**Victorian Certificate of Education
2010**

STUDENT NUMBER

Letter

Figures

Words

INFORMATION TECHNOLOGY: SOFTWARE DEVELOPMENT

Written examination

Thursday 11 November 2010

Reading time: **11.45 am to 12.00 noon (15 minutes)**
Writing time: **12.00 noon to 2.00 pm (2 hours)**

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	20	20	20
B	4	4	17
C	13	13	53
			Total 90

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied
- Question and answer book of 22 pages with a detachable insert containing a case study for Section C in the centrefold.
- Answer sheet for multiple-choice questions.

Instructions
- Remove the insert containing the case study during reading time.
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.

- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions

Question 1

If you buy a software licence from a company it means you can

A.   use the software.

B.   sell the software.

C.   make copies of the software to give to friends.

D.   hold the company responsible if your computer fails.

Question 2

A small company uses two floors of a building for its office. A 24-port switch is used on each floor to connect all the computers on that floor. Each computer has a network card and is connected to the switch by cable.

The topology used on **each floor** is

A.   bus only.

B.   star only.

C.   hybrid.

D.   a combination of bus and star.

Question 3

User documentation is prepared in which phase of the Systems Development Life Cycle (SDLC)?

A.   design

B.   analysis

C.   evaluation

D.   implementation

Question 4

Computer systems use protocols to communicate.

A protocol that allows computers to communicate with the Internet is

A.   HTTP

B.   TCP/IP

C.   BIOS

D.   IP Address

The following algorithm applies to Questions 5, 6 and 7.

Begin

    Read T

    If T>35 **then**

        X←'very hot'

    Else

        If T>25 **then**

            X←'warm'

        Else

            If T>20 **then**

                X←'perfect'

            Else

                If T<20 **then**

                    X←'cold'

End

Question 5

When converting the above algorithm into a program it would be best for other programmers if the program used

A.   meaningful variable names and internal documentation.

B.   meaningful variable names and external documentation.

C.   single letter variable names and internal documentation.

D.   meaningful variable names and no documentation.

Question 6

When the above algorithm was tested it was found that it did not provide the correct result when T=20.

This was caused by a

A.   logic error.

B.   syntax error.

C.   run time error.

D.   compile time error.

Question 7

Test the above algorithm with the value T=25.

The variable X will contain

A.   'cold'

B.   'warm'

C.   'perfect'

D.   'very hot'

The following two sets of data are required for Questions 8 and 9.

Data set 1

Date	Customer ID	Customer comment
8/02/2010	24917	customer complained that account was in error
12/02/2010	27493	she thinks our new web access is fantastic (hooray!)
14/02/2010	31113	the customer said he couldn't find where to pay the account
17/02/2010	28033	client wasn't sent an account and can't access our web page
17/02/2010	23715	customer wanted to know how to get web access to

Data set 2

Order number	Request date	Ready date	Number of items
3876	10/01/2010	19/01/2010	1
2108	10/01/2010	20/01/2010	4
3159	10/01/2010	15/01/2010	3
3910	10/01/2010	26/01/2010	5
1674	11/01/2010	28/01/2010	1
1324	11/01/2010	18/01/2010	10
2972	11/01/2010	22/01/2010	4
3657	11/01/2010	13/01/2010	4
1292	11/01/2010	18/01/2010	10
2850	12/01/2010	26/01/2010	6
4037	12/01/2010	21/01/2010	6
3618	12/01/2010	1/02/2010	5
3193	12/01/2010	29/01/2010	6
4381	12/01/2010	1/02/2010	2
1191	12/01/2010	24/01/2010	
3836	13/01/2010	14/01/2010	
3055	13/01/2010	18/01/2010	
3675	14/01/2010	24/01/2010	
4236	14/01/2010	20/01/20	

Question 8

Both data set 1 and data set 2 were obtained from a **new** system.

For which phase of the Systems Development Life Cycle (SDLC) would the data have been collected?

A. design

B. analysis

C. evaluation

D. implementation

Question 9

Select the most correct pair of statements.

A. Data set 1 could be used to measure an **efficiency** objective.
Data set 2 could be used to measure an **efficiency** objective.

B. Data set 1 could be used to measure an **effectiveness** objective.
Data set 2 could be used to measure an **effectiveness** objective.

C. Data set 1 could be used to measure an **efficiency** objective.
Data set 2 could be used to measure an **effectiveness** objective.

D. Data set 1 could be used to measure an **effectiveness** objective.
Data set 2 could be used to measure an **efficiency** objective.

The following information is required for Questions 10, 11 and 12.

The Big Computer Company (BCC) has a project involving the creation of a new information system for The Small Book Store (SBS).

Simon works for BCC. He has just finished installing a new information system at SBS's head office. Cheryl works for SBS. She watches Simon run a series of tests on the new system. At the end of the tests Cheryl signs a document agreeing that the system has passed all the tests.

Question 10

Cheryl's signing of the test document marks a project milestone.

This means that

A. a major point in the project has been reached.

B. a major delay in the project has been avoided.

C. a dependency in the project has been completed.

D. no further work can happen until another task is complete.

Question 11

The procedure carried out by Simon and Cheryl is known as

A. informal testing.

B. software testing.

C. validation testing.

D. acceptance testing.

Question 12

Simon has worked all weekend to get the new information system up and running by Monday morning. SBS had shutdown its old information system on Friday night.

The changeover method being used is

A. pilot.

B. direct.

C. phased.

D. parallel.

Question 13

Assume A=1, B=2 and C=3.

The statement that causes D to become true is

A. If A>B and C>B then D←true

B. If B>A and B>C then D←true

C. If A>B or C>B then D←true

D. If A>B or B>C then D←true

Question 14

The two data types that best store the family name of a person, for example Smith, and their phone number, for example (03) 9999 9999, are

A. Number and Time/Date

B. Number and String/Text

C. String/Text and Time/Date

D. String/Text and String/Text

Question 15
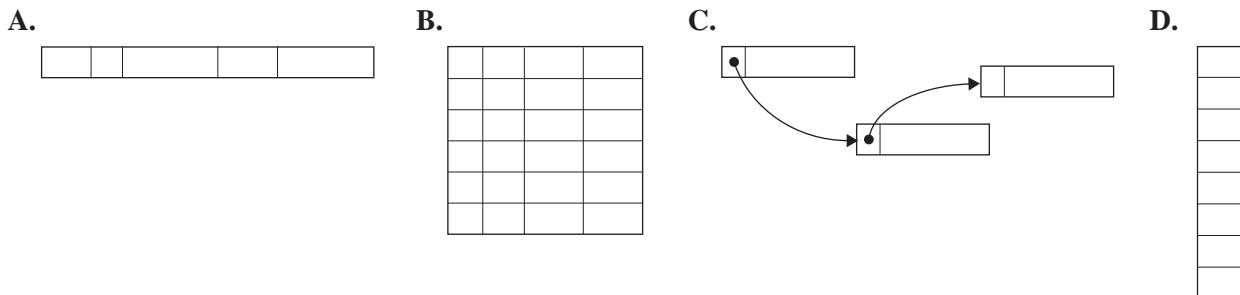
A variable is required to store a true/false value.

The best data type for this variable is

A. Number

B. Boolean

C. String/Text

D. Time/Date

Question 16

Each diagram below represents a kind of data structure.

The diagram that best represents a two-dimensional array is

Question 17

Removing data no longer being used and storing it on a DVD in case it is required in the future is known as

A. archiving.

B. backing up.

C. file disposal.

D. data security.

Question 18

Copying data onto CDs in case the original data is lost is known as

A.   archiving.

B.   backing up.

C.   file disposal.

D.   data security.

Question 19

Below is part of an algorithm that reads and checks passwords. It is to be represented as a Nassi-Schneiderman diagram.

Begin

……

    Get correctpassword

    checkpassword←not correct

    While checkpassword is not correct

        Read code typed on keyboard

        If code equals correctpassword **then**

            checkpassword←correct
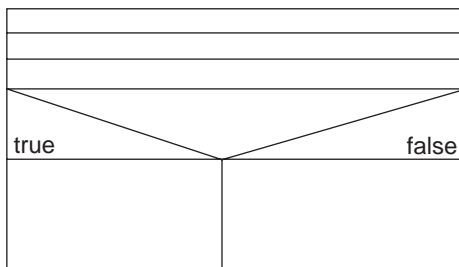
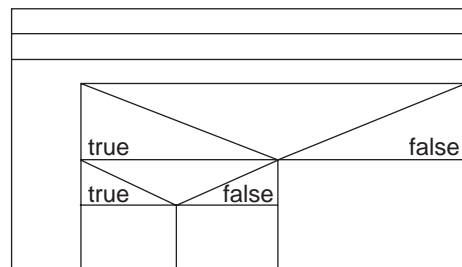   **End If**

    End While

……

End

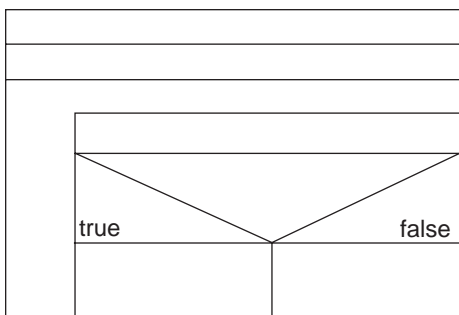Which diagram shows the correct **structure** for this part of the algorithm?

A.
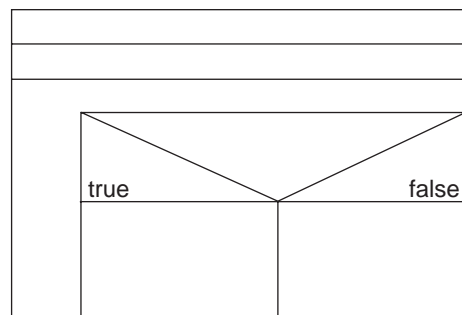

B.

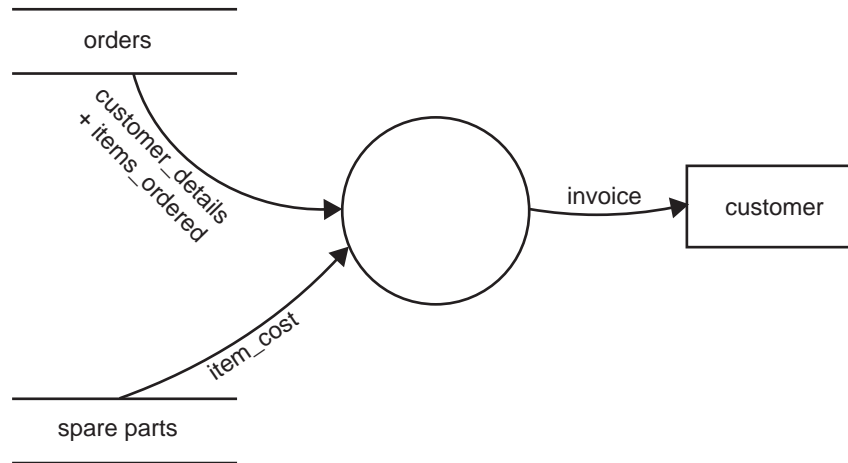C.

D.

Question 20

Which statement best represents what is shown in the data flow diagram above?

A. A customer places an order for a spare part and an invoice is sent to them.

B. A process reads data from two data stores and creates an invoice for customers.

C. Two processes send data to a program which then stores the invoice in a file called customer.

D. Two data flows are combined in a data store to produce a new data flow which then goes to the customer.

SECTION B – Short answer questions

Instructions for Section B

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

Question 1

Sue Sands Super Store has an extensive database of all items that it sells. One of the files in the database uses 3.5 GB (gigabytes) of hard disk space. A new procedure requires individual records from this file to be displayed on the screen. Two alternative methods for obtaining the data have been suggested.

Method 1

At the start of the program read the whole file into memory and search memory each time a record is required.

Method 2

Obtain the record from the file each time it is required.

---

a. State one disadvantage of method 1.

_____

1 mark

b. State one disadvantage of method 2.

_____

1 mark

c. **i.** Outline how the file could be organised to make method 2 more efficient.

_____

_____

ii. Explain why this file organisation will be more efficient.

_____

_____

1 + 1 = 2 marks

Question 2

Threats to computer systems come in many forms.

a.   Explain the key difference between the way viruses and trojans get into a computer system.

2 marks

b.   Explain the key difference between the purpose of spyware and the purpose of viruses.

2 marks

Question 3

Novorodsky Dancing Shoes (NDS) manufactures custom-made dancing shoes in its small Sydney factory. Its information system consists of a database containing product and customer information. The company has a long list of regular customers and it relies on its excellent reputation to get new sales. About 50% of its orders come from Sydney, the rest from other parts of Australia. They are usually made over the phone although some are made by fax or letter. It usually takes about a month to fill an order.

The owner of NDS has decided that it is time for her company to have a presence on the World Wide Web. She would like a website that includes an online ordering page. It will link to NDS's existing database.

a.   In addition to allowing customers to order dancing shoes, state **two** other purposes NDS might have in putting its information system into a global environment.

2 marks

b.   In addition to security concerns, explain one disadvantage for NDS in putting its information system into a global environment.

_____

_____

_____

2 marks

c.   The online ordering page of the website will require a program that allows the user to look at a catalogue of products and place an order. NDS can either buy an existing web-based ordering program or hire a programmer to write its ordering program.

   i.   State one advantage of buying an existing program.

_____

_____

   ii.   State one advantage of hiring a programmer to write NDS's own program.

_____

_____

1 + 1 = 2 marks

Question 4

The main result of the **analysis** phase of the Systems Development Life Cycle (SDLC) is the **logical design** of a new or modified information system. The main result of the **design** phase of the SDLC is the **physical** design of a new or modified system.

a.   Describe the main difference between the logical design and the physical design of a new system.

_____

_____

_____

2 marks

b.   State one type of tool that can be used to represent the **physical** design of a new system.

_____

1 mark

Total 17 marks

END OF SECTION B
TURN OVER

SECTION C – Case study

Instructions for Section C

Answer **all** questions in the spaces provided. Remove the case study insert and read **all** the information provided before you answer these questions. Answers must apply to the case study.

Question 1

At the beginning of his analysis, Percy wants to make sure that he understands why RuraLink is being created.

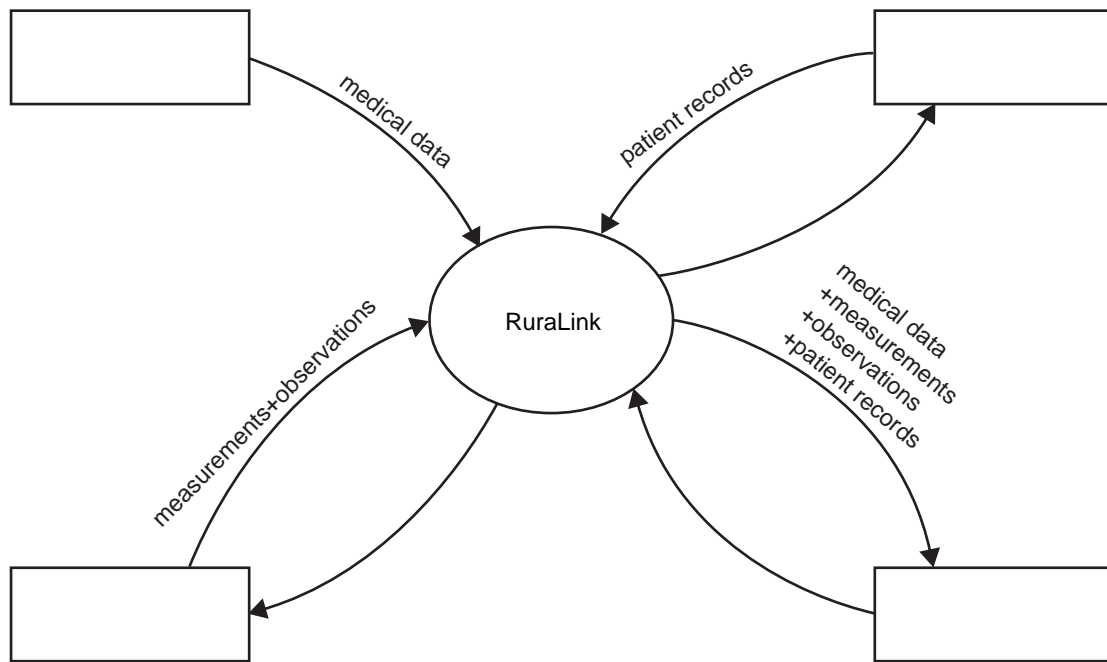**a.** State the government's main reason for the creation of RuraLink.

_____

1 mark

b. Is this a technical, economic or social factor that is prompting change?

_____

1 mark

Question 2

After completing his analysis Percy draws a context diagram for the new RuraLink system. Complete his context diagram by filling in the boxes.

4 marks

Question 3

During his investigation Percy found that a single consultation with a patient could create about 1 GB (gigabyte) of data. He also found that in 0.1% of cases complications can arise up to five years after the consultation. Many doctors told him that it would be an advantage if they could review a patient's video and other data again.

a. Assuming 100 consultations occur across the state on any day, and given that there are 365 days in a year, how much data will need to be stored for five years (ignoring leap years)?

_____

_____

_____

1 mark

Percy has three possible solutions for storing this data.

Solution A: Store all the patient data in the RuraLink system for five years.

Solution B: Store only the data for the 0.1% of cases the doctors wish to review.

Solution C: Store the data onto a DVD and give it to the patients to keep.

b. Select one solution and justify why you think this would be the best choice for RuraLink.

Solution _____

Justification _____

_____

_____

_____

_____

_____

_____

_____

3 marks

Question 4

One of RuraLink's specifications is that a specialist in Melbourne can access patient records stored in a country hospital's database. Patients, however, may have data about them stored at more than one hospital. So that RuraLink can provide data to the specialist from any hospital database, the patients' Medicare numbers will be used as a link between databases.

Percy is writing the program specification. For the section dealing with entry of the Medicare number he writes

If the user makes a mistake entering the Medicare number, the program has to provide as much information as possible about what is wrong. Therefore include these validation tests.

> **Length** – to make sure that the correct number of characters has been entered
>
> **Existence** – to make sure that the number entered exists on Medicare's database
>
> **Null** – to make sure something has been entered
>
> **Type** – to make sure that only numeric characters have been entered

Note: These tests must be performed in the most effective order.

a. Place these validation tests in the most effective order.

1. _____ 2. _____ 3. _____ 4. _____

1 mark

b. Give three reasons why this order is the most effective way of doing these validation tests.

Reason 1 _____

_____

Reason 2 _____

_____

Reason 3 _____

_____

3 marks

Question 5

Percy decides to use a BrandX video camera for the telemedicine trolley. However, Suzie, Percy's chief programmer, found a much higher resolution video camera at a similar cost and reliability. She also makes sure that her camera will be compatible with the other equipment on the telemedicine trolley. Suzie argues that her choice will improve the images the specialists in Melbourne receive in real time.

Explain one other aspect of the system that needs to be checked before changing to Suzie's choice of video camera.

_____

_____

_____

_____

2 marks

Question 6

The specialists in Melbourne require real-time data about patients. Nurses need to use a portable device to

- find patient records on the hospital database
- enter various observations such as blood pressure and pulse rates then **upload** these from the portable device to the telemedicine trolley
- access important blood test results
- read reports from doctors and other nurses.

One way of connecting the portable device to the telemedicine trolley is to use a cable.

a. Suggest another way to connect to the telemedicine trolley.

_____

1 mark

b. Other than cost, explain one major advantage and one major disadvantage of your method.

Advantage _____

_____

Disadvantage _____

_____

2 marks

Question 7

Percy has to decide what type of portable device needs to be purchased for the nurses. The most important feature of these portable devices is the method of communication. Select three essential features from the list below and explain why each is important.

Features
touch screen
battery life
weight
keypad
storage capacity (bytes)
stylus
USB connections
Ethernet connection
screen size

Feature 1 _____

Explanation _____

_____

_____

Feature 2 _____

Explanation _____

_____

_____

Feature 3 _____

Explanation _____

_____

_____

3 marks

Question 8

Percy has decided to first build a trial system. It will connect one country hospital to one Melbourne hospital.

The country hospital chosen for the trial is the Wanlan Base Hospital.

One of Percy's aims in conducting the trial will be to evaluate the software to be used on the telemedicine trolley computer.

Software qualities are measured on the basis of

- effectiveness
- efficiency
- stability
- reliability
- usability
- maintainability.

Percy is proposing four criteria to evaluate the software. For each criterion listed in the table, select from the above list one quality that the criterion is measuring.

Criteria	Software quality
After 1 hour's training the software can be operated by doctors and nurses without further help in 98% of all cases.	
The software can be modified to take on new diagnostic equipment where needed.	
The software uses less than 50% of its allowable bandwidth to transmit data at maximum resolution.	
The software allows all video and images to be transmitted in a clear high-resolution format.	

4 marks

TURN OVER

Question 9

During the trial it was found that when nurses changed their passwords for the portable devices the program failed and they were locked out. Investigation found that entering certain characters caused the problem, so it was decided to limit the passwords to just alphabetic letters and numbers. Suzie has suggested the algorithm below to validate a new password before it is stored in the system. She must now test it.

> **Begin**
>> **Get** Password
>> Charcount←1
>> PasswordChar←1st Character of Password
>> ValidPassword←True
>>
>> **Repeat**
>>> PasswordChar←Next Character of Password
>>> Charcount←Charcount +1
>>> **If** (PasswordChar is **Not** Numeric) **Or** (PasswordChar is **Not** Alphabetic) **Then**
>>>> ValidPassword←False
>>> **EndIf**
>> **Until** Charcount=length(password)
>>
>> **If** ValidPassword=False **Then**
>>> **Print** 'Password rejected'
>> **Else**
>>> **Print** 'Password accepted'
>> **EndIf**
> **End**

Suzie created the test data shown below.

a. For each item of data, give a reason for why that data was chosen.

Test data	Reason for choosing it
12a	
*1a	
1*a	
1a*	

4 marks

b. Suggest one other item of data that will test another aspect of the password procedure and explain why it should also be used.

Test data _____

Explanation _____

_____

_____

2 marks

Question 10

a. For the algorithm in Question 9, complete the test table below showing what output is expected from the test data and what it actually produces.

Test data	Expected output	Actual output
12a		
∗1a		
1∗a		
1a∗		

2 marks

Suzie found her algorithm does not produce the output expected.

b. Explain why the algorithm is giving the wrong output.

_____

_____

_____

_____

_____

2 marks

c. Explain how the algorithm could be corrected.

_____

_____

_____

_____

_____

3 marks

SECTION C – continued
TURN OVER

Question 11

The new telemedicine trolley for Wanlan Base Hospital arrived with three large printed technical manuals for each component of the hardware and software. These manuals were left with the trolley for the staff to use. The doctors and nurses who are to use the trolley have complained to management that the manuals are unsuitable.

a. Explain why these technical manuals are not suitable for use by the doctors and nurses.

_____

_____

_____

1 mark

b. Identify two different types of user documentation that would be more suitable for the doctors and nurses. State reasons for your choices.

Type 1 _____

Reason _____

_____

_____

Type 2 _____

Reason _____

_____

_____

4 marks

Question 12

With the new system in place, Wanlan Base Hospital must now decide on a suitable training program for users of the system before it can be put to use.

Doctors and nurses must use this system.

a. Identify one other key group of staff that must have training in the operation of this new equipment.

_____

1 mark

Percy has developed a training strategy for the hospital and has recommended that all staff be trained on site.

b. Discuss why he has recommended this strategy.

_____

_____

_____

_____

2 marks

The hospital has been offered a one-day intensive training session for each member of staff.

c. Suggest one reason why a one-day session is not considered the most appropriate by the hospital management.

_____

_____

_____

_____

2 marks

Question 13

In order to evaluate the success of the new system, the hospital needs to collect data from the system to determine whether the goals and objectives have been achieved.

One of the key hospital goals for RuraLink is to improve country patient outcomes through timely specialist treatment of serious medical issues via the telemedicine trolley.

Data can be collected to evaluate the extent to which the hospital's goal was achieved.

Give two examples of data that could be collected, and explain how this data would be used.

Data 1 _____

How this data would be used to evaluate the achievement of the goal _____

_____

_____

Data 2 _____

How this data would be used to evaluate the achievement of the goal _____

_____

_____

4 marks

Total 53 marks

END OF QUESTION AND ANSWER BOOK

CASE STUDY INSERT FOR SECTION C
Please remove from the centre of this book during reading time.

TURN OVER

Case study

Country hospitals are finding it difficult to employ specialist doctors. To deal with the problems caused by this, it was suggested that doctors in country hospitals be put in touch with specialists in Melbourne via the Internet. The government decided to set up a project to create the suggested system naming it RuraLink.

Percy Farmer has been hired to manage the RuraLink system. He was told that RuraLink must allow

- the specialists in Melbourne to obtain medical data about patients directly from equipment, such as heart-rate monitors, X-ray machines, ultrasound scanners and video cameras
- the specialists to access patient records in the country hospital databases
- doctors and nurses at the country hospitals to send any measurements or observations they make; for example patients' weight or a description of injuries
- the specialists in Melbourne to provide immediate advice to the country hospital doctors and nurses.

Percy drew this diagram (Figure 1) to help him understand what was required.
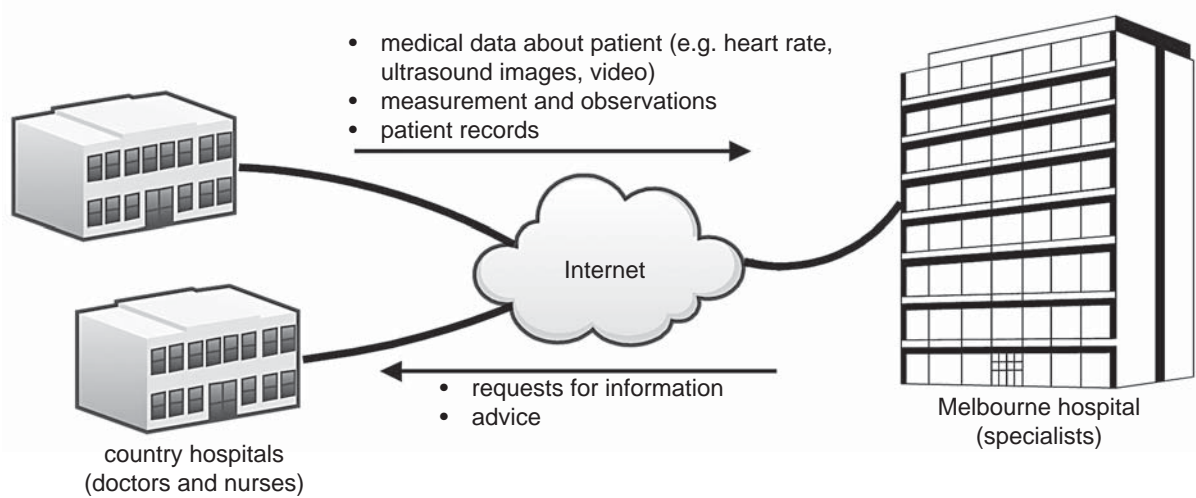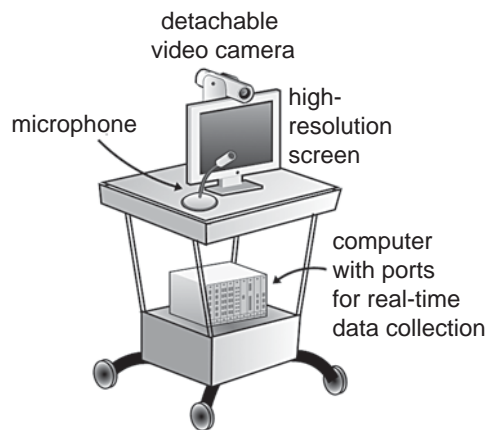

Figure 1

After some investigation Percy found that all country hospitals have a computer-based administration system. These systems are usually small local area networks with workstations located in the administration area, at each ward desk, and in the emergency department, as shown in Figure 2. To keep costs to a minimum Percy has decided that RuraLink should use as much of the existing country hospital's system as possible.
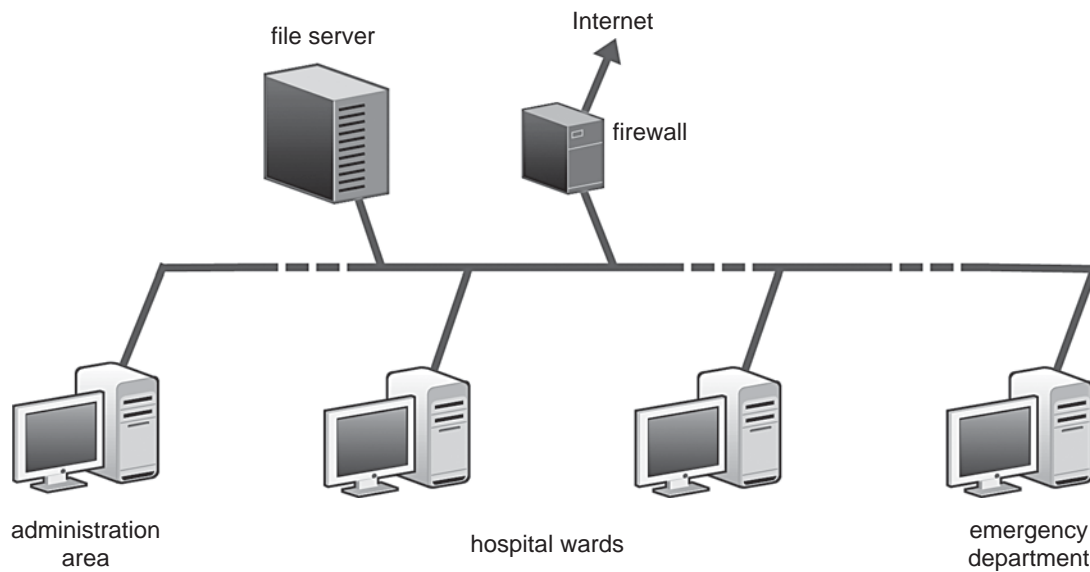
Figure 2

Percy's investigations have also found that it would be better if the equipment came to the patients rather than having the patients moved to the equipment. He drew a diagram showing how a 'telemedicine' trolley might be used to bring the equipment to the patients. It is shown in Figure 3.

The computer on the telemedicine trolley will connect to a country hospital's network and use its Internet connection to send data to Melbourne.

Figure 3

END OF CASE STUDY INSERT FOR SECTION C