Diploma Programme
Programme du diplôme
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Markscheme

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Information technology in a global society

Standard level

Paper 1

18 pages

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. *Google* healthcare data

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** items of health-related data that could be used to improve the treatment of patients. **[2]**

Answers may include:
- age
- weight
- heart beat pattern
- blood pressure
- blood type
- breathing rate
- blood oxygen concentration
- body temperature
- allergies
- pre-existing medical conditions
- gender.

*Award **[1]** for identifying each item of health-related data that could be used to improve the treatment of patients up to a maximum of **[2]**.*

(ii) Identify **two** characteristics of *data mining*. **[2]**

Answers may include:
- large data sets are interrogated
- automated techniques are used to interrogate data
- this interrogation searches for previously unknown patterns or associations
- the results can be used for marketing
- measures probabilities of patterns being significant
- requires intense processing power.

*Award **[1]** for identifying each characteristic of data mining up to maximum of **[2]**.*

(iii) Identify **two** reasons why NHS records are stored in a database rather than a spreadsheet. **[2]**

Answers may include:

Reasons to not use spreadsheets

- spreadsheets cannot accommodate very large data sets / only have 105 000 rows
- spreadsheets are designed to perform calculations
- spreadsheets do everything in memory so any unsaved data can be lost if the system crashes.

Reasons to use a database

- databases generally have more intuitive user interfaces
- complex queries can be set up and applied to the data set
- reports can be generated
- a DBMS (database management system) usually has security features to keep the data safe.
- data is written to disc immediately
- related data tables can be linked
- reduces data redundancy.

*Award **[1]** for identifying each reason why NHS records are stored in a database rather than a spreadsheet up to maximum of **[2]**.*

(b) The agreement between *Google* and the NHS includes policies for the **collection**, **storage** and **sharing** of patient data.

Explain why it is important that the agreement between *Google* and the NHS includes policies for the **collection**, **storage** and **sharing** of patient data. **[6]**

Answers may include:

A policy is required for the Collection:
- so that only the relevant information is collected (with such a large data set, large amounts of data could be collected, much of which are not relevant)
- so that it is made clear to the data subjects/patients the purpose of collecting the data is / what data will be collected.
- so that it is clear who is responsible for collecting the data.
- so that it is clear how the data will be collected.
- to ensure that only the information of patients who have consented to the use of their data is collected or that they have a way to 'opt-out' of their data being used
- so that the accuracy of the data collection can be ensured.
- to ensure that the data is collected consistently

A policy is required for Storage as:
- ensure that data is stored securely
- make it clear who is responsible for the security of data storage
- make it clear who should be accountable for the security of the data.
- make it clear where the data is stored (it is likely that most of it is confidential)
- make it clear who has access to the data
- ensure that data is stored in an accessible manner for authorized users
- make it clear that data storage will comply with the law
- make it clear how the data will be stored
- make it clear how long the data can be stored.

A policy is required for the Sharing:
- so that it is clearly identify with whom the data will be shared,
- to make it clear how the data will be shared (will they be safe during the transmission?)
- to make it clear what happens to the data once it is shared.
- to make it clear for what purpose the data will be shared (it is likely that a large part of the data linked to patients is confidential)

N.B.: *the response requires an explanation of why a policy is required rather than discussion of what is included in the policy. There must be an explanation for why* ***each*** *policy is required.*

Award ***[1]*** *for identifying why a policy for the collection, storage and sharing of patient data* ***is required*** *and* ***[1]*** *for a development of the explanation up to a maximum of* ***[2]****.*

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

(c) Evaluate the decision by the NHS to share patient data with *Google*. **[8]**

Answers may include:

Reasons for sharing the patient data with *Google*

- *Google* may have access to data analytics tools that can interrogate the data far more effectively than the NHS data analytics systems
- *Google* may provide additional IT expertise that the NHS can use
- *Google* may be able to provide additional health related information
- *Google* may be able to integrate this NHS data with existing applications such as *Google* Maps to provide meaningful visual data / *Google* may provide additional resources such as data visualization tools
- data can be analysed against other data sets.

Reasons for not sharing the patient data with *Google*

- there may be no way of knowing which other third parties *Google* is sharing the NHS information with
- the NHS may find that the patient data becomes integrated onto *Google*'s tools so that they cannot extricate themselves from the contract
- the NHS may find as part of the agreement *Google* imposes conditions that may mean the data is not used in an optimal manner, or not used for the purposes it was intended
- once the data is shared it is hard to guarantee that is deleted when it is no longer needed
- patient privacy is a concern. Is data anonymized and does *Google* have sufficient security measures in place?
- rejection of patients' consent to share their data with Google.

Please see generic markband information sheet on page 20.

2. Cell phone farmers

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** advantages of using text messaging to communicate. **[2]**

Answers may include:
- easy to use
- not dependent on internet access
- cheap
- can be done from very old hardware
- messages get sent when there is reception even if they are written when there is no reception
- quick communication
- messages get stored in the device
- allows the communication with people that are a long distance away.

Award ***[1]*** *for identifying each advantage of using text messaging up to a maximum of* ***[2]****.*

(ii) Identify **two** items that contribute to the cost of accessing the internet. **[2]**

Answers may include:
- subscription to ISP / cost of data bundles
- cost of hardware
- line rental
- cost of electricity
- the cost of education to learn how to use equipment.

Do not accept costs related to the limited infrastructure.

Award ***[1]*** *for identifying each item that contributes to the cost of Internet access up to maximum of* ***[2]****.*

(iii) Outline the difference between the internet and the World Wide Web. **[2]**

Answers may include:
- the internet is a global network of interconnected computers / a network of networks
- the World Wide Web is software / a service that runs on the hardware of the internet and provides access to content / a collection of pages that can be accessed through hyperlinks / a way of accessing and sharing the information that is held on the internet in webpages
- the World Wide Web uses the http protocol. This is only one of the many protocols used by the internet.

The response must make reference to both the internet and the World Wide Web. Do not award marks if only one is mentioned.

Award ***[1]*** *for identifying each difference up to maximum of* ***[2]****.*

(b) Analyse the effectiveness of using face-to-face (F2F) training compared to distance learning to train farmers to use Agritexte. **[6]**

Answers may include:

Advantages of F2F training
- the workshop leader/teacher can adapt their teaching to the needs of the students
- specific questions can be addressed in the moment
- the teacher can observe participants using the technology first-hand to assess their progress
- easier for farmers to concentrate if they have a block of time away from farm duties
- access to Internet is not required.

Disadvantages of F2F training
- it is costly to send a person to run the training or to send farmers to a workshop
- classes might be large and so students will not get much personal tutoring by the teacher
- if a student misses something the teacher says they might get lost and have misunderstandings
- if a student is unable to attend a session they will miss out on that information and training
- there could be personality clashes between the teacher and their students
- could be difficult to fit training around farmers' work schedules.

Advantages of distance learning
- can be accessed 24/7 – farmers can still run their farms
- learning can be self-paced
- teaching material can be viewed as many times as students need in order to be able to understand it
- it is easier to spread the training over several weeks allowing farmers to try the technology in between classes
- it would be cheaper than running workshops.

Disadvantages of distance learning
- some technology would be required by farmers to access the training materials
- farmers will need to be trained to use the training technology
- if students don't understand something in the training materials it is harder for them to ask for further explanation
- there would be significant set-up costs
- access to Internet is necessary. An unstable connection to Internet may affect the quality of the learning as it may caused frustration amongst the farmers.

Marks	Level descriptor
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 relative advantages and disadvantages of face-to-face learning and distance learning. 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 face-to-face learning and distance learning. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

(c) The government of Cameroon is watching the results of the Agritexte initiative. It is considering two options:
- Extend the functionality of Agritexte into a web-based information system.
- Invest in education and training on the use of the existing Agritexte SMS system.

Evaluate these **two** options. **[8]**

Answers may include:

Extend the functionality of Agritexte
- many more services can be offered
- this would be an investment in the future giving farmers the potential to access developing/new technologies
- the current system can still continue to operate as it has been doing and the new functionality will only add to the system
- the extension into a web based information system could inspire citizens to educate themselves
- the extension into a web based information system could inspire citizens to explore other things that they can do on the web
- farmers' lack of IT knowledge is already a problem so they may have difficulty using the web based system so training will be required.

Invest in education and training
- training would allow more people to access the information that currently exists
- training would extend people's skill sets and they could use those skills to improve their lives
- it would be a very visible investment from the government
- other beneficial things could be included in the education program
- education would improve the community connections
- the money would be spent training farmers to use a technology with limited functionality
- lack of internet availability might limit farmers' ability to access the system
- development and maintainence of the system woud incur costs.

Please see generic markband information sheet on page 20.

3. Sports photographs

Note to examiners.

- *All part a and part b questions are marked using ticks and annotations where appropriate*
- *Part c is 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** image file formats that *ALC* could use for its photographs. **[2]**

Answers may include:

- Jpg/jpeg
- Bmp
- Tiff
- PNG
- Raw
- gif.

*Award **[1]** for identifying each appropriate file format up to maximum of **[2]**.*

(ii) Define the term *resolution*. **[2]**

Answers may include:

- the detail of an image, such as number of pixels per inch
- the ability to determine individual elements (pixels) within the digital image
- how densely packed the pixels are in the photo
- determines the visual quality of an image.

*Award **[1]** for each appropriate comment about resolution up to maximum of **[2]**.*

(iii) Outline the differences between lossless and lossy compression. **[2]**

Answers may include:

- lossy compression results in the loss of detail and lower resolution/quality in the image in the image when it is decompressed
- lossless compression means that the file size is compressed but the picture quality remains the same
- with lossless compression the original file can be recovered, with lossy compression this is not the case
- lossy compression - discards similar data that does not affect the view how the image looks
- lossy compression - convert to the same color pixels with similar colors to reduce size
- lossless compression - stores the color and the times it repeats.

*Award **[1]** for each difference identified up to a maximum of **[2]**.*

(b) Explain why each image has its resolution reduced and is watermarked before it is uploaded to the *ALC*'s website. **[6]**

Answers may include:

- reducing the resolution of an image reduces its size so that it can be uploaded more quickly. This ensures that the maximum amount of data may be transferred in the shortest possible time, which in the case of a cycle event means the competitors can see images immediately after a race
- reducing the resolution reduces file size so more photos can be included on the website (viewers can see more images)
- reducing the resolution of an image reduces its size so web pages load more quickly when competitors are trying to view them
- using low resolution images means people are less likely to download them without paying, because the image quality makes it not suitable to be printed
- watermarking ensures that the image available on screen is not suitable for use beyond being seen as a preview – prevents people downloading a printable copy without paying the company
- watermarking means that the identity of the photographer is easily visible to the prospective purchaser of the image so the participant can easily select between different photographers
- watermarking creates an identity of the company that owns the photograph.

Marks	Level descriptor
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 partial explanation of why an image may have its resolution reduced and a watermark added when posted on a website. There is some use of appropriate ITGS terminology in the response.
5–6	A thorough explanation of why an image may have its resolution reduced and a watermark added when posted on a website. Explicit and relevant references are made to the scenario in the stimulus material. There is appropriate ITGS terminology throughout the response.

(c) Some people feel uncomfortable about having their photographs taken and posted on a public website.

To what extent is it acceptable for *ALC Photography* to take photographs of participants, post them online and sell them? **[8]**

Answers may include:

Arguments for it being acceptable

- it is acceptable if participants (or their parents) signed an agreement for the photo to be taken when they entered the race
- it is acceptable if the images are not offensive or infringe the privacy of the riders (*ie* it is not possible to aggregate information from a number of sources to determine the identity of the rider)
- *ALC* provides the riders with a number of professional photographs of them that they may want to use on their own websites, or for social networking sites
- as the photographers are reputable and have been sanctioned by the race organizers, there is no problem
- the photos may be circulated by riders anyway so the issues related to privacy may be unfounded.

Arguments for it not being acceptable

- if *ALC* has not sought the agreement of the riders there could be issues linked to the privacy of the riders being compromised. Parental permission would be needed if minors (under 18 years) are involved
- some riders may not want their photos published on public websites – there may be reasons they do not wish to publicise that they were in the race (*eg* off work due to supposed illness)
- riders may feel that publicly shared photos don't show them in their best moments
- riders don't get to choose which photos are available publicly
- some riders may have sponsorship deals that include clauses about how images of them are used
- some photos may be inappropriate – photographers need to abide by a code of ethics to ensure photos are appropriate.

Please see generic markband information sheet on page 20.

4. Uber taxis

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** characteristics of real-time processing. **[2]**

Answers may include:
- information is captured when the taxi is in service
- this allows the software to interact with the users to inform them of their activity
- the results of processing are fed back almost instantly
- input data is processed in milliseconds so that results are available virtually immediately to feedback to the system from which it originated.

Award ***[1]*** *for identifying each appropriate statement relating to real-time processing up to maximum of* ***[4]****.*

(ii) Identify the steps a global positioning system (GPS) follows to give an accurate location. **[4]**

Answers may include:
- the GPS receiver receives data from satellites that circle the earth
- the GPS receiver receives information about the orbits of each satellite (so it knows where each satellite will be at any given moment)
- the GPS receiver calculates the how far away from each satellite it is and therefore where it is on the surface of the earth
- it measures the distance to each satellite by calculating the amount of time it takes to receive its signal
- once the GPS receiver has a minimum of three satellites in its fix it can calculate its position on earth
- it uses a process trilateration
- with two satellites in its fix a GPS receiver can calculate its latitude and longitude (2D fix)
- with three satellites in its fix a GPS receiver can calculate its latitude, longitude and altitude (3D fix)
- with four or more satellites in range the GPS receiver can compensate for time differences between the receiver's clock and the satellites' clocks.

Award ***[1]*** *for identifying each step that Global Positioning Systems (GPS) follow to give an accurate location up to maximum of* ***[4]****.*

(b) The Uber app was created using the product development life cycle (PDLC). Explain why the developers would have included a **feasibility study**, **project schedule** and **user evaluation**. **[6]**

Answers may include:

Feasibility study
- this provides the project manager with an indication about whether the project is realistic (possible solutions, identification of end-users)
- the feasibility study may include an analysis of constraints such as cost, time required, technical expertise, IT infrastructure.

Project schedule
- this provides the project manager with a possible timeline for the implementation of the app
- this will enable the project manager to have an overview of the respective tasks, how they relate to each other and potential pinch points in the development process.

User evaluation
- this will provide the developers with first hand feedback about the performance of the app
- this will inform the developers of potential issues that may arise when the app is released and potential areas for improvement in the app.

*Award **[1]** for explaining why a feasibility study, project schedule and user evaluation have been included and **[1]** for a development of the reason identified up to a maximum of **[2]**.*

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

(c) To what extent should the taxi driver rely on the Uber app rather than their own knowledge of the city when determining the best route? **[8]**

Answers may include:

- the Uber app provides the route that the software generates and may be considered the most efficient route
- the app takes away the route-finding requirements of drivers which may mean that some drivers will not have to focus on this element of their job
- the app will act as a support mechanism for the new drivers
- the app may be programmed based on a set of circumstances that may not be the same as the road conditions the drivers face
- the app can generate routes that cross/pass by unsafe places or neighborhoods making customers feeling distrust
- the application can be used by drivers who do not know the city, therefore they do not know how to find routes when there are particular circumstances
- the app may lead to employment of drivers who lack the knowledge of how to find routes when there are unusual circumstances such as road closures, accidents or roadworks. This is a disadvantage for customers
- the app may make drivers reliant on the technology rather than relying on their judgment and intuition
- the app may lead to issues relating to accountability, for example if the driver is travelling the wrong way down a one way street “the app told me to go this way”.

Please see generic markband information sheet on page 20.

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

Marks	*Level descriptor*
No marks	• *A response with no knowledge or understanding of the relevant ITGS issues and concepts.* • *A response that includes no appropriate ITGS terminology.*
Basic ***1–2 marks***	• *A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.* • *A response that includes minimal use of appropriate ITGS terminology.* • *A response that has no evidence of judgments and/or conclusions.* • *No reference is made to the scenario in the stimulus material in the response.* • *The response may be no more than a list.*
Adequate ***3–4 marks***	• *A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.* • *A response that includes limited use of appropriate ITGS terminology.* • *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.* • *Implicit references are made to the scenario in the stimulus material in the response.*
Competent ***5–6 marks***	• *A response with knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately in places.* • *A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.* • *Explicit references to the scenario in the stimulus material are made at places in the response.*
Proficient ***7–8 marks***	• *A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately throughout.* • *A response that includes conclusions and/or judgments that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the scenario in the stimulus material throughout the response.*