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

Friday 16 May 2014 (afternoon)

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. Each question is worth *[20 marks]*.
- The maximum mark for this examination paper is *[60 marks]*.

Answer **three** questions. Each question is worth [20 marks].

**1. Analysis of external examination grades by an international school**

Students from an international school sit end-of-course exams, which are set by the Oneto7 examination board. The Oneto7 examination board has a secure site from which schools may then download their exam results. The international school uses a spreadsheet to analyse the results.

The results are downloaded as CSV files and are then imported into a spreadsheet showing the data, as in Sheet 1. The CSV files contain data about individual candidates and the final grade awarded for each subject.

	A	B	C	D	E	F	G	H	I	J	K	L
1	NUM	NAME	ART	MUSIC	SCIENCE	ECONOMICS	ENGLISH	SPANISH	FRENCH	GEOGRAPHY	HISTORY	MATHEMATICS
2	257	JANET LEE			7	6	7	7			7	7
3	258	CARMEN SANCHEZ	2		4			5	5	5		3
4	259	ALEXANDRA JAMESON			6	5	5	5				5
5	260	CARLOS SANTANA			7	7	7	7			7	7
6	261	JOSEPH AUBRY	2	5	2			5	5		3	3
7	262	BARBARA DOLORES	2		3	3		5				4
8	263	ALEXIA HUMPHREY	3		3			6	5		3	3
9	264	PAUL GOYESCAS			6	6	6	6	6	6		6
10	265	ADRIAN CHAVEZ			7	7	7	7			7	7

Sheet 1: Examination grades imported from the CSV file provided by the examination board.

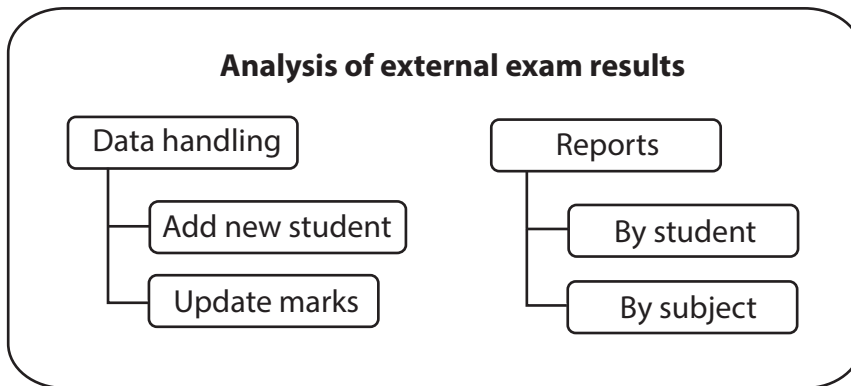
The school uses this information to carry out statistical analyses and to create graphs.

- (a) (i) Identify **two** characteristics of a CSV file. [2]
- (ii) Identify **two** reasons why the Oneto7 examination board would provide files in CSV format. [2]
- (iii) Identify **two** characteristics of a “secure site”. [2]

*(This question continues on the following page)*

*(Question 1 continued)*

The previous headmaster used a database application designed by the IT department in the school that allowed him to list students with certain marks and create specific reports.



The present headmaster would like to analyse the results in more detail. This may include information such as:

- all the students who got 7 in their Spanish exam
- the average grade of the students
- charts to compare different subjects.

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

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

[6]

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

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

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

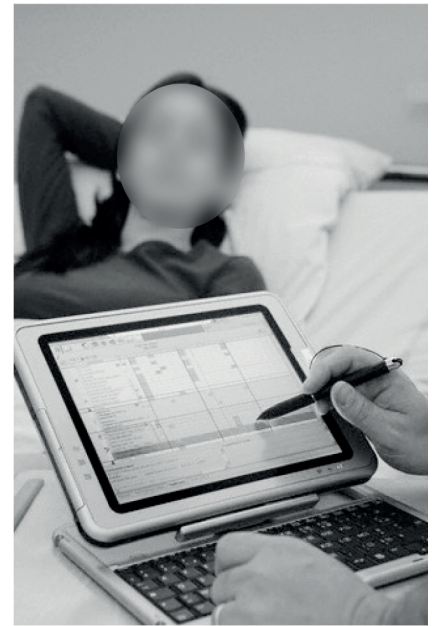
[8]

## 2. Hospital network

A hospital in Perth is upgrading its network resources. They plan to install network switches on every floor and wireless access points\* along the corridors. Switches will be connected to the servers using optical fibre. With these new wireless access points nurses and doctors can now use tablet computers to enter and retrieve patient information throughout the hospital.

There are also plans for all of the 25 hospitals in Perth to connect their LANs to form a WAN in order to share patient information. These plans have run into difficulties for a number of reasons.

One strategy being evaluated is whether to introduce a RFID-based tracking system in the future, which might be used to track equipment, patients and staff, using its wireless network.



[Source: © International Baccalaureate Organization 2014]

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\* wireless access point: a hardware device that allows a wireless device to connect to a network

- (a) (i) Identify **two** characteristics of a WAN. [2]
- (ii) Identify **two** ways data about a patient could be entered into the wireless tablets. [2]
- (iii) Describe the purpose of switches in the network. [2]
- (b) Explain **three** problems that could result from linking 25 hospitals in the city through a WAN. [6]
- (c) Discuss the implications for the staff of the introduction of the RFID-based tracking system in the hospital. [8]

### 3. Online training

Fernando Garcia is a mining engineer based in La Paz, Bolivia. His company has a subscription to a training company that provides online streaming of interactive videos as a service for mining companies. As part of his job, he needs to use these videos to train his staff.

The training company has offered to provide certificates for the participants in the online training but they have to complete the online modules first. These modules have an evaluation area where trainees are required to answer questions related to the videos and participate in discussion forums.

However, most of the work of Fernando’s company is carried out in the Andes mountains, a few hours from La Paz, where internet access can be poor at times.

A colleague informed Fernando that it is possible to download the videos from the training company website using lossy compression. He has downloaded these interactive training videos while in La Paz, so that he and his staff can use the videos when they are in the mountains.

The first video Fernando downloaded had a file size of 720 MB and he used a service with a bandwidth of 800 kb/sec (kilobits per second).

- (a) (i) Calculate the length of time it took to download the 720 MB video. [2]
- (ii) Outline the difference between lossless and lossy compression. [2]
- (iii) Outline the difference between downloading and streaming videos. [2]
- (b) Compare the use of online evaluation tasks versus face-to-face evaluation tasks to assess the skills the trainees may have learned with the training videos. [6]
- (c) Evaluate Fernando’s decision to download the videos and use them to train his staff in the Andes. [8]

#### 4. Indonesia makes progress on its ambitious biometric national identity card project

Indonesia is about to enrol all of its citizens for its biometric national identity card initiative.

The world’s most ambitious biometric national electronic identity card initiative will be a challenge for numerous reasons:

- more than 240 million people
- more than 17 000 islands
- infrastructure difficulties such as unreliable access to electricity and low internet bandwidth.

The enrolment process consists of getting a photograph of the person’s face, fingerprints of all ten fingers, iris images of both eyes, a digitized signature, and biographical information. This personal information is stored in the biometric national identity card database as a record. Each individual record is associated with a personal electronic identity card. This card will contain an image of a fingerprint, a photo and personal information of the citizen.

The national identity scheme is expected to eliminate voter fraud and combat terrorism. However, many other countries have tried to introduce national identity card systems with varying success.

[Source: “Indonesia makes progress on its ambitious biometrics national ID card project”, Paul Mah, October 2, 2012. [www.techrepublic.com](http://www.techrepublic.com). Used with permission. [www.techrepublic.com/blog/asian-technology/indonesia-makes-progress-on-its-ambitious-biometrics-national-id-cardproject/418?tag=nl.e101&s\\_cid=e101](http://www.techrepublic.com/blog/asian-technology/indonesia-makes-progress-on-its-ambitious-biometrics-national-id-cardproject/418?tag=nl.e101&s_cid=e101)]

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

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

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

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

For **each** of the concerns above, explain a policy that could be used to ensure that the concerns of the citizens are addressed. [6]

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

Discuss whether the Indonesian government should continue with the implementation of the national identity card scheme. [8]

## 5. Energy efficient data centres

The Green Grid is an association of IT professionals seeking to raise the energy efficiency of data centres.

Even though companies like *Amazon*, *Google*, *Facebook* and *Apple* are becoming more energy efficient, they are still using large amounts of energy. Consumers are not aware that constant uploading and downloading of large files stores large amounts of information on many data centres. Consumers also expect instant access to these files; this requires the servers and data centres to be permanently active.

It is estimated that the total of the world's data storage is in the region of 300 exabytes (300 million terabytes). It is believed much of this data is redundant.

- (a) (i) Define the term *terabyte*. [1]
- (ii) Identify **three** features/characteristics of data centres that make them consume large amounts of energy. [3]
- (iii) Identify **two** ways that data redundancy may occur in data centres. [2]
- (b) Some governments have decided that data centres will be charged for their environmental impact. This may be done by monitoring the volume of data stored and the energy consumed to maintain the data centre.
- Analyse this decision. [6]
- (c) ORM, a large company, is expanding and the managers are concerned that their IT systems will need an expensive upgrade to be able to manage the increasing amount of data held by the company. The company is considering moving all of its data to an external data centre and relying on their services to store and provide access to this data.
- Discuss whether ORM should move all of its data to a data centre. [8]
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