



International Baccalaureate®  
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# **Information Technology in a Global Society**

## **Higher level and standard level**

**Specimen papers 1, 2 and 3**

**For first examinations in 2012**

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**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
HIGHER LEVEL  
PAPER 1**

SPECIMEN PAPER

2 hours 15 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Section A: answer two questions from Section A.
- Section B: answer one question from Section B.
- Section C: answer one question from Section C.

## SECTION A

Answer *two* questions.

### 1. Government websites

The Australian government website (see Item 1 below) provides news, advice and government information for Australian citizens and business travellers.

It allows citizens to pay tax, update personal details in government databases, claim welfare benefits, view previous medical claims and search for jobs. The image below shows part of the home page with the navigation bar and hyperlinks.

It also allows Australian citizens and business travellers to obtain relevant information about other countries such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and travellers can also visit the website and subscribe to RSS feeds.

#### Item 1



[Source: adapted from <http://www.australia.gov.au/>, copyright Commonwealth of Australia reproduced by permission, 13 November 2009]

*(This question continues on the following page)*

(Question 1 continued)

Online help is available in the form of demonstration videos. By clicking on the hyperlink below, the user can access a video explaining how to register for online services as a nominee.

**Item 2**

Register for online services as a nominee	This video shows you how to register for online services as a nominee.	<ul style="list-style-type: none"><li>• <a href="#">How to register for online services as a nominee</a> [Video, Flash FLV: 9,395 KB]</li></ul>
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[Source: [http://www.centrelink.gov.au/internet/internet.nsf/online\\_services/online\\_demo.htm](http://www.centrelink.gov.au/internet/internet.nsf/online_services/online_demo.htm), copyright Commonwealth of Australia reproduced by permission, 13 November 2009]

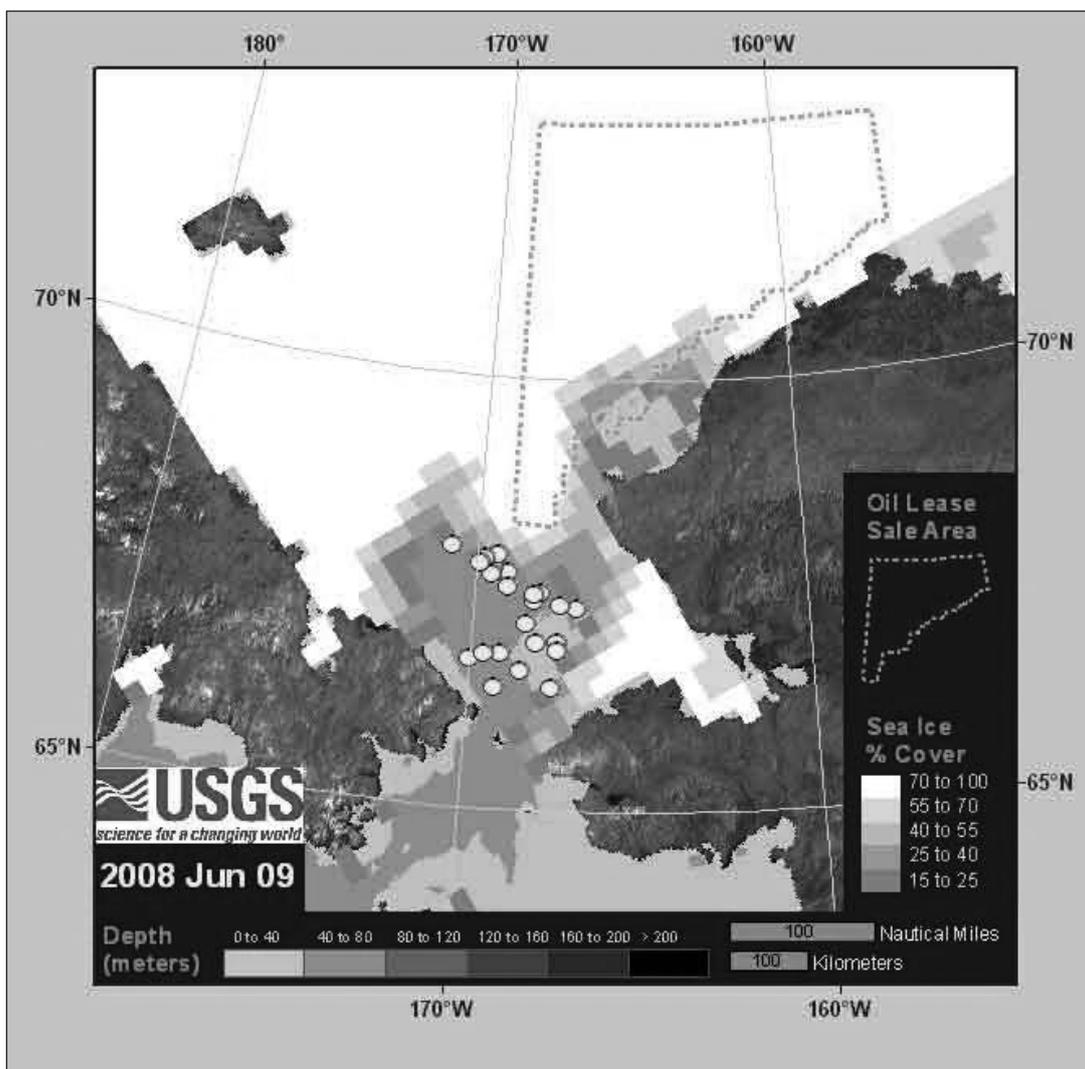
- (a) (i) State **two** file formats, other than Flash (FLV), that could be used to store the video in Item 2 shown above. [2 marks]
- (ii) The Australian government uses the online tax and welfare databases to provide services to their citizens and to find persons who try to avoid paying taxes. Outline the steps involved in using data matching for these purposes. [4 marks]
- (b) Governments normally have policies on their website describing how they safeguard the privacy of their citizens. Explain **three** policies that might be included and how they protect the privacy of citizens. [6 marks]
- (c) The website *smartraveller.gov.au* enables the Australian government to provide tips for business travellers relating to issues such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and can also visit the website and subscribe to RSS feeds. Previously, this information was only available by telephoning the government office.
- Discuss the business travellers' use of the government website (*smartraveller.gov.au*) to access the information that they require. [8 marks]

## 2. Walrus radio-tracking in the southern Chukchi Sea 2008

During the 2008 migration, researchers attached satellite radio-tags to 28 walrus in the southern Chukchi Sea region. Tracking data from this study was intended to help describe walrus movements, feeding areas and sea ice habitats within the area of the Chukchi Sea where oil companies were planning to drill for oil. Data was also collected to show when the animals were in the water and when they were on ice sheets.

The data from this study was plotted onto an animated map to show the daily locations of tagged walrus. It also showed the distribution of sea ice based on real-time imagery.

Other information can also be collected by the walrus tags, such as sea temperatures, salt levels of the ocean and concentrations of chemicals associated with the oil industry. This information can be used to create models to predict future environmental changes, such as sea ice levels and pollution.



[Source: from the website for U.S. Geological Survey, [http://alaska.usgs.gov/science/biology/walrus/2008animation\\_Norseman.html](http://alaska.usgs.gov/science/biology/walrus/2008animation_Norseman.html)]

*(This question continues on the following page)*

*(Question 2 continued)*

- (a) (i) Define the term *real-time*. [2 marks]
- (ii) Outline **four** steps involved in converting the data collected from the walrus tag to the animated map in the image on the opposite page. [4 marks]
- (b) (i) Explain **one** advantage of using visualization to display the data collected on the walrus tags. [2 marks]
- (ii) Before walrus were tagged electronically, researchers had to directly observe and manually record their movements.
- Compare the data collected from walrus tags electronically with that obtained manually. [4 marks]
- (c) To what extent can information collected from the walrus tags in the Chukchi Sea assist environmental agencies in making decisions about the future development of the area? [8 marks]

### 3. Online Amateur News Reporting

In January 2009 a plane crashed in the Hudson river, New York City. A citizen, Janis Krums, took the first photo of the plane using a cell/mobile phone while on a ferry. He immediately uploaded the photo to his micro-blogging account.

The interest in the photo and the vast number of people trying to access the photo at the same time caused the micro-blogging service to be down at times. Nearly 40 000 web users viewed the photo in the first four hours after the posting, and thousands of users filled more than 100 screens with replies to Krums' micro-blogging account. Thousands more – including mainstream news websites – created links to the image.

This is an example of an online citizen reporting a news story as it happens and making it instantly accessible. This is a trend that has steadily increased as people use online services to post text and photos from their cell/mobile phones.



[Source: <http://latimesblogs.latimes.com/technology/2009/01/citizen-photo-o.html>, © Janis Krums, 2009]

*(This question continues on the following page)*

(Question 3 continued)

- (a) (i) In an emergency situation, such as the Hudson river crash, the cell/mobile phone user must be able to post a photo immediately.

Identify **two** preconditions that were necessary to enable Janis Krums to make this instantaneous posting.

[2 marks]

- (ii) Describe **two** methods that a photo hosting website, such as *Flickr*, can use to restrict access to users' photos.

[4 marks]

- (b) A high school has agreed to students posting photos of field trips and other school activities on the school website. However, this requires students to sign a contributor's agreement.

Explain **three** statements that would be contained in a contributor's agreement for the school website.

[6 marks]

- (c) The increasing trend for individuals to post information and photos about current events as they are occurring is welcomed by some people and causes considerable concern for others.

Discuss the decision of a national newspaper to use images from citizens such as Janis Krums rather than using professional photographers.

[8 marks]

**SECTION B**

Answer *one* question.

**4. IT Systems in Moldazia state**

The government of Moldazia state wishes to develop a new government information system which will organize all its stored data in a central location. Part of this new system will enable citizens to gain access to appropriate information using a web browser.

Using this system, citizens will be able to download publications, forms and information about the state’s services as well as to provide feedback.

Currently, the information is stored in a wide variety of formats held on a number of servers. This means that inquirers have to contact a member of staff by phone or email and request the information to be sent.

The newly elected governor has told the chief IT project manager that a fully functional, integrated and interactive IT system allowing citizens access to appropriate information must be implemented by 1 June 2011.

In order to speed up the process, the programmer has been allowed to start work on some of the modules in advance of project approval.

The work breakdown structure for the development of the Moldazia IT system is as follows:

<b>Project stage</b>	<b>Start date</b>	<b>End date</b>	<b>Development Personnel</b>
Analysis of current situation	22 June 2009	9 October 2009	Analyst
Feasibility study	12 October 2009	3 March 2010	Technical author
Acceptance	3 March 2010	3 March 2010	Client
Design	4 March 2010	29 June 2010	Designer
Development	1 March 2010	22 April 2011	Programmer
Implementation	25 April 2011	1 June 2011	Installer
Sign off	1 June 2011	1 June 2011	Client

*(This question continues on the following page)*

*(Question 4 continued)*

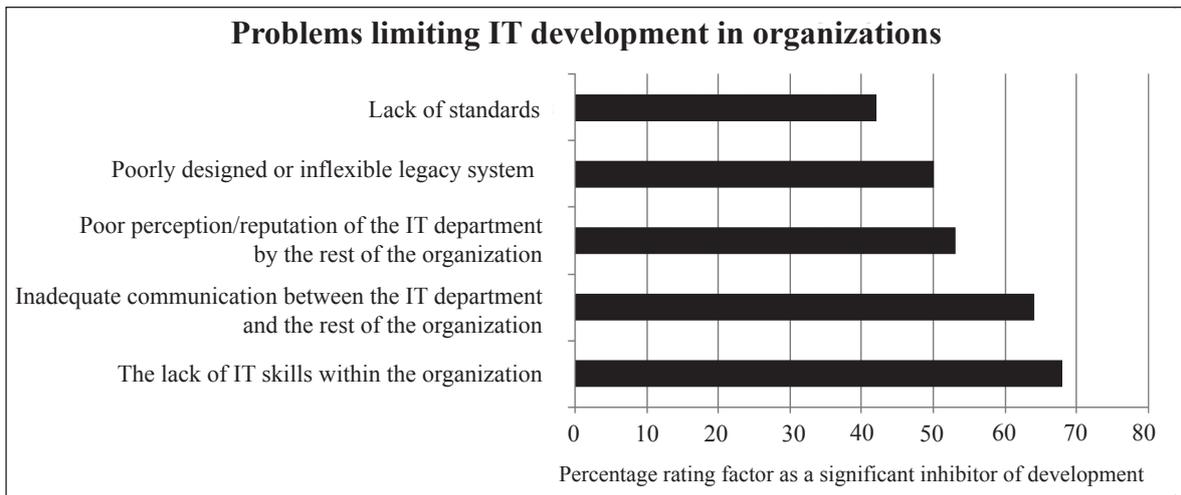
- (a) (i) Identify **two** items that will be present in the project initiation document for the Moldazia information system. *[2 marks]*
- (ii) State **two** milestones that occur in the course of this project. *[2 marks]*
- (iii) State **two** reasons why a feasibility study is produced during project development. *[2 marks]*
- (b) (i) Construct a Gantt chart using the information in the table on the opposite page. *[4 marks]*
- (ii) Explain **one** advantage of using a Gantt chart for the management of an IT project. *[2 marks]*
- (c) The project manager has to decide whether to use the waterfall development model or agile development model in order to manage the project. Evaluate the strengths and weaknesses of each approach in the case of the Moldazia information system. *[8 marks]*

### 5. Annual review of IT strategy in the United Kingdom (UK)

A survey is carried out each year by the *UK National Computing Centre (NCC)* of significant trends in the IT industry.

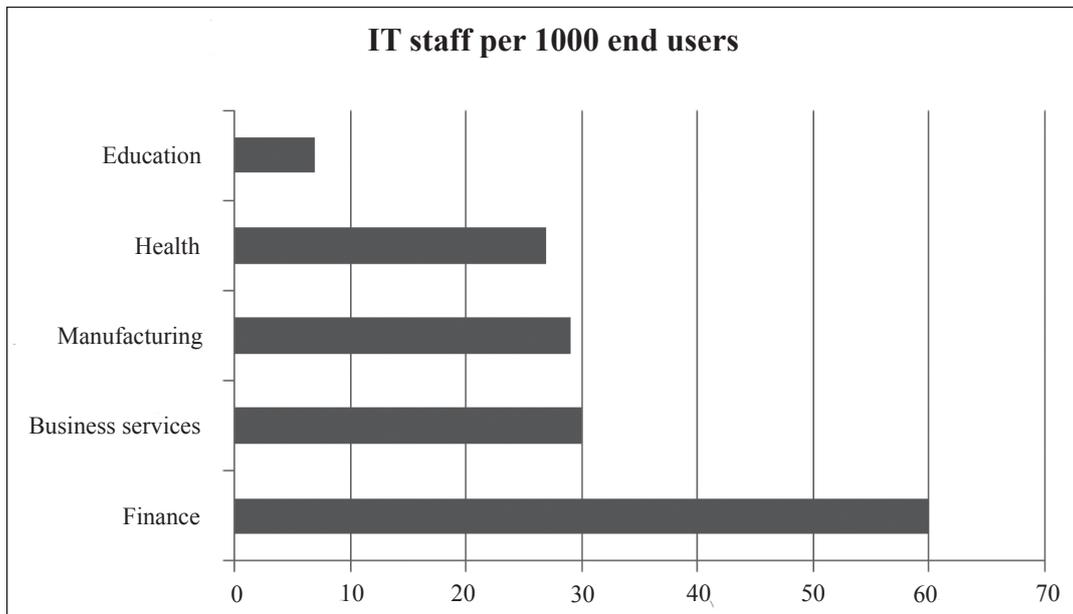
Item 1 and Item 2 below were part of the findings of the survey for 2008.

#### Item 1



[Source: adapted from Benchmark for IT Strategy 2008. Manchester: The National Computing Centre, [www.ncc.co.uk](http://www.ncc.co.uk), 2008]

#### Item 2



[Source: adapted from Benchmark for IT Strategy 2008. Manchester: The National Computing Centre, [www.ncc.co.uk](http://www.ncc.co.uk), 2008]

*(This question continues on the following page)*

*(Question 5 continued)*

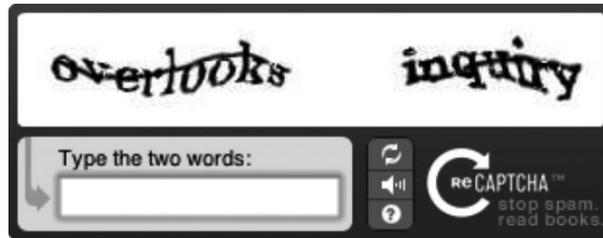
- (a) (i) Define the term *legacy system*. [2 marks]
- (ii) The IT departments of organizations often use email for communicating with other departments. Describe how this can contribute to misunderstandings. [2 marks]
- (iii) Identify **two** reasons why organizations continue to use legacy systems. [2 marks]
- (b) (i) Distinguish between an end-user and a client. [2 marks]
- (ii) Explain **two** reasons why there are such great differences between the number of IT staff per 1000 users employed in education and finance. [4 marks]
- (c) Many organizations are developing intranets in an attempt to address the problems in their IT developments, shown in Item 1 on the opposite page. To what extent are intranets likely to overcome these problems? [8 marks]

SECTION C

Answer **one** question.

6. CAPTCHA

The following text in the image below has been generated by a CAPTCHA program.



[Source: <http://recaptcha.net/captcha.html>]

The CAPTCHA is used to control access to an online medical expert system which contains sensitive information. This system was installed at a cost of 25 million euros. It provides patients with an opportunity to self-diagnose their illnesses.

- (a) (i) Identify **two** ways that a CAPTCHA can be used to distinguish between human and machine. *[2 marks]*
- (ii) Identify **two** components of an expert system. *[2 marks]*
- (iii) Describe **one** difference between a CAPTCHA and the Turing test. *[2 marks]*
- (b) Explain **two** reasons why the development of an expert system for self-diagnosis may bring benefits to patients and medical staff. *[6 marks]*
- (c) To what extent does the development of tests such as CAPTCHAs help to advance the development of artificial intelligence? *[8 marks]*

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## 7. Robotics

Most robots do not resemble the way they are depicted in science fiction books, films and on television, but are useful special purpose IT systems. They are increasingly used both in the home and industry. For example, a robotic lawn mower can be set to mow the lawn at intervals programmed by the owner, returning to a docking station to recharge as necessary. Robotic paint sprayers have been used to paint cars for over 20 years.

Another area where robots are being developed is in warfare.

The cruise missile is a weapon that can travel thousands of kilometres in order to hit a pre-determined target. It is accurate enough to be aimed at a single building. Cruise missiles are able to fly low, following the terrain, so that they avoid detection by enemy radar. It is also possible to select a new target by providing the global positioning system (GPS) coordinates after the missile has been launched.

Future developments could include the missile being able to decide on its approach whether the target is friend or enemy, preventing the possibility of the cruise missile striking friendly forces. One day, robotic weapons could be given a degree of autonomy where they could make their own decisions about whether to kill or not. Some people think that there should always be a human involved in this decision making process but others think that such decisions should be based on logic rather than human judgment.



[Source: [www.defenseimagery.mil/imagery.html#a=search&s=%20USS%20Merrill](http://www.defenseimagery.mil/imagery.html#a=search&s=%20USS%20Merrill) and [www.defenseimagery.mil/imagery.html#a=search&s=%20USS%20tomahawk](http://www.defenseimagery.mil/imagery.html#a=search&s=%20USS%20tomahawk) from U.S. Department of Defense, 9 September 2009. ]

*(This question continues on the following page)*

*(Question 7 continued)*

- (a) Describe how IT systems can enable the missile to fly close to the ground and hit the intended target. *[6 marks]*
- (b) Analyse whether it is acceptable that autonomous machines should be allowed to fight in wars. *[6 marks]*
- (c) To what extent could a cruise missile be considered a robot? *[8 marks]*
-





# **MARKSCHEME**

## **SPECIMEN PAPER**

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

#### **Higher Level**

#### **Paper 1**

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 *e.g.* “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.

**SECTION A**

1. (a) (i) **State *two* file formats, other than Flash (FLV), that could be used to store the video in Item 2 shown above.** [2 marks]

*Answers may include:*

- AVI
- MOV
- MPEG-3 or MP3
- MPEG-4 or MP4
- Real Media.

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

- (ii) **The Australian government uses the online tax and welfare databases to provide services to their citizens and to find persons who try to avoid paying taxes. Outline the steps involved in using data matching for these purposes.** [4 marks]

*Answers may include the following steps:*

- open tax database
- open welfare database
- look at one individual's record from one database
- search other database for match
- look for inconsistencies between records
- if there are inconsistencies, then carry out an investigation
- repeat for other records.

*Award [1 mark] for each correct step identified in sequence, up to a maximum of [4 marks].*

- (b) **Governments normally have policies on their website describing how they safeguard the privacy of their citizens. Explain *three* policies that might be included and how they protect the privacy of citizens.** **[6 marks]**

*Answers may include the following policies and reasons:*

- process is audited externally – to reassure that process of data collection is carried out properly/fairly
- data collection is done legally – to assure that no improper intrusion is used
- only used for intended purpose – to avoid problems that emerge (*i.e.* data matching, unsolicited advertising)
- disclosure: only seen by authorized persons – to avoid the leakage of personal information
- data quality: data held is accurate – to prevent problems that may result from the use of inaccurate data
- data security: data is looked after properly (*i.e.* not sent on CD-ROMs by post) – to prevent personal information being accessed by unauthorized persons
- openness: no secret data collected – to prevent data being used for purposes unknown to individuals
- access and correction: persons can check that their personal information is correct – to allow the person to see the information held about them and avoid problems that emerge from incorrect information being used
- identifiers: persons cannot be identified from any statistical publications – to avoid the exposure of personal information and subsequent results
- trans-border data flows: data not exported to untrustworthy countries – to avoid unauthorized access to personal information by corrupt persons (*i.e.* sharing of personal banking details).

*Award [1 mark] for each type of appropriate policy identified, and [1 mark] for each appropriate explanation of how that policy will protect the privacy of its citizens up to a maximum of [2 marks] for each policy. Award a maximum of [6 marks] for the answer.*

- (c) The website *smartraveller.gov.au* enables the Australian government to provide tips for business travellers relating to issues such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and can also visit the website and subscribe to RSS feeds. Previously, this information was only available by telephoning the government office.

Discuss the business travellers' use of the government website (*smartraveller.gov.au*) to access the information that they require.

[8 marks]

*Answers may include:*

**Advantages**

- can always be up to date
- immediate access to the information on the website (*i.e.* no waiting to get through on the telephone, no problem locating right person)
- can print the information
- can select what is needed
- information on a government website is reliable.

**Disadvantages**

- need appropriate computing technologies with internet access
- might take a while to find what you want, website may not be intuitive
- the website may not provide all of the information required (*i.e.* might be better to talk to someone who can advise you if you have a particular requirement).

*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 21.*

2. (a) (i) **Define the term *real-time*.** [2 marks]

*Answers may include:*

- output occurs rapidly/immediately
- next input can respond to output
- computer systems that update information at the same rate they receive information.

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

- (ii) **Outline four steps involved in converting the data collected from the walrus tag to the animated map in the image on the opposite page.** [4 marks]

*Answers may include:*

- map loaded
- repeat (for each tag)
- repeat (for each location of data item)
- old marker deleted
- data item read
- data used to identify location on map
- marker written to map at that point
- move to next data item
- until end of data
- until no more tags.

*Award [1 mark] for each step outlined in the correct sequence up to a maximum of [4 marks].*

- (b) (i) **Explain one advantage of using visualization to display the data collected on the walrus tags.** [2 marks]

*Answers may include:*

- information easy to understand/interpret
- humans respond better to visual data/find lots of figures counter-intuitive.

*Award [1 mark] for identifying an advantage of using visualization and [1 mark] for an appropriate explanation of how it is used to effectively display the data collected up to a maximum of [2 marks].*

- (ii) **Before walrus tags were electronically, researchers had to directly observe and manually record their movements.**

**Compare the data collected from walrus tags electronically with that obtained manually.**

*[4 marks]*

*Answers may include:*

- more accurate
- no human error
- data collected 24/7
- previously only collected when researchers were at work
- more walrus observed
- previously limited to those walrus that were being observed by humans.

*[1–2 marks]*

*Candidate conveys some understanding of the difference between the quality of the data, but the two ways would have been described in isolation.*

*[3–4 marks]*

*The candidate provides an explicit and direct comparison of the two techniques used for data collection with the use of appropriate terminology.*

- (c) **To what extent can information collected from the walrus tags in the Chukchi Sea assist environmental agencies in making decisions about the future development of the area?** *[8 marks]*

*Answers may include:*

**Advantages**

- they now know where the animals go
- can limit exploitation to areas that will not affect the animals
- can take seasonality into account
- exploit area when animals are away
- can incorporate the data collected from the tags into other models or simulations such as those that measure the extent of the sea ice or the temperature of the Arctic Ocean
- may lead to sharing of information.

**Disadvantages**

- data may be insufficient in volume or cover a restricted area to be meaningful to other models
- models generated from this inaccurate data may give an inaccurate picture of the changes to the Arctic Ocean to strategic planners
- maybe disturbances have indirect effects
- possibly affect food supply
- other species not investigated
- may be used by other organizations such as fishing fleets that leads to the disruption of the food chain by overfishing.

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

*Please see generic markband information sheet on page 21.*

3. (a) (i) In an emergency situation, such as the Hudson river crash, the cell/mobile phone user must be able to post a photo immediately.

Identify *two* preconditions that were necessary to enable Janis Krums to make this instantaneous posting. *[2 marks]*

*Answers may include:*

- set up the micro-blogging account to accept photos being sent from the cell/mobile phone
- set up the cell/mobile phone to send all photos directly to the specific micro-blogging account.

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

- (ii) Describe *two* methods that a photo hosting website, such as *Flickr*, can use to restrict access to users' photos. *[4 marks]*

*Answers may include:*

- viewers must have a *Flickr* account with a password or be invited – allows some vetting / identification of users
- the user sets the privileges on the photo hosting website – this determines who can view the pictures.

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

- (b) A high school has agreed to students posting photos of field trips and other school activities on the school website. However, this requires students to sign a contributor’s agreement.

Explain *three* statements that would be contained in a contributor’s agreement for the school website.

*[6 marks]*

*Answers may include:*

- the school agreement will have control over the content of the image such as not including inappropriate/adult/potentially embarrassing content
- the school agreement will require the written consent of the parent/guardian if a photo contains the image of their child
- the school agreement may specify the length of time the image may be kept posted on the website
- the school agreement indicates that it has the right to remove the image without consulting the contributor.

*Award [1 mark] for each statement identified and [1 mark] for each appropriate explanation of that statement up to a maximum of [2 marks]. Award a maximum of [6 marks] for the answer.*

- (c) **The increasing trend for individuals to post information and photos about current events as they are occurring is welcomed by some people and causes considerable concern for others.**

**Discuss the decision of a national newspaper to use images from citizens such as Janis Krums rather than using professional photographers.**

*[8 marks]*

*Answers may include:*

**Positive effects**

- amateurs are sometimes paid, albeit less than professional photographic agencies, for their photo submissions
- amateurs may collect valuable information that would be useful in court cases (*i.e.* accident scene) increasing the credibility of the newspaper
- photos from citizens will arrive quicker to the newspaper from the time that the event happened than those obtained from professional photographic agencies
- the newspaper may be able to sell these images to other organizations
- money saved in not paying professional photographic agencies may be spent on other services (*i.e.* maintaining the photo library, purchasing extra IT capacity).

**Negative effects**

- in instances of disaster, family members of persons involved in disasters could be psychologically affected by the photos appearing in the newspaper before they have been informed
- individuals in photos taken by amateurs have not given their permission for the photo to be used
- the issue of ownership may be a complex one and require considerable cost to develop a contributor's agreement
- the quality of the images will not be as good as those obtained from professional photographic agencies
- the website of the newspaper may not be able to cope with the volume of images submitted by citizens and crash at key periods.

***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 21.***

**SECTION B**

- 4. (a) (i) Identify *two* items that will be present in the project initiation document for the Moldazia information system. [2 marks]**

*Answers may include:*

- project goals
- scope
- project organization
- business case
- constraints.

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

- (ii) State *two* milestones that occur in the course of this project. [2 marks]**

*Answers may include:*

- acceptance of the feasibility study
- acceptance of the design of the solution
- sign off that the project is finished.

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

- (iii) State *two* reasons why a feasibility study is produced during project development. [2 marks]**

*Answers may include the following reasons:*

- to identify current problems
- to clarify the current organizational system
- to identify constraints that are involved in the project
- to identify possible alternative IT solutions
- to determine whether the benefits are cost effective
- to determine whether the new IT system will deliver what is required
- to determine whether the new IT systems is achievable
- to determine to what extent new hardware or networking considerations are involved
- to determine the nature of the training that will be required
- to determine whether existing staff can cope with the new IT system.

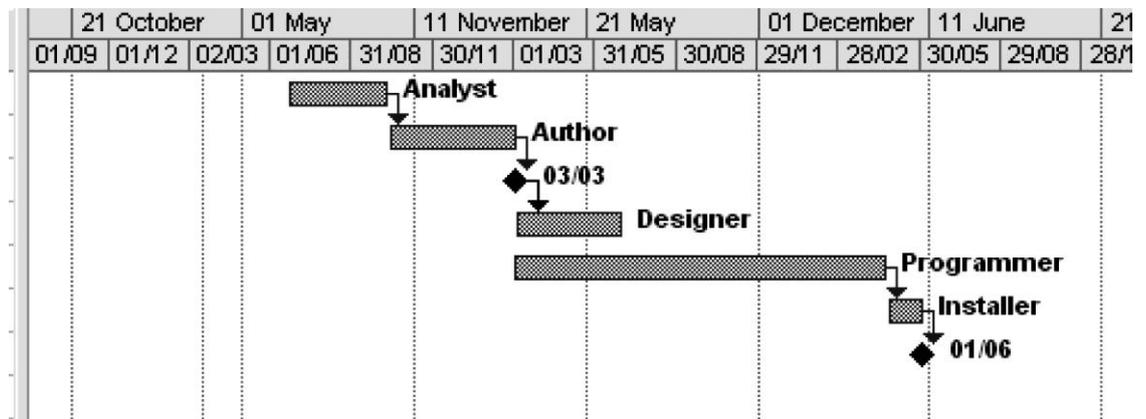
*Award [1 mark] for each correct reason stated up to a maximum of [2 marks].*

(b) (i) Construct a Gantt chart using the information in the table on the opposite page. [4 marks]

Award [1 mark] for each of the following:

- a bar for each task with the bars correctly positioned
- a correct scale with dates indicated in some way
- milestones indicated
- resources indicated.

example for reference:



(ii) Explain one advantage of using a Gantt chart for the management of an IT project. [2 marks]

Answers may include:

- overview of project is clear – visual representation of a complex process
- clashes can be seen/resolved – easy to see if tasks do not follow on properly
- stages clear – can allocate resources effectively.

Award [1 mark] for an advantage of using a Gantt Chart identified, and [1 mark] for an appropriate explanation of the idea up to a maximum of [2 marks].

- (c) **The project manager has to decide whether to use the waterfall development model or agile development model in order to manage the project. Evaluate the strengths and weaknesses of each approach in the case of the Moldazia information system.**

*[8 marks]*

*Answers may include:*

**Waterfall model**

**Strengths**

- breaks project into stages
- good for producing a project plan
- problems identified and fixed at an early stage
- encourages correct documentation.

**Weaknesses**

- implies stages that may not exist
- assumes that one stage follows another
- does not model parallel development of modules.

**Agile model**

**Strengths**

- more interaction with clients
- no rigid plan
- software developed more quickly
- better response to client demands
- encourages teamwork
- responsive to client.

**Weaknesses**

- lack of structure
- only works with expert developers
- needs frequent meetings
- insufficient design
- insufficient documentation
- deliverables not specified exactly
- can be inefficient – code can often be re-written
- can lead to poor quality
- concentrates on functionality, less on usability
- cultural changes required by organizations.

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

*Please see generic markband information sheet on page 21.*

5. (a) (i) **Define the term *legacy system*.** [2 marks]

*Answers may include:*

- an old/out-of-date computer system
- has been used for a long time
- may cause compatibility problems with new systems.

*Award [1 mark] for a definition that covers the basis of the ideas stated above. For example, the legacy system is an old computer system. Award [2 marks] for a definition that covers the ideas in the points above.*

- (ii) **The IT departments of organizations often use email for communicating with other departments. Describe how this can contribute to misunderstandings.** [2 marks]

*Answers may include:*

- emails are often written in a hurry
- emails may be deleted
- emails may get sent to the spam folder
- emails may not be taken as seriously as more formal methods
- members of the IT department are not necessarily good at expressing thoughts in words.

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

- (iii) **Identify two reasons why organizations continue to use legacy systems.** [2 marks]

*Answers may include:*

- cost issues
- file compatibility issues
- organizations are accustomed to it and see no reason to change
- legacy systems continue to provide adequate functionality
- no one is in charge of the legacy systems and implement change.

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

- (b) (i) **Distinguish between an end-user and a client.** [2 marks]

*Answers may include:*

- end-user – the person who operates the system
- client – the person who commissions/pays for the system.

*Award [1 mark] for an answer that only identifies either the nature of the end-user or the client.*

*Award [2 marks] for an answer that covers both the ideas in the points above.*

- (ii) Explain *two* reasons why there are such great differences between the number of IT staff per 1000 users employed in education and finance. [4 marks]

*Answers may include:*

**Education**

- education is less well funded
- IT facilities less critical
- education does not tend to employ IT experts.

**Finance**

- finance is IT intensive
- finance has more money available
- high dependence on IT systems
- finance is information intensive.

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

- (c) Many organizations are developing intranets in an attempt to address the problems in their IT developments, shown in Item 1 on the opposite page. To what extent are intranets likely to overcome these problems? [8 marks]

*Answers may include:*

**Positive**

- intranets are cheap to implement (*i.e.* work on TCP/IP protocols)
- only need a browser to interact with intranets
- can restrict intranets to internal personnel (*i.e.* by using suitable settings on routers/switches)
- can make intranets accessible from home
- intranets are easily available to all employees
- employees can access them whenever they need
- employees can deliver information in an easy-to-use manner (*i.e.* consistent appearance, well-structured system, presentation using consistent applications).

**Negative**

- staff may not use the intranet
- staff may not find intranets easy to use
- cost / effort to set intranets up/maintain them
- quality issues
- may prefer the human angle.

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

*Please see generic markband information sheet on page 21.*

**SECTION C**

6. (a) (i) **Identify *two* ways that a CAPTCHA can be used to distinguish between human and machine.** [2 marks]

*Answers may include:*

- code is an image, not text
- machine can't read/interpret it
- human can read/interpret it.

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

- (ii) **Identify *two* components of an expert system.** [2 marks]

*Answers may include:*

- database of expert knowledge / knowledge base
- inference engine
- interface.

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

- (iii) **Describe *one* difference between a CAPTCHA and the Turing test.** [2 marks]

*Answers may include:*

- Turing test seeks to identify if a machine is intelligent
- CAPTCHA seeks to identify if a communicator is a human.

*Award [1 mark] for identifying the difference between a CAPTCHA and the Turing test, and [1 mark] for each development of the idea up to a maximum of [2 marks].*

- (b) **Explain *two* reasons why the development of an expert system for self-diagnosis may bring benefits to patients and medical staff.** [6 marks]

*Answers may include:*

- allows patients to receive responses based on the knowledge of experts
- provides patients and medical staff with consistent analysis/response to patients' queries
- may be cheaper to implement than providing sufficient medical staff to provide the same service
- can be made available 24/7 to patients– whereas medical staff may only be available at certain times
- is easy to update and can provide medical staff with the benefits of the most current medical research
- is programmed to ask questions in a logical sequence in order to analyze a patients' problem.

*Award [1 mark] for each reason for the development of an expert system identified, [1 mark] for each appropriate explanation of it and [1 mark] for a subsequent development of that explanation. Award a maximum of [6 marks] for the answer.*

- (c) **To what extent does the development of tests such as CAPTCHAs help to advance the development of artificial intelligence?** **[8 marks]**

*Answers may include:*

- to provide improved methods will be used for CAPTCHAs to prevent illegitimate automated attempts to gain access to websites
- to automate user access to IT systems
- to develop better CAPTCHAs that promote an understanding of how human thought can be automated
- to advance AI in character recognition
- to develop AI alternatives to letter recognition (*i.e.* pattern recognition)
- to provide a more sophisticated AI system to prevent unauthorized access (*i.e.* hacking).

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

***Please see generic markband information sheet on page 21.***

7. (a) **Describe how IT systems can enable the missile to fly close to the ground and hit the intended target.** [6 marks]

*Answers may include:*

- sensor/altimeter to detect height above ground
- sensor to detect air speed
- sensor to visually detect obstructions
- timer to record time into flight
- GPS system to establish location
- GPS to record target coordinates
- database of terrain
- database of when to make flight adjustments
- software makes flight adjustments based on position and destination
- software compares current terrain with database of terrain
- software compares height of the missile with parameters for safe height
- software makes flight adjustments as necessary.

*Award [2 marks] for each way identified up to a maximum of [6 marks].*

- (b) **Analyse whether it is acceptable that autonomous machines should be allowed to fight in wars.** [6 marks]

*Answers may include:*

**Acceptable**

- more accurate so more likely to hit correct target
- can be programmed to make logical decisions about friend or enemy
- more likely to make right assessment of a situation
- no inhibitions about killing
- reacts faster than human.

**Not acceptable**

- may make mistakes
- decisions may be made on an inadequately defined model
- moral objections about machines taking life
- sometimes human judgment/experience may be more reliable
- sometimes need to take into account human/illogical factors.

**[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 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 are used throughout the response. There is appropriate ITGS terminology throughout the response.*

(c) To what extent could a cruise missile be considered a robot?

[8 marks]

*Answers may include:*

**Robot**

- carries out a physical action
- under processor control
- can be (re-)programmed
- has sensors
- can move
- has power source
- has a defined task.

**Not a robot**

- lack of autonomy (at the moment)
- lack of decision-making power
- controlled remotely
- not anthropomorphic.

*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 21.*

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

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





**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
STANDARD LEVEL  
PAPER 1**

SPECIMEN PAPER

1 hour 45 minutes

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**INSTRUCTIONS TO CANDIDATES**

- Do not open this examination paper until instructed to do so.
- Answer three questions.

Answer **three** questions.

**1. The MP3 player**

The MP3 player is a result of the convergence of many technologies and has grown in popularity in recent years. Individually, none of its components are revolutionary, but together they create an innovative product.



[Source: <http://portableplayers.blogspot.com/2008/01/sym-164-flash-mp3-player.html>]

On an audio CD, a typical song of 4 minutes takes up about 40 megabytes (MB) of storage. An equivalent MP3 format file of the same song is compressed to about 4 MB. MP3 players, like most modern electronic devices, are under the control of an embedded system.

*(This question continues on the following page)*

*(Question 1 continued)*

- (a) (i) Outline the steps that the MP3 player must take in order to play a song. *[4 marks]*
  
- (ii) A student wishes to download a 4 minute song (MP3 file) to her MP3 player. The speed of her internet connection is 12 megabits per second (Mbps). Calculate how long it will take the student to download this song. *(Show all your working)* *[2 marks]*
  
- (b) Embedded systems, such as those used in MP3 players, are commonly found in many consumer products such as refrigerators, washing machines, dishwashers and cars. Analyse the advantages **and** disadvantages of the use of embedded systems in appliances. *[6 marks]*
  
- (c) A school is investigating an m-learning programme that allows students to access their lesson resources remotely using mobile devices. Discuss whether the learning of students will be improved by the use of podcasts, MP3s and other mobile technologies. *[8 marks]*

## 2. Distributed computing

Peer-to-peer networking (P2P) is a means of connecting computers where all participating computers are equal. P2P can be achieved over internet connections, where individual computers can contact each other without the need to enter into a client-server relationship. They often operate outside the domain name system (DNS) and thus have considerable autonomy from servers.

One way in which P2P can be implemented is for a user to run client software which is given the IP address of one or more participating computers:

- the software contacts the participating computers directly
- a request for a file is sent to that computer
- if the file is on that computer, the file is sent back to the computer replacing the request
- otherwise, the request is passed on to other participating computers
- each participating computer stores the IP addresses of some other participating computers
- the request can be passed on repeatedly
- the request has a “time-to-live” (TTL) or pre-determined length of time that the requests can be passed on, so that the process does not go on forever.

- (a) (i) Define the term *IP address*. *[2 marks]*
- (ii) Describe the relationship between the server and a client in a network. *[2 marks]*
- (iii) Identify **two** steps a DNS server takes to help a user locate a particular web page. *[2 marks]*
- (b) (i) Explain **one** reason why a user may use more than one web browser. *[2 marks]*
- (ii) Explain **two** reasons why the illegal copying of music on a P2P network is more difficult to prosecute than that on client-server networks. *[4 marks]*
- (c) A company is based at various geographical locations. The senior managing team is considering the use of web-based P2P networking in order to make business-related files available to its staff. To what extent would this be an effective way to share its business data? *[8 marks]*

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### 3. Government websites

The Australian government website (see Item 1 below) provides news, advice and government information for Australian citizens and business travellers.

It allows citizens to pay tax, update personal details in government databases, claim welfare benefits, view previous medical claims and search for jobs. The image below shows part of the home page with the navigation bar and hyperlinks.

It also allows Australian citizens and business travellers to obtain relevant information about other countries such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and travellers can also visit the website and subscribe to RSS feeds.

#### Item 1



[Source: adapted from <http://www.australia.gov.au/>, copyright Commonwealth of Australia reproduced by permission, 13 November 2009]

*(This question continues on the following page)*

(Question 3 continued)

Online help is available in the form of demonstration videos. By clicking on the hyperlink below, the user can access a video explaining how to register for online services as a nominee.

**Item 2**

Register for online services as a nominee	This video shows you how to register for online services as a nominee.	<ul style="list-style-type: none"><li>• <a href="#">How to register for online services as a nominee</a> [Video, Flash FLV: 9,395 KB]</li></ul>
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[Source: [http://www.centrelink.gov.au/internet/internet.nsf/online\\_services/online\\_demo.htm](http://www.centrelink.gov.au/internet/internet.nsf/online_services/online_demo.htm), copyright Commonwealth of Australia reproduced by permission, 13 November 2009]

(a) (i) State **two** file formats, other than Flash (FLV), that could be used to store the video in Item 2 shown above. [2 marks]

(ii) The Australian government uses the online tax and welfare databases to provide services to their citizens and to find persons who try to avoid paying taxes. Outline the steps involved in using data matching for these purposes. [4 marks]

(b) Governments normally have policies on their website describing how they safeguard the privacy of their citizens. Explain **three** policies that might be included and how they protect the privacy of citizens. [6 marks]

(c) The website *smartraveller.gov.au* enables the Australian government to provide tips for business travellers relating to issues such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and can also visit the website and subscribe to RSS feeds. Previously, this information was only available by telephoning the government office.

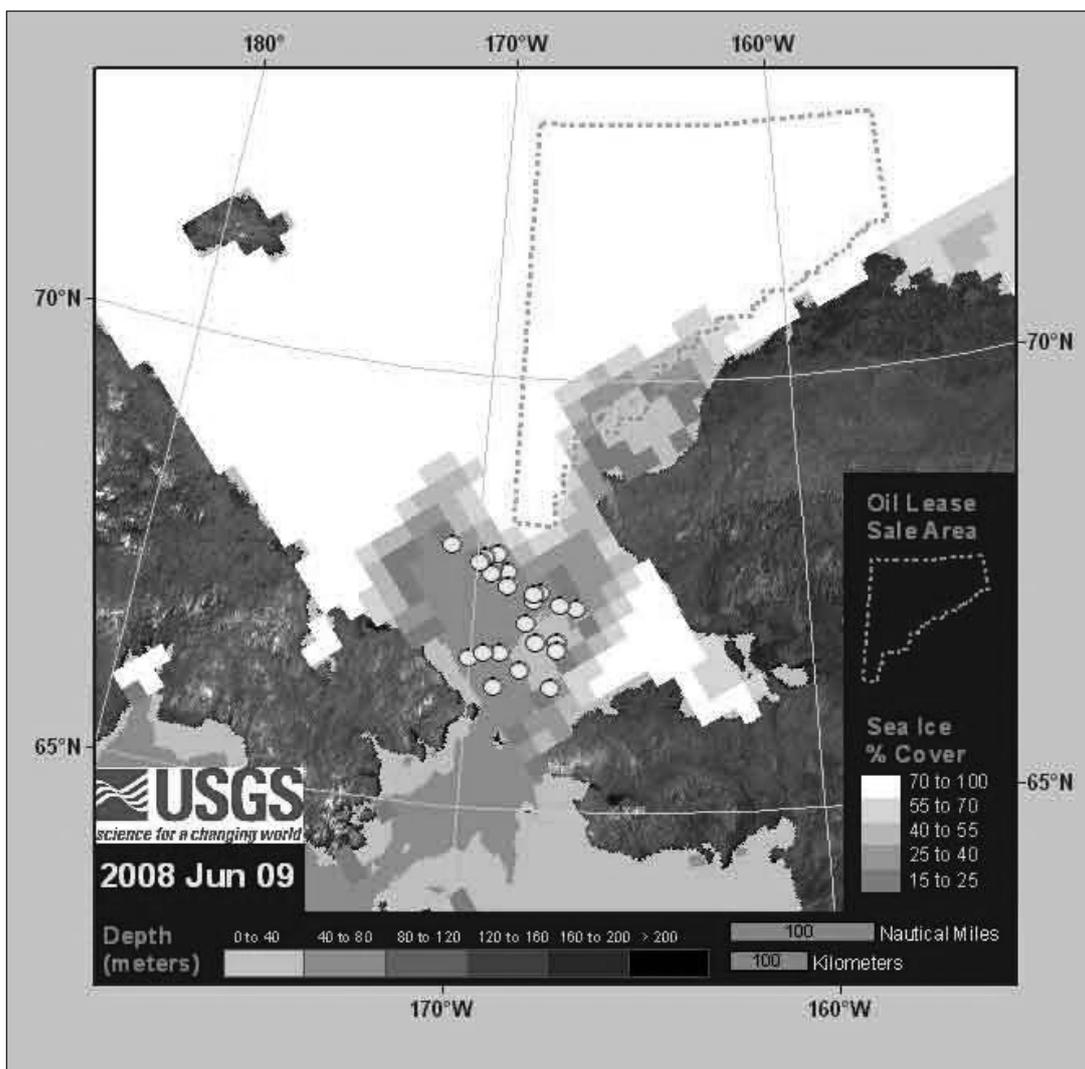
Discuss the business travellers' use of the government website (*smartraveller.gov.au*) to access the information that they require. [8 marks]

#### 4. Walrus radio-tracking in the southern Chukchi Sea 2008

During the 2008 migration, researchers attached satellite radio-tags to 28 walrus in the southern Chukchi Sea region. Tracking data from this study was intended to help describe walrus movements, feeding areas and sea ice habitats within the area of the Chukchi Sea where oil companies were planning to drill for oil. Data was also collected to show when the animals were in the water and when they were on ice sheets.

The data from this study was plotted onto an animated map to show the daily locations of tagged walrus. It also showed the distribution of sea ice based on real-time imagery.

Other information can also be collected by the walrus tags, such as sea temperatures, salt levels of the ocean and concentrations of chemicals associated with the oil industry. This information can be used to create models to predict future environmental changes, such as sea ice levels and pollution.



[Source: from the website for U.S. Geological Survey, [http://alaska.usgs.gov/science/biology/walrus/2008animation\\_Norseman.html](http://alaska.usgs.gov/science/biology/walrus/2008animation_Norseman.html)]

*(This question continues on the following page)*

*(Question 4 continued)*

- (a) (i) Define the term *real-time*. *[2 marks]*
- (ii) Outline **four** steps involved in converting the data collected from the walrus tag to the animated map in the image on the opposite page. *[4 marks]*
- (b) (i) Explain **one** advantage of using visualization to display the data collected on the walrus tags. *[2 marks]*
- (ii) Before walrus were tagged electronically, researchers had to directly observe and manually record their movements.
- Compare the data collected from walrus tags electronically with that obtained manually. *[4 marks]*
- (c) To what extent can information collected from the walrus tags in the Chukchi Sea assist environmental agencies in making decisions about the future development of the area? *[8 marks]*

## 5. Online Amateur News Reporting

In January 2009 a plane crashed in the Hudson river, New York City. A citizen, Janis Krums, took the first photo of the plane using a cell/mobile phone while on a ferry. He immediately uploaded the photo to his micro-blogging account.

The interest in the photo and the vast number of people trying to access the photo at the same time caused the micro-blogging service to be down at times. Nearly 40 000 web users viewed the photo in the first four hours after the posting, and thousands of users filled more than 100 screens with replies to Krums' micro-blogging account. Thousands more – including mainstream news websites – created links to the image.

This is an example of an online citizen reporting a news story as it happens and making it instantly accessible. This is a trend that has steadily increased as people use online services to post text and photos from their cell/mobile phones.



[Source: <http://latimesblogs.latimes.com/technology/2009/01/citizen-photo-o.html>, © Janis Krums, 2009]

*(This question continues on the following page)*

(Question 5 continued)

- (a) (i) In an emergency situation, such as the Hudson river crash, the cell/mobile phone user must be able to post a photo immediately.

Identify **two** preconditions that were necessary to enable Janis Krums to make this instantaneous posting.

[2 marks]

- (ii) Describe **two** methods that a photo hosting website, such as *Flickr*, can use to restrict access to users' photos.

[4 marks]

- (b) A high school has agreed to students posting photos of field trips and other school activities on the school website. However, this requires students to sign a contributor's agreement.

Explain **three** statements that would be contained in a contributor's agreement for the school website.

[6 marks]

- (c) The increasing trend for individuals to post information and photos about current events as they are occurring is welcomed by some people and causes considerable concern for others.

Discuss the decision of a national newspaper to use images from citizens such as Janis Krums rather than using professional photographers.

[8 marks]

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# **MARKSCHEME**

## **SPECIMEN PAPER**

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

#### **Standard Level**

#### **Paper 1**

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 *e.g.* “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. (a) (i) **Outline the steps that the MP3 player must take in order to play a song.** [4 marks]

*Answers may include:*

- loads/retrieves the song from storage
- decompresses the MP3 encoding
- converts the digital information to analogue (sound waves)
- amplifies the analogue signal, allowing the song to be heard.

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

- (ii) **A student wishes to download a 4 minute song (MP3 file) to her MP3 player. The speed of her internet connection is 12 megabits per second (Mbps). Calculate how long it will take the student to download this song. (Show all your working)** [2 marks]

- $4\text{MB} = 4 \times 8\text{Mbit} = 32\text{Mbit}$
- $\text{Speed} = 32 \div 12 = 2 \frac{2}{3}$  seconds (or 2.66 seconds).

*N.B. Accept an answer that has been rounded up to 3 seconds.*

*Award [1 mark] for:*

- *a correct answer with no evidence how the answer was arrived at*
- *correct workings but the answer is incorrect due to an arithmetic error.*

*Award [2 marks] for both a correct answer and correct workings.*

- (b) **Embedded systems, such as those used in MP3 players, are commonly found in many consumer products such as refrigerators, washing machines, dishwashers and cars. Analyse the advantages and disadvantages of the use of embedded systems in appliances.**

**[6 marks]**

*Answers may include:*

**Advantages**

- increased functionality
- can be repaired easily / replace module when faulty
- more inventive products produced
- easier to use products
- more efficient products / work at optimum level instead of expecting consumer to set parameters
- products capable of making decisions.

**Disadvantages**

- wastage – throw away whole module if faulty instead of repair component part
- may make decisions that user does not want (*e.g.* camera setting optimized instead of specially selected).

**[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 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 are used throughout the response. There is appropriate ITGS terminology throughout the response.*

- (c) A school is investigating an m-learning programme that allows students to access their lesson resources remotely using mobile devices. Discuss whether the learning of students will be improved by the use of podcasts, MP3s and other mobile technologies.

[8 marks]

*Answers may include:*

**Advantages**

- wide variety of sources for a greater learning experience
- availability of podcasts/vidcasts from experts
- students can learn when they feel like it rather than set times
- a variety of teaching techniques may accommodate varied learning styles.

**Disadvantages**

- students will not want to have school intruding into their personal time
- students will not want to clutter up their MP3 players with school work
- students may not perceive mobile technologies for learning devices (*i.e.* MP3 player is for fun, not school work)
- learning with mobile technologies requires a reliable connection to the internet and this may not be available
- no reason to think that using novel methods will be an incentive
- students may prefer to have a real teacher to explain things / interactivity / personalized.

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

*Please see generic markband information sheet on page 18.*

2. (a) (i) **Define the term *IP address*.** [2 marks]

*A unique number that identifies a resource on a network [1 mark], plus any one of the additional points below [2 marks].*

- consists of 4 octets
- each of 8 bits / 1 byte
- each contains a number from 0–255
- octets are separated by dots
- would be written as 36.134.200.5 for example.

(ii) **Describe the relationship between the server and a client in a network.** [2 marks]

- Client-server identifies the relationship between two different network components/computers, *i.e.* the client program on the computer requests services, and the server program provides those services.

*Award [1 mark] for a statement that correctly identifies both of the network components *i.e.* client machine and server machine, and award [1 mark] for correctly identifying the relationship between the two different network components/computers. For example, the client requests services and the server provides them. Award a maximum of [2 marks] for the response.*

(iii) **Identify two steps a DNS server takes to help a user locate a particular web page.** [2 marks]

*Answers may include the following steps:*

- DNS server stores IP addresses and equivalent domain names
- user enters (easy to remember) domain name in their browser
- DNS server looks up IP address
- DNS server substitutes IP address for the domain name.

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

- (b) (i) **Explain *one* reason why a user may use more than one web browser.** [2 marks]

*Answers may include the following reasons:*

- web browsers differ in facilities offered
- users need to access company websites using the recommended web browser
- some web browsers have better security
- some web browsers have useful/different add-ons
- some web browsers are open source and can be modified.

*Award [1 mark] for each type of appropriate reason identified, and [1 mark] for the explanation of that reason up to a maximum of [2 marks].*

- (ii) **Explain *two* reasons why the illegal copying of music on a P2P network is more difficult to prosecute than that on client-server networks.** [4 marks]

*Answers may include the following reasons:*

- no single location for the illegal files, therefore cannot identify single IP address
- source may be different each time user accesses resource so difficult to know who to pursue
- users may be online only for a short time so it cannot be determined if they are guilty
- more legitimate traffic on users' computers so more difficult to identify illicit material.

*Award [1 mark] for each appropriate reason identified up to a maximum of [2 marks], and [1 mark] for an appropriate explanation of each reason up to a maximum of [2 marks]. Award a maximum of [4 marks] for the answer.*

- (c) **A company is based at various geographical locations. The senior managing team is considering the use of web-based P2P networking in order to make business-related files available to its staff. To what extent would this be an effective way to share its business data?**

*[8 marks]*

*Answers may include:*

**Advantages**

- In a pure P2P architecture there is no single point of failure; that means, if one peer breaks down, the rest of the peers are still able to communicate.
- P2P provides the opportunity to take advantage of unused resources such as processing power for computations and storage capacity. In client-server architectures, the centralized system bears the majority of the cost of the system. In P2P, all peers help spread the cost.
- P2P can prevent bottlenecks such as traffic overload using a central server architecture, because P2P can distribute data and balance request across the net without using a central server.
- There is better scalability due to a lack of centralized control and because most peers interact with each other.

**Disadvantages**

- Today, many applications need a high security standard, which is not satisfied by current P2P solutions.
- The connections between the peers are normally not designed for high throughput rates, even if the coverage of ADSL and cable modem connections is increasing.
- A centralized system or a client-server system will work as long as the service provider keeps it up and running. If peers start to abandon a P2P system, services will not be available to anyone.
- Most search engines work best when they can search a central database rather than launch a meta search of peers.
- Most networks using client-server architecture will have a network manager assigned to the maintenance of the network. A P2P network may be managed on an ad-hoc basis.
- Many business-related files need to be updated by a variety of employees. If copies of files are allowed to proliferate with a loss of control over updating, then serious problems will ensue.

*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 18.*

3. (a) (i) **State *two* file formats, other than Flash (FLV), that could be used to store the video in Item 2 shown above.** [2 marks]

*Answers may include:*

- AVI
- MOV
- MPEG-3 or MP3
- MPEG-4 or MP4
- Real Media.

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

- (ii) **The Australian government uses the online tax and welfare databases to provide services to their citizens and to find persons who try to avoid paying taxes. Outline the steps involved in using data matching for these purposes.** [4 marks]

*Answers may include the following steps:*

- open tax database
- open welfare database
- look at one individual's record from one database
- search other database for match
- look for inconsistencies between records
- if there are inconsistencies, then carry out an investigation
- repeat for other records.

*Award [1 mark] for each correct step identified in sequence, up to a maximum of [4 marks].*

- (b) **Governments normally have policies on their website describing how they safeguard the privacy of their citizens. Explain *three* policies that might be included and how they protect the privacy of citizens.** **[6 marks]**

*Answers may include the following policies and reasons:*

- process is audited externally – to reassure that process of data collection is carried out properly/fairly
- data collection is done legally – to assure that no improper intrusion is used
- only used for intended purpose – to avoid problems that emerge (*i.e.* data matching, unsolicited advertising)
- disclosure: only seen by authorized persons – to avoid the leakage of personal information
- data quality: data held is accurate – to prevent problems that may result from the use of inaccurate data
- data security: data is looked after properly (*i.e.* not sent on CD-ROMs by post) – to prevent personal information being accessed by unauthorized persons
- openness: no secret data collected – to prevent data being used for purposes unknown to individuals
- access and correction: persons can check that their personal information is correct – to allow the person to see the information held about them and avoid problems that emerge from incorrect information being used
- identifiers: persons cannot be identified from any statistical publications – to avoid the exposure of personal information and subsequent results
- trans-border data flows: data not exported to untrustworthy countries – to avoid unauthorized access to personal information by corrupt persons (*i.e.* sharing of personal banking details).

*Award [1 mark] for each type of appropriate policy identified, and [1 mark] for each appropriate explanation of how that policy will protect the privacy of its citizens up to a maximum of [2 marks] for each policy. Award a maximum of [6 marks] for the answer.*

- (c) The website *smartraveller.gov.au* enables the Australian government to provide tips for business travellers relating to issues such as health warnings, entry and visa requirements, and travel advice. Travellers can submit a form to register their emergency contact details, and can also visit the website and subscribe to RSS feeds. Previously, this information was only available by telephoning the government office.

**Discuss the business travellers' use of the government website (*smartraveller.gov.au*) to access the information that they require.**

**[8 marks]**

*Answers may include:*

**Advantages**

- can always be up to date
- immediate access to the information on the website (*i.e.* no waiting to get through on the telephone, no problem locating right person)
- can print the information
- can select what is needed
- information on a government website is reliable.

**Disadvantages**

- need appropriate computing technologies with internet access
- might take a while to find what you want, website may not be intuitive
- the website may not provide all of the information required (*i.e.* might be better to talk to someone who can advise you if you have a particular requirement).

*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 18.*

4. (a) (i) **Define the term *real-time*.** [2 marks]

*Answers may include:*

- output occurs rapidly/immediately
- next input can respond to output
- computer systems that update information at the same rate they receive information.

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

- (ii) **Outline four steps involved in converting the data collected from the walrus tag to the animated map in the image on the opposite page.** [4 marks]

*Answers may include:*

- map loaded
- repeat (for each tag)
- repeat (for each location of data item)
- old marker deleted
- data item read
- data used to identify location on map
- marker written to map at that point
- move to next data item
- until end of data
- until no more tags.

*Award [1 mark] for each step outlined in the correct sequence up to a maximum of [4 marks].*

- (b) (i) **Explain one advantage of using visualization to display the data collected on the walrus tags.** [2 marks]

*Answers may include:*

- information easy to understand/interpret
- humans respond better to visual data/find lots of figures counter-intuitive.

*Award [1 mark] for identifying an advantage of using visualization and [1 mark] for an appropriate explanation of how it is used to effectively display the data collected up to a maximum of [2 marks].*

- (ii) **Before walrus tags were electronically, researchers had to directly observe and manually record their movements.**

**Compare the data collected from walrus tags electronically with that obtained manually.**

*[4 marks]*

*Answers may include:*

- more accurate
- no human error
- data collected 24/7
- previously only collected when researchers were at work
- more walrus observed
- previously limited to those walrus that were being observed by humans.

*[1–2 marks]*

*Candidate conveys some understanding of the difference between the quality of the data, but the two ways would have been described in isolation.*

*[3–4 marks]*

*The candidate provides an explicit and direct comparison of the two techniques used for data collection with the use of appropriate terminology.*

- (c) **To what extent can information collected from the walrus tags in the Chukchi Sea assist environmental agencies in making decisions about the future development of the area?** *[8 marks]*

*Answers may include:*

**Advantages**

- they now know where the animals go
- can limit exploitation to areas that will not affect the animals
- can take seasonality into account
- exploit area when animals are away
- can incorporate the data collected from the tags into other models or simulations such as those that measure the extent of the sea ice or the temperature of the Arctic Ocean
- may lead to sharing of information.

**Disadvantages**

- data may be insufficient in volume or cover a restricted area to be meaningful to other models
- models generated from this inaccurate data may give an inaccurate picture of the changes to the Arctic Ocean to strategic planners
- maybe disturbances have indirect effects
- possibly affect food supply
- other species not investigated
- may be used by other organizations such as fishing fleets that leads to the disruption of the food chain by overfishing.

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

*Please see generic markband information sheet on page 18.*

5. (a) (i) In an emergency situation, such as the Hudson river crash, the cell/mobile phone user must be able to post a photo immediately.

Identify *two* preconditions that were necessary to enable Janis Krums to make this instantaneous posting. *[2 marks]*

*Answers may include:*

- set up the micro-blogging account to accept photos being sent from the cell/mobile phone
- set up the cell/mobile phone to send all photos directly to the specific micro-blogging account.

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

- (ii) Describe *two* methods that a photo hosting website, such as *Flickr*, can use to restrict access to users' photos. *[4 marks]*

*Answers may include:*

- viewers must have a *Flickr* account with a password or be invited – allows some vetting / identification of users
- the user sets the privileges on the photo hosting website – this determines who can view the pictures.

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

- (b) A high school has agreed to students posting photos of field trips and other school activities on the school website. However, this requires students to sign a contributor’s agreement.

Explain *three* statements that would be contained in a contributor’s agreement for the school website.

*[6 marks]*

*Answers may include:*

- the school agreement will have control over the content of the image such as not including inappropriate/adult/potentially embarrassing content
- the school agreement will require the written consent of the parent/guardian if a photo contains the image of their child
- the school agreement may specify the length of time the image may be kept posted on the website
- the school agreement indicates that it has the right to remove the image without consulting the contributor.

*Award [1 mark] for each statement identified and [1 mark] for each appropriate explanation of that statement up to a maximum of [2 marks]. Award a maximum of [6 marks] for the answer.*

- (c) **The increasing trend for individuals to post information and photos about current events as they are occurring is welcomed by some people and causes considerable concern for others.**

**Discuss the decision of a national newspaper to use images from citizens such as Janis Krums rather than using professional photographers.**

*[8 marks]*

*Answers may include:*

**Positive effects**

- amateurs are sometimes paid, albeit less than professional photographic agencies, for their photo submissions
- amateurs may collect valuable information that would be useful in court cases (*i.e.* accident scene) increasing the credibility of the newspaper
- photos from citizens will arrive quicker to the newspaper from the time that the event happened than those obtained from professional photographic agencies
- the newspaper may be able to sell these images to other organizations
- money saved in not paying professional photographic agencies may be spent on other services (*i.e.* maintaining the photo library, purchasing extra IT capacity).

**Negative effects**

- in instances of disaster, family members of persons involved in disasters could be psychologically affected by the photos appearing in the newspaper before they have been informed
- individuals in photos taken by amateurs have not given their permission for the photo to be used
- the issue of ownership may be a complex one and require considerable cost to develop a contributor's agreement
- the quality of the images will not be as good as those obtained from professional photographic agencies
- the website of the newspaper may not be able to cope with the volume of images submitted by citizens and crash at key periods.

*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 18.*

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

<i>Marks</i>	<i>Level descriptor</i>
<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>



**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
HIGHER LEVEL AND STANDARD LEVEL  
PAPER 2**

SPECIMEN PAPER

1 hour 15 minutes

**ARTICLE**

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INSTRUCTIONS TO CANDIDATES

- Do not open this booklet until instructed to do so.
- This booklet contains the article required for information technology in a global society higher level and standard level paper 2.

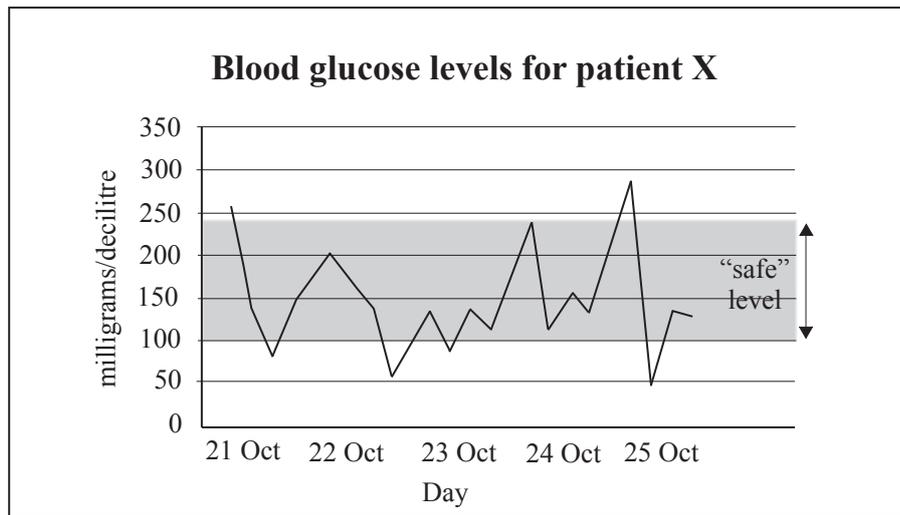
**Topic: Health**

5 Patients who have diabetes (diabetics) must measure their blood sugar (blood glucose) a number of times a day to ensure that it stays within safe levels. If their blood glucose level is too high, they may become unconscious and fall into a coma. Diabetics are expected to record their results daily so that they can monitor their own blood glucose levels. These results are accessible to patients and also reviewed by their doctors at the local hospital on a monthly basis.

Diabetics have been involved in tests with new IT technologies that experts hope will lead to an increase in the use of online health records.

10 Previously a diabetic would be required to record blood glucose levels in a notebook. Now a blood glucose meter can be used to measure levels of blood glucose and this information can be uploaded to a computer.

This development has taken place in partnership with the company *LivingWithDiabetes* which has developed a website that makes it possible for patients to upload their blood glucose levels so that medical staff can view this information as shown in the chart below.



The process works as follows:

- 15 1. Blood is taken and glucose levels are measured by the meter.
- 2. The results are uploaded and stored on the patient's computer.
- 3. Results are sent to the *LivingWithDiabetes* website.
- 4. Results are viewed by medical staff.

20 Doctors believe that this new online blood glucose recording system will be significantly better than the previous manual system because patients play a key role in managing their own condition. Previously doctors relied on patients providing information about their blood glucose levels to the medical staff and the information would then be passed on to the doctors. Now doctors can immediately access this information online.

25 This online blood glucose recording system would only require one nurse to manage 200 diabetic patients. It would allow nurses to spend more time with patients when they are first diagnosed, teaching them how to manage their condition.

Doctors believe this is an ideal solution for themselves, other medical staff and diabetic patients.

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**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
HIGHER LEVEL AND STANDARD LEVEL  
PAPER 2**

SPECIMEN PAPER

1 hour 15 minutes

Candidate session number

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**INSTRUCTIONS TO CANDIDATES**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Read the article in the accompanying booklet carefully.
- Write a response in the spaces provided.
- It is recommended that 15 minutes is spent reading the article before writing the response.

Read the article and write a response in the spaces provided. Your response should be **approximately 750 words in total**. Write under the criteria headings A, B, C and D. Use clear and precise language. Use appropriate ITGS terminology. Develop answers that demonstrate understanding beyond what is explicitly stated in the article.

**Topic: Health**

**Criterion A — The issue and stakeholder(s)**

**[4 marks]**

Describe **one** social/ethical concern related to the IT system.

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Describe the relationship of **one** primary stakeholder to the IT system.

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**Criterion B — The IT concepts and processes**

***[6 marks]***

Describe, step by step, how the IT system works.

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Explain the relationship between the IT system and the social/ethical concern described in **Criterion A**.

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# **MARKSCHEME**

## **SPECIMEN PAPER**

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

#### **Higher Level and Standard Level**

#### **Paper 2**

## Using assessment criteria for external assessment

For external assessment, a number of assessment criteria have been identified. Each assessment criterion has level descriptors describing specific levels of achievement, together with an appropriate range of marks. The level descriptors concentrate on positive achievement, although for the lower levels failure to achieve may be included in the description.

Examiners must judge the externally assessed work at SL and at HL against the four criteria (A–D) using the level descriptors.

- The same assessment criteria are provided for SL and HL.
- The aim is to find, for each criterion, the descriptor that conveys most accurately the level attained by the candidate, using the best-fit model. A best-fit approach means that compensation should be made when a piece of work matches different aspects of a criterion at different levels. The mark awarded should be one that most fairly reflects the balance of achievement against the criterion. It is not necessary for every single aspect of a level descriptor to be met for that mark to be awarded.
- When assessing a candidate's work, examiners should read the level descriptors for each criterion until they reach a descriptor that most appropriately describes the level of the work being assessed. If a piece of work seems to fall between two descriptors, both descriptors should be read again and the one that more appropriately describes the candidate's work should be chosen.
- Where there are two or more marks available within a level, examiners should award the upper marks if the candidate's work demonstrates the qualities described to a great extent. Examiners should award the lower marks if the candidate's work demonstrates the qualities described to a lesser extent.
- Only whole numbers should be recorded; partial marks, that is fractions and decimals, are not acceptable.
- Examiners should not think in terms of a pass or fail boundary, but should concentrate on identifying the appropriate descriptor for each assessment criterion.
- The highest level descriptors do not imply faultless performance but should be achievable by a candidate. Examiners should not hesitate to use the extremes if they are appropriate descriptions of the work being assessed.
- A candidate who attains a high level of achievement in relation to one criterion will not necessarily attain high levels of achievement in relation to the other criteria. Similarly, a candidate who attains a low level of achievement for one criterion will not necessarily attain low achievement levels for the other criteria. Examiners should not assume that the overall assessment of the candidates will produce any particular distribution of marks.
- The assessment criteria must be made available to candidates prior to sitting the examination.

**Topic: Health**

**Criterion A — The issue and stakeholder(s)**

**[4 marks]**

**Describe *one* social/ethical concern related to the IT system.**

*Social/ethical concerns may include the following:*

- privacy/security of patient information, for example, sensitive patient information stored on the website may be viewed by hackers
- reliability of the transfer of data, for example, patient data could be lost during transmission from the patient’s computer to the website
- reliability of the website where data is uploaded, for example, the web server could be unavailable preventing the upload of patient data.

**Describe the relationship of *one* primary stakeholder to the IT system.**

*Primary stakeholders may include the following:*

- diabetic patients, whose results are uploaded/stored
- medical staff: doctors and nurses who use this IT system for the care of diabetic patients.

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1	Either an appropriate social/ethical concern <b>or</b> the relationship of <b>one</b> primary stakeholder to the IT system in the article is identified.
2	Either an appropriate social/ethical concern <b>or</b> the relationship of <b>one</b> primary stakeholder to the IT system in the article is described <b>or</b> both are identified.
3	Either an appropriate social/ethical concern <b>or</b> the relationship of <b>one</b> primary stakeholder to the IT system in the article is described; the other is identified.
4	Both an appropriate social/ethical concern <b>and</b> the relationship of <b>one</b> primary stakeholder to the IT system in the article are described.

**Criterion B — The IT concepts and processes****[6 marks]****Describe, step by step, how the IT system works.***Answers provided in the article include the following:*

- meter reads patient's blood glucose level
- results are stored on the patient's computer
- results are sent to *LivingWithDiabetes* website
- records are accessed by doctors and medical staff
- patients can access their own results.

*Answers with additional information to that in the article may include the following:*

- meter reads patient's blood glucose level and this is uploaded to the patient's computer using a cable via serial/USB port
- time of upload is recorded by the computer's internal clock
- data is stored on the patient's computer hard disk
- patient loads the *LivingWithDiabetes* website using an internet browser
- patient logs into *LivingWithDiabetes* website using a previously given login and secret password
- special file transfer software is provided by *LivingWithDiabetes* to allow the patient to upload results
- results are stored in a database on the *LivingWithDiabetes* website
- relevant health practitioners/medical staff are given a login and password to access the results on the *LivingWithDiabetes* website
- results are analysed/manipulated to see changes in patient's condition.

**Explain the relationship between the IT system and the social/ethical concern described in Criterion A.**

*Answers may include the following:*

*Privacy may be an issue if data is not properly secured, for example:*

- if data is intercepted by hackers during transfer of results from the patient’s computer to the *LivingWithDiabetes* website
- if passwords are not used on the *LivingWithDiabetes* server and unauthorized access is possible.

*Reliability would be a concern if:*

- there is a malfunction of the meter when reading the blood glucose level
- there is an error during transmission resulting in incorrect data transfer
- the web server is down and the results cannot be uploaded.

*Candidates are expected to make reference to relevant stakeholders, information technologies, data and processes. Candidates will be expected to refer to “how the IT system works” using appropriate IT terminology.*

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	There is little or no understanding of the step-by-step process of how the IT system works and does not go beyond the information in the article.  The major components of the IT system are identified using minimal technical IT terminology.
3–4	There is a description of the step-by-step process of how the IT system works that goes beyond the information in the article.  Most of the major components of the IT system are identified using some technical IT terminology.  The relationship between the IT system referred to in the article and the concern presented in criterion A is identified, with the some use of ITGS terminology.
5–6	There is a detailed description of the step-by-step process that shows a clear understanding of how the IT system works that goes beyond the information in the article.  The major components of the IT system are identified using appropriate technical IT terminology.  The relationship between the IT system referred to in the article and the concern presented in criterion A is explained using appropriate ITGS terminology.

**Criterion C — The impact of the social/ethical issue(s) on stakeholders**

**[8 marks]**

**Evaluate the impact of the social/ethical issues on the relevant stakeholders.**

*Patient advantages may include the following:*

- fewer errors compared with manual recording of results – greater accuracy leads to better treatment
- patients get better feedback on their blood glucose levels – they will be better-informed about their health and able to manage their disease more effectively
- records are archived – past records can be easily accessed
- fewer visits to the doctor/hospital – if levels are acceptable there would not be a need to visit the doctor as often.

*Patient disadvantages may include the following:*

- lack of security of sensitive medical data – hackers may intercept and interpret the results during transfer resulting in an invasion of privacy
- reliability of the equipment – leading to errors during data transfer
- reliability of the web server – results cannot be uploaded if the server is unavailable
- difficulty using the equipment – patients may not be computer literate and will need to learn how to upload results
- cost of the meter and internet access – will the patient be assisted with this expense?

*Health workers' advantages may include the following:*

- ability to graph results – enables health workers to easily check patients' results and see changes in blood glucose levels over time
- database features such as sorting, searching and reporting – allow manipulation of patients' results
- less pressure on busy medical staff – patients are entering their own results
- less interruption to the nurses during a working day – results can be viewed at anytime.

*Health workers' disadvantages may include the following:*

- liability if the web server is down or there is a malfunction of the equipment – diabetes is a serious disease and the doctors/hospital may be held responsible if there are reliability issues
- need for training to use this new technology.

*If the evaluation does not provide any additional information to that in the article, the candidate will be awarded a maximum of [2 marks].*

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	The impact of the social/ethical issues on stakeholders is described but not evaluated. Material is either copied directly from the article or implicit references are made to it.
3–5	The impact of the social/ethical issues on stakeholders is partially analysed, with some evaluative comment. Explicit references to the information in the article are partially developed in the response. There is some use of appropriate ITGS terminology
6–8	The impact of the social/ethical issues on stakeholders are fully analysed and evaluated. Explicit, well-developed references to information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology.

**Criterion D — A solution to a problem arising from the article**

**[8 marks]**

**Evaluate *one* solution that addresses at least *one* problem identified in *Criterion C*.**

*Answers may include the following:*

*Solutions to the problem of reliability:*

- ability to manually enter/change results on the website will overcome reliability problems with the blood glucose meter
- online tutorials/help files, email support, phone support will assist if reliability problems are associated with user error
- alternatives such as phoning in results if the server is down
- strict backup routines and disaster recovery programs will allow data to be reinstated should a server crash.

*Solutions to the problem of security/privacy:*

- encryption of data on the server will help ensure that data is not accessible by unauthorized people
- encryption of data during transfer will help secure data from attack during transmission
- levels of password/biometrics will help ensure that data is only accessible to permitted health workers.

*Solutions to the problem of cost to patients:*

- health insurance/medical benefits may allow patients to claim back cost of the meter and internet access.

*Solutions to the training issues for health workers:*

- various types of training could be provided, for example, training workshops, video tutorials loaded onto the hospital intranet.

*If the evaluation does not provide any additional information to that in the article, the candidate will be awarded a maximum of [2 marks].*

Marks	Level descriptor
0	The response does not reach a standard described by the descriptors below.
1–2	<b>One</b> feasible solution to at least <b>one</b> problem is proposed and described. No evaluative comment is offered. Material is either copied directly from the article or implicit references are made to it.
3–5	<b>One</b> appropriate solution to at least <b>one</b> problem is proposed and partially evaluated. The response contains explicit references to information in the article that are partially developed. There is some use of appropriate ITGS terminology.
6–8	<b>One</b> appropriate solution to at least <b>one</b> problem is proposed and fully evaluated, addressing both its strengths and potential weaknesses. Areas for future development may also be identified. Explicit, fully developed responses to the information in the article are made appropriately throughout the response. There is use of appropriate ITGS terminology.



**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
CASE STUDY: N&Q INVESTMENTS**

SPECIMEN PAPER

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**INSTRUCTIONS TO CANDIDATES**

- Case study booklet required for higher level paper 3 information technology in a global society examinations.

## Foreword

The ITGS case study, *N&Q Investments*, is the stimulus material for the research investigation required for the Higher Level Paper 3. All of the work related to the case study should reflect the integrated approach explained on pages 15–17 of the ITGS guide.

Candidates should consider *N&Q Investments* with respect to:

- relevant IT systems in a social context
- both local and global areas of impact
- social and ethical impacts on individuals and societies
- current challenges and solutions
- future developments.

Candidates are expected to research real-life situations similar to *N&Q Investments* and relate their findings to first-hand experiences wherever possible. Information may be collected through a range of activities: primary and secondary research, field trips, guest speakers, personal interviews and email correspondence.

Responses to examination questions **must** reflect the synthesis of knowledge and experiences that the candidates have gained from their investigations. In some instances, additional information may be provided in examination questions to allow candidates to generate new ideas.

## Overview

*N&Q Investments* is an investment company which has operated from Adelaide since 1979. It deals with the financial affairs of numerous clients ranging from individuals and small businesses to multinational companies. With the rapid advances in information technology, it found it was able to expand beyond Australia, opening a second office in Los Angeles in 1988. 5 Currently *N&Q Investments* has additional offices in London and Toronto, employing a current total of 60 staff, many of whom travel extensively.

## Hector Byrne

Hector Byrne is an international fund manager based in Adelaide and is employed by *N&Q Investments*. His clients are predominantly multinational companies and he buys and sells shares to increase the value of their investment portfolios. Over the last decade Hector has developed a good rapport with his clients at face-to-face meetings, seeing a rapid growth in the number of his clients, which he believes more than compensates for the large amount of time he spends travelling. 10

When working in the different *N&Q Investments* offices, in hotels or at home, he is required to have access to the records of clients, which are held on network servers and accessible via a WAN. When he has to make sales, purchases or fund transfers on behalf of his clients, it must be done instantaneously. Consequently Hector has to maintain contact with colleagues and clients at all times, which requires the use of wireless networks that can be accessed via hotspots at airports, hotels and other public places. When operating using a wireless network Hector is concerned that correspondence between him and the Head Office or any notes he makes about clients for his personal use should remain completely confidential. 15 20

There are issues about the levels of security of the wireless networks in some of the locations he uses. In some cases the network is unsecured and requires no username or password. Other networks, for example in airports, do not change login details for long periods of time. In some hotels, connecting to the network requires either so much time or the level of security appears so low that Hector questions whether it is a valid use of time or it creates an unnecessary risk to the confidentiality of company information. Therefore, he works offline and moves company information between his laptop, his home PC and his personal hand held device. He then sends the information by email to colleagues and clients. 25

When Hector is working from home, he often needs to access the *N&Q Investments* WAN. He has found that he can connect his laptop to the internet by searching for an available unsecured wireless network or he can use the broadband cable connection on his home desktop PC but on a number of occasions has left sensitive client data saved on the hard drive. Hector often finds that working from home causes a dilemma. He has to choose between using the unsecured wireless connection or leaving sensitive data on his hard drive and can only see the problem getting worse as his teenage children will increasingly require the home PC. To resolve this issue Hector is considering creating a home network; however, his son has warned him that there will be security issues involved in setting this up and he must first address them. 30 35

### Recent developments

40 In the last 6 months, *N&Q Investments* has opened new offices in Shanghai, Mumbai, Nairobi, Buenos Aires and Moscow, recruiting a number of employees to carry out duties similar to Hector's. However, *N&Q Investments* is trying to reposition itself as an environmentally responsible organization and is concerned about its "carbon footprint" and the escalating travel costs, particularly with the need to train staff in the new offices. Following a number of senior management meetings, *N&Q Investments* is investigating a range of IT solutions to address this problem.

45 With the new organizational structure, Hector is now the line manager of Betty Gonzalez, who is based in the new Buenos Aires office. Betty will carry out duties similar to Hector's and has been provided with a laptop computer by her local office. Unfortunately, Hector has found that her laptop has different specifications and uses different versions of software. Hector and Betty are both concerned as this will potentially cause problems in sharing and editing documents.

### Technical background

- 50
- Each office has a technical department, which is responsible for the maintenance and upgrade of all IT equipment. The maintenance of the WAN is controlled by the technical staff at the head office.
  - Each office of the company is connected via a WAN.
  - Client data is held on the database at the head office.
- 55
- Hector uses a wireless enabled laptop configured by the company's IT department.
  - When travelling, Hector carries with him a laptop, PDA and cell/mobile phone.
  - Hector's home PC has a broadband cable connection to the internet that is used by all the family.
  - Hector uses email to keep up to date with colleagues and transfer information.

### Challenges faced

60 With the possible significant increase in staff travel, *N&Q Investments* is also investigating a range of alternatives to replace face-to-face meetings between staff in the established and new offices. The senior managers at *N&Q Investments* have proposed the use of video conferencing or virtual meetings but Hector is concerned that the quality of the outcomes from these meetings may be compromised.

65 With continued growth, issues are arising such as the lack of compatibility between Hector's and Betty's laptops, so the company is considering commissioning a report from a specialist consultancy company to evaluate emerging issues relating to company practice and policies, security and data integrity.

70 The company is aware of the problems that arise when employees use multiple devices such as laptops, PDAs and cell/mobile phones, which could lead to numerous different versions of the same document as well as the possible theft of these devices.

Hector and many of his colleagues work from home on a regular basis. The company is concerned that many of the home networks set up by its employees are not secure and could potentially be a route that hackers would use to access sensitive customer information.

### Additional Terminology not in the Guide

Antenna

DHCP

Hotspot

Radio channels

Spam/spyware protection

SSID

USB hub

Web conferencing environment

Virus protection

WEP/WPA/WPA2

*Companies, products, or individuals named in this case study are fictitious and any similarities with actual entities are purely coincidental.*

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**INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY  
HIGHER LEVEL  
PAPER 3**

SPECIMEN PAPER

1 hour 15 minutes

Candidate session number

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**INSTRUCTIONS TO CANDIDATES**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Read the case study carefully.
- Answer all the questions in the spaces provided.

Answer **all** the questions in the spaces provided.

Refer to the *N&Q Investments case study* **and** to your own related research in responding to the following questions.

1. Define the following terms:

(a) *hotspot*

[2 marks]

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(b) *https.*

[2 marks]

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2. “Hector is considering creating a home network” (*lines 35–36*). Explain the purposes of the following in the home network:

(a) SSID

[2 marks]

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(b) router

[2 marks]

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(c) switch.

[2 marks]

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# **MARKSCHEME**

## **SPECIMEN PAPER**

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

#### **Higher Level**

#### **Paper 3**

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 e.g. “describe two kinds”, mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

**1. Define the following terms:**

(a) *hotspot* *[2 marks]*

*Answers may include:*

- a place that offers internet access
- (a place that provides public) wireless LAN/WiFi
- accessible by laptop/WiFi phone/PDA *etc.*
- short range of access.

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

(b) *https.* *[2 marks]*

*Answers may include:*

- Hypertext Transfer Protocol (Secure)
- used to encrypt and decrypt data
- ... passing between the user and the server
- operates at transport layer
- suitable application for sending sensitive information, such as bank details.

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

2. “Hector is considering creating a home network” (lines 35–36). Explain the purposes of the following in the home network:

(a) SSID

[2 marks]

*Answers may include:*

- Service Set Identifier
- name used to identify a wireless LAN
- 32 character unique identifier
- used to select correct network
- there may be others in range
- allows use of virtual access points from same physical access point.

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

(b) router

[2 marks]

*Answers may include:*

- used to connect different networks together
- receives data packets from a wide area network
- can connect to an Internet Service Provider
- device that forwards data packets along a network
- selects optimum route (for data packets).

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

(c) switch.

[2 marks]

*Answers may include:*

- network device that is used to connect segments of a LAN
- useful when connecting within various parts of a building
- network segments are isolated from each other
- sometimes called a bridge
- filters and forwards data packets to another segment of a network
- reduces the incidence of data collisions.

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

3. Discuss *two* methods that Hector can use to ensure the security of the wireless network he intends to use in his home. [8 marks]

*The question asks for two methods. Please annotate the script with M1 and M2, etc. to indicate the start of each method. Do not credit further methods if given. Do not treat brief erroneous comments as a “method”.*

*Answers may include the following methods:*

- use of firewall
- use of anti-virus/anti-spyware/other malware protection
- secure your wireless router or access point
- set up admin rights
- set up admin password/settings
- don't use default password
- don't use default settings for the device connected to the network
- don't broadcast SSID
- change the default SSID
- this should prevent sniffers
- enable WPA or WEP encryption
- WPA is more secure than WEP
- use long keys
- change keys often
- use MAC filtering for controlling access to your WLAN
- only designated computers can access the network
- reduce your WLAN transmitter power
- disable remote administration.

*In 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.*

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

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

4. Betty “has been provided with a laptop computer by her local office. Unfortunately, Hector has found that her laptop has different specifications and uses different versions of software. Hector and Betty are both concerned as this will potentially cause problems in sharing and editing documents.” (*lines 46–49*)

Evaluate *two* possible strategies that *N&Q Investments* could adopt in order to reduce the problems with sharing and editing documents. *[12 marks]*

*The question asks for two strategies. Please annotate the script with S1 and S2, etc. to indicate the start of each strategy. Do not credit further strategies if given. Do not treat brief erroneous comments as a “strategy”.*

*Answers may include the following strategies:*

- centralized control over purchasing
- policy on hardware purchase
- policy on software purchase
- policy on operating systems
- version control of software throughout company
- examples of software incompatibilities
- standardize file formats used
- check for backward compatibility issues
- insist on simple/standard document layouts
- provide templates
- provide macros
- use of PDF files
- web-based applications / cloud computing
- references to companies/organizations that they have researched.

*If the candidate only offers **one** strategy, then award a maximum of [8 marks].*

**HL paper 3 question 4 markband**

Marks	Level descriptor
<p><b>No marks</b></p>	<ul style="list-style-type: none"> <li>• <i>A response with no knowledge or understanding of the relevant ITGS issues and concepts.</i></li> <li>• <i>A response that includes no appropriate ITGS terminology.</i></li> </ul>
<p><b>Basic 1–3 marks</b></p>	<ul style="list-style-type: none"> <li>• <i>A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.</i></li> <li>• <i>A response that includes minimal use of appropriate ITGS terminology.</i></li> <li>• <i>A response that has no evidence of judgments, conclusions or future strategies.</i></li> <li>• <i>No reference is made to the information in the case study or independent research in the response.</i></li> <li>• <i>The response may be no more than a list.</i></li> </ul>
<p><b>Adequate 4–6 marks</b></p>	<ul style="list-style-type: none"> <li>• <i>A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.</i></li> <li>• <i>A response that includes limited use of appropriate ITGS terminology.</i></li> <li>• <i>A response that has evidence of conclusions, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.</i></li> <li>• <i>Implicit references are made to the information in the case study or independent research in the response.</i></li> </ul>
<p><b>Competent 7–9 marks</b></p>	<ul style="list-style-type: none"> <li>• <i>A response with knowledge and understanding of the relevant ITGS issues and/or concepts.</i></li> <li>• <i>A response that uses ITGS terminology appropriately in places.</i></li> <li>• <i>A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.</i></li> <li>• <i>Explicit references to the information in the case study or independent research are made at places in the response.</i></li> </ul>
<p><b>Proficient 10–12 marks</b></p>	<ul style="list-style-type: none"> <li>• <i>A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.</i></li> <li>• <i>A response that uses ITGS terminology appropriately throughout.</i></li> <li>• <i>A response that includes conclusions, judgments or future strategies that are well supported and underpinned by a balanced analysis.</i></li> <li>• <i>Explicit references are made appropriately to the information in the case study and independent research throughout the response.</i></li> </ul>