



MARKSCHEME

November 2010

INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Higher Level

Paper 2

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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 the case of a “describe” question, which asks for a certain number of facts *e.g.* “describe two kinds”, mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

“ITGS terminology refers to both the IT technical terminology and the terminology related to social and ethical impacts.”

Area of impact: Education / Health

1. (a) **Identify *two* methods that can be used to create a PDF file from a file saved in DOC format.** **[2 marks]**

Answers may include:

- use the commercial pdf creator Adobe Acrobat Professional/open Word document in Adobe Acrobat (free version ‘Reader’) and save it as PDF
- some operating systems (*e.g.* Macintosh) allow a DOC file to be printed to PDF file
- install an Add-in to a document editor (eg MS Word) which then allows you to save as pdf /use a document editor which includes an ‘export as pdf’ option/use a program that can open DOC format files and save as PDF
- upload to a website and have the file converted on their remote server
- right click on the file name and choose ‘convert to PDF’
- copy and paste the file into Google docs and download as PDF.

Do not accept printing out the DOC file and scanning to a PDF format.

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

- (b) A customer is already registered at *Amazon.com* as an e-book customer. Describe a step-by-step process that could be used by the customer to login, purchase and download an e-book from the *Amazon.com* server directly to their Kindle. **[4 marks]**

Answers may include any four of the following steps:

CONNECT

- customer clicks on the icon (or makes a request) to connect the Kindle to *Amazon.com*

LOGIN

- the system prompts the customer to enter their username and password
- login information is matched with the database to authenticate the customer.

PURCHASE

- customer selects the e-book that they wish to purchase/adds book to shopping trolley
- customer is requested to enter their payment details (*e.g.* credit card, debit card, *PayPal*, checking account)/ if customer details are already on their system these will be used and there will be no need to re-enter the details
- payment details are verified by the *Amazon.com* system.

DOWNLOAD

- the system allows the customer to click on “download” to begin downloading the e-book directly on the Kindle/downloading starts automatically upon payment.

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

- (c) Explain *two* features that could be included in the Kindle to allow improved access to e-books by persons with impaired vision. *[4 marks]*

Answers may include:

- paper-like screen which allows easy reading of text and viewing of images in different lighting conditions
- changing the text features (*e.g.* size, style, font) in order to accommodate the needs of persons with impaired vision - visually impaired users could adjust the font to double the height and width
- text-to-speech feature which will read newspapers, blogs and e-books out loud
- e-books can be stored in audio format - with the addition of headphones users can listen to the e-books
- zoom/magnifying feature - which allows sections of text to be enlarged
- adjust contrast/brightness of Kindle - an off white background may create less glare
- braille keyboard - allows visually impaired users to do word searches/add notes
- voice input/speech recognition - allows visually impaired users to verbally request functions eg book purchase.

Award [1 mark] for each feature identified that allows improved access to e-books by persons with impaired vision up to a maximum of [2 marks]. Award an additional [1 mark] for the development of each feature up to a maximum of [2 marks]. Mark the first two correct features identified.

- (d) **Instead of purchasing printed textbooks, the Bay City International School is considering providing all IB teachers and their students with a Kindle and e-books. Discuss the advantages and disadvantages, for IB students, of using the Kindle and e-books instead of printed textbooks.**

[10 marks]

Answers may include:

Disadvantages of the Kindle compared to printed textbooks

- Special licensing arrangements will have to be made for the use of e-books for all the students. No licensing is involved in the purchase of textbooks (licensing agreements could be expensive, students will need to abide by licensing agreements).
- Not all of the current textbooks that are required for IB courses may be available on the Kindle (*i.e.* alternative textbooks may have to be selected which are not as good as the original printed textbooks).
- Accessibility to e-books for students (*i.e.* students may need to download an e-book again and not have enough download rights).
- Students may not stay focused on their studies due to other features of the Kindle (*e.g.* access to *Wikipedia*, blogs, Internet, playing music).
- If the battery fails in a place where power is not available, the student cannot replace the battery and loses access to the e-books until it is recharged.
- Some students are accustomed to writing in/highlighting text books - however the search & notes features may be more convenient once they become used to the Kindle.
- Security measures will need to be taken as theft/damage/loss could occur - this is less likely with printed texts and a student would lose all of his texts/students may need to pay for replacement hardware and e-books.
- Students may begin to prefer to use the Kindle instead of using books resulting in a loss of research skills and therefore a negative impact on learning
- Health impacts could result from poor ergonomics - sitting hunched over the Kindle, continuously reading from a screen.
- The Kindle currently is black and white - this would be a disadvantage with some subjects (eg Biology) where coloured illustrations enhance the explanation.

Advantages of the Kindle compared to printed textbooks

- the Kindle in school bags compared to carrying school books (*i.e.* the Kindle is lighter than textbooks, up to 200 books can be carried)/organisation is easier with all books in the one place.
- the Kindle and e-books provide additional learning opportunities not possible with printed textbooks (*e.g.* listening to audio versions of textbooks, increasing the text size, annotating in the margins, bookmarking and exporting annotations and bookmarks).
- e-books can easily be updated - unlike text books which require a new edition for information to be current
- delivery of books is immediate through download - unlike text books which may need to be collected from a store or sent to the school (possibly from overseas if the school is in a remote location).

Do not accept responses that are not advantages or disadvantages for IB students eg environmentally friendly/cost to the school is not acceptable.

In part (d) of this question it is acceptable if there is more emphasis on the ITGS terminology related to social and ethical impacts and less on IT technical terminology.

Please see generic markband information sheet on page 17.

Area of impact: Politics and government / Arts, entertainment and leisure

2. (a) **Identify *two* file formats that are used to post images on the Internet.** [2 marks]

Answers may include:

- JPG
- GIF
- PNG.

Award [1 mark] for each file format up to a maximum of [2 marks].

- (b) **Describe *two* different graphics techniques that could be used to create the photo in Image 3 by using elements from the photo in Image 1 or from other digital sources.** [4 marks]

Answers may include:

- lasso a missile/ select with selection tool eg in Image 1 and copy and paste the missile into Image 3 (possibly on a new layer)
- resize eg the missile in Image 1 and copy and paste the missile into Image 3
- rotate eg a missile in Image 1 and copy and paste to create multiple copies of the missile in Image 3
- lasso eg the cartoon character from a digital source and copy and paste into Image 3 (possibly on a new layer)
- use any of the above techniques and flatten the layers of Image 3
- use the cloning tool to duplicate parts of an image eg clone a missile in image 1 and copy to image 3
- use layers to superimpose objects - objects can be placed on top of one another and locking/hiding layers assists editing/superimpose the cartoon image onto image 1
- magic wand tool (eg Photoshop) allows selection of pixels of similar colour - eg this could be used to select a missile in Image 1 and copy and paste to image 3
- copy and paste - a missile in image 1 could be copied and then pasted into image 3.

Award [1 mark] for identifying one graphic technique that could be used to create the photo in Image 3 by using elements from the photo in Image 1 or from other digital sources up to a maximum of [2 marks]. Award an additional [1 mark] for a description of each graphic technique up to a maximum of [2 marks].

- (c) **Publishers, such as *News Magazine*, may use the same photos in both their weekly colour magazine and on their web site. Explain the problems that may arise in the weekly colour magazine or on the web site from trying to use the same image files for both purposes.** **[4 marks]**

Answers may include:

Problems for the web site

- initial images may be high resolution and load slowly
- file size may require too much storage space on the web server
- colours on the web site may not be the same as in the printed version due to differences in the appearance of colours on monitors and printers
- quality of the images on the web site will be different from the printed version (*i.e.* not glossy high resolution images).

Problems for the weekly colour magazine

- colours may appear fine on the monitor, but colour adjustment will be required to synchronize colours between the monitor and printer
- shape of the image may need to be adjusted for the design of the page.

[1 mark]

A limited response that indicates very little understanding of the topic or the reason is not clear.

[2–3 marks]

A reasonable description of the problems that may arise from trying to use the same initial image for both purposes. The answer may be unbalanced and lack appropriate reasoning at the lower end of the band.

[4 marks]

A clear, detailed and balanced explanation of why problems may arise from trying to use the same initial image for both purposes.

- (d) **Private individuals often eyewitness news events as they occur. Using cell (mobile) phones they can immediately capture a photo and post it to a public web site. This type of posting is very different from the reporting of a news photographer to a news agency, which follows well-defined processes for editing and submitting photos.**

Discuss the ethical implications of an amateur photographer posting images to a public web site.

[10 marks]

Answers may include:

- Amateur photographers may unethically manipulate their own photos before submitting them to the public web site. The work of the professional photographer must follow *National Press Photographers Association (NPPA)* guidelines.
- Copyright/ownership of the images that are posted on the web site by the amateur photographer (*i.e.* web site policy claim ownership). The professional photographer is given credit for his work.
- Photos placed on public web sites by citizens are not controlled (*i.e.* by any ethical guidelines other than the individual's sense of right and wrong, no control persons). The news photographer's work is monitored (*i.e.* by policies from the news agency and/or *NPPA*).
- The amateur photographer may include persons in photos without permission or not using good ethical judgment. The professional photographer must follow policies set by the news agency and/or *NPPA*.
- Poor quality of iPhone image could lead to misinterpretation of events - unlike a news agency there is no quality control of amateur photos.
- The amateur photographer does not have to provide his/her name so is less accountable (cannot be contacted), whereas the news agency provides details of the organisation and possibly the photographer.
- Copyright/ownership of images - news agencies are required to acknowledge/lock copyright images but amateur photographer may upload images without taking these measures (eg photo of a work of art).
- Amateur photographers may post images without captions/context leading to misinterpretation - images provided by a news agency usually include captions and/or accompanying text to explain the photo.
- Public websites may have less security measures in place than a news agency site resulting in potential loss of integrity of photos due to hackers.

In part (d) of this question it is acceptable if there is more emphasis on the ITGS terminology related to social and ethical impacts and less on IT technical terminology.

Please see generic markband information sheet on page 17.

Area of impact: Science and the environment

3. (a) **Identify *two* input devices that are required in order for Jules to interact with a real person.** **[2 marks]**

Answers may include:

- microphone
- digital video camera or web cam
- camera.

Award [1 mark] for each input device up to a maximum of [2 marks].

- (b) **Describe the steps that Jules would take in order to follow the movement of the person talking to him.** **[4 marks]**

Answers may include:

- capture the initial image of the person with the web cam/robot (sensors) captures image
- use facial recognition software to determine the parts of the face to be tracked (reference points) / identify parts of the face (eg eyes for eye contact)
- record an initial position (*i.e.* t_0), of the face to be tracked/set the position of the human in relation to robot's own position
- record time lapse intervals
- capture another image at a second position (*i.e.* t_1)
- determine the location of the reference points
- compare new position of reference points (t_1), with the initial position (t_0)
- if position is the same as before, then no movement is detected and there is no adjustment
- if position changes, movement is detected and robot adjusts to the movement
- changing voice frequency may assist in determining the person's position
- calculate the rotation to move Jules' head
- actuators/mechanical devices rotate robot's head the required distance
- loop/repeat the process.

Ref: http://mail.isr.uc.pt/~mrl/admin/upload/Paper_EPIA07-LNCS.pdf

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

- (c) Jules may have difficulty understanding a sentence in a conversation with a human. Explain why this could happen. [4 marks]**

Answers may include:

- vocabulary used in the sentence is unknown to the robot (reason: word is not in its internal language database)
- unusual grammar or sentence structure (reason: may be limited by Jules' ability to eg analyse context)
- accent or dialect making the words sound different (reason: robot has not been trained to recognise that person's voice)
- idiomatic expression was used
- unclear/inaudible speech (reason: captured voice unclear then converted to digital sound files which can't be matched)
- background noise/interference may mask human voice input
- linguistic differences - words may have different meaning depending of the context.

[1 mark]

A limited response that indicates very little understanding of the topic or the reason is not clear.

[2–3 marks]

A reasonable description of the difficulties that Jules has in understanding a sentence in a conversation with a human. The answer may be unbalanced and lack appropriate reasoning at the lower end of the band.

[4 marks]

A clear, detailed and balanced explanation of why Jules may have difficulty understanding a sentence in a conversation with a human.

- (d) **The organizers of an important tennis tournament are considering using a robot similar to Jules, named Tennis-Umpire, for the purpose of umpiring some of the games. This robot, which remains seated throughout the match, uses its own cameras to analyse the game and then communicates its decisions to the human spectators using speech.**

Evaluate whether the organizers should go ahead with this decision to replace human umpires with robotic umpires such as Tennis-Umpire. [10 marks]

Answers may include:

Positive

- Robot would consistently determine the outcome of each play – eliminates variation in human reaction.
- Robot is not affected by physical conditions (e.g. tiredness, weather, crowd reaction).
- Robot is not biased – a human umpire may have a preference towards a particular player winning, or according to recent studies, tennis umpires are more likely to make mistakes when they call balls “out” than when they call them “in”. These errors are a result of the way the human brain processes visual information about motion.

[Source: adapted from <http://physorg.com/news144328896.html>, 4 July 2009]

Negative

- Robots involve mechanical moving parts, there is a possibility of a problem in the physical functioning of the robot (necessitating replacement with another robot or human umpire).
- Robot may not be able to follow the movement of the ball quickly enough, causing a delay in processing the call.
- In a tennis game there are several other officials – one robot cannot call all of the plays (players may block the view, other umpires will be required with the ability to communicate with the Tennis-Umpire).
- Robots can judge technical details of tennis (e.g. location of the tennis ball, applying the rules), but cannot judge human aspects of the game (e.g. inappropriate behaviour by players).
- Job loss for current umpires.
- Cost of Tennis-Umpire including hardware, software, updates, maintenance, repairs – this will be offset by saving on salaries.
- Public (players/supporter) reaction to Tennis-Umpire may be negative – how do players dispute a decision?
- A robot is not programmed to anticipate the unexpected – eg if a supporter interrupts play by running onto the court a human umpire could request a replay.

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

Please see generic markband information sheet on page 17.

Area of impact: Business and employment

4. (a) Identify *two* characteristics of a P2P network. *[2 marks]*

Answers may include:

- no server or client computers
- each computer is a node
- network used primarily for sharing files between the users.
- a direct link between two computers via an internet connection
- every computer acts as a client and a server.

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

- (b) Users of illegal P2P file sharing networks run the risk of downloading viruses. Describe *one* indication that a computer has a virus and *one* preventative measure that a user can take to avoid viruses on their computer. *[4 marks]*

Answers may include:

Signs of a virus

- unusual actions on the computer screen or computer (*e.g.* message or image is displayed on the computer screen, unusual sound or music plays randomly)
- available memory is less than what should be available
- program or file is suddenly missing
- file problems (*e.g.* file size changes without explanation, file is corrupted)
- operating system runs much slower than usual
- warning appears from an anti-virus program.

Preventative measures

- no downloading of files from unknown sources
- no downloading of illegal files
- firewall
- using anti-virus software
- downloading current definitions for anti-virus software to keep it updated.

Award [1 mark] for one indication that a computer has a virus and award an additional [1 mark] for a description up to a maximum of [2 marks]. Award [1 mark] for one preventative measure that a user can take to avoid viruses on their computer and award an additional [1 mark] for a description up to a maximum of [2 marks].

- (c) Explain *two* kinds of evidence that could have been presented in court to prove that copyrighted songs were offered by the woman using a P2P file sharing account. **[4 marks]**

Answers may include:

- Internet service provider (ISP) provides the data log of the files transferred from the woman's computer using her TCP/IP number
- the police could have found evidence on the computer hard disk used by the woman indicating her P2P username and illegal music downloads
- evidence could have been presented from someone who downloaded music from the P2P user "tereastarr"
- evidence on the woman's computer hard disc of illegal music in a public folder which has been made available for sharing by other users.

Award [1 mark] for each kind of evidence that could have been presented in court to prove that copyrighted songs were offered by the woman using a P2P user account up to a maximum of [2 marks]. Award an additional [1 mark] for the development of each kind of evidence up to a maximum of [2 marks]. Mark the first two correct kinds of evidence identified.

- (d) **A range of online solutions have been developed to provide customers with legal access to music files.**

To what extent have online solutions been made available to meet customers' needs? Use specific examples in your response.

[10 marks]

Answers may include:

- range of services are offered by web sites (e.g. collection of MP3 music, search functions, download/setup, help/support)
- online purchase - effective means for purchasing/downloading individual music titles from an online service (e.g. iTunes, Spotify)
- subscription-based model (e.g. Napster /Spotify a subscription charged and artists are paid each time their song is played)
- free download - download music made available by the artist for free (e.g. MySpace)
- easy access to purchase songs eg You Tube, in collaboration with Apple iTunes, is now including a link under its music videos to direct users to purchase the song from iTunes
- the iPhone app, Shazam tags a sound track that is playing, identifies the track and provides information for purchase via iTunes.

The specific examples may be analysed in the following manner:

Some customers feel that online solutions are not meeting their needs because

- some solutions are only available in certain countries
- some downloads are only available for approved players
- customers may be reluctant to give personal details
- many young people do not have access to credit cards which are required for payment
- costs of online purchase.

However others are moving towards legal downloads because:

- these sites have GUI which are easy to use
- most music is available
- even though there is a fee, music is still cheaper than purchasing in a shop
- there is no need to worry about viruses – viruses may be associated with some P2P file sharing
- reviews are often available
- it may be possible to try out songs before buying
- secure payment is possible
- songs are high quality
- it may be possible to purchase a single song as well as an album.

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

Please see generic markband information sheet on page 17.

Markband for all extended response questions

Opinion discuss, evaluate and to what extent	0	<i>No knowledge or understanding of IT issues and concepts or use of ITGS terminology.</i>
	1–2 marks	<i>A brief and generalized response with very little knowledge and understanding of IT issues and concepts with very little use of ITGS terminology.</i>
	3–5 marks	<i>A response that may include opinions, conclusions and/or judgments that are no more than unsubstantiated statements. The response will largely take the form of a description with a limited use of ITGS terminology and some knowledge and/or understanding of IT issues and/or concepts. If no reference is made to the information in the stimulus material, award up to [3 marks]. At the top end of this band the description is sustained. At the lower end of the band a tendency towards fragmentary, common sense points with very little use of ITGS terminology.</i>
	6–8 marks	<i>A response that demonstrates opinions, conclusions and/or judgments that have limited support. The response is a competent analysis that uses ITGS terminology appropriately. If there is no reference to ITGS terminology the candidate cannot access this markband. There is evidence that the response is linked to the information in the stimulus material. At the top end of the band the response is balanced, the response is explicitly linked to the information in the stimulus material and there may be an attempt to evaluate it in the form of largely unsubstantiated comments. There is also evidence of clear and coherent connections between the IT issues. At the lower end of the band the response may lack depth, be unbalanced or tend to be descriptive. There may be also implicit links to the information in the stimulus.</i>
	9–10 marks	<i>A detailed and balanced (at least one argument in favour and one against) response that demonstrates opinions, conclusions and/or judgments that are well supported and a clear understanding of the way IT facts and ideas are related. Thorough knowledge and understanding of IT issues and concepts. Appropriate use of ITGS terminology and application to specific situations throughout the response. If there is no reference to ITGS terminology candidates cannot access this markband. The response is explicitly linked to the information in the stimulus material. At the lower end of the band opinions, conclusions and/or judgment may be tentative.</i>

“ITGS terminology refers to both the IT technical terminology and to the terminology related to social and ethical impacts.”