



MARKSCHEME

May 2014

INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Standard Level

Paper 1

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

*It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of the IB Assessment Centre.*

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. Analysis of external examination grades by an international school

- (a) (i) Identify *two* characteristics of a CSV file. [2 marks]**

Answers may include:

- comma separated values
- a text file
- a file without formatting where data in a record is separated by commas
- a file that represents data in tabular form. Rows are represented by new lines and cells are separated by commas.

Note: do not accept firewall or anti-virus software.

Award [1 mark] for each of the above up to a maximum of [2 marks].

- (ii) Identify *two* reasons why the Oneto7 examination board would provide files in CSV format. [2 marks]**

Answers may include:

- a file format that is compatible with different spreadsheets and database formats
- a CSV file carries no formatting, only text, therefore the file size depends only on the quantity of data it contains, *ie* the CSV file will be smaller than a formatted file from any application
- CSV files are text files and can be opened with many applications, therefore can even transfer manually if needed.

Award [1 mark] for each of the above up to a maximum of [2 marks].

- (iii) Identify *two* characteristics of a “secure site”. [2 marks]**

Answers may include:

- accessed using HTTPS – Hypertext Transfer Protocol Secure
- information sent to and from those sites cannot be accessed by anyone else (i.e. user needs to enter authentication information such as username and password in order to access the site)
- Secure Sockets Layer (SSL) provides encryption – preventing information from being read in transit
- Secure Sockets Layer (SSL) provides authentication (verifying that the site is who they claim to be).
- Secure sites display a padlock/lock symbol
- Secure sites use trusted certificates to check for authenticity

Award [1 mark] for each of the above up to a maximum of [2 marks].

- (b) Schools can use either spreadsheets or database software to analyse these exam results.

Analyse the use of these two software types for this purpose.

[6 marks]

Advantages of a database application in this scenario	Advantages of a spreadsheet in this scenario
<ul style="list-style-type: none"> • queries can be made and saved for future use • reports can use queries and produce nicely formatted printed reports to be used repeatedly • menu's with buttons for the different needs may be prepared for the headmaster to use • database applications may share one database among many users simultaneously • a relational database allows several tables of data to be linked together in a way that may be transparent to the final user (the headmaster) • a database application may give the user (headmaster) access to results without giving access to make accidental changes. 	<ul style="list-style-type: none"> • data in the form of tables can be clearly seen by all users • a user-friendly spreadsheet may allow the headmaster to produce his own analysis • spreadsheets may show data in graphs – a great variety of different types of graphs • some data may be extracted into a smaller set to be shared with others.

Disadvantages of a database application in this scenario	Disadvantages of a spreadsheet in this scenario
<ul style="list-style-type: none"> • its use may be complicated for the headmaster (outside the prepared menu) • may need preparation by an IT person before the headmaster can use it • cannot produce graphs. 	<ul style="list-style-type: none"> • headmaster would need to know how to use the spreadsheet • unless macros are used, each type of result needs to be obtained when needed. • where large amount of information is stored in a spreadsheet, it is difficult to analyze and display the results.

[1–2 marks]

A limited response that demonstrates minimal knowledge and understanding of the topic through simple statements and uses little or no appropriate ITGS terminology.

[3–4 marks]

A response that demonstrates some knowledge and understanding of the topic and describes features of spreadsheets or databases in this scenario that would make them appropriate. Some relevant examples relating to the scenario are used within the response. There is some use of appropriate ITGS terminology in the response.

[5–6 marks]

A thorough response that demonstrates knowledge and understanding of the topic and makes comparisons between spreadsheets and databases in this scenario and why they are, or not, appropriate. The response demonstrates thorough knowledge and understanding of the topic. Relevant examples relating to the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response.

- (c) Oneto7, an examination board that serves 5000 schools, has been contacted by a new company, schoolscompare.com. This company, schoolscompare.com, wishes to buy the data about students' results from the Oneto7 examination board.

Schools, parents and others can pay schoolscompare.com for a more detailed analysis of the examination results. This analysis will be provided using data bought from Oneto7, as well as other data they have acquired.

Discuss the implications of the Oneto7 examination board selling the data it holds about the schools to schoolscompare.com.

[8 marks]

Answers may include:

- Oneto7 examination board would have to ask schools to authorize the sharing of their data
- Oneto7 examination board would have to wait for parents in the schools to authorize the sharing of their son's/daughter's data
- Oneto7 would have the possibility of comparing its results with those of other boards
- other boards would have access to Oneto7's results
- a more in-depth analysis may be provided to the schools and parents
- parents would be able to compare their children's results with others from the same and other schools / boards
- schools may be assessed by prospective parents from these results
- universities and other institutions may use this information to evaluate their prospective candidates
- policies of privacy and correct use of information would have to be put in place
- security issues to guarantee the reliability and integrity of the data must be evaluated
- Oneto7 must investigate that schoolscompare.com has adequate security measures
- agreement needed that Oneto7 will not use the data for any purposes other than analysis (eg distributing tutoring information to schools that did not perform well).

Note: do not accept generic references to hacking or unauthorized access. References must be explicitly related to the scenario.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 23.

2. Hospital Network

(a) (i) Identify *two* characteristics of a WAN. *[2 marks]*

- a computer network that covers a relatively large geographical area (i.e. wide area network)
- a WAN may join two or more LANs
- a network of computers that use the telecommunications network to connect between them.

Award [1 mark] for each of the above up to a maximum of [2 marks].

(ii) Identify *two* ways data about a patient could be entered into the wireless tablets. *[2 marks]*

Answers may include:

- sensor directly connected to the tablet
- voice input – nurse reads out the data
- nurse/user types data
- nurse/user selects from options on a touch screen
- handwritten input using a stylus and converted to text with handwriting recognition software.

Award [1 mark] for each of the above up to a maximum of [2 marks].

(iii) Describe the purpose of switches in the network. *[2 marks]*

Answers may include:

- switches allow the joining of multiple computers together in a network
- a network component that filters and forwards packets between LAN segments
- network can grow as switches can be connected to each other to add a progressively larger number of devices to a LAN
- allow network services to be provided to devices that are otherwise not on the network
- manage data flow on a network by only sending a received message to the device for which the message was intended
- increase network security.

Award [1 mark] for each of the above up to a maximum of [2 marks].

- (b) Explain *three* problems that could result from linking 25 hospitals in the city through a WAN. **[6 marks]**

Answers may include:

- compatibility between the systems in the different hospitals / hospitals may run different platforms of hardware and software, and databases may need to be configured for all or may not run at all
- privacy issues of information being available across hospitals / patients may not trust how some of these hospitals deal with their private information about certain illnesses or conditions
- data collection of information to be shared should be standardized between hospitals / if each hospital enters data in its own way then it will be very difficult for others to understand it and use it – similar codes for different procedures, illnesses and patients must be agreed
- sharing of costs to implement the connectivity between the hospitals / the implementing of a WAN to connect all hospitals may need a greater infrastructure, equipment, IT team, training and this will involve costs
- appropriate bandwidth to effectively share important information / x-rays and images or voice consultations may require large bandwidth for doctors in different hospitals to have access to all information needed about a patient. One of the hospitals may not have this and patients may be at a disadvantage
- ensuring that the data is kept secure from accidental tampering / how will they prevent the accidental change of data by people in different hospitals who may now have access to the data
- providing different levels of access consistently across the different hospitals / agreeing on who will have access to what and who will be allowed to add information to patients' data to update records
- security of data. During transmission, data may pass through servers that are outside of the control of the hospital. There is the potential for interception of data, packet sniffing or other means of unauthorized access. The network could be infected by viruses or other malware.
- in the case of problems in using the WAN (i.e. WAN failure / server failure, too much traffic on the network causing slowness), the hospitals who previously had their own database/LAN are now impacted.

Award [1 mark] for each problem identified up to a maximum of [3 marks].

Award an additional [1 mark] for each problem explained up to an additional maximum of [3 marks].

- (c) **Discuss the implications for the staff of the introduction of the RFID-based tracking system in the hospital.** **[8 marks]**

Marking note: Candidates do not need to explicitly refer to the implications for equipment and patients; however, they may do this implicitly when they discuss the implications for staff.

Answers may include:

- staff will need to retrieve the information collected from the RFID tags/ use of RFID tag readers – this may involve training.
- staff will need alternative methods for tracking if the RFID tracking system goes down.

RFID to tag equipment

- staff may use it to track equipment that they need / equipment that is shared by several doctors / nurses may be tracked if needed for another patient
- staff in charge of a set of equipment may be able to know where it is for their use and storage
- will prevent theft of equipment.

RFID to tag staff

- staff may be found if needed in an emergency
- staff's whereabouts may be monitored during working hours (e.g. privacy issues related to tracking, analysis of how much time staff spend in various areas while working, taking breaks or other activities). This may have implications for work contracts to maximize time efficiency.
- staff access to restricted areas may be identified
- analysis could be carried out on the data collected from the movement of staff in the hospital to optimize the location of areas that are used most frequently (e.g. if staff are walking frequently to a particular storage area, that storage area can be re-located in convenient more accessible location to reduce staff time and fatigue).
- measures will have to be put in place so that the RFID tag for staff cannot be used by another staff member.

RFID to tag patients

- staff will be able to know the whereabouts of patients who are able to leave their room without having to notify staff in advance
- staff may not need to stay with patients who have to undergo procedures in other areas of the hospital – this may allow nurses to return to the wards until patient needs to return to their room
- warn staff of dangerous or risky situations – some patients may have permission to move around certain areas and staff will be warned if they leave permitted areas
- provide staff with correct patient identification – patients in coma or asleep can be identified with the appropriate reader and the correct actions / medications can be provided – will allow for faster treatment and fewer errors
- provide staff with patient information – the RFID chip may contain medical data such as allergies for surgical patients – will allow fast access to data without having to read files or access database.

Note: Do not accept implications related to emission of radiation from RFID tags, training of staff in using the actual RFID tags or missing RFID tags.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 23.

3. Online training

(a) (i) Calculate the length of time it took to download the 720 MB video. [2 marks]

- using 1024 KB per MB:
 - 720 MB is $720 \times 1024\text{KB} = 737\,280\text{ KB}$
 - bandwidth of 800 Kb/sec = 100KB/sec (KB is kilobyte, Kb is kilobit)
 - $737280 \div 100 = 7372.8$ seconds = 123 minutes = 2 hours 3 minutes

- accept the approximate of 1000 kb per mb:
 - $720 \times 1000 = 720\,000\text{KB}$ (KB is kilobyte, Kb is kilobit)
 - bandwidth of 800 Kb/sec = 100KB/sec
 - $720\,000 \div 100 = 7200$ seconds or 120 minutes or 2 hours.

Note: Accept 123 minutes = 2.048 hours = 2 hours and 3 minutes or approximately 2 hours.

Award [1 mark] for the correct calculation of file size into KB (720 MB is $720 \times 1024 = 737\,280\text{ KB}$ or $720 \times 1000 = 720\,000\text{ KB}$. Accept if some indication of units in the calculation. Award one mark for 737280 or 720 000.)

Award [1 mark] for the correct calculation into time.

(ii) Outline the difference between lossless and lossy compression. [2 marks]

Difference in the reconstruction of original data

- lossless data compression uses algorithms that allow the exact original data to be reconstructed from the compressed data
- lossy data compression does not allow the exact original data to be reconstructed from the compressed data as some data is removed during the compression

Difference in the loss of data

- in lossless data compression no information is lost, it is only changed so that the file size is reduced.
- in lossy data compression some information is taken from the file that will change the final image or sound and will make the file smaller.

Difference in loss in quality

- in lossless data compression no information is lost and therefore no loss in quality.
- in lossy data compression some information is taken from the file that will result in some loss in quality which normally goes unnoticed.

Difference in the types of file that are compressed

- in lossless data compression is used to compress text and data files.
- in lossy data compression is used to compress audio, video and image files.

Note: each bullet point refers to a difference between lossy compression and lossless compression.

Award [1 mark] if there is a difference for either lossy or lossless compression with an implied reference to the other.

Award up to a maximum of [2 marks] for an outline of a difference between lossy and lossless compression that explicitly refers to both methods of compression.

(iii) Outline the difference between downloading and streaming videos. [2 marks]

Answers may include:

- streaming is when video content is sent in compressed form over the internet and displayed on the receiving device in real time . A downloaded video is played from a local storage device.
- when streaming a video the user does not have to wait to download the video to play it / watch it A downloaded video must be stored in order to view it.
- streaming a video involves playing the video on one device while the media is displayed on another. The video is not moved or copied to the device that is playing it Downloaded video is played directly from local media or storage device where it is stored.
- a fast internet connection is needed to stream high definition videos from the internet without interruption. When downloading videos, a fast internet connection is not required.
- when streaming video the user needs a player, which is a special program that uncompresses and sends video data to the display and audio data to the speakers Downloaded videos are played with a media player that is installed as a part of most operating systems.
- a streaming video is not saved on your device. Once you stop playing, the media is no longer available A downloaded video is stored on local media or storage device (i.e. downloaded videos can be moved to different devices (by copying them, video is available whenever you want to play it, must wait until the download is complete before you can watch the media)

Note: each bullet point refers to a difference between streaming videos and downloading videos.

Award [1 mark] if there is only reference to streaming video or downloading video with an implied difference to the other.

Award up to a maximum of [2 marks] for an outline of the difference between downloading and streaming videos.

- (b) Compare the use of online evaluation tasks versus face-to-face evaluation tasks to assess the skills the trainees may have learned with the training videos.

[6 marks]

Answers may include:

Face-to-face evaluation tasks specific to the scenario	Online evaluation tasks specific to the scenario
<ul style="list-style-type: none"> • examiner may ask the participant to repeat the particular procedure related to mining or to do something different that was not in the initial evaluation task • trainees can ask for a clarification of the tasks that is being evaluated • practical aspects are easier to assess face-to-face by seeing how the participants react and use the system (e.g. mining equipment) • participants need to fix a time for the evaluation to be held with the examiner • examiner can use judgment to assess participant and ask to repeat if he/she is nervous or if there was an equipment failure • evaluation may be subjective or biased • the evaluation can be closely monitored to ensure that no unacceptable assistance is provided.. 	<ul style="list-style-type: none"> • will have a limited set of questions which may not be customized in case the participant needs more emphasis on certain aspects • can be done by the participant at any time, from any place as long as the internet access available (i.e. poor access at times in the Andes) • evaluation module will need to be created and tested thoroughly, considering several options and assigning value to the actions of the participants • no hands-on tasks can be included in the evaluation • unbiased evaluation performed by the training system • online systems can give immediate feedback to some types of evaluation tasks (e.g. multiple-choice) • it may be possible to get unacceptable assistance during the evaluation (such as friends, books).

[1–2 marks]

A limited response that demonstrates minimal knowledge and understanding of the topic and identifies features of either online or face-to-face evaluation tasks. No examples from the scenario have been provided. The response uses little or no appropriate ITGS terminology.

[3–4 marks]

A response that demonstrates some knowledge and understanding of the topic and describes how specific online or face-to-face evaluation tasks would be appropriate. Some relevant examples from the scenario are used within the response. There is some use of appropriate ITGS terminology in the response.

[5–6 marks]

A thorough response that demonstrates knowledge and understanding of the topic and makes comparisons between specific online and face-to-face evaluation tasks and why they are appropriate. The response demonstrates thorough knowledge and understanding of the topic. Relevant examples from the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response.

- (c) **Evaluate Fernando’s decision to download the videos and use them to train his staff in the Andes.** **[8 marks]**

Answers may include:

Mining personnel

- can use the videos several times and go through the steps of the training that may have not been clear
- no need to travel to La Paz to watch the videos means that time will be saved because the videos can be watched at the mining site
- staff will not be able to receive recognition after having done the training
- will not be able to interact with the interactive parts of the video
- may not be using the most up-to-date version of the videos.

Fernando

- will have to take a manual record of those who completed the training and of their performance
- may lose credibility as he cannot guarantee that the training company will issue certificates for those who do the training
- may make several copies of the videos and share them with many employees who might need to go over the training
- needs to check if the training company allows the videos to be downloaded and used offline
- if training videos were not available onsite, the employees would need to be sent to La Paz from the mining site to be trained.
- by downloading the videos, Fernando’s company may avoid additional costs from the local ISP when trying to access the videos from the mining site in the Andes.
- the downloaded videos offer the miners more training opportunities (such as view the videos as a group and group discussion of the various aspects of the video).
- due to poor internet access in the Andes, downloading the videos will ensure that the trainees will have uninterrupted access to the videos.

Training company

- may lose track of its videos if several copies are made and given out to many people
- downloading the videos may violate copyright policy (such as download policy may only allow the use of one copy of the training videos, employees may share the videos with other miners who are not in the company).
- will not be able to keep an updated record of the personnel who have received the training.

Note: do not accept references to video quality due to compression.

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 23.

4. Indonesia makes progress on its ambitious biometrics national ID card project

- (a) (i) Describe how the person’s record in the database can be found from the information on the electronic identity card. [2 marks]**

Answers may include either ID number, fingerprint recognition or facial recognition:

- the card contains an ID number that is unique for each card owner
- the database contains records of the citizens with a key field with the citizen’s ID number
- the database can be searched to find the record that contains the ID number input/read from the card.

Fingerprint recognition

- the card contains a fingerprint of the card owner
- the database contains records of the citizens with a key field with the citizen’s fingerprint (or fingerprint identification descriptors)
- an algorithm is used to determine which record contains the fingerprint (fingerprint identification definition) in the database that matches the fingerprint on the identity card.

Facial recognition from photograph

- the card contains a photograph of the card holder
- the database with the records of the citizens has a key field with the citizen’s photograph
- an algorithm is used to determine which record contains the photograph in the database that matches the photograph on the identity card.

Award [1 mark] for each each bullet point under ID number, fingerprint recognition, or facial recognition of the above up to a maximum of [2 marks].

- (ii) Identify the steps that are used by biometric software to identify a person from a photograph of the face. [4 marks]**

Answers may include:

- at enrolment a photograph was taken, facial features were identified by software and stored in the database
- photograph is read/scanned / read from the card of the person to be identified
- facial features are identified by software from the photograph
- biometric software compares facial features on the photograph with the facial features (“faceprint”) stored in a database
- if there is a match, then the record of the person is found/displayed
- if the biometric system determines no match, then person needs to use a second method for identification.

Note: do not accept as a step that “the person is identified”. This is stated in the question.

Award [1 mark] for each of the above up to a maximum of [4 marks].

(b) In the future, financial, health, and other government departments and private institutions will be able to use the information gathered as part of the national identity card system.

Many citizens are concerned about the *privacy, anonymity* and *security* of their data.

For *each* of the concerns above, explain a policy that could be used to ensure that the concerns of the citizens are addressed.

[6 marks]

Answers may include the following stated policies with reason(s)::

Privacy

- citizens are informed to specify how the data may be used. For example, whether it may be shared with third parties
- only authorized personnel will have access to the national identity card database.

Anonymity

- enabling the data associated with the citizen to be detached from their personal details such as using only the citizen’s ID instead of the citizen’s personal details when sharing or querying data
- reports made by the government will not allow individuals to be identified.

Security

- ensuring the data provided by the citizen is secure (for example, firewall, password access, secure servers)
- measures may be taken to restrict access to the data (such as levels of password access)
- data is encrypted during its transmission.

Note: the response requires an explanation of a policy and not a discussion of the problems themselves. There must be a policy for each kind of concern: privacy, anonymity and security and reason(s).

Award [1 mark] for each policy identified up to a maximum of [3 marks].

Award [1 mark] for an explanation of the policy or how the policy will ensure that the concerns of the citizens are addressed up to a maximum of [2 marks].

Award up to a maximum of [2 marks] for each concern with reason.

- (c) **The implementation of this system has been delayed and the government is now reconsidering whether to implement the system.**

Discuss whether the Indonesian government should continue with the implementation of the national identity card scheme.

[8 marks]

Answers may include:

- sheer size of the national ID card system may be prohibitive
- will the infrastructure be able to cope with the gathering, storage and security of the data?
- government needs to evaluate how important it is for them to have updated information on their citizens, by looking at the quality of the information they now have available on all citizens, including criminals, terrorists, immigrants
- government needs to see if they will be able to retrieve the information required in a sensible period of time – for this they would need to implement offices all over the country, in the different islands, for people to be able to provide the data
- cost and possible training of people for the data collection need to be considered
- costs and use of hardware – networks may need to be installed in order to allow for the data collected to be kept in a centralized database; systems must be kept running constantly.
- campaigns to inform citizens to avoid the feeling of invasion of privacy
- policies will need to be discussed to clarify the use of the data being collected
- appropriate storage devices capable of handling the large amount of data that will be collected will be needed
- cost and availability of equipment – cameras, scanners, computers
- make a plan for implementation (for example, implement area-by-area, implement pilot areas before going nationwide)
- government needs to consider how the security of the national identity card database can be maintained..

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 23.

5. Energy efficient data centres

(a) (i) Define the term *terabyte*.

[1 mark]

Answers may include:

- 2^{40} bytes
- 1 099 511 627 776 bytes
- 1024 gigabytes
- 1 trillion bytes
- 10^{12} bytes
- 1000GB.

Note: units must be included in the response.

Award [1 mark] for any of the above.

(ii) Identify *three* features/characteristics of data centres that make them consume large amounts of energy.

[3 marks]

Answers may include:

- large amount of hardware (computers/servers/routers/switches) need energy to function
- processing requiring large amounts of energy (such as large volume of CPU activity, inefficient processors)
- redundant or backup power supplies
- air conditioning is needed to cool equipment
- need for the data center to work 24/7 (i.e. run all of the equipment)
- fire control systems
- cabling with high energy consumption (i.e. some types of cabling require more energy than optic fiber cable, energy consumption can vary between types of optic fiber cable).

Award [1 mark] for each of the above up to a maximum of [3 marks].

(iii) Identify *two* ways that data redundancy may occur in data centres.

[2 marks]

Answers may include:

- local backups (kept for security in case of device failure)
- data centres are backed up in different locations (to allow a different data centre to pick up in case the previous one fails)
- data centres (that store information from social networks) may have files saved by several users repeatedly.

Award [1 mark] for each of the above up to a maximum of [2 marks].

- (b) **Some governments have decided that data centres will be charged for their environmental impact. This may be done by monitoring the volume of data stored and the energy consumed to maintain the data centre.**

Analyse this decision.

[6 marks]

Answers may include:

- monitoring by government may be an invasion of privacy and may cause clients to find a data centre in a country where these regulations do not exist
- some data centres will put more emphasis on the purchase of energy efficient equipment even if these are more expensive
- some data centres will opt to downsize their facilities causing slower access or lack of backup services causing discontent among clients
- data centers may investigate ways to reduce redundant data stored on their servers
- data centers may increase the amount that they charge their clients for data storage.
- large data centres with high incomes may support economically projects for more efficient energy generators (eg Facebook funding the changes from coal to solar panels of the energy-producing companies)
- in order to implement this decision the government will have to monitor the data centers. This has implications for cost, personnel and infrastructure.

Note: accept responses that address the impacts of the decision as well as those that relate to the decision itself.

[1–2 marks]

A limited response that demonstrates minimal knowledge and understanding of the topic and uses little or no appropriate ITGS terminology.

[3–4 marks]

A partial analysis, either lacking detail or balance, that demonstrates some knowledge and understanding of the topic. Some relevant examples related to the scenario are used within the response. There is some use of appropriate ITGS terminology in the response.

[5–6 marks]

A balanced and detailed analysis of the issue which demonstrates thorough knowledge and understanding of the topic. Relevant examples related to the scenario are used throughout the response. There is appropriate ITGS terminology throughout the response.

- (c) **ORM, a large company, is expanding and the managers are concerned that their IT systems will need an expensive upgrade to be able to manage the increasing amount of data held by the company. The company is considering moving all of its data to an external data centre and relying on their services to store and provide access to this data.**

Discuss whether ORM should move all of its data to a data centre.

[8 marks]

Answers may include:

- costs – they will have to compare the cost of upgrading their local servers and IT facilities with the cost of paying for the services of the external data centre provider
- complexity of the change – they will have to take into account the complexity of the change from their local in-house providers of IT services to the move of data to the external data centre (time required, changeover period, reliability of the files when moved to a different location – may be too large and time to upload will make them unavailable)
- personnel – many of the ORM IT personnel may not be needed and will be made redundant – social implications
- policies – they will have to carefully review the policies at the external data centre to understand their responsibilities in the keeping of backups, privacy of the information and availability of the services
- confidential information - ORM will need to determine whether data that involves confidential company information should be stored on data centre servers. Data can be accessed by personnel at the data center.

Note: the external data center does not belong to ORM.

Note: do not consider any references to hacking into the data center servers

In part (c) of this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts.

Please see generic markband information sheet on page 23.

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>