

Markscheme

November 2019

**Information technology
in a global society**

Standard level

Paper 1

No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without written permission from the IB.

Additionally, the license tied with this product prohibits commercial use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, is not permitted and is subject to the IB's prior written consent via a license. More information on how to request a license can be obtained from <http://www.ibo.org/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite de l'IB.

De plus, la licence associée à ce produit interdit toute utilisation commerciale de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, n'est pas autorisée et est soumise au consentement écrit préalable de l'IB par l'intermédiaire d'une licence. Pour plus d'informations sur la procédure à suivre pour demander une licence, rendez-vous à l'adresse <http://www.ibo.org/fr/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin que medie la autorización escrita del IB.

Además, la licencia vinculada a este producto prohíbe el uso con fines comerciales de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales— no está permitido y estará sujeto al otorgamiento previo de una licencia escrita por parte del IB. En este enlace encontrará más información sobre cómo solicitar una licencia: <http://www.ibo.org/es/contact-the-ib/media-inquiries/for-publishers/guidance-for-third-party-publishers-and-providers/how-to-apply-for-a-license>.

Critical Thinking – explanation, analysis and evaluation

These trigger words often signal critical thinking. The bold words are the key terms in the various criteria.

Explanation – *Because, as a result of, due to, therefore, consequently, for example*

Analysis – *Furthermore, additionally, however, but, conversely, likewise, in addition, on the other hand, whereas*

Evaluation – *My opinion, overall, although, despite, on balance, weighing up*

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your team leader.

In the case of an “identify” question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In all other cases where a question asks for a certain number of facts eg “describe two kinds”, mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

It should be recognized that, given time constraints, answers for part (c) questions are likely to include a much narrower range of issues and concepts than identified in the markband. There is no “correct” answer. Examiners must be prepared to award full marks to answers which synthesize and evaluate even if they do not examine all the stimulus material.

1. Biometric authorization

Note to examiners:

- All part (a) questions are marked using ticks and annotations where appropriate.
- Part (b) and part (c) are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks.**

- (a) (i) Identify **two** fields that could be in the *Employee* table of the database. [2]

Answers may include:

- First name
- Surname
- ID number
- Gender / sex
- Phone number
- Date of birth
- Manager's name
- Position
- Department e-mail.

Award [1] for identifying each appropriate field up to maximum of [2].

- (ii) Identify **two** characteristics of a relational database. [2]

Answers may include:

- more than one linked table/entity
- primary key fields linked to foreign key fields
- each record is unique
- eliminates data redundancy
- is a smaller file than a flatfile database.

Award [1] for identifying each characteristic of a relational database up to maximum of [2].

- (iii) Identify **two** methods that could be used to ensure that the data input to the database is accurate. [2]

Answers may include:

- validation
- verification.

Award [1] for identifying each method that can be used to ensure the data added into the database is accurate up to maximum of [2].

- (b) As part of the implementation of the biometric authorization system, *Bright Creativa* has written a privacy policy.

Explain **three** features that *Bright Creativa* would need to include in a privacy policy linked to the company's biometric authorization system.

[6]

Answers may include:

- The privacy policy will need to be easily understood/transparent.
- So employees are able to understand how their data will be collected, stored or who it may be shared with.

- The privacy policy must explain what data is being collected about them.
- And this data is intended to be used by the company.

- The privacy policy will need to explain that data will only be stored for as long as necessary / for the length of time the employee is with the company.
- And that appropriate measures have been taken to safeguard it from unauthorized access.

- If a data breach occurs, i.e. the data is compromised or stolen.
- The company must inform the users immediately.

*Award [1] for identifying a feature that *Bright Creativa* would need to include in a privacy policy and [1] for explaining why that feature should be included up to a maximum of [2].*

Mark as [2] + [2] + [2].

- (c) To what extent is the employees' improved access to company resources outweighed by their concerns about the level of surveillance by the company?

[8]

Answers may include:

Advantages to the employee

- convenience, such as there is no need to carry ID cards to unlock doors
- there is no need to remember passwords to logon to the network, or to continuously change the password
- is likely to be more secure than relying on authentication techniques such as a username and password as it is harder to forge a fingerprint than remember a password
- may provide quicker access to resources
- they don't need to carry cash to buy items from the café.

Concerns of the employee may

- their performance could be monitored and performance ratings based on potentially information provided by the system
- monitoring may become covert surveillance which may be unethical, especially if the employees are not aware of the ways in which the information is used
- purchases are tracked and judgements might be made about them, for example, what foods they purchase
- the fingerprints may not always be reliable, for example if the employee cuts the finger that is used for biometric authentication, which means that a resource may not be accessible
- logging on to each resource using biometric identification may be time consuming and lead to inefficient working practices.

Please see generic markband information sheet on page 16.

2. Wildfire modelling

Note to examiners:

- All part (a) questions are marked using ticks and annotations where appropriate.
- Part (b) and part (c) are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks.**

- (a) (i) Identify **two** stages of the product development life cycle (PDLC). [2]

Answers may include:

- investigation of existing system
- feasibility study
- requirement Specification
- project schedule
- product Design
- product development
- prototyping
- technical documentation
- client and end-user evaluation
- testing and debugging.

Award [1] for identifying each stage of the product development life cycle (PDLC) up to maximum of [2].

- (ii) Identify **two** methods that could be used to train the staff to use the new modelling system. [2]

Answers may include:

- video tutorials
- “how to” guides
- face-to-face training
- online training courses.

Award [1] for identifying each method that could be used to train the staff to use the new modelling system up to maximum of [2].

- (iii) Identify **two** measurements that could be taken by the weather sensors in the Kinakora National Park. [2]

Answers may include:

- air temperature
- wind speed
- wind direction
- humidity
- the amount of precipitation
- ground temperature.

Award [1] for identifying each measurement that could be taken by the weather sensors in the Kinakora National Park up to maximum of [2].

- (b) Two methods for informing tourists about wildfires in Kinakora National Park are:
- Short Message Service (SMS) texting/text messaging
 - Posting information on the Kinakora National Park website.

Analyse these **two** methods.

[6]

Answers may include:

Advantages of using SMS texting

- easy to use
- information is pushed out to the tourists
- not dependent on internet access
- cheap
- low tech / can be done from very old hardware
- faster than posting information in a website / synchronous.

Disadvantages of using SMS texting

- tourists need phone reception to get the message
- the national park needs all tourists' phone numbers to ensure all tourists can access this information
- data needs to be stored (phone numbers) so an appropriate privacy policy needs to be in place
- there is no guarantee the message has got through
- some tourist might not have their phone
- batteries can run out.

Advantages of using the Kinakora National Park website

- the information can use graphics/maps
- it is not necessary to collect/store tourists' phone numbers.

Disadvantages of using the Kinakora National Park website

- tourists need to visit the website to get information
- tourist may not have web access
- visually impaired visitors might not get the information.

Note: Many of the advantages of SMS text are automatically disadvantages of the Kinakora National Park website or vice versa.

[0]

No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.

[1–2]

A limited response that indicates very little understanding of the topic or the reason is not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical.

[3–4]

A description, unbalanced or partial analysis of the issues related to using SMS texting or the Kinakora National Park website. There is some use of appropriate ITGS terminology in the response.

[5–6]

A balanced and detailed analysis of the relative advantages and disadvantages of using SMS texting or the Kinakora National Park website. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

- (c) Evaluate Kinakora National Park’s decision to use computer modelling to develop strategies for dealing with wildfires.

[8]

Answers may include:

Advantages of using computer models to develop strategies to deal with wildfires

- many different scenarios can be tried out before a final strategy is determined
- dangerous situations can be tried without the risk to human life
- possible fires can be predicted, and strategies can be defined to deal with them
- the development of the model may lead to a greater understanding of the factors that influence the start and spread of forest fires; for example, fires starting in similar circumstances may not always follow same pattern
- models may be revised as the nature of forest fires evolves, for example, as a result of drier conditions, hotter summer temperatures
- models can be used for training.

Disadvantages of using computer models to develop strategies to deal with wildfires

- the data that is being input / data must be reliable / GIGO
- the model is a simplification of a real situation and there may be factors that it is not possible to consider
- expensive to develop a model/ requires large amount of processing power and this may not be an effective use of resources
- the conditions in the national park may evolve more quickly than the model is able to which may lead to predictions not being as accurate as expected.

Please see generic markband information sheet on page 16.

3. Online learning

Note to examiners:

- All part (a) questions are marked using ticks and annotations where appropriate.
- Part (b) and part (c) are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks.**

- (a) (i) Identify **two** ways that the *TailorEd* system could provide feedback to the students. [2]

Answers may include:

- graphics/text on the screen
- sent by email to the student
- haptic feedback on correct answers in a mobile version
- notifications in a mobile app
- by awarding badges
- chat/chatbot.

Award [1] for identifying each way the TailorEd system could provide feedback to the students up to maximum of [2].

- (ii) Identify **two** ways that the data collected about students' academic progress could be used by *TailorEd*. [2]

Answers may include:

- to send students advertisements of relevant educational material
- to ascertain the effectiveness of the lessons
- to adapt the tasks to the students' abilities
- to offer tutoring if students fail a particular unit
- to share with universities and aid candidate selection
- to give opportunities to high scoring students
- to keep parents informed.

Award [1] for identifying each way the data collected about students' academic progress could be used by TailorEd up to maximum of [2].

- (iii) Outline how a firewall functions. [2]

Answers may include:

- monitors incoming and outgoing traffic
- acts like a filter between the computer and the Internet
- blocks specific ports / IP addresses / protocols / words or phrases
- either allows traffic to pass through the firewall or not based on a set of predetermined rules.

Award [1] for identifying the basic function of a firewall and [1] for a development of the initial idea up to maximum of [2].

- (b) There are two possible methods for ensuring students use the *TailorEd* online learning system responsibly. They are:
- Restrict access to sites that may be considered inappropriate.
 - Educate the students about acceptable use.

Analyse these **two** options.

[6]

Answers may include:

Reasons for restricting access to sites that may be considered inappropriate

- to stop students going to websites they shouldn't
- to ensure the schools bandwidth is used for education rather than for other purposes
- to protect students from dangers on the web / some inappropriate sites appear without warning and they are hard to avoid
- parents may be happier knowing the filtering technology is in place as it will restrict access for younger students who cannot filter for themselves.

Reasons for educating students about acceptable use

- the students learn to take responsibility for their actions as this will be a skill they will need outside of school
- students will always find ways to circumvent the filters applied by the school
- who decides what will be blocked? Learning may be constricted by the use of a white list.

[0]

No knowledge or understanding of ITGS issues and concepts. No use of appropriate ITGS terminology.

[1–2]

A limited response that indicates very little understanding of the topic or the reason is not clear. Uses little or no appropriate ITGS terminology. No reference is made to the scenario in the stimulus material. The response is theoretical.

[3–4]

A description, unbalanced or partial analysis of the decision whether to either restrict access to certain websites or to educate the students about using the platform in an acceptable manner. There is some use of appropriate ITGS terminology in the response.

[5–6]

A balanced and detailed analysis of the decision whether to either restrict access to certain websites or to educate the students about using the platform in an acceptable manner. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

- (c) To what extent do the benefits of collecting students' progress data outweigh the concerns of the students, teachers and parents?

[8]

Answers may include:

Benefits of collecting students' progress data

- the data collected can be tailored to provide more individualized learning for the student
- the student's progress can be reported back to the teacher/parent on a more regular basis and in a more standardized format
- the school is able to use the data to identify trends and patterns that may not be immediately obvious and use this data driven approach to improve the performance of its teachers and students
- this information can be used by the students when applying for jobs or even for further education.

Concerns of the students, teachers and parents

- they may not know what data is being collected, stored and/or disseminated
- they may not know the degree to which the identity of the student is anonymized
- there may be a purely data driven approach to the use of the student data which may lead to a narrowing of the teaching to ensure short term targets are met at the expense of the whole learning experience
- large amounts of teachers' time may be taken up with the collection and entering of this data into the *TailorEd* database
- the cost of purchasing the *TailorEd* system may not be cost-effective as it may involve staff training costs or the employment of staff to enter the data.

Please see generic markband information sheet on page 16.

4. Sharing dashcam footage with police

Note to examiners:

- All part (a) questions are marked using ticks and annotations where appropriate.
- Part (b) and part (c) are marked using markbands. Use annotations and text comments to provide a rationale behind the marks you awarded. **Do not use ticks.**

- (a) (i) Identify **one** video file type that could be uploaded to the police department server.

[1]

Answers may include:

- Audio Video Interleave (AVI)
- Flash Video Format (FLV)
- Windows Media Video (WMV)
- Apple QuickTime Movie (MOV)
- Moving Pictures Expert Group 4 (MP4).

Award [1] for identifying an appropriate file type.

- (ii) Calculate how long it would take to upload a 1 gigabyte (GB) video file to the police website using 80 million bits per second (Mb/s) internet connection.

1 gigabyte (GB) = 1000 megabytes (MB).

[2]

Answers may include:

Convert Mb/s to MB/s:

$$\frac{80 \text{ Mb/s}}{8} = 10 \text{ MB/s}$$

Convert GB to MB

$$1 \text{ GB} = 1000 \text{ MB}$$

Calculate the time

$$\frac{1000}{10} = 100 \text{ seconds}$$

= 1 minute 40 seconds.

Award [1] for the working.

Award [1] for an answer of 1 minute 40 seconds.

- (iii) Identify **three** steps that the public will need to take to upload their footage to the police website. [3]

Answers may include:

- footage is recorded on a dashcam
- create an account on the police department website
- citizens enter their details on the police department website
- citizen is authenticated by matching their login details with those stored in the police database
- footage is downloaded from the dashcam
- citizen logs into the police department website
- the video file is selected for upload to the police department website
- video is uploaded.

Award [1] for identifying each appropriate step up to maximum of [3].

- (b) (i) Distinguish between privacy and anonymity. [2]

Answers may include:

- privacy is knowing the individual but not knowing what they are doing
- anonymity is knowing what the individual is doing, but not knowing who they are.

Award [1] for the correct definition of either privacy or anonymity, and [1] for an additional correct definition up to a maximum of [2].

- (ii) The police websites include help pages that give the public guidance on files and on how to upload them.

Explain why the help pages should provide guidelines about the file format and the file resolution. [4]

Answers may include:

File format

- Files uploaded should be compatible with the acceptable file formats required by the police department system
- Therefore, the help pages should explicitly state which file formats are acceptable.

File resolution

- Files created in a high resolution may lead to the creation of excessively large files
- This may lead to longer upload times than would be desirable
- Files created in a low file resolution may lead to grainy / poor quality images
- This may mean that the information provided may not be of a quality that can be used by the police department.

Award [1] for an identification of why the help pages should provide guidelines about the file resolution and the format of the file and [1] for an explanation of why it is appropriate up to a maximum of [2].

Mark as [2] + [2].

- (c) The police are considering using dashcam footage uploaded by the public as part of their attempt to reduce the number of accidents caused by dangerous driving.

Discuss whether this dashcam footage should be used by the police as part of their attempt to reduce the number of accidents caused by dangerous driving.

[8]

Answers may include:

Advantages of a using dashcam footage

- perpetrators are not aware that their dangerous or illegal behaviour is being filmed
- there are a lot of dashcams in use, whereas there is a limit to the number of police on patrol so more information can be gathered
- some of the dashcam footage may be seen as entrapment
- the use of dashcam footage may have an effect of citizens improving their behaviour as they are aware they are being filmed
- it may be used to corroborate the evidence gathered by the Police and/or CCTV cameras.

Disadvantages of a dashcam footage

- the use of dashcam footage may not be admissible as evidence in court
- the dashcam footage may not be data stamped or may be doctored / falsified
- additional police servers may be required to store the large quantities of dashcam footage provided
- there may be data protection issues relating to the storage and use of the dashcam footage
- the quality of the dashcam footage may not be of a standard that is usable
- the format of the dashcam footage may not be compatible with the Police software.

Please see generic markband information sheet on page 16.

SL and HL paper 1 part (c) and HL paper 3 question 3 markband

Marks	Level descriptor
No marks	<ul style="list-style-type: none"> • <i>A response with no knowledge or understanding of the relevant ITGS issues and concepts.</i> • <i>A response that includes no appropriate ITGS terminology.</i>
Basic 1–2 marks	<ul style="list-style-type: none"> • <i>A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.</i> • <i>A response that includes minimal use of appropriate ITGS terminology.</i> • <i>A response that has no evidence of judgments and/or conclusions.</i> • <i>No reference is made to the scenario in the stimulus material in the response.</i> • <i>The response may be no more than a list.</i>
Adequate 3–4 marks	<ul style="list-style-type: none"> • <i>A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that includes limited use of appropriate ITGS terminology.</i> • <i>A response that has evidence of conclusions and/or judgments that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.</i> • <i>Implicit references are made to the scenario in the stimulus material in the response.</i>
Competent 5–6 marks	<ul style="list-style-type: none"> • <i>A response with knowledge and understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that uses ITGS terminology appropriately in places.</i> • <i>A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.</i> • <i>Explicit references to the scenario in the stimulus material are made at places in the response.</i>
Proficient 7–8 marks	<ul style="list-style-type: none"> • <i>A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.</i> • <i>A response that uses ITGS terminology appropriately throughout.</i> • <i>A response that includes conclusions and/or judgments that are well supported and underpinned by a balanced analysis.</i> • <i>Explicit references are made appropriately to the scenario in the stimulus material throughout the response.</i>