professional codes. Human journalists have professional codes which may (or may not) conflict with this decision.

4.   (a)   (i)   Identify **three** types of artificial intelligence (AI).   **[3]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. AI is a notoriously difficult to define term with many possible types, including those that exist currently and others that do not. There are many possible correct responses to this question, including:
- Narrow AI
- General AI
- Super AI
- Reactive machines
- Limited memory
- Machine learning (including, e.g., supervised and/or unsupervised)
- Deep learning

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a type of AI, up to a maximum of **[3]**.

(ii)   Identify **three** characteristics of a real-world example of artificial intelligence (AI).   **[3]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Ability to seem intelligent
- Power to copy intelligent human behaviour
- Capacity to learn
- Decision making ability
- Adaptation to circumstances
- Well defined goals
- Problem solving skill
- Reasoning ability
- Autonomy
- Flexibility.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a characteristic of existing AI, up to a maximum of **[3]**.

(b)   Explain **two** reasons that a human rights activist might disagree with the use of
       artificial intelligence (AI) in criminal sentencing.   **[6]**

       "Explain" is a command term that requires a detailed account that includes
       reasons and or causes. There are many possible correct responses to this
       question, including the following:
       • AI and AI techniques are not necessarily less biased than human judgements.
       • AI and AI techniques may not be transparently biased, making them difficult to
         analyse and appeal.
       • AI and AI techniques used in sentencing may not be able to be applied
         uniformly in more than one context.
       • Criminal sentencing is inherently a human problem and value judgement to
         make, AI and AI techniques cannot adequately replicate these qualities.
       • There may be less accountability for the use of AI and AI techniques in
         sentencing, than sentencing by a human judge. Human judges, for instance,
         can be recalled or reprimanded.
       • There may be less transparency about the use and origin of AI and AI
         techniques in sentencing, than sentencing by a human judge.
       • The use of AI and AI techniques in criminal sentencing may be unevenly
         applied, so that some jurisdictions employ AI while others do not for the same
         crime.

       The list above is not exhaustive. Candidates are expected to provide relevant and
       accurate responses, but may choose a different word, example and/or approach
       in their response. Award **[1]** for identifying a reason and **[1]** for explaining the
       reasoning, up to a maximum of **[6]**. Responses that provide fewer than three
       reasons cannot score higher than **[4]**.

(c)   The European Union (EU) has passed a law that allows citizens to challenge
       decisions made using artificial intelligence (AI) in the criminal justice system.

       Evaluate this decision with reference to **one** course concept.   **[8]**

       *Part c is assessed with the markbands on page 3 in conjunction with these
       marking notes.*

       "Evaluate" is a command term that requires an appraisal that weighs up strengths
       and limitations, in this case a specific decision. While this question asks for
       similar reasoning as part b (and some of the same reasoning might apply), the
       focus in part c is more specific to governmental decision-making. Additionally, the
       candidate is challenged here to also consider the possible positive uses of AI in
       sentencing. The addition of a course concept adds further depth to responses.

       The markbands for this question additionally note that evaluation and synthesis is
       to be supported with relevant and accurate knowledge from the course and
       responses well-structured and organised. In their responses, candidates must
       indicate both strengths and limitations of the decision. Some possible reasoning
       follows below.

Strengths of decision
- The EU already implements broad policies to protect data privacy and this decision aligns with these policies.
- The criminal justice system in most EU countries is well developed and implemented, there may not be a clear and defined need for the use of AI and/or AI techniques.
- There are developed means for appealing criminal judgements in the EU, this decision uses these established processes.
- Access to appeal is important because biases could be incorporated into the AI because of the attitudes of the human beings who created it.
- Access to appeal is important because the designers of the AI systems in this example may not be criminal justice experts.
- Access to appeal is important because the underlying data that is used to make the sentencing decisions may be unreliable, inaccurate and/or incomplete.

Limitations of decision
- The understanding of AI and AI techniques is so uneven and murky, that this decision could lead to far more appeals that is feasible to address.
- While the EU is a defined bloc of nations, there is great variability in terms of criminal codes and technology access. The decision may not take into account these differences.
- The use of AI and AI techniques within criminal sentencing may lead to positive impacts in the EU that outweigh concerns, including standardising the criminal justice process, less incarceration, more rationalised outcomes.
- The decision values human judgement over artificial judgment and assumes humans are more transparent, fair and accountable than digital systems. This is not a proven assumption.
- The decision may pose a barrier to the further development of better AI and AI techniques.

The question instructs candidates to reference one course concept. There are several ways a relevant course concept might be integrated into responses, including but not limited to the following frames for the evaluation on the part of the candidate:

Concept	Possible uses / relevance
Change	The nature of change is contested. The use of AI in criminal sentencing may appear as progress, but it could be argued that does not advance legal, criminal or political rights and justice.
Identity	Identities are often intersectional. AI and AI techniques in the criminal justice system may not be able to address these complexities in sentencing as effectively as a human judge.
Power	Power is embedded in governments and institutions. This is true both in human and AI supported criminal justice. The application of a new technology does not make the use of power less significant.
Space	Space organises human experience into different categories such as cities, nations, regions, etc. This decision appears to uniformly apply to a bloc of nations, but may overlook the diversity of experiences within that bloc.
Systems	Systems involve interdependencies. The use of AI in the criminal justice system may have many unintended consequences.
Values and ethics	Values and ethics guide human action and decision-making. Is it possible for AI to actually make ethical decisions, or does it merely appear to do so?

Section B

5. Digital innovations are disrupting the nature of work in many organizations and companies.

Discuss a real-world example in which the benefits of digital innovation are outweighed by the negative impacts for employees. In your response, refer to **one** real-world example **and one** of the following concepts:
- Change
- Power
- Space   **[12]**

Section B is assessed using the markbands of page 4 in conjunction with these marking notes.

"Discuss" is a command term that requires a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge with well-structured and organised responses. In their responses, candidates should consider both positive and negative impacts. Counter-claims must also be considered in the response. The integration of a real-world example and one of the three indicated course concepts is required. Some possible reasoning for responses follows below.

Digital innovations are positively impacting work and employment by:
- Increasing flexibility in location, timing and nature of work.
- Optimised work practices and processes with specific digital systems including email, conferencing software and more.
- Integrating advanced digital systems like AI reduces repetitive work for employees.
- Broadening access to different jobs and types of employment to people and communities that may have been excluded in the past.
- Allowing more engagement with employees and overall flattening of organizational hierarchies.

Digital innovations are negatively impacting work and employment by:
- Eroding traditional divisions between workplace and home; professional and personal life.
- Creating an "always available" approach to work.
- Inundating workers with new systems, technologies and practices that are difficult to manage or keep pace with.
- Re-allocating costs once addressed by business to the employees themselves.
- Introducing invasive systems that threaten employee privacy.
- Reducing and/or eliminating jobs through automation.
- Flexibility in location, such as digital nomadism, means that employees have less connection with others, making relationships harder to establish and a social life more difficult to maintain.

The question instructs candidates to reference one of the listed course concepts. There are several ways a relevant course concept might be integrated into responses, including but not limited to the following frames for the discussion on the part of the candidate:

Concept	Possible uses / relevance
Change	The question notes that digital innovations are a "disruptive" type of change. Candidates may consider the nature and scope of this disruption, including indicating that these changes represent either continuity or discontinuity (or both) with prior practices.
Power	Power is structured and embedded within all organisations. Candidates may consider how power is involved with digital innovations in the workplace, such as through automation and organisational hierarchies.
Space	The space of working is a key area of disruption. Candidates may consider, for instance, how the space of the workplace has been disrupted through "digital nomadism," office arrangements etc.

6.   The internet and social media help people connect and communicate with others whose backgrounds and experiences may be different from their own.

Examine the claim that social media fosters greater understanding of diverse backgrounds and experiences. In your response, refer to **one** real-world example within **one** of the following contexts:
- Cultural
- Political
- Social   **[12]**

Section B is assessed using the markbands on page 4 in conjunction with these marking notes.

"Examine" is a command term that requires a consideration of an argument or concept in a way that uncovers assumptions and interrelationships of the issue.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge with well-structured and organised responses. In their responses, candidates should consider both the claim and relevant counter-claims. The integration of a real-world example within one of the three indicated course contexts is required. Some possible reasoning for responses follows below.

Online social media fosters greater tolerance for diverse backgrounds and experiences by:
- Exposing and/or integrating different types of people and perspectives to their users.
- Supporting new forms of communication and connection between people who may not have communicated / connected previously.
- Creating an inclusive and less restrictive public venue or sphere for interaction
- Encouraging users to share different aspects of their background and experiences with others.
- Disseminating information and knowledge about diverse people and communities through their platforms.

Online social media fosters less tolerance for diverse backgrounds and experiences by:
- Tailoring their services and/or content to targeted communities and populations.
- Encouraging homogeneity in the conventions and behaviours of their users.
- Creating "filter bubbles" through personalisation that may actually increase polarisation.
- Profiting through user attention rather than user communication and connections.
- The nature of digital divides and barriers to access based on income, age, ability and/or access.
- Restricting and/or censoring particular viewpoints and expressions.

The question instructs candidates to integrate a real-world example within one of the listed course contexts. There are several ways a response might demonstrate this, including but not limited to specific real-world examples relevant to the following:

Context	Possible uses / real-world examples
Cultural	• Real world examples involving popular culture and the online social media, such as the role of memes, online forums and/or streaming services. • Real-world examples involving diverse heritages and customs. • Real-world examples involving youth culture and other kinds of online subcultures (often associated with particular social media platforms).
Political	• Real world examples involving political activism, advertising and/or propaganda encountered on social media platforms • Real-world examples involving state and non-state actors on social media, such as the deliberate attempts to ferment discord among people and communities. • Real-world examples involving laws, policies or codes that encourage (or restrict) diversity and access.
Social	• Real-world examples involving the use of social media to express, share or better understand social components of identity (such as gender expression, sexuality, age or religious beliefs). • Real-world examples involving social media, families and relationships.

Digital society
Higher level and standard level
Paper 2 – source booklet

Specimen paper
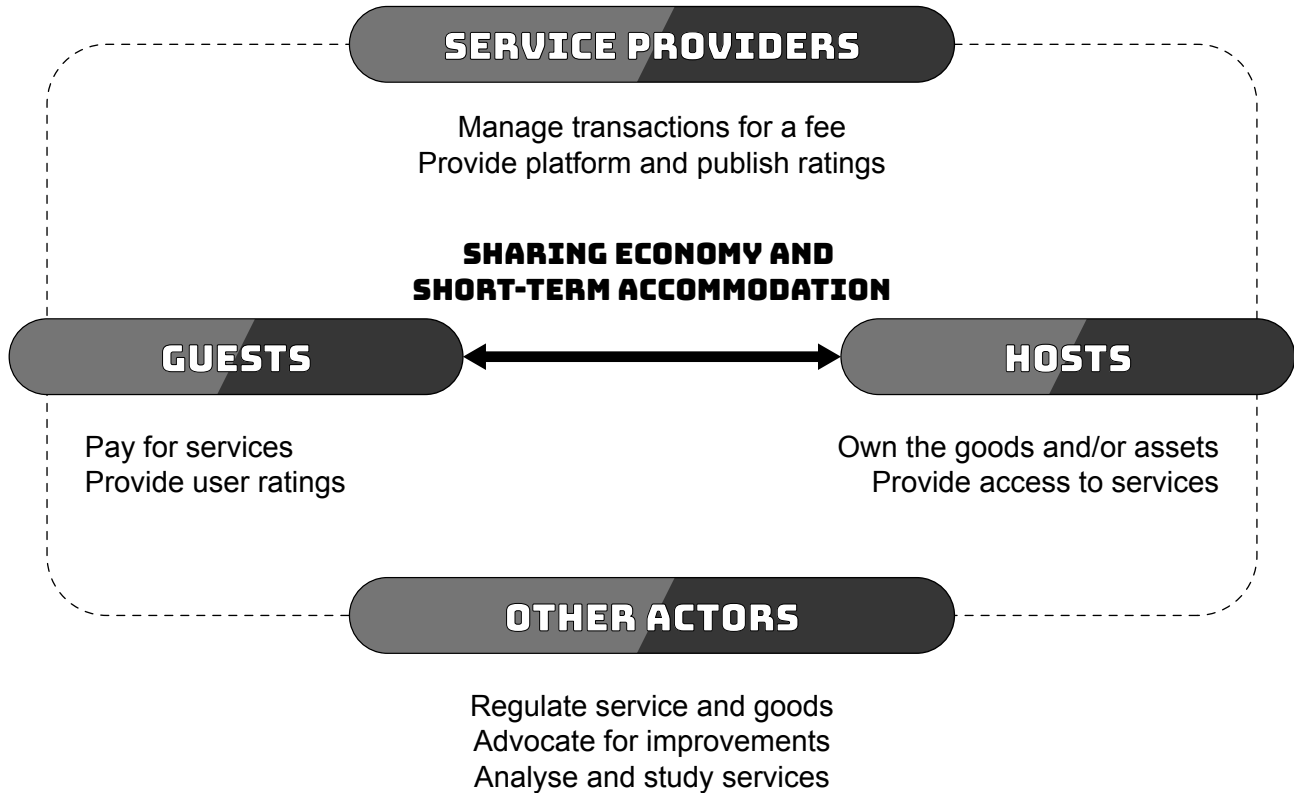
1 hour 15 minutes

Instructions to candidates

- Do not open this booklet until instructed to do so.
- This booklet contains the sources required for digital society higher level and standard level paper 2.

Source A   Adapted from "Platforms in the peer-to-peer sharing economy" in the *Journal of Service Management* (2019).

SERVICE DELIVERY ACTORS AND RELATIONSHIPS

SERVICE PROVIDERS

Manage transactions for a fee
Provide platform and publish ratings

**SHARING ECONOMY AND
SHORT-TERM ACCOMMODATION**

GUESTS   **HOSTS**

Pay for services   Own the goods and/or assets
Provide user ratings   Provide access to services

OTHER ACTORS

Regulate service and goods
Advocate for improvements
Analyse and study services

Source B   Adapted from the paper *Who benefits from the sharing economy of Airbnb?*, delivered at an international computing conference (2016).

The sharing economy has become extremely popular in the last decade and has changed the way in which we commute, travel and borrow, among many other activities. The term refers to peer-to-peer providers that connect people for the purpose of distributing and using services and goods for a fee. The sharing economy includes many types of activities, such as services that offer access to short-term accommodation.

Despite their popularity among consumers, some prominent short-term accommodation services are criticized by local communities and policy makers, who argue that they lead to negative impacts associated with mass tourism. Some experts, however, believe that these services may benefit cities and communities by supporting urban renewal efforts and contributing to the economic health of neighbourhoods.

One thing, however, is clear. The sharing economy is difficult to control, and many of our approaches to regulation have not kept pace with changing times.

Source C   Adapted from the article "How Airbnb took over the world", published in UK
                     newspaper *The Guardian* (May 2019).

Airbnb lists more than six million rooms, flats and houses in over 81 000 cities across the globe. On
average, two million people rest their heads in an *Airbnb* property each night. London, Paris and
New York have the biggest number of listings, but *Airbnb* accommodation is available in Mandalay,
Ulaanbaatar and Brazzaville.

Some residents in areas with a big *Airbnb* presence claim the company is damaging communities by
forcing increases in rents, limiting the availability of long-term housing and importing large numbers of
tourists who are often not considerate of their temporary neighbours.

Social media abounds with stories of excessive noise, trashed homes, wild parties, last-minute
cancellations and scams. But they are matched by positive experiences from satisfied travellers who
have found affordable alternatives to hotel rooms.

Many local authorities are implementing regulations to mitigate the negative impact of short-term
accommodation. In London, for example, the mayor called for a registration scheme for people renting
properties on a short-term basis, and a legal cap of 90 nights a year for short-term rentals in London has
been in place since 2015 but has been almost impossible to enforce.

Source D   Adapted from the article "Fairbnb: The ethical home-sharing alternative that
                     wants to undermine mass tourism", published on the *Forbes* online news website
                     (March 2019).

The digital age has changed the face of many cities by contributing to mass tourism. Venice, a
thousand-year-old city, is now considered by some to be a theme park. According to urban activists,
cities and neighbourhoods are losing their identity, distinctiveness and individuality. Commercial activities
that once supported the local economy have been replaced by franchises catering to tourists.

This is why an Italian start-up company has founded an alternative to short-term accommodation
called *Fairbnb*. The new English-language platform advertises rooms, apartments and houses for
short-term accommodation, but hosts must prove that they are city residents and have strictly followed
local regulations. Additionally, hosts and guests must agree to sustainability guidelines developed
within each city. The service also charges travellers a small additional fee that is used to fund local
social projects.

According to *Fairbnb*'s founders, the initiative has been welcomed positively. While the platform alone
is not a solution to mass tourism, it does provide residents and visitors a way to experiment with new
models of responsible digital tourism.

References:

Source A   Wirtz, J., *et al*., 2019. Platforms in the peer-to-peer sharing economy. *Journal of Service Management*, 30(4), pp.452–483.

Source B   Quattrone, G., et al., 2016. Who benefits from the sharing economy of Airbnb? *Proceedings of the 25th International Conference on World Wide Web*, pp.1385–1394. [online] Available at: <https://dl.acm.org/doi/10.1145/2872427.2874815> [Accessed 28 July 2021].

Source C   Sherwood, H., 2019. How Airbnb took over the world. *The Guardian* [online], 5 May. Available at: <https://www.theguardian.com/technology/2019/may/05/airbnb-homelessness-renting-housing-accommodation-social-policy-cities-travel-leisure> [Accessed 28 July 2021].

Source D   Girardi, A., 2019. Fairbnb: The Ethical home-sharing alternative that wants to undermine mass tourism. *Forbes* [online], 21 March. Available at: <https://www.forbes.com/sites/annalisagirardi/2019/03/21/fairbnb-the-ethical-home-sharing-alternative-that-wants-to-undermine-mass-tourism/?sh=2cd784fd3878> [Accessed 28 July 2021].

Digital society
Higher level and standard level
Paper 2

Specimen paper

1 hour 15 minutes

Candidate session number

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Read the sources in the accompanying booklet carefully.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- The maximum mark for this examination paper is **[24 marks]**.

08EP01

Answer **all** questions. Refer to the sources in the accompanying source booklet. Answers must be written within the answer boxes provided.

1. With reference to Source A, identify **two** ways in which actors other than guests and hosts contribute to the sharing economy. [2]

2. With reference to Source B and one other real-world example you have studied, explain why it may be difficult to regulate the sharing economy. [4]

3. Compare what Source C **and** Source D reveal about local impacts associated with the sharing economy. [6]

Turn over

4. "*Uber*, the world's largest taxi company, owns no vehicles. *Facebook*, the world's most popular social media platform, creates no content. *Alibaba*, the most valuable retailer, has no inventory. And *Airbnb*, the world's largest accommodation provider, owns no real estate. Something interesting is happening."

With reference to all the sources and your own knowledge, discuss whether the sharing economy represents change that is an evolution or a transformation. [12]

Turn over

References:

1.   Goodwin, T., 2015. The battle is for the customer interface. *Techcrunch* [online], 3 March. Available at: <https://techcrunch.com/2015/03/03/in-the-age-of-disintermediation-the-battle-is-all-for-the-customer-interface/> [Accessed 28 July 2021]. SOURCE ADAPTED.

08EP08

Markscheme

Specimen paper

Digital society

Higher level and standard level

Paper 2

General marking guidance

Please note that session marking guidance may be presented differently than guidance found here. For example, lists may be used in place of tables.

Expect a range of approaches in candidate responses
Examination questions encourage independent thinking on the part of candidates. Expect a range of appropriate responses. Examiners should be aware that in some cases, candidates may take a different approach that, if appropriate, should be rewarded. If in doubt, check with your team leader.

Marking accurate and relevant knowledge and examples
For some questions, there is no "correct" answer. Examiners must be prepared to award full marks to answers which demonstrate accurate and relevant knowledge.

For example, bulleted lists in this markscheme indicate likely points that candidates may include in their answer: they are not exhaustive, and examiners should credit other valid points not listed. Additionally, in cases where a question asks for a certain number of items, read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

Supporting critical and creative thinking
In their responses, particular phrases often signal critical and/or creative thinking on the part of candidates. Such phrases, when they appear in response to appropriate command terms, may help examiners determine the proper marks to award. For example:

Sample command term	Possible signal phrase
Explain	Because, as a result of, due to, therefore, consequently, for example
Analyse	Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas
Evaluate	My opinion, overall, although, despite, on balance, weighing up

About extended responses
It should be recognized that, given time constraints, answers for Question 4 are not intended to reflect a fully polished extended response that addresses the full range of possible examples, issues and topics. Use the provided markbands in conjunction with the marking notes to award marks for this question.

1. With reference to Source A, identify **two** ways in which actors **other than** guests and hosts contribute to the sharing economy. **[2]**

"Identify" is a command term that requires an answer from a range of possibilities. Additional details are not required. Answers may include, but are not limited to:
- Advocate for improvements including enforcement or new policies
- Regulate services and transactions in the sharing economy
- Managing transactions (broadly) between hosts and guests
- Maintaining and/or providing the app and platform for the service
- Collecting and/or publishing ratings of services

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for each relevant item up to a maximum of **[2]**.

2. With reference to Source B and **one other** real-world example you have studied, explain why it may be difficult to regulate the sharing economy. **[4]**

"Explain" is a command term that requires a detailed account including reasons or causes. Answers may include, but are not limited to:
- Rapid growth in popularity of sharing economy services outpacing laws and regulations
- Difficult to make uniform regulations that cover such a broad area of services (short-term lodging, banking, ride sharing, etc)
- Regulations are usually place-based (local, regional, national) while sharing economy services are often borderless and/or global
- Disagreements among experts, policymakers, etc, on the balance of positive and negative impacts associated with sharing economy services

Valid examples from own knowledge may include, but are not limited to:
- Court cases involving sharing economy services such as *Uber*, *Airbnb* and others
- Specific laws, policies or regulations proposed by a city, region and/or country
- Advocacy on the part of consumers, users and/or experts
- Examples of "mismatch" between older laws and regulations and rapidly growing new services

The lists above are not exhaustive. Other relevant points not listed can also be rewarded. Candidates are not expected to make four separate points in order to achieve full marks. For each valid point a maximum of **[2]** may be awarded, up to a total of **[4]**. If there is no reference to another example studied, award a maximum of **[3]**.

3. Compare what Source C and Source D reveal about local impacts associated with the sharing economy. **[6]**

"Compare" is a command term that requires an account of the similarities between two (or more) items or situations, referring to both (or all of them) throughout. Note that both sources refer to a specific service in the sharing economy: *Airbnb*. Responses should focus on this specific real-world example, as the question does not require external knowledge or examples.

Answers may include, but are not limited to:

Quantity / scope of growth
- Source C observes the service now offers a high number of beds, listing and rentals and that local caps and regulations are not very successful
- Source D notes that mass tourism is turning cities into theme parks
- Both sources C and D use descriptive terms that indicate a high amount of tourism, such as: "importing large numbers", "social media reports abound", "mass tourism"

Widespread nature of impact
- Source C indicates that the impact is felt in cities and communities around the world.
- Source D notes that Airbnb is changing " the face" of cities many cities
- Both sources C and D use descriptive terms that indicate the pervasive nature of the impacts

Economic and commercial impacts
- Source C includes charged language about economic impacts noting Airbnb "is damaging communities by forcing increases in rents, limiting the availability of long-term housing". Some positive commercial aspects are also noted, including affordability for consumers/users.
- Source D notes that *Airbnb* is leading to the replacement of local commercial activities in favour of franchises that cater to tourists. Source D also indicates that the *Fairbnb* alternative contributes to sustainable solutions, which would extend to economic aspects as well.
- Both sources C and D emphasize negative impacts to local city economies and commercial activities, with some potential positive impacts as mentioned above.

Quality of life
- Source C indicates several negative impacts on quality of life including "stories of excessive noise, damaged homes, wild parties, last-minute cancellations and scams."
- Source D indicates several negative impacts are felt in cities and neighbourhoods that fear "losing their identity, distinctiveness and individuality". The use of the term "theme park" fits here as well.
- Both sources C and D highlight explicit negative impacts on the quality of life. Source D also does so implicitly by describing an alternative service that is more attentive to local concerns.

Positive consumer views
- Source C provides an example of positive consumer views on *Airbnb* (and the sharing economy) that indicates "satisfied travellers who have found affordable alternatives to hotel rooms".
- Source D portrays *Airbnb* fairly negatively, but does indicate the positive possibilities of the sharing economy through an alternative service that "provide[s] residents and visitors a way to experiment with new models of responsible digital tourism".
- Both sources C and D highlight potential positive aspects to the sharing economy.

Counter efforts by communities
- Source C indicates attempts to regulate and set caps, for instance, on short-term rentals and lodging.
- Source D provides an extended example of a counter / alternative efforts through a new service called *Fairbnb*.
- Both sources C and D offer specific examples taken by cities to reduce the negative impacts associated with the sharing economy (and *Airbnb* in particular).

Do not expect all of the points above, and allow other valid points. Award **[2]** per effective point of comparison up to a maximum of **[6]**. If the view of only one source is discussed award a maximum of **[3]**. For responses that discuss the sources separately, rather than in a running comparison, award a maximum **[4]**.

4. "*Uber*, the world's largest taxi company, owns no vehicles. *Facebook*, the world's most popular social media platform, creates no content. *Alibaba*, the most valuable retailer, has no inventory. And *Airbnb*, the world's largest accommodation provider, owns no real estate. Something interesting is happening."

With reference to all the sources **and** your own knowledge, discuss whether the sharing economy represents change that is an evolution or a transformation.   **[12]**

Question 4 is assessed according to the markbands on page 8, in conjunction with these marking notes.

"Discuss" is a command term that requires a considered and balanced review that includes a range of arguments, factors, or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence. The question includes reference to "change that is an evolution or a transformation", which is a prescribed course area for inquiry.

The stimulus quote might push candidates to consider the sharing economy as transformational, while the sources add more nuance to this appraisal. This tension is at the heart of this question.

Issues derived from source materials may include, but are not limited to:

Nature of the service
* Sources A and B visualize and describe the nature of the sharing economy using the real-world example of short-term accommodation (i.e., *Airbnb*). Source B indicates this as a new type of business and service, but it could be argued using the information conveyed in Source A that the service replicates a fairly traditional one ("providing rooms to travellers") through a potentially novel means. The impact of the sharing economy on cities is the crucial matter of Sources C and D, but again candidates may argue that these impacts are not new or transformational so much as an evolution of impacts felt by tourism in general.

Relationship between actors
* This is an especially fruitful area for candidates to explore in this question, as it can be argued effectively that these relationships are transformational (peer-to-peer is important here) and/or evolutionary, in that none of the key actors visualized in Source A are particularly new or novel for the sharing economy. Here candidates might pursue how the technology / platform underlying the relationships has evolved or transformed them.

Efforts to regulate the business
* All sources highlight efforts to regulate a business in the sharing economy. There are numerous examples and descriptions of this in action. Candidates could effectively argue that these efforts are either evolutionary or transformative depending on their focus.

Impact on local communities
* All sources highlight a range of positive, negative and more nuanced impacts on local communities. There are numerous examples and descriptions of these impacts. Candidates could effectively argue that these impacts are either evolutionary or transformative depending on their focus.

Alternative services and business models
- Source D offers a detailed alternative approach to the sharing economy that leverages its newness to provide a sustainable alternative. Candidates could effectively argue that this alternative is either evolutionary or transformative depending on their focus.

Do not expect all of the above, and reward other relevant points and/or examples not listed. If only source material or only own knowledge is used, the response can only be awarded a maximum of **[8]**. To achieve the maximum **[12]**, expect argument, synthesis of all four sources and own knowledge. Candidates should synthesize and evaluate evidence from the sources and from their study of the course.

The following markbands should be used with responses to question 4.

SL and HL Paper 2, question 4	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–3	- The response shows a limited understanding of the demands of the question. - There is limited relevant knowledge. - Evidence from sources is not integrated with the response. - The response has limited organization.
4–6	- The response shows some understanding of the demands of the question. - Some knowledge is demonstrated but this is not always relevant or accurate. - Evidence from sources is partially integrated into the response. - The response is partially organized.
7–9	- The response shows adequate understanding of the demands of the question. - Relevant and accurate knowledge is demonstrated with some lapses. - There is adequate integration of evidence from the sources, but this is not always sustained. - The response is adequately organized.
10–12	- The response is focused and shows an in-depth understanding of the demands of the question. - Relevant and accurate knowledge is demonstrated throughout, adding insight to the response. - There is consistent and effective integration of evidence from the sources. - The response is well-structured and effectively organized.

Digital society
Higher level
Paper 3 – source booklet

Specimen paper

1 hour 15 minutes

Instructions to candidates

- Do not open this booklet until instructed to do so.
- This booklet contains the sources required for digital society higher level paper 3.

Happy Parking

A European telecommunications company recently launched a mobile digital application (app) called *Happy Parking*. The app was piloted in the city of Hamburg and is gradually being rolled out to over 80 cities across Germany.

5　*Happy Parking* helps automobile drivers locate, navigate and pay for a parking space close to their location within a city. The app's marketing team promises an easy and seamless user experience. To use the app, each user must first register a credit card for payment purposes, submit images verifying their legal eligibility to drive, and allow the app to access their geographical location in real time.

10　The *Happy Parking* app combines driver location data with data collected from parking sensors located throughout the city. It then uses this data to provide users with accurate, real-time information on available parking spaces. Once a user selects an available space, optimized routing towards the chosen parking space is displayed by the app. When the user parks, the app processes a small fee, allowing the space to be used for a pre-set time. If a user does not pay for the parking space, their vehicle is flagged for a fine and may even be towed away or have its

15　tyres clamped.

Figure 1: The *Happy Parking* app mobile interface
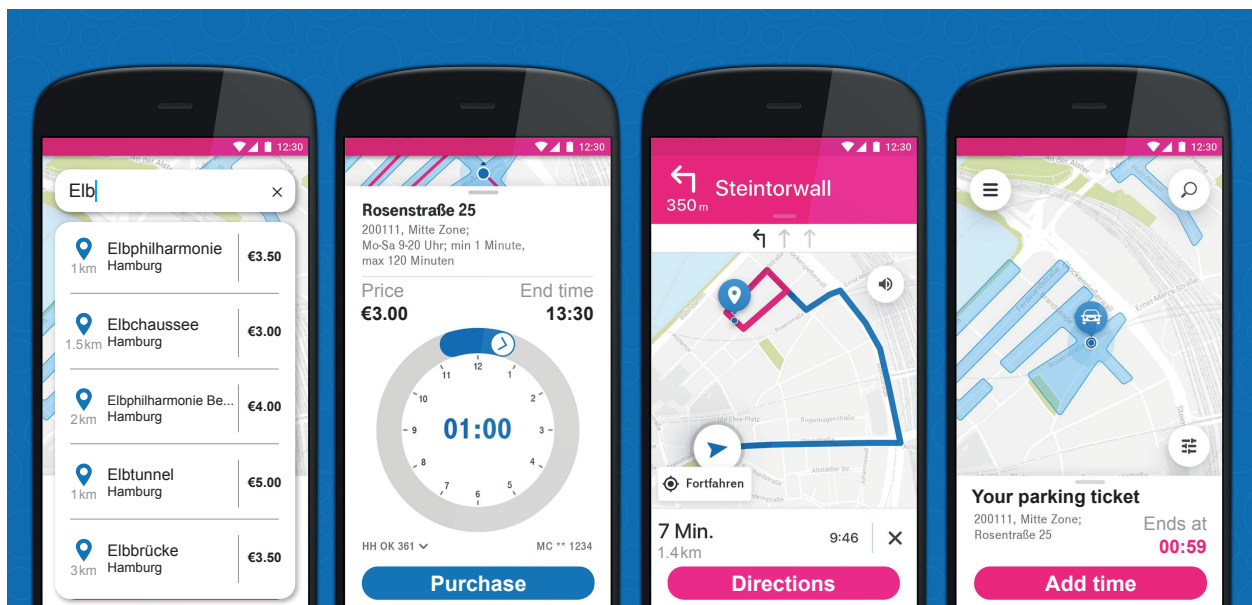
Early results show that *Happy Parking* app users save time finding and securing parking spaces. However, parking sensors are unevenly distributed across areas of the pilot city, and paid parking lots and garages are starting to express concern about the app's impact on their businesses. The app is also not currently available on all mobile devices and operating systems.

20　It is too early in the pilot to conclusively determine the app's impact on air pollution.

Disclaimer:

Content used in IB assessments is taken from authentic, third-party sources. The views expressed within them belong to their individual authors and/or publishers and do not necessarily reflect the views of the IB.

References:

Figure 1   Park and Joy, n.d. *[Mobile interface]*. [image online]. Available at: <https://apkpure.com/br/park-and-joy-parkplatz-finden-digital-bezahlen/de.telekom.parkandjoy> [Accessed 27 July 2021]. SOURCE ADAPTED.

Diploma Programme
Programme du diplôme
Programa del Diploma

Digital society
Higher level
Paper 3

Specimen paper

Candidate session number

1 hour 15 minutes

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A clean copy of the **digital society pre-released statement** is required for this examination paper.
- Read the sources in the accompanying booklet carefully.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- The maximum mark for this examination paper is **[30 marks]**.

08EP01

International Baccalaureate
Baccalauréat International
Bachillerato Internacional

Answer **all** questions. Refer to the sources in the accompanying source booklet, the pre-released statement, and your own related research. Answers must be written within the answer boxes provided.

1. (a) Identify **two** reasons why it may take time for the *Happy Parking* app to be regularly used by a large number of people. [2]

(b) Describe **one** feature of the mobile interface that helps drivers use the *Happy Parking* app. [2]

2. Explain **two** ways in which the *Happy Parking* app might mitigate the challenge of air pollution. [6]

3. Evaluate the potential effectiveness of the *Happy Parking* app in terms of equity **and** acceptability. [8]

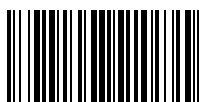**4.** Governments, organizations and private companies are considering a range of digital interventions to address the challenge of pollution caused by traffic flows and congestion.

With reference to the proposed app and your own inquiries, recommend a digital intervention that would most effectively address the challenge of pollution caused by traffic flows and congestion. [12]

Markscheme

Specimen paper

Digital society

Higher level

Paper 3

General marking guidance

Please note that session marking guidance may be presented differently than guidance found here. For example, lists may be used in place of tables.

Expect a range of approaches in candidate responses
Examination questions encourage independent thinking on the part of candidates. Expect a range of appropriate responses. Examiners should be aware that in some cases, candidates may take a different approach that, if appropriate, should be rewarded. If in doubt, check with your team leader.

Marking accurate and relevant knowledge and examples
For some questions, there is no "correct" answer. Examiners must be prepared to award full marks to answers which demonstrate accurate and relevant knowledge.

For example, bulleted lists in this markscheme indicate likely points that candidates may include in their answer: they are not exhaustive, and examiners should credit other valid points not listed. Additionally, in cases where a question asks for a certain number of items, read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

Supporting critical and creative thinking
In their responses, particular phrases often signal critical and/or creative thinking on the part of candidates. Such phrases, when they appear in response to appropriate command terms, may help examiners determine the proper marks to award. For example:

Sample command term	Possible signal phrase
Explain	Because, as a result of, due to, therefore, consequently, for example
Analyse	Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas
Evaluate	My opinion, overall, although, despite, on balance, weighing up

About extended responses
It should be recognized that, given time constraints, answers for Q3 and Q4 are not intended to reflect a fully polished extended response that addresses the full range of possible examples, issues and topics possible. Use the provided markbands in conjunction with the marking notes to award marks for this question.

1.   (a)   Identify **two** reasons why it may take time for the *Happy Parking* app to be
regularly used by a large number of people.   **[2]**

This question is divided into two parts. Candidate must respond to both parts.

"Identify" is a command term that requires an answer from a range of
possibilities. Additional details are not required. Answers may include, but are not
limited to:
- Increasing the time for the new service/app to be adopted
- Drivers may not need to use the service
- Drivers cannot use the service because it is limited for various reasons
- Difficulty using the service
- Drivers may not have downloaded the app
- Drivers may be concerned with the privacy and use of the data collected by the service
- Drivers may not have a credit card.
- Drivers may be driving without a driving license
- Drivers may be from another country and their driver's licence may not be recognized
- Drivers may have parking spots allocated for their use at a business
- Drivers may use public transport and not need to drive a car
- Drivers may not be able to use the app on their devices

The list above is not exhaustive. Candidates are expected to provide relevant and
accurate responses, but may choose a different word, example and/or approach
in their response. Award **[1]** for each relevant item up to a maximum of **[2]**.

(b)   Describe **one** feature of the mobile interface that helps drivers use the
Happy Parking app.   **[2]**

"Describe" is a command term that requires a detailed account in the response.
Responses must include a description of how the mobile interface helps the
driver to use the service. Candidates may identify other features than those
present in the images in the stimulus.

Answers may include, but are not limited to:

The mobile interface provides:
- the address of the parking spot – helps the user find the spot and return to it using
  local knowledge
- a map of the location – helps the user find the spot
- list of spots available – helps the user choose the best spot
- map with clear directions to find the spot, visual or spoken – helps the user find the
  spot easily
- prices of each spot – helps the user select the cheapest spot
- how much time is left on the spot – helps the user not go over time and be towed
  away; allows the user to pay more to extend the time
- how much money is available on the credit card – allows the user to know if they
  have enough money to pay
- list of previous uses of the service – helps the user remember where the most
  available spots are and go directly there.

The list above is not exhaustive. Candidates are expected to provide relevant and
accurate responses, but may choose a different word, example and/or approach in their
response. Award **[1]** for identifying an appropriate feature and **[1]** for describing how the
feature helps the driver to use the service for a maximum of **[2]**.

2.   Explain **two** ways in which the *Happy Parking* app might mitigate the challenge of
air pollution.   **[6]**

"Explain" is a command term that requires a detailed account including reasons or
causes. The guide prescribes the use of the term "mitigates" which is defined as
"reducing negative aspects related to a challenge". Candidates should be familiar with
this term and definition.

Answers may include, but are not limited to, the following explanations:
- The service saves time in finding car parking spots by providing those that are the
  closest to where the driver is at the moment, e.g. home, office. This means that the
  car would need to travel less distance, thereby producing less pollution.
- The service provides a quick and easy way of finding directions to a parking spot,
  which means less time is needed to drive around searching for an empty space,
  thereby producing less pollution.
- The data collected from the app can help the local authorities determine and design
  better patterns of parking spot use. This means the authorities can optimize the
  location, timing and pricing of the parking spots (these ways may be marked
  individually depending on how the candidate explains how the urban air pollution is
  reduced. A single explanation would mean these are treated as one way only – use of
  data collected).
- The app allows drivers to pay for a spot for a determined length of time, which may
  preclude the need for moving and/or changing spaces, leading to a reduction in
  exhaust and pollution.

The list above is not exhaustive. Other relevant points not listed can also be rewarded.
Candidates are not expected to make four separate points in order to achieve full
marks. Award **[1]** for identifying the way the app mitigates pollution and **[2]** for the
explanation of the mitigation. For each valid point, a maximum of **[3]** may be awarded,
up to a total of **[6]**.

3. Evaluate the potential effectiveness of the *Happy Parking* app in terms of equity and acceptability.   **[8]**

This question is assessed according to the markbands on page 7, in conjunction with these marking notes.

"Evaluate" is a command term that requires an appraisal that weighs up strengths and limitations. The guide prescribes the use of the terms "equity" and "acceptability" which are described as:
- **Equity:** Does the intervention equitably address the needs, claims and interests of specific people and/or communities affected by the challenge?
- **Acceptability:** Do specific affected people and/or communities view the intervention as acceptable?

Candidates should be familiar with these terms and descriptions. In their response, candidates should evaluate the effectiveness of the *Happy Parking* app with reference to the people and communities impacted by the challenge and the intervention. These include:
- Owners of the cars, drivers of the cars
- Local authorities that control the parking of cars
- Local communities where cars are parked
- Owners of paid parking lots and garages
- People in the cities and locations affected by air pollution

Responses must refer to both equity and acceptability, which may be linked in the candidate's evaluation. A balanced approach to equity and acceptability is not required by the question.

Possible reasoning may include:

Factors in evaluating equity
- Digital divides or lack of access to required technologies and systems (for example, the app presumes a level of wealth that is not uniformly shared).
- Barrier or obstacles in payment and/or legal documentation.
- The app may not impact other key drivers of air pollution (such as commercial vehicles).
- The app may not be uniformly available in cities and locations (for instance, confined to particular neighbourhoods).
- If all parking spots are allocated within the new system, the app provides an equitable solution to optimize the parking process.

Factors in evaluating acceptability
- It places the burden of mitigation of pollution on the individual choice of drivers to use the app.
- It introduces a new / additional technological layer into the process of parking that users may not accept.
- Drivers, users and city officials may not accept the collection and use of data by the app.
- Communities may feel that the app does not provide a tangible or measurable means to mitigate pollution.
- Given uneven access to the app (due to, for example, digital divides and/or technological barriers), users and local communities may not find the app an acceptable intervention.

4. Governments, organizations and private companies are considering a range of digital interventions to address the challenge of pollution caused by traffic flows and congestion.

With reference to the proposed app **and** your own inquiries, **recommend** a digital intervention that would most effectively address the challenge of pollution caused by traffic flows and congestion. **[12]**

Question 4 is assessed according to the markbands on page 8, in conjunction with these marking notes.

"Recommend" is a command term that requires presenting an advisable course of action with appropriate supporting evidence/reason in relation to a given situation, problem or issue. This question requires candidates to provide a well-supported, organized and structured response with a clear recommendation. Reference to knowledge and insight from candidate inquiries is noted as a requirement for the demands of this question.

Supporting evidence
There is no "correct" answer to this question. There are numerous valid and supportable recommendations. Recommended interventions may serve different purposes and impact different areas in a distinct ways (for example, highway vs. city traffic).

Candidates must present a basic description of their recommendation in order to meet the demands of the question. The candidate must explain why their recommended intervention would be effective with supporting evidence. To achieve the upper markband, candidates must also consider possible trade-offs and implications.

Responses should integrate evidence from inquiries. Supporting evidence could include relevant and specific real-world examples involving places, communities, people, businesses, policies, technologies, etc.

Possible interventions may include those listed below. Examiners must consult the question markscheme in their evaluation.

Possible recommended interventions:

- Digital systems to monitor and control traffic lights to enhance traffic flow and to reduce congestion at intersections.
- Smart highways with variable speed limits and automated re-routing for drivers to avoid accidents.
- Encouraging the use of digital ride sharing applications on the part of governments, organisations and employers.
- The use of on-demand vehicle rental services.
- Increasing the use of self-driving cars.
- Adaptive public transport that uses big data and analytics to improve the use of public transport options.

The following markbands should be used with responses to question 3.

HL Paper 3, question 3	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–2	• The response shows a limited understanding of the demands of the question. • Response is of limited relevance. The response is descriptive and consists mostly of unsupported generalizations. • The response has limited organization.
3–4	• The response shows some understanding of the demands of the question. • The response is primarily descriptive with some evaluation demonstrated but this is not sustained or fully supported. • The response is partially organized.
5–6	• The response shows adequate understanding of the demands of the question. • Response demonstrates adequate evaluation that is relevant and supported. • The response is adequately organized.
7–8	• The response is focused and shows an in-depth understanding of the demands of the question. • Response demonstrates sustained evaluation that is relevant and well-supported throughout. • The response is well-structured and effectively organised.

The following markbands should be used with responses to question 4.

HL Paper 3, question 4	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–3	• The response shows a limited understanding of the demands of the question. • The response consists mostly of unsupported generalizations with limited relevant knowledge. • No recommendations are presented or those that are presented have only limited support. • The response has limited organization.
4–6	• The response shows some understanding of the demands of the question. • The response demonstrates some knowledge, but this is not always relevant or accurate and may not be used appropriately or effectively. • Recommendations are presented with some support although this is not sustained and only partially effective. • The response is partially organized.
7–9	• The response shows adequate understanding of the demands of the question. • Response is adequately supported with relevant and accurate knowledge. • Recommendations are presented and effectively supported. • The response is adequately organized.
10–12	• The response is focused and shows an in-depth understanding of the demands of the question. • Response is well-supported throughout with relevant and accurate knowledge. • Recommendations are presented and well-supported with a clear consideration of possible trade-offs and implications. • The response is well-structured and effectively organized.

Digital society
Standard level
Paper 1

Specimen paper

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer two questions.
- The maximum mark for this examination paper is **[40 marks]**.

Blank page

Answer **two** questions. Each question is worth [20 marks].

1. **Monitoring online activity**

    Adults are increasingly using digital services to monitor the online activities of young people. The goal of these services is to provide useful data that will protect young people from online threats and dangers.

    Companies that develop these services often promote the following features, which may be adjusted and personalized by those monitoring young people:
    *   Restricting internet browsing by denying access to websites that may contain objectionable content.
    *   Background monitoring that sends an alert when specific words or phrases appear in social media posts and private messages.
    *   A searchable history of online activity, including access to all texts, website visits and application (app) usage on a young person's mobile device, tablet or computer.

    Many of these services are invisible to young people and other users, so they do not always know they are being monitored.
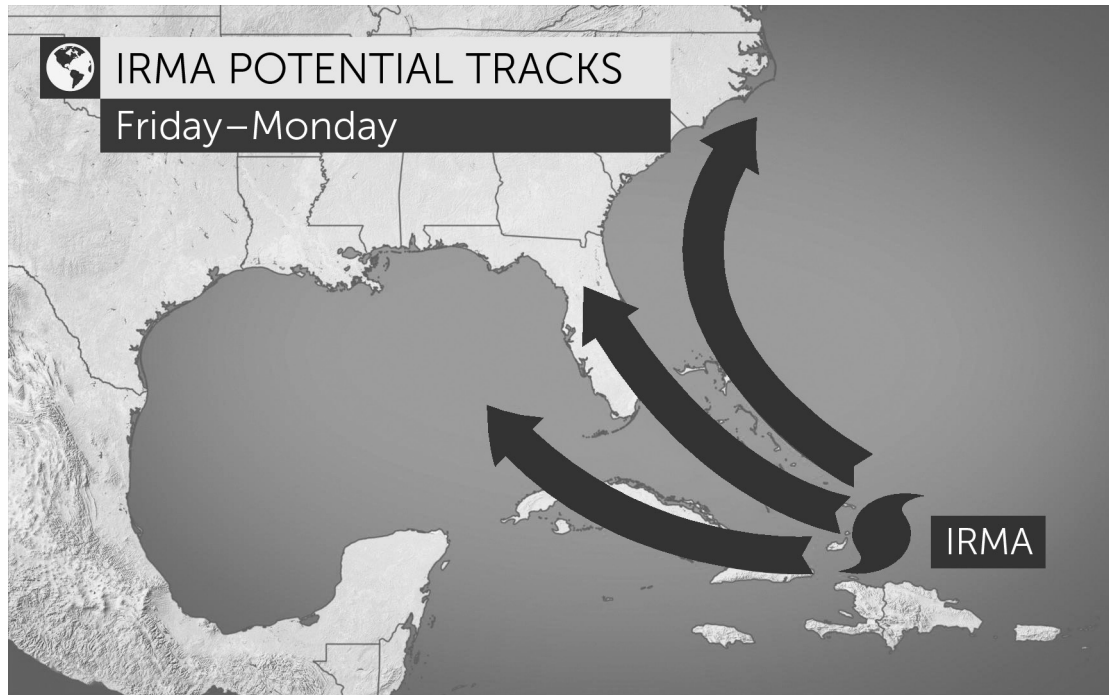
    (a) (i)   Identify **two** types of data that might be collected by these digital services. [2]

    (ii) Describe **two** contexts in which collecting data about online activity may lead to privacy concerns for young people. [4]

    (b) (i)   Suggest a security measure that these digital services might implement to protect the data that they collect. [3]

    (ii) Explain **one** possible impact for young people associated with these digital services. [3]

    (c)   To what extent is it acceptable for adults to use digital services to monitor the online activities of young people? [8]

Turn over

2.   Natural disasters and computer models

In 2017, Hurricane Irma was a catastrophic natural disaster. Many computers did not accurately predict the course of the storm, including its direction of travel. This put populated areas in a great risk of danger. Predicting the course of a hurricane is critical for protecting life and property.

The potential courses that Hurricane Irma could have taken are shown in **Figure 1**.

Figure 1

Older and less accurate computer models for predicting the course of the hurricane relied on data gathered from a few stationary weather balloons. One newer approach by the Panasonic Weather Service (PWS) relied on real-time weather data collected from over 3500 aircraft every day.

The PWS model used privately developed machine-learning algorithms to process the collected data. Details about these algorithms, however, were not shared with governmental and public weather organizations: PWS stated that doing so would compromise its commercial interests.

The PWS model was more accurate in forecasting the course of Hurricane Irma four to seven days in advance.

(This question continues on the following page)

(Question 2 continued)

    (a)   (i)   Outline **three** ways in which data is different from information.   [3]

            (ii)   Describe **one** reason why visualizations are used to represent data
                 and information.   [3]

    (b)   Data about weather variables, such as wind speed and temperature, are needed to
         predict the course of a hurricane.

            (i)   Suggest **one** reason to support the frequent collection of weather data in
                a hurricane.   [2]

            (ii)   Explain **two** reasons why the PWS model may have been more accurate in
                predicting the course of Hurricane Irma.   [4]

    (c)   With reference to the real-world example provided, discuss whether companies
         should be required to share details about privately developed algorithms used to
         predict natural disasters.   [8]

Turn over

3. **Automated journalism**

Online content is sometimes created by software that uses algorithms and natural-language generators to turn facts and trends into news stories. News organizations often rely on automated journalism software to provide coverage of important topics, and experts predict that automated journalism will generate up to 90 % of all online news articles by 2026.

Automated journalism is most effective when generating routine news stories on repetitive topics for which clean, accurate, and easily accessible data are available. It is less effective when addressing topics that are new or that require human judgment and expertise.

According to the Tow Center for Digital Journalism at Columbia University, the key drivers of automated journalism are an ever-increasing availability of data and the aim of news organizations to cut costs and increase the quantity of content and news. Some people argue that automated journalism makes human journalists available for more important work. Others disagree and think that all news stories should be written by humans.

(a) (i)   Identify **two** characteristics of an algorithm. [2]

 (ii) Describe **two** real-world examples for which automated journalism would not be effective at generating news content. [4]

(b) The developers of automated journalism software need to understand how human journalists work. Two methods for gathering this information are:
   • observations and interviews with journalists
   • conducting large-scale surveys involving journalists.

 Explain how each of these methods may provide insight into how human journalists work. [6]

(c) An online news organization has decided to exclusively use automated journalism to provide coverage for a major upcoming political election.

 Evaluate this decision with reference to **one** course concept. [8]

4. Artificial intelligence (AI) and criminal sentencing

Some governments are using artificial intelligence (AI) to assist judges in their work.

Judges are responsible for deciding the type and duration of punishment when a person is found guilty of a crime. One factor used by judges to make this decision is the likelihood that a criminal will re-offend or commit another crime in the future.

Some applications of AI claim to predict the likelihood of criminal re-offense with great accuracy, and research has indicated that AI software is often, but not always, more reliable than human judges in predicting who is likely to re-offend.

Some critics, however, have observed that AI is frequently as biased as human intelligence. These critics argue that fully automated judgments should not be made for such important decisions.

(a) (i) Identify **three** types of artificial intelligence (AI). [3]

(ii) Identify **three** characteristics of a real-world example of artificial intelligence (AI). [3]

(b) Explain **two** reasons that a human rights activist might disagree with the use of artificial intelligence (AI) in criminal sentencing. [6]

(c) The European Union (EU) has passed a law that allows citizens to challenge decisions made using artificial intelligence (AI) in the criminal justice system.

Evaluate this decision with reference to **one** course concept. [8]

References:

Figure 1   BPH-MIK, 2017. Cresce la preoccupazione per l'Uragano Irma, potrebbe generare una nuova catastrofe! *Blue Planet Heart*, [blog] 4 September. Available at: <http://www.blueplanetheart.it/2017/09/cresce-la-preoccupazione-luragano-irma-generare-nuova-catastrofe/> [Accessed 13 August 2021].

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

Specimen paper

Digital society

Standard level

Paper 1

16 pages

International Baccalaureate
Baccalauréat International
Bachillerato Internacional

General marking guidance

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For example, bulleted lists in this markscheme indicate likely points that candidates may include in their answer: they are not exhaustive, and examiners should credit other valid points not listed. Additionally, in cases where a question asks for a certain number of items, read all answers and mark positively up to the maximum marks. Disregard incorrect answers.

Supporting critical and creative thinking
In their responses, particular phrases often signal critical and/or creative thinking on the part of candidates. Such phrases, when they appear in response to appropriate command terms, may help examiners determine the proper marks to award. For example:

Sample command term	Possible signal phrase
Explain	Because, as a result of, due to, therefore, consequently, for example
Analyse	Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas
Evaluate	My opinion, overall, although, despite, on balance, weighing up

About extended responses
It should be recognized that, given time constraints, answers for part c are not intended to reflect fully polished extended responses that address the full range of possible examples, issues and topics possible. Use the provided markbands in conjunction with the marking notes to award marks for these questions.

The markbands on page 3 should be used where indicated in the markscheme.

SL and HL Paper 1, part c	
Marks	**Level descriptor**
0	The work does not reach a standard described by the descriptors below.
1–2	• The response shows limited understanding of the demands of the question. • There is limited relevant knowledge. The response is descriptive and consists mostly of unsupported generalizations. • The response has limited organization or is only a list of items.
3–4	• The response shows some understanding of the demands of the question. • Some relevant knowledge is demonstrated, but this is not always accurate and may not be used appropriately or effectively • The response moves beyond description to include some analysis, but this is not always sustained or effective. • The response is partially organized.
5–6	• The response shows adequate understanding of the demands of the question. • Response demonstrates adequate and effective analysis supported with relevant and accurate knowledge. • The response is adequately organized.
7–8	• The response is focused and demonstrates an in-depth understanding of the demands of the question. • Response demonstrates sustained evaluation and synthesis that is effectively and consistently supported with relevant and accurate knowledge. • The response is well-structured and effectively organised.

1. (a) (i) Identify **two** types of data that might be collected by these digital services. **[2]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Personal data, such as name, age, gender
- Geographical and/or location-based data
- Data about incoming and outgoing messages, calls and communication
- Online activity and usage data
- Data involving online searches, messaging and social media posts
- Time and duration of use data
- Private pin codes and passwords
- Metadata related to online activities.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying types of data, up to a maximum of **[2]**.

(ii) Describe **two** contexts in which collecting data about online activity may lead to privacy concerns for young people. **[4]**

"Describe" is a command term that requires a more detailed account than simply listing an item. The use of context in this question indicates that responses should be grounded in one of the course's contexts.

There are many possible correct responses, including the following, which correspond to the course's prescribed contexts:
- <u>Cultural</u>, such as details about membership within online communities or forums; messages and communications related to cultural heritage and customs; information specific to hobbies, gaming or pastimes.
- <u>Economic</u>, such as banking details, data about purchases and transactions; messages and communication related to money, employment and/or a young person's economic resources.
- <u>Health</u>, such as personal medical and/or health information; web and search histories involving medical information and/or consultation; messages and communication related to health and/or medical issues.
- <u>Human knowledge</u>, such as the collection and use of data about young children within education and/or through educational technologies and platforms.
- <u>Political</u>, such as data on political activities and/or advocacy; messages and communication related to political issues. Also, data that poses privacy concerns related to the political situation and/or laws where the young person is located.
- <u>Social</u>, such as data related to demographics, gender, gender expression and sexuality and/or ability status; data about online activities related to religious beliefs and practices; messages and communication related to family structures and/or relationships.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[2]** for each description of a relevant context, up to a maximum of **[4]**.

(b) (i) Suggest a security measure that these digital services might implement to protect the data that they collect. **[3]**

"Suggest" is a command term that requires the candidate to propose a possible solution. Of note, this question is asking the candidate to suggest measure for the services to employ, not the users of the services themselves. There are many possible correct responses, including:
- Adequately encrypting collected data
- Regularly erasing collected data
- Anonymising and/or masking collected data
- Restricting access to collected data from other vendors and/or services
- Securely storing data in ways that avoid potential hacking threats or data loss
- Only using data for approved purposes in line with terms of service and good practice
- Restricting the ability to transfer collected data

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for naming a possible solution and **[2]** for providing detail in the response about this solution, up to a maximum of **[3]**.

(ii) Explain **one** possible impact for young people associated with these digital services. **[3]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. Note that impacts may be positive and/or negative. There are many possible correct responses, including the following:
- Impacts involving family structures, relationships and practices
- Impacts involving online activity and behaviour, including changing personal practices on social media, reducing cyber-bullying, and/or attempt
- Impacts involving future consequences related to schooling, employment and/or reputation
- Impacts involving psychological and social factors including trust, authority, and privacy erosion

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for naming a possible impact and **[2]** for providing reasons and causes related to this impact, up to a maximum of **[3]**.

(c)   To what extent is it acceptable for adults to use digital services to monitor the online activities of young people? **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"To what extent" is a command term that requires candidates to consider the merits of an argument or concept. Opinions and conclusions should be presented clearly and supported by evidence and a sound argument.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organized.

In their responses, candidates may indicate the acceptability or unacceptability of the use of these services or a more nuanced response. Some possible reasoning may include:

Acceptable:
- Adult responsibility to protect young people from threats and danger.
- To ensure the health and well-being of young people.
- To effectively manage the time of young people.
- Legal requirements for supervision of legal minor.
- Limited maturity and/or cognitive/emotional development on the part of young people to fully understand consequences of decisions.

Unacceptable:
- Young people's privacy is important to respect.
- Monitoring may provide a distorted or unrepresentative understanding of online behaviour.
- Monitoring may not accurately record or present online activities.
- Monitoring apps may share data in unacceptable ways and/or with unforeseen consequences.
- Monitoring might restrict access to important information for young people.

2. (a) (i) Outline **three** ways in which data is different from information. **[3]**

"Outline" is a command term that requires a brief account or summary. There are many possible correct responses, including the following:
- Data are raw facts or figures that may not be ordered, whereas information is ordered.
- Data are raw facts or figures that may not be processed, whereas information has been processed.
- Data are raw facts or figures that may not be analysed, whereas information is analysed.
- Data are raw facts or figures that may not have context, whereas information has been contextualized.
- Data are raw facts or figures that may not have discernible meaning or significance, whereas information typically does have meaning and significance.
- Data is often an input into a digital system, whereas information is typically an output.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for each correct response, up to a maximum of **[3]**.

(ii) Describe **one** reason why visualizations are used to represent data and information. **[3]**

"Describe" is a command term that requires a more detailed account than simply listing an item. There are many possible correct responses, including the following:
- Visualizations organise data and information in a way that is more understandable such as images and charts.
- Visualizations can be presented to audiences who may not have the specialist knowledge required to understand the data and information.
- Visualizations can help synthesise data and information so that they can be used to make decisions or come to a conclusion.
- Visualizations can indicate potential trends and future developments related to the presented data and information.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for a response that identifies a reason why visualizations might be used and **[2]** for details of that reason, up to a maximum of **[3]**.

(b) (i) Suggest **one** reason to support the frequent collection of weather data in a hurricane.   **[2]**

"Suggest" is a command term that requires the candidate to propose a possible solution, hypothesis or other possible answer. Suggest here is indicating to the candidate to apply critical thinking to the question proposed. There are many possible correct responses, including the following:
- Wind speed is the critical and rapidly changing variable in the hurricane therefore, it needs to be sampled as regularly as possible to be able to monitor the possible trends
- Sampling the wind speed frequently enables the track of the hurricane and its effects to be predicted more accurately.
- Temperature data can also change rapidly and therefore frequent sampling is desirable.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a reason and **[1]** for a development of that reason, up to a maximum of **[2]**.

(ii) Explain **two** reasons why the PWS model may have been more accurate in predicting the course of Hurricane Irma.   **[4]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. There are many possible correct responses, including the following:
- The PWS model was newer than other approaches, and may have been more refined or developed as a consequence.
- The PWS model used real-time data that may have been more accurate than that collected in the other models.
- The PWS model used data collected from more sources than other models.
- The algorithms used in the PWS model may have been more effective at processing the collected weather data.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a reason and **[1]** for the development of that reason, up to a maximum of **[4]**.

(c)   With reference to the real-world example provided, discuss whether companies should be required to share details about privately developed algorithms used to predict natural disasters.   **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"Discuss" is a command term that requires a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organised. In their responses, candidates may indicate an affirmative, negative or more balanced reply to the question. Some possible reasoning linked to the stimulus example includes:

Yes, should be required:
- The PWS model is more effective and should be required to share details that could help governments prepare for natural disasters.
- Sharing details might prevent the loss of life and property which outweighs the needs of one private company.
- Hurricanes occur regularly and may have devastating consequences, so in such a situation of crisis, governments should have the power and the right to use the PWS model and approach as needed.
- Sharing details will allow governments, organizations and other companies to develop equally effective models and, if not, refine them into better ones.
- Sharing details about the model should not involve the loss of individual/personal privacy or confidentiality (only corporate), so this is not a case where the government would infringe on people's rights or liberty.

No, should not be required:
- The company that developed the PWS model invested a lot of money and other resources so it is not fair towards the owners, shareholders and workers that a government gets access to the model without adequate payment.
- If governments believe there is an urgent need for effective models such as the PWS mode, they should develop such programmes of weather predictions, rather than rely on private companies to do so at their own cost.
- As a principle, governments should respect the private nature of data that belongs to independent companies, otherwise this could open the gate to many other cases in scientific research (e.g., with pharmaceutical drugs) where the governments overstep their boundaries and their rights.
- If the PWS model does not continue to perform as effectively for future hurricanes, leading to loss of life and property, who is accountable?

3. (a) (i) Identify **two** characteristics of an algorithm. **[2]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Unambiguous. An algorithm is generally clear and unambiguous. Each of its steps (or phases), and their inputs/outputs should be clear and must lead to only one meaning.
- Well-defined inputs and/or outputs. An algorithm should have well-defined inputs and outputs.
- Finiteness. Algorithms terminate after a finite number of steps.
- Feasibility. An algorithm should be feasible with the available resources.
- Independent. An algorithm should have step-by-step directions, which should be independent of any programming code.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a characteristic of algorithms, up to a maximum of **[2]**.

(ii) Describe **two** real-world examples for which automated journalism would not be effective at generating news content. **[4]**

"Describe" is a command term that requires a more detailed account than simply listing an item. The real-world example should be detailed enough to indicate why automated journalism would be effective. There are many possible correct responses, including the following:
- Examples involving sporting events and results.
- Examples involving cultural events and/or offerings that do not require in-depth or original reviews.
- Examples that involve collating pre-existing descriptions, reviews and/or ratings into news content.
- Examples involving statistical information and/or performance such as for markets, medical issues, agriculture or manufacturing.
- Examples that involve condensing longer form reporting into shorter, concise summaries.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[2]** for each description, up to a maximum of **[4]**.

(b)   The developers of automated journalism software need to understand how
      human journalists work. Two methods for gathering this information are:
      • observations and interviews with journalists
      • conducting large-scale surveys involving journalists.

      Explain how each of these methods may provide insight into how human journalists
      work.   **[6]**

      "Explain" is a command term that requires a detailed account that includes
      reasons and or causes. There are many possible correct responses to this
      question, including the following:

      Observations and interviews
      • Allow direct observation and documentation of processes, tools and resources
        used by journalists.
      • Allow in-depth discussion about the nature of work as a journalist. This may
        allow the reasons behind the decisions made to be explored in more depth.
      • May reduce the time required to carry out the investigation as the discussion
        is synchronous.
      • May be able to discuss aspects of work that is not available through other
        means, such as internet searches or in publications.

      Surveys
      • Can allow for anonymity that may lead to more honest responses.
      • Allow for a greater number of responses within a standardised format for
        analysis.
      • Allow for potentially more diverse set of responses targeted to particular
        contexts and cohorts.
      • Allow for the collection, processing and analyse of numerical and/or statistical
        data useful for developing automated software.

      The list above is not exhaustive. Candidates are expected to provide relevant and
      accurate responses, but may choose a different word, example and/or approach
      in their response. Award **[2]** for each explanation of up to a maximum of **[6]**.
      Responses that only provide an explanation for one method versus both cannot
      score higher than **[4]**.

(c) An online news organization has decided to exclusively use automated journalism to provide coverage for a major upcoming political election.

Evaluate this decision with reference to **one** course concept.   **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"Evaluate" is a command term that requires an appraisal that weighs up strengths and limitations, in this case a specific decision. The question instructs candidates to integrate a course concept into their response.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organised. In their responses, candidates must indicate both strengths and limitations of the decision. Some possible reasoning follows below.

Strengths of the decision
- Many more news articles can be generated using this method. Content can be generated faster – this is important for breaking news.
- Audiences may not trust human generated content due to perceived bias.
- This may give human reporters more time to do in-depth analysis.
- This may provide background information for human-based news stories.
- This can eliminate some of the more mundane/boring jobs and allow reporters to focus on more thought-provoking stories – this may improve the quality of their writing.

Limitations of decision
- It takes time and money to train the software.
- Audiences may not trust the automated content.
- Automated content may not include authentic analysis.
- Can't provide the human perspective that makes articles interesting.
- Automated software may not be able to discover news stories; they are restricted to generating content from pre-existing materials.
- Bias may be built into the automated software in ways that are not immediately transparent or accountable.
- Journalists may lose jobs.

The question instructs candidates to reference one course concept. There are several ways a relevant course concept might be integrated into responses, including but not limited to:

Concept	Possible uses / relevance
Change	Understanding change involves considering people, ideas, objects and forces that shape the world: past, present and future. This is central to the coverage of an important political election.
Expression	Expression brings people and communities together but can also have the opposite effect. Political coverage can be a form of expression that does either or both.
Identity	Political coverage is often tailored to specific groups and/or identities.
Power	Power includes the ability to influence the beliefs and behaviours of others. This understanding of power is important to consider in relation to political content and this decision.
Systems	Changes in a system may lead to unintended consequences. This is especially relevant in this case.
Values and ethics	Values and ethics involve professional codes. Human journalists have professional codes which may (or may not) conflict with this decision.

4. (a) (i) Identify **three** types of artificial intelligence (AI). **[3]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. AI is a notoriously difficult to define term with many possible types, including those that exist currently and others that do not. There are many possible correct responses to this question, including:
- Narrow AI
- General AI
- Super AI
- Reactive machines
- Limited memory
- Machine learning (including, e.g., supervised and/or unsupervised)
- Deep learning

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a type of AI, up to a maximum of **[3]**.

(ii) Identify **three** characteristics of a real-world example of artificial intelligence (AI). **[3]**

"Identify" is a command term that requires an answer from a number of possibilities. Further details are not needed. There are many possible correct responses to this question, including:
- Ability to seem intelligent
- Power to copy intelligent human behaviour
- Capacity to learn
- Decision making ability
- Adaptation to circumstances
- Well defined goals
- Problem solving skill
- Reasoning ability
- Autonomy
- Flexibility.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a characteristic of existing AI, up to a maximum of **[3]**.

(b)   Explain **two** reasons that a human rights activist might disagree with the use of artificial intelligence (AI) in criminal sentencing.   **[6]**

"Explain" is a command term that requires a detailed account that includes reasons and or causes. There are many possible correct responses to this question, including the following:
- AI and AI techniques are not necessarily less biased than human judgements.
- AI and AI techniques may not be transparently biased, making them difficult to analyse and appeal.
- AI and AI techniques used in sentencing may not be able to be applied uniformly in more than one context.
- Criminal sentencing is inherently a human problem and value judgement to make, AI and AI techniques cannot adequately replicate these qualities.
- There may be less accountability for the use of AI and AI techniques in sentencing, than sentencing by a human judge. Human judges, for instance, can be recalled or reprimanded.
- There may be less transparency about the use and origin of AI and AI techniques in sentencing, than sentencing by a human judge.
- The use of AI and AI techniques in criminal sentencing may be unevenly applied, so that some jurisdictions employ AI while others do not for the same crime.

The list above is not exhaustive. Candidates are expected to provide relevant and accurate responses, but may choose a different word, example and/or approach in their response. Award **[1]** for identifying a reason and **[1]** for explaining the reasoning, up to a maximum of **[6]**. Responses that provide fewer than three reasons cannot score higher than **[4]**.

(c)   The European Union (EU) has passed a law that allows citizens to challenge decisions made using artificial intelligence (AI) in the criminal justice system.

Evaluate this decision with reference to **one** course concept.   **[8]**

Part c is assessed with the markbands on page 3 in conjunction with these marking notes.

"Evaluate" is a command term that requires an appraisal that weighs up strengths and limitations, in this case a specific decision. While this question asks for similar reasoning as part b (and some of the same reasoning might apply), the focus in part c is more specific to governmental decision-making. Additionally, the candidate is challenged here to also consider the possible positive uses of AI in sentencing. The addition of a course concept adds further depth to responses.

The markbands for this question additionally note that evaluation and synthesis is to be supported with relevant and accurate knowledge from the course and responses well-structured and organised. In their responses, candidates must indicate both strengths and limitations of the decision. Some possible reasoning follows below.

Strengths of decision
- The EU already implements broad policies to protect data privacy and this decision aligns with these policies.
- The criminal justice system in most EU countries is well developed and implemented, there may not be a clear and defined need for the use of AI and/or AI techniques.
- There are developed means for appealing criminal judgements in the EU, this decision uses these established processes.
- Access to appeal is important because biases could be incorporated into the AI because of the attitudes of the human beings who created it.
- Access to appeal is important because the designers of the AI systems in this example may not be criminal justice experts.
- Access to appeal is important because the underlying data that is used to make the sentencing decisions may be unreliable, inaccurate and/or incomplete.

Limitations of decision
- The understanding of AI and AI techniques is so uneven and murky, that this decision could lead to far more appeals that is feasible to address.
- While the EU is a defined bloc of nations, there is great variability in terms of criminal codes and technology access. The decision may not take into account these differences.
- The use of AI and AI techniques within criminal sentencing may lead to positive impacts in the EU that outweigh concerns, including standardising the criminal justice process, less incarceration, more rationalised outcomes.
- The decision values human judgement over artificial judgment and assumes humans are more transparent, fair and accountable than digital systems. This is not a proven assumption.
- The decision may pose a barrier to the further development of better AI and AI techniques.

The question instructs candidates to reference one course concept. There are several ways a relevant course concept might be integrated into responses, including but not limited to the following frames for the evaluation on the part of the candidate:

Concept	Possible uses / relevance
Change	The nature of change is contested. The use of AI in criminal sentencing may appear as progress, but it could be argued that does not advance legal, criminal or political rights and justice.
Identity	Identities are often intersectional. AI and AI techniques in the criminal justice system may not be able to address these complexities in sentencing as effectively as a human judge.
Power	Power is embedded in governments and institutions. This is true both in human and AI supported criminal justice. The application of a new technology does not make the use of power less significant.
Space	Space organises human experience into different categories such as cities, nations, regions, etc. This decision appears to uniformly apply to a bloc of nations, but may overlook the diversity of experiences within that bloc.
Systems	Systems involve interdependencies. The use of AI in the criminal justice system may have many unintended consequences.
Values and ethics	Values and ethics guide human action and decision-making. Is it possible for AI to actually make ethical decisions, or does it merely appear to do so?

Digital society
Pre-released statement: Sustainable development

For use with specimen examination papers

Instructions to candidates

- Pre-released statement required for higher level paper 3.

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Traffic, pollution and cities

This pre-released statement outlines the real-world nature of a challenge and intervention related to the DP digital society higher level extension. The pre-released statement should be used by candidates to plan and conduct extended inquiries in advance of paper 3.

- Challenge topic(s): Sustainable development
5 - Area(s) for inquiry: Managing pollution and waste

In addition to the information contained in this statement, candidates should also consider relevant connections to additional digital society concepts, content and contexts.

About the challenge

An increasing percentage of the human population lives in urban centres. People often move from
10 smaller towns and rural areas to larger cities seeking a higher quality of life. Many global cities, however, are suffering negative effects from urbanization, including rising levels of air pollution. Air pollution is linked to many adverse health conditions.

In most cities, automobile traffic and congestion are frequently the main sources of air pollution. With rising levels of urbanization, traffic and congestion are getting worse. As a consequence,
15 managing traffic flows and congestion in cities is a significant focus for sustainable development.

Governments, organizations and private companies are considering a range of digital interventions to address the challenge of air pollution caused by urban traffic flows and congestion.

About the intervention

Paper 3 will include stimulus about a digital intervention made by cities. Candidates should
20 consider multiple relevant digital interventions proposed or implemented on a local level.