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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
HIGHER LEVEL
PAPER 2

Friday 6 May 2011 (morning)

2 hours

INSTRUCTIONS TO CANDIDATES

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

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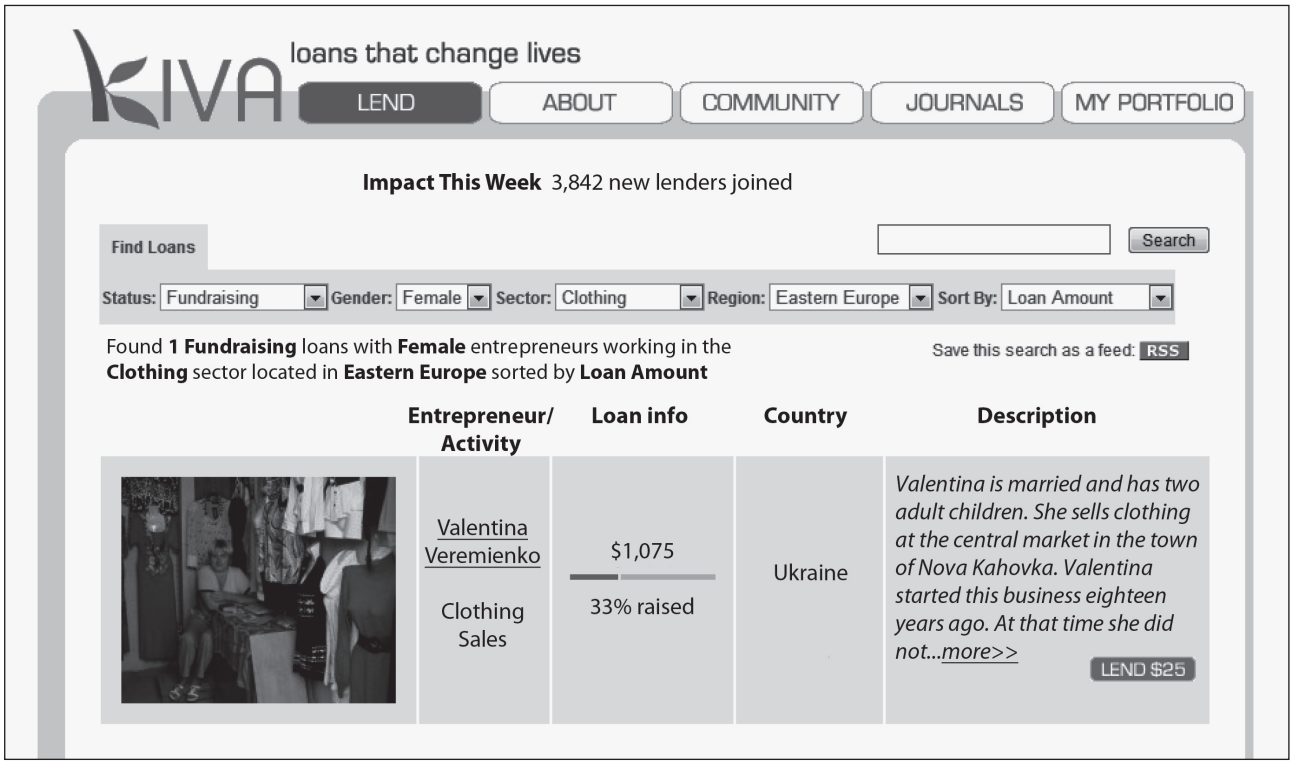
*Answer **three** questions.*

Area of impact: Business and employment

1. *Kiva* is a company that lends money to small businesses in the developing world. Details of each business are displayed on the *Kiva* web site. New businesses wanting loans can sign up, at no cost, and individuals who wish to lend money can register as lenders. Lenders can search the *Kiva* database and choose a new business from countries such as Kenya and Vietnam.

Lenders transfer money to the *Kiva* web site in the form of a loan using *PayPal* or a credit card. Lenders may lend as little as US$25 so a loan is usually shared by many lenders. The loan is complete when the total of individual lenders' loans equals the sum required by the business owner. Provided the business is successful the business owner gradually repays each loan.

Regular electronic feedback is provided to the lenders on the status of their loans and the success of the business. Lenders can also log in to the web site at any time and check current and past loans. Download speeds vary and are often slow in developing countries. Lenders find information about the progress of each loan useful and it makes them feel valued. This often encourages further loans.



[Source: www.kiva.org. Used with permission]

(This question continues on the following page)

(Question 1 continued)

(a) The information about loans is stored in a relational database such as the one illustrated below.

LENDERS
Lender_ID
First_Name
Family_Name
Street
City
Country
Email_Address
Payment_Method

LOANS
Loan_ID
Business_ID
Lender_ID
Amount_Loaned
Date_Loaned

RECEIVER_OF_LOAN (*i.e.* BUSINESS)
Business_ID
Business_Name
Business_Description
Contact_Name
Address
Phone_Number
Loan_Status

(i) Identify the key field in the RECEIVER_OF_LOAN table. *[1 mark]*

(ii) Identify the data type for the field Phone_Number in the RECEIVER_OF_LOAN table. *[1 mark]*

(b) The database administrator wishes to produce an alphabetical list of lenders from France who have contributed at least US$50 after 01/01/2001.

Describe the query that produces the list specified above. *[4 marks]*

(c) The field Business_Description should not be included in the LOANS table because this would lead to data redundancy.

Explain why this could lead to inaccuracies in the database. *[4 marks]*

(d) "*Kiva* provides a data-rich, transparent lending platform. We are constantly working to make the system more transparent to show how money flows throughout the entire cycle, and what effect it has on the people and institutions that lend, borrow and manage it along the way."

[Source: www.kiva.org. Used with permission]

Discuss what online services the *Kiva* web site could provide for effective online reporting back to the lenders about the status of the recipient's business and the loan repayments. *[10 marks]*

Area of impact: Arts, entertainment and leisure / Health

2. The exercise watch is a device which detects physiological parameters (*e.g.* heart rate, body temperature), concerned with an individual's fitness. These parameters are sampled by sensors and stored inside the watch in flash memory. Data can be uploaded to a web site in order to produce a visual display of the user's fitness. Once the memory inside the watch is full, data must be deleted.

Many people who exercise regularly use a device similar to the exercise watch shown below. This acts as a stop watch and includes a timer which allows the user to time laps on a running track.

This exercise watch comes with a chest strap which communicates with the watch so the user can see details of heart rate and calories burned. The heart rate can be recorded every five seconds.

[Source: www.garmin.co.uk. Reproduced with permission]

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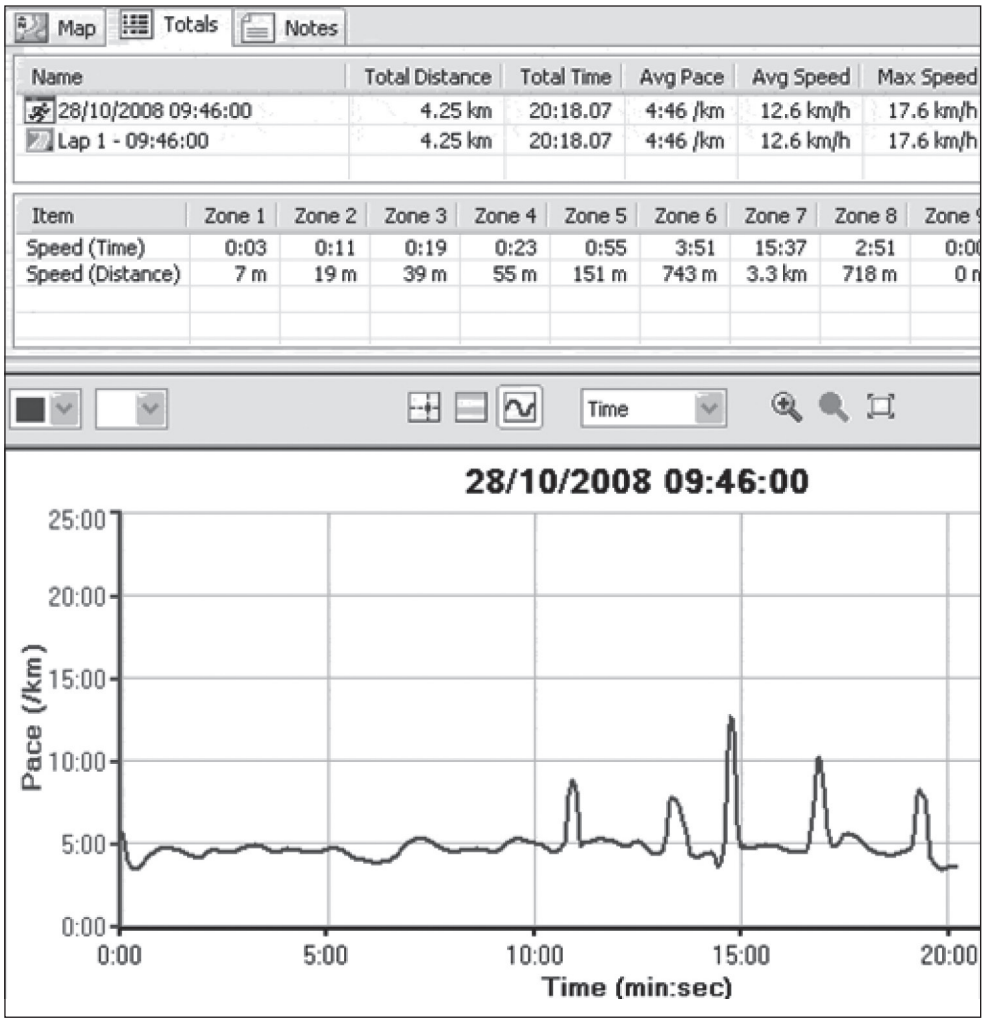
(Question 2 continued)

Suppliers such as *Garmin* have training web sites and data can be uploaded once the exercise is finished. The results can then be displayed as shown in the example below.



[Source: www.garmin.co.uk. Reproduced with permission]

(a) Define the term *sensor*. *[2 marks]*

(b) Describe the steps involved in the transmission of the user's heart rate data to the exercise watch and then to the *Garmin* web site. *[4 marks]*

(c) Some users have seen unusual/unexpected information displayed on the watch.

Explain **two** possible causes of inaccuracies in the data. *[4 marks]*

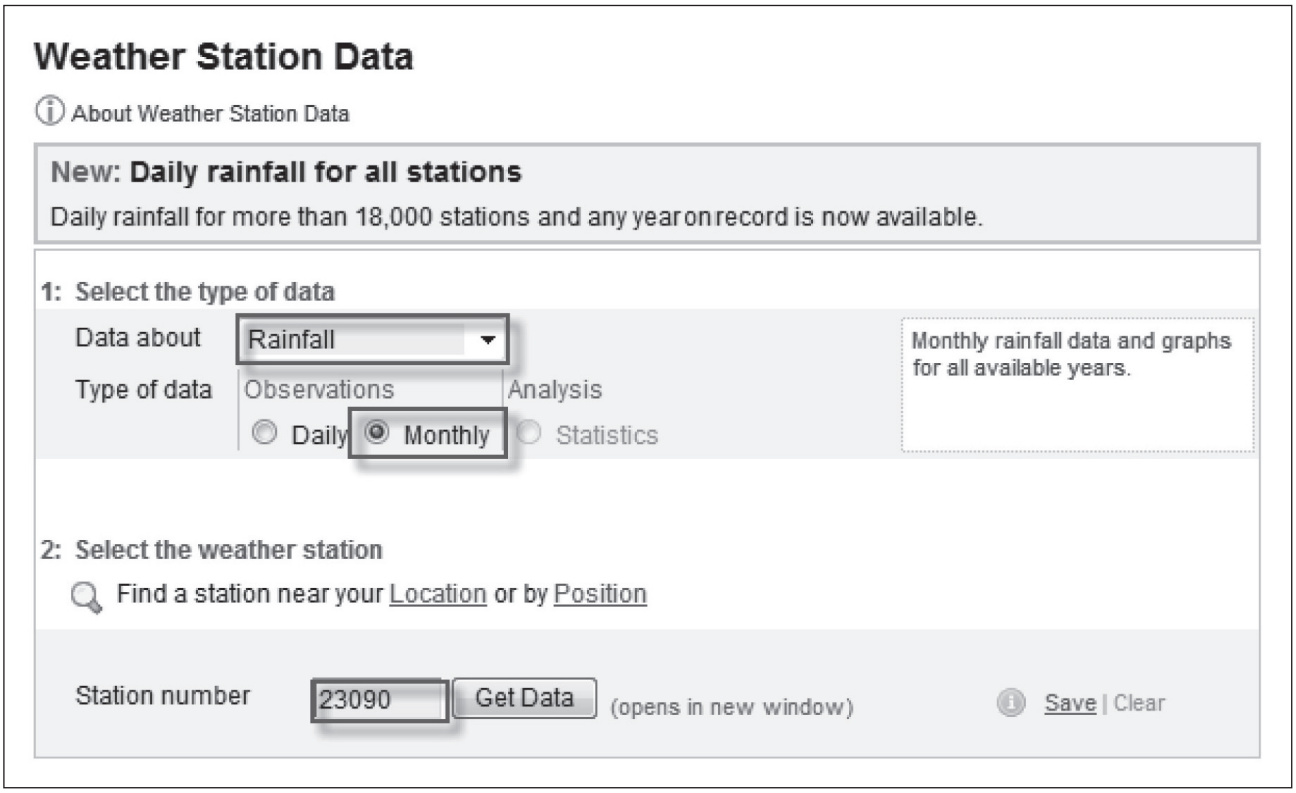
(d) Exercise watches have become very popular for athletes and individuals who exercise regularly. Evaluate the features of this technology for the user. *[10 marks]*

Area of impact: Science and the environment

3. A government bureau of meteorology collects data from weather stations. This data is imported into a database and displayed on a web site.

On the web site (Diagram 1) it is possible for a user to select a particular weather station, *e.g.* 23090, and display data such as temperature, rainfall and other weather conditions, and to choose daily or monthly statistics.

Diagram 1



[Source: http://bom.gov.au. Commonwealth of Australia permission]

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(Question 3 continued)

This data is also used for climatic modelling and is used by companies who need additional analysis of the information provided. This data is stored in the form of spreadsheets.

When station 23090 is selected the screen displays a snapshot of data from Adelaide Hyde Park (Diagram 2). Collection began in 1977 and continues to the present day.

Diagram 2

Monthly rainfall
ADELAIDE (HYDE PARK)

About this page | About monthly rainfall — Data file (csv) | Print file (pdf)

Site name: ADELAIDE (HYDE PARK) **Site number:** 23090 **Commenced:** 1977
Latitude: 34.92° S **Longitude:** 138.62° E **Elevation:** 48 m **Operational status:** Open
Map

Key: Units are millimetres. *12.3* = Not quality controlled.

Highlight data in table: No highlight — Period for calculating statistics: All years / 1961-1990

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Plot													
1977	4	17	34	26	43	59	23	27	48	47	37	15	380
1978	3	7	9	47	53	108	112	69	84	27	46	23	588
1979	40	12	6	71	64	32	74	102	123	66	34	36	660
1980	5	0	0	68	44	98	81	21	24	105	45	35	526
1981	22	4	63	1	60	175	110	112	45	25	30	24	671
1982	21	8	43	67	51	55	32	26	28	15	1	10	357
1983	13	1	106	105	71	48	111	91	69	52	8	17	692
1984	31	3	29	33	52	31	82	109	63	25	53	7	518
1985	4	1	53	45	88	60	44	78	68	38	23	60	562
1986	8	1	2	63	45	37	160	107	70	69	10	33	605
1987	29	25	23	27	128	100	116	30	16	39	6	36	575

[Source: http://bom.gov.au. Commonwealth of Australia permission]

(a) Identify **two** methods of updating a database with data from a spreadsheet. *[2 marks]*

(b) A spreadsheet will be unreliable if data has been entered incorrectly.

Describe **two** ways to prevent the input of invalid data. *[4 marks]*

(c) The output from the spreadsheet (Diagram 2) contains valuable data for users of the web site. Compare **two** different ways a user may choose to save copies of this data to a personal computer (PC). *[4 marks]*

(d) Many companies create their own spreadsheets so they can use the data from the government bureau of meteorology web site in order to assist in their decision-making. Results are often limited due to poor design, maintenance or control of these spreadsheets.

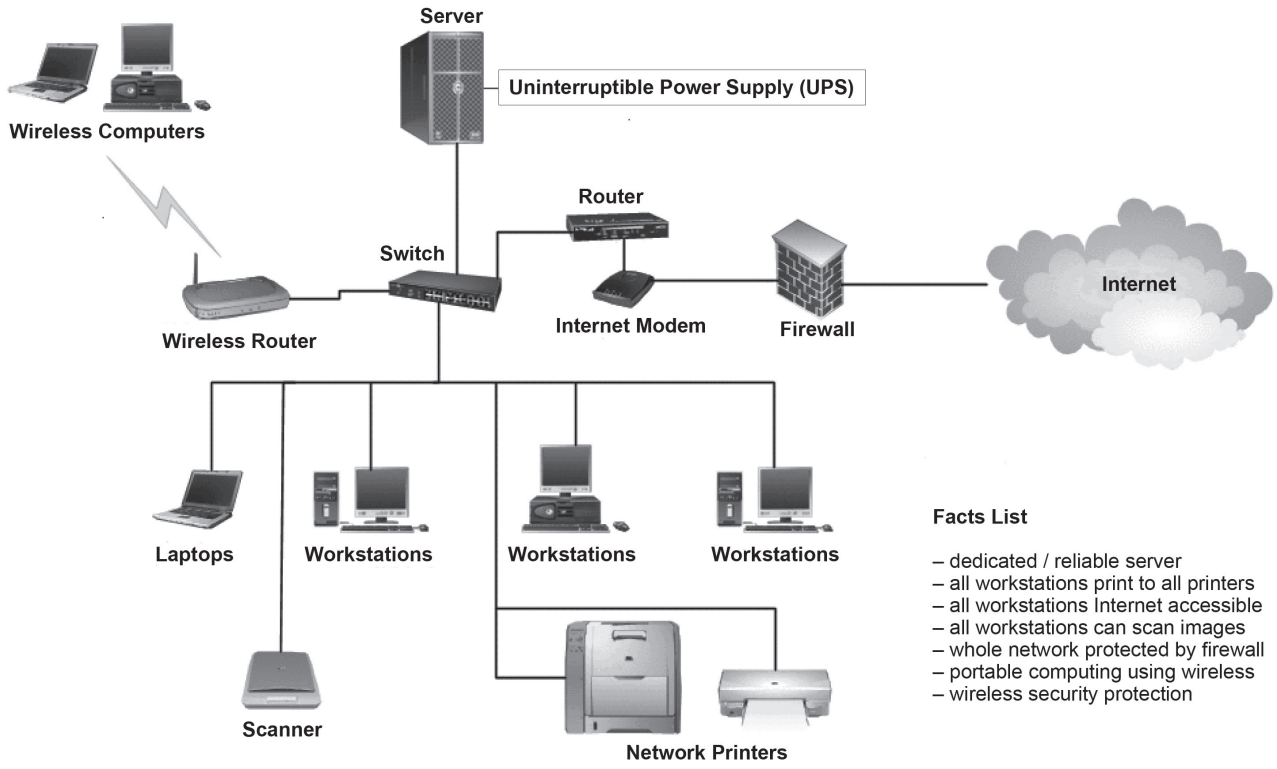
Discuss the policies that a company can implement to overcome such problems. *[10 marks]*

Area of impact: Education / Politics and government

4. A government is donating money to high (secondary) schools in order to improve students' access to computers. The aim is to ensure that high (secondary) schools use the computers in the best possible way. Some schools have already introduced mobile devices, such as personal digital assistants (PDAs), netbooks and laptops instead of desktop personal computers (PCs).

Students may buy a laptop through the school which has applications pre-installed and is configured to access the school network. The school also allows students to bring in their own private laptops.

Below is a diagram of part of a school network.



[Source: adapted from http://creativecomputers.us/images/lan.gi, 19 September 2009]

(a) Identify **two** steps that must be taken in order for students to be able to log in to the school network shown in the diagram above. *[2 marks]*

(b) Describe the role of the uninterruptible power supply (UPS) **and** the role of the firewall shown in the diagram above. *[4 marks]*

(c) Explain why a school may decide to spend their money on training **and** network infrastructure before purchasing more hardware and software. *[4 marks]*

(d) In certain schools, students are able to purchase their own laptops which can be brought into school and configured to access the school network. Evaluate the school's decision to allow this to happen. *[10 marks]*