



# **MARKSCHEME**

**November 2013**

## **INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY**

**Standard Level**

**Paper 1**

19 pages

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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. Mobile Wallet**

- (a) (i) **Identify *two* pieces of information that are being collected by the grocery store’s computer system when the bill is paid.** [2 marks]

*Answers may include:*

- customer’s name
- credit/debit card type (Visa/Mastercard/America Express *etc*)
- credit/debit card number
- credit/debit card PIN
- expiry date of credit/debit card
- total amount of bill
- date/time of the bill
- items purchased.

*Award [1 mark] for each item identified up to a maximum of [2 marks].*

- (ii) **Define the term *RFID*.** [2 marks]

*Answers may include:*

- radio-frequency identification
- data collection that uses a radio frequency wireless system to transfer data
- wireless system that uses tags to track data
- short range identification system that uses antennas to transmit signals.

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

- (iii) **Define the term *encryption*.** [2 marks]

*Answers may include:*

- translates plain text into cipher text
- encodes messages that can only be read by authorized users
- used to secure data/information/websites
- converts data into code
- uses algorithms to scramble information.

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

- (b) (i) **Explain *one* reason why encryption is used in this case.** [2 marks]

*Answers may include:*

- to prevent unauthorized access to data when data is transferred over the network to server
- to ensure that the customer's personal details and banking information are safe (*ie* information cannot be accessed without encryption key)
- to protect from credit card fraud or identity theft – information cannot be accessed without encryption key
- wireless network encryption – used to protect wireless data transfer against “eavesdropping” and “spoofing”.

*Award [1 mark] for the reason identified, and [1 mark] for the appropriate explanation of it. Award a maximum of [2 marks] for the response.*

- (ii) **Explain *two* disadvantages for the customer of using “the wallet”.** [4 marks]

*Answers may include:*

- cell phone battery may not be charged – cannot use cell phone to make purchases
- reliability – signal from RFID may not be available to process payment, cannot purchase groceries
- stores may profile user data and send unwanted emails/texts to customers
- availability – wallet may not be available at all stores, users would be required to use another payment method
- the store will collect information from customers using the wallet about their shopping habits (*ie* could invade customer privacy)
- if the wallet gets lost or stolen, other individuals may be able to perform transactions causing a financial loss to the customer (*ie* some clients have the bad habit of storing their cards pin numbers in the cell phone).

*Do not accept hacking the account. This is not related specifically to “the wallet”.*

*Award [1 mark] for each disadvantage identified, and [1 mark] for an explanation of that disadvantage. Award a maximum of [4 marks] for the response.*

- (c) **To what extent are the security measures used by the store during purchases appropriate?** [8 marks]

*Answers may include the following security measures indicated in the scenario:*

- secured access to data – the setup only allows authorized users access to data
- credit card verification – PIN is required to verify user
- data backup – to ensure data is not lost, data can be recovered
- antivirus software – installed to protect system from viruses
- encryption of data – data is encrypted so if it is intercepted it is not possible to read information without key
- uses NFC (Near Field Communication) – an RFID with a short range so hackers would have to be very close to steal data
- WiFi security – the encryption of wireless network to protect data that is transferred between devices and servers.

*Weaknesses of the security measures. Additional security measures that the store should have considered:*

- data backup – to ensure data is not lost, data can be recovered
- antivirus software – installed to protect system from viruses
- sharing information policy – store has a policy agreeing not to sell data to third party companies
- database server location/access – location of servers is within the same country of store so external governments or other political entities do not have access to it.

*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 19.***

**2. DRM (Digital Rights Management) Cloud movies**

- (a) (i) Identify *two* features of digital rights management (DRM). [2 marks]**

*Answers may include:*

- protect digital media files by encrypting with a key
- secure control over file usage (*ie* viewing, printing, modifying, saving, *etc*)
- expire documents on a certain date, time limit, or after number of views, *etc*
- terminate access to a protected file
- control the locations from where file can be viewed
- limit number of devices or users to access file.

*Award [1 mark] for each item identified up to a maximum of [2 marks].*

- (ii) Apart from movies, identify *two* other media that use DRM. [2 marks]**

*Answers may include:*

- software – productivity software/gaming software
- audio files/podcasts/music – CDs/internet music
- e-Books
- documents
- photographs/pictures/images
- television programs.

*Award [1 mark] for each item identified up to a maximum of [2 marks].*

- (iii) Define the term *intellectual property*. [2 marks]**

*Answers may include:*

- creative rights of an individual
- ownership of intangible items and/or ideas – names, designs, artwork, writing, audio tracks/videos
- property protected by trademarks, copyright, or patents.

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

- (b) ***Ultra Violet* has policies on its website describing the user agreement. Explain two policies that might be included and how they protect the rights of users.** [6 marks]

*Answers may include:*

- user's personal information is kept secure – user information will not be changed or manipulated by company
- secure data – user information will be saved in the database and cannot be accessed by search engines
- data sharing – user information will not be shared with third party companies
- security – user data will be protected from viruses with software and hardware
- secure data transfer – user information will be encrypted (eg personal details, credit card information)
- data backup – servers will be backed up so user data will not be lost, and access will not be compromised
- users will only be able to access *Ultra Violet* media using *Ultra Violet* – provides user access to age-appropriate media
- users must not share their login information. This prevents media being accessed and related to the user's access that they do not approve of.

*Award [1 mark] for each policy identified, up to [2 marks] for each appropriate explanation he policy and how it protects the rights of users. Award a maximum of [6 marks] for the response.*

- (c) **Customers may either purchase their movies from online services such as *iTunes* by downloading them and storing them on their computer or streaming them from *Ultra Violet*. Evaluate these two options.** [8 marks]

*Answers may include:*

***iTunes***

- anytime-anywhere access – *iTunes* movies can be downloaded directly to device, and no internet required to view files once purchased
- need a significant amount of storage on device if you want to download several movies
- ease of use – many users already have an *iTunes* account
- accessibility – can access media from computers and mobile devices
- viewing – can be viewed on home televisions using devices such as an *AppleTV*.

***UltraViolet***

- streaming is limited to amount of bandwidth – movies could have buffering or playback problems
- requires internet access to stream from the cloud
- up to 12 devices can be accessed at a time
- does not require large amounts of storage on computer
- can have both the DVD and streamed version of the movie.

*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 19.***



**3. Senior Care goes hi-tech with virtual doctor visits**

- (a) (i) **Identify *two* input devices required for the videoconference to take place.** [2 marks]

*Answers may include:*

- camera/webcam
- microphone/headset
- remote control to increase/decrease volume.

*Award [1 mark] for each item identified up to a maximum of [2 marks].*

- (ii) **There have been issues with the accuracy of the information held in the database. Describe how validation and verification are used to ensure data is accurate.** [4 marks]

*Answers may include:*

**Validation**

- automatic process to check that the data entered is reasonable using a set of rules
- validation types used to check data, such as: format, length, range, type, lookup
- process of checking data against set of validation rules is used to ensure data is accurate
- validation process does not check the accuracy of data, checks if data is reasonable.

**Verification**

- ensures the data entered exactly matches the original source
- ensures database contains as few mistakes as possible
- double entry verification – entering the data twice and comparing the two copies (eg passwords entered twice for verification)
- proofreading data verification – visually checking the data entered against the original paper document.

**N.B.** Both validation and verification must be described in the response.

*Award [1 mark] for each requirement identified up to a maximum of [2 marks] and award [1 mark] for the description of each requirement up to a maximum of [2 marks]. Award a maximum of [4 marks] for the answer.*

- (b) Explain *three* technical issues would be needed to be addressed in order to set up an effective videoconferencing system. **[6 marks]**

*Answers may include:*

- bandwidth – video latency and buffering issues arise due to insufficient bandwidth
- unreliable wifi/Internet connection
- security – protection against unauthorized access during transmission
- hardware specifications – workstations must be able to support video conferencing (*eg* processing power, headset, webcam)
- software – software will need to be installed to run the videoconferencing system that meets requirements (*eg* screensharing, accommodates the required number of participants)
- providing the necessary physical components to avoid interference (*ie* forests, hills, curves, *etc*).

*Award [1 mark] for each type of information identified, and [1 mark] for each appropriate explanation of it. Award a maximum of [6 marks] for the response.*

- (c) **The nursing home technical staff are considering replacing the existing database with a new one. The two options being considered are:**
- **purchasing a commercial package that has been developed for institutions such as nursing homes**
  - **developing the database themselves.**

**Evaluate these two options.**

**[8 marks]**

*Answers may include:*

**Commercial packages**

- cannot be customized – may only partially meet needs of the nursing home
- templates – reports are already designed and ready to use
- initial cost – more expensive initially for nursing home
- nursing home staff will find it easier and more intuitive to use
- nursing home can receive customer support from the company online or on the phone
- looks more professional
- nursing home does not have to dedicate any of their time to the development process (*eg specifications, design, testing etc*)
- nursing home may have to alter the way they work in order to fit in with the way that the software has been designed
- there will probably be operations required by the nursing home that cannot be done with the software.

**Database created by nursing home**

- the program can be customized to suit needs of nursing home
- hard for the nursing home to design if not experienced, which can be very time consuming
- the software used for development tends to be relatively cheap to purchase, the major costs come from the time to design and develop product
- support is available for the software program as there are many other users using the same software
- it is easy to share files produced by the software with others as they may have the software available to open the file
- the nursing home can make the database work the way they want, rather than having to adapt the way they work to meet the restrictions of the software
- nursing home may expect to pay more for it than for a packaged solution (both in time and money) and need a professional developer on staff at nursing home
- it has been specifically designed for particular requirements and can be tailored to fit with the nursing home's needs
- it can be customized to work to interface with other software at the nursing home to provide a fully integrated IT system
- it is much more flexible than commercial software and can be modified and changed over time as requirements and nursing home practices change
- a large investment of their time is required during the development process, will take longer to implement than commercial package
- it can be difficult to get support
- the design of the database may not be well-documented and difficult to update later
- no commercial training materials exist and must be developed specifically for this database.

*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 19.***

**4. Developing a website**

**(a) (i) State the formula in cell E2. [1 mark]**

- =D2-C2

*Award [1 mark] for the stated formula.*

**(ii) State the formula in cell F2 using an absolute cell reference. [1 mark]**

- =E2\*\$B\$13

*Award [1 mark] for the stated formula.*

**(iii) Outline why spreadsheet designers should use absolute cell references to calculate costs such as those within column F. [2 marks]**

*Answers may include:*

- if you want to refer to a cell that is going to be a set value in a cell
- if a cell value changes periodically, it is better to use absolute reference in that cell
- when you copy a formula, the cell (both the column letter and the row number) does not change.

*Award [1 mark] for each item outlined up to a maximum of [2 marks].*

**(iv) Identify two problems that can occur when two different people enter data into a common online spreadsheet. [2 marks]**

*Answers may include:*

- different formatting of data entered – data format may be entered differently by different individuals
- repeat of data entries, data entered twice
- if accessing the spreadsheet at the same time, some information may not be saved.

*Award [1 mark] for each item identified up to a maximum of [2 marks].*

- (b) The website that has been designed has been tested by the following persons:
- Technical expert
  - Client
  - End users.

For each of the testers above, explain the reason why they are used to test the website.

[6 marks]

*Answers may include:*

**Technical expert**

- compatibility – technical experts test to see if product conflicts with other software or hardware devices
- performance – technical experts test to see if product performs properly
- integration – technical experts test to see if the product integrates with all other system requirements
- load – technical experts test to see if product loads properly.

**Client**

- functionality – client checks against the requirements specification to check if the system does everything it was set out to do in the beginning
- ease of use – client tests to see if product is easy to use/navigate, technical requirements
- appearance – client tests to see if product meets the design requirements.

**End-user**

- functionality – end-user tests to see if the product is usable
- effectiveness – end-user tests to see if the product works effectively
- ease of use – end-user tests how easy it is to use and if the system is appropriate for their situation
- ease of use – end-user tests to see if the product makes work easier and if any improvements can be made.

*Award [1 mark] for each reason identified for each user, and [1 mark] for each appropriate explanation of it. Award a maximum of [6 marks] for the response.*

- (c) **The owner of Jen Gems is involved in every stage of the website development. The first two stages of the product development life cycle are:**
- **Initial investigation and feasibility study**
  - **Analysis.**

**Discuss the importance of the client's involvement in these *two* stages of the product development life cycle (PDLC).**

*[8 marks]*

*Answers may include:*

**Initial investigation and feasibility study**

- identify their current problem
- explain what kind of solution they want and what needs it must meet
- discuss a list of requirements for the product
- feasibility study – is it achievable (can a product be created to meet the requirements)
- technical requirements – what is needed in order to use the product
- discuss possible solutions that address their problem
- decide if project should proceed
- authorizes the start of the analysis.

**Analysis**

- makes certain that flaws in current system are addressed by the new product
- gather information of what they are trying to achieve and for the product
- decide who will be responsible for signing off on various stages
- discuss possible solutions with the developer to see what works and what does not
- weigh pros and cons of proposed solutions based on the analysis
- finalize requirements for the product
- approve the type of product to be developed
- authorize that the design process can begin.

***N.B.*** Both stages must be addressed in the response.

*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 19.***

**5. Using GPS to monitor vehicle movements**

- (a) (i) State two purposes of the server in the diagram. [2 marks]**

*Answers may include:*

- GPS data is sent directly from the truck to the server, where information is processed for the company
- server collects GPS location information from devices at regular intervals
- the server receiving data from the GPS tracking unit, stores it, and makes it accessible to the user.

*Award [1 mark] for each item stated up to a maximum of [2 marks].*

- (ii) Identify the steps used by the GPS system to locate the position of a vehicle. [4 marks]**

*Answers may include:*

- the GPS satellites transmit signals to a GPS receiver
- each satellite transmits data that indicates its location and the current time
- satellites synchronize so repeating signals are transmitted at the same instant
- the signals are sent to the receiver at slightly different times because some satellites are further away than others
- the distance to the satellites can be determined by estimating the amount of time it takes for their signals to reach the receiver
- when the receiver estimates the distance to at least three satellites (triangulation), it can calculate its position in three dimensions.

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



- (b) (i) **Explain *two* reasons why using only the data collected from the GPS systems to predict traffic flow may not be suitable.** **[4 marks]**

*Answers may include:*

- does not account for delays such as weather, construction, accidents
- data may not be up-to-date, inaccurate information may be used to predict traffic flow
- GPS system may not be functioning properly
- data will be incomplete as some vehicles do not possess GPS chips.

*Award [1 mark] for each reason identified, and [1 mark] for each appropriate explanation of it. Award a maximum of [4 marks] for the response.*

- (ii) **Explain *one* reason why civil liberties groups may be concerned about the use of this data by governments and authorities.** **[2 marks]**

*Answers may include:*

- vehicles are tracked non-stop 24/7 – no privacy
- type of information collected – information about where the vehicle goes and when it travels is collected
- misuse of information – may use information collected for unauthorized purposes.

*Award [1 mark] for the reason identified, and [1 mark] for the appropriate explanation of it. Award a maximum of [2 marks] for the response.*

- (c) **Discuss whether GPS systems such as the one above should be introduced into all vehicles.** **[8 marks]**

*Answers may include:*

- routing – the route determined can reduce travel time
- safety – drivers will obey traffic laws and drive safer
- efficiency – truck drivers will keep on task and be more efficient, not off task
- lost vehicle – if driver loses a vehicle, it can be located
- additional information can be accessed while travelling (eg hotels, restaurants)
- reports – can see traffic reports
- company can automatically send driver information
- over-dependence – rely too heavily on the routes provided by the GPS system (ie do not take into account road construction, road damage)
- following the directions from a GPS system while driving is stressful for drivers
- job loss – truck drivers can be fired if not following rules
- reliability – device may not work due to weather
- accuracy – inaccurate results if device was not updated, may not have the data for new streets
- device failure – battery life, may not be charged.

**N.B.** Responses may address either commercial or private vehicles.

*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 19.***

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

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