



# Victorian Certificate of Education 2007

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

Letter

Figures

Words


## INFORMATION TECHNOLOGY: SOFTWARE DEVELOPMENT

### Written examination

Thursday 15 November 2007

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	5	5	20
C	15	15	53
			Total 93

- 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 25 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

### Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

### Question 1

A recently developed piece of software requires 512 MB of RAM to run effectively.

Based on the information provided below, which laptop is definitely able to run this software?

A.



**GSX Super Notebook**  
Features include:  
Celeron 1.8 GHz, 15" XGA  
60 GB HDD, DVDRW  
LAN, WIFI

B.



**HSV Games Notebook**  
Features include:  
Core Duo 2.0 GHz  
256 MB RAM  
100 MB HDD, Bluetooth  
DVDRW

C.



**SP Business Notebook**  
Features include:  
Core Duo 1.66 GHz  
120 GB HDD, wireless LAN  
256 MB RAM upgradable

D.



**GTX Student Notebook**  
Features include:  
Celeron 1.66 GHz  
17" WXGA, 1 GB RAM  
80 GB HDD, LAN, Bluetooth

### Question 2

Stages of software development include

- A. designing, testing, operating.
- B. analysing, testing, documenting.
- C. analysing, coding, documenting.
- D. solving, implementing, evaluating.

### Question 3

An 'array' and a 'record' are two types of data structure.

The main difference between the two is that

- A. arrays can only store the same type of data in each element.
- B. records can only store the same type of data in each field.
- C. arrays can only store numeric data.
- D. records can only store textual data.

**Question 4**

A text editor can be used to

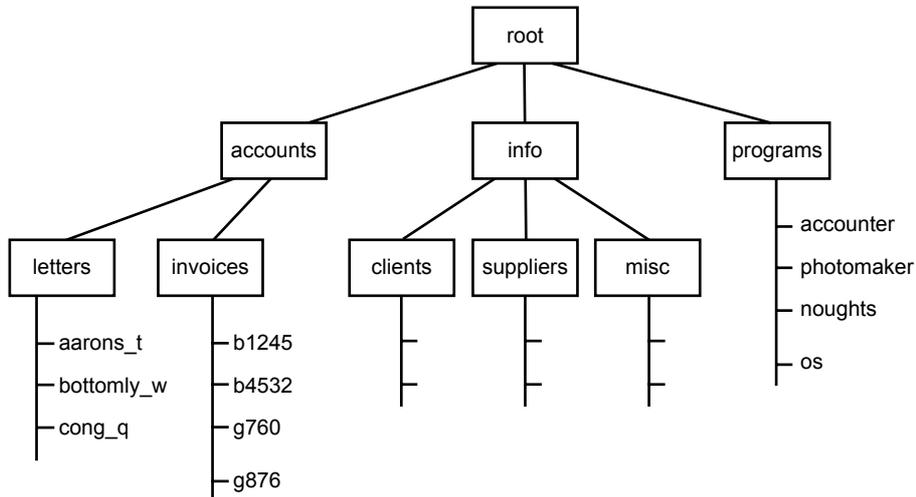
- A. view and edit program icons.
- B. write and test programs without the need for other software.
- C. test programs and make any necessary corrections.
- D. write programs which can then be tested using another program.

**Question 5**

When evaluating a piece of software for the role required, the best criteria to use would be

- A. stability, reliability and usability.
- B. stability, reliability and popularity.
- C. reliability, sustainability and usability.
- D. usability, popularity and flexibility.

*The following diagram shows the folder structure for a file server.  
Use this diagram to answer Questions 6 and 7.*

**Question 6**

The box labelled 'accounts' in the diagram is best described as

- A. a file.
- B. a folder.
- C. a hard disk.
- D. a field.

**Question 7**

The full path to invoice b4532 is

- A. invoices\b4532
- B. accounts\invoices\
- C. root\accounts\invoices\
- D. root\accounts\invoices\b1245\

**Question 8**

The product code **T39.04** is best stored as the data type

- A. floating point.
- B. integer.
- C. text (string).
- D. Boolean.

*The following information is to be used to answer Questions 9, 10 and 11.*

Programs A, B and C were run 1000 times each on the same computer. The following statistics were obtained.

	<b>Program A</b>	<b>Program B</b>	<b>Program C</b>
Total number of errors in output	4	7	3
Average running time	3.2 s	2.9 s	3.5 s
Total number of fatal errors (program 'crash')	1	0	1

**Question 9**

Which statement about efficiency is supported by the evidence in the table?

- A. Program A is more efficient than Program C.
- B. Program B is not as efficient as Program A.
- C. Program C is the most efficient program.
- D. Program A and Program C are both more efficient than Program B.

**Question 10**

Which statement about reliability is supported by the evidence in the table?

- A. Program A is more reliable than Program C.
- B. Program C is as reliable as Program A.
- C. Program A is not as reliable as Program B.
- D. Program C is the most reliable program.

**Question 11**

Which statement about stability is supported by the evidence in the table?

- A. Program B is an unstable program.
- B. Program A is as stable as Program C.
- C. Program B is the least stable program.
- D. Program C is more stable than Program B.

**Question 12**

The following IF statement needs to be tested.

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IF b > 10 AND b < 20 THEN
    PRINT b
ENDIF

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The best set of test data for **b** to test this algorithm is

- A. 10, 11, 15, 19, 20
- B. 8, 9, 10, 11, 20
- C. 9, 10, 12, 20, 21
- D. 8, 9, 10, 20, 21

**Question 13**

After making substantial changes to its information system, BTQ Pty Ltd kept a logbook of all errors encountered when running the new software. System users were also monitored to see how quickly they completed certain tasks when using the new system. After six months the system performance data was analysed and a report was written for BTQ's management.

Which aspect of the System Development Life Cycle is described above?

- A. the analysis phase
- B. the evaluation phase
- C. the testing phase
- D. the operational phase

**Question 14**

Here is a summary of an error log for one of the objectives of a transaction processing system.

Total	1 378 467
Successful scans	1 325 411
Unsuccessful scans	53 056
%	3.85%

This data would show that the objective has been met if the objective was

- A. a success rate of less than 4%
- B. a response rate of less than 4%
- C. an accuracy rate of less than 4%
- D. a failure rate of less than 4%

**Question 15**

What is Spyware?

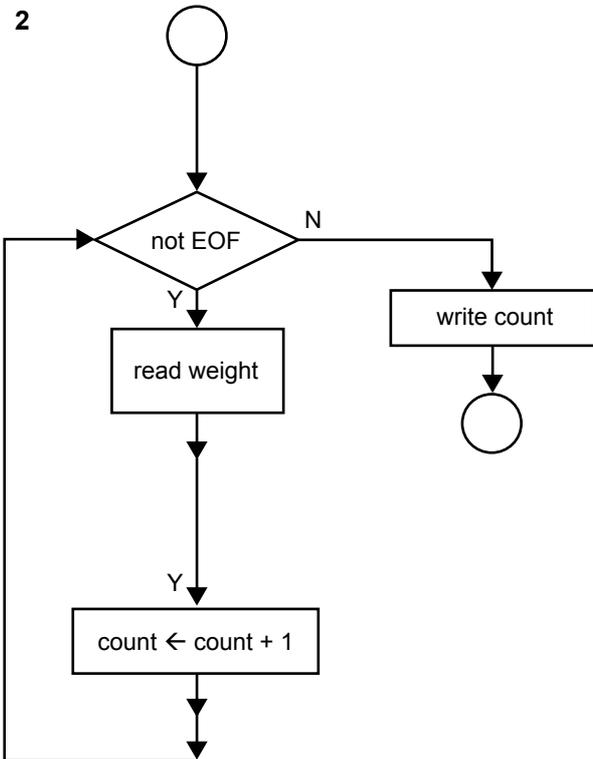
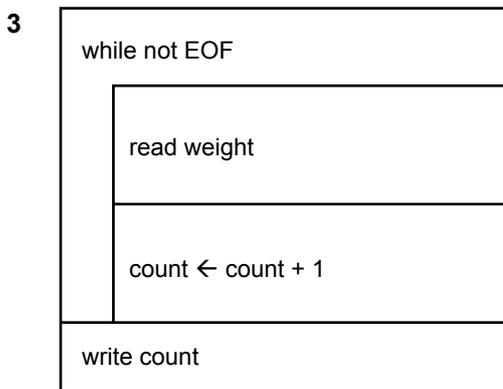
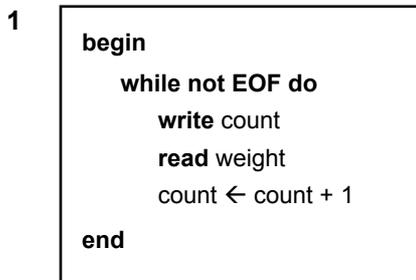
- A. any program that runs on your computer to detect spies
- B. any program that is triggered by a specific date
- C. any program that replicates itself on your computer
- D. any program that monitors what you do on your computer in order to use this information without you knowing

**Question 16**

The clock speed of a CPU is measured in

- A. bits per second.
- B. bytes per second.
- C. hertz.
- D. gigs.

**Question 17**



Which statement about diagrams 1, 2 and 3 is true?

- A. The algorithm represented by diagram 1 is the same as that represented by diagram 2.
- B. The algorithm represented by diagram 2 is the same as that represented by diagram 3.
- C. The algorithm represented by diagram 3 is the same as that represented by diagram 1.
- D. All three diagrams represent the same algorithm.

**Question 18**

A program is being designed for a networked desktop computer that has 120 GB available on its hard disk drive. It will have to read data from a 500 MB file on a CD-ROM. The CD-ROM drive is on the computer that will run the program. The programmer would like the program to run in the shortest time possible.

The main factor that the programmer will have to consider when designing the program is

- A. data transfer rate over the network.
- B. the size of the computer’s hard disk drive.
- C. the time taken to retrieve data from the CD-ROM.
- D. the time taken to write data to the CD-ROM.

**Question 19**

When implementing a new system, a large chain of supermarkets decides to install the system in one supermarket while the others continue to use the existing system. When all bugs are fixed the system will be installed at the other supermarkets.

This is an example of

- A. pilot conversion.
- B. direct conversion.
- C. phased conversion.
- D. parallel conversion.

**Question 20**

To assist a technician to **install** a new server on an existing system, which of the following documents would be useful?

- A. server technical manual, operating system manual, applications manual
- B. server technical manual, system recovery manual, networking manual
- C. server technical manual, networking manual, operating system manual
- D. server technical manual, backup manual, system recovery manual

**SECTION B – Short answer questions**

**Instructions for Section B**  
Answer **all** questions in the spaces provided.

**Question 1**

Describe the differences between a bus, a star and a hybrid network topology.

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3 marks

**Question 2**

Robert is a professional photographer who saves an average of 100 pictures (each approximately 2 MB) per day. The hard disk on his computer is rapidly filling up.

- a. If he saves pictures on 300 days a year, how much storage space (in Gigabytes) will one year’s images take?

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1 mark

Judy suggests that he burns the images onto CDs and then removes these images from his hard disk.

- b. Describe **one** problem that Robert may have using CDs as his only photo storage solution.

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2 marks

- c. Describe and justify a better solution for Robert to use to store his pictures and keep them safe.

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3 marks

**Question 3**

For each of the acceptance criteria listed below, describe a testing procedure that would show if the criterion was being met.

Acceptance criteria	Testing procedure
The server must have less than two failures in a month	<hr/> <hr/> <hr/> <hr/>
The network is able to have 150 computers logged on at the same time without crashing	<hr/> <hr/> <hr/> <hr/>
More than one user can be using the system and updating the same files at the same time	<hr/> <hr/> <hr/> <hr/>
Records can always be retrieved in less than four seconds	<hr/> <hr/> <hr/> <hr/>

4 marks

**Question 4**

Hungarian notation is a naming convention for program elements such as variables and objects. The convention is that the first two or three letters of the element's name indicate the type of element. The rest of the name indicates its purpose, and starts with a capital letter; for example a text box containing a first name could be called **txtFname**. State **three** benefits of this method of naming.

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3 marks

**Question 5**

Mick had been an IT teacher at BN College for 15 years. During this time, he had created and supported their administrative system. Management wanted to sell the system to other schools to earn funds for the school. Mick rejected this idea claiming it would create too much work and would interfere with his teaching. Last year Mick moved to a new school in the new suburb of Melinda. He immediately adapted and installed his administrative system in his new school to the disapproval of the management of BN College.

Identify and discuss a legal **or** ethical issue involved in this situation.

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4 marks

Total 20 marks

**SECTION C – Case study**

**Instructions for Section C**

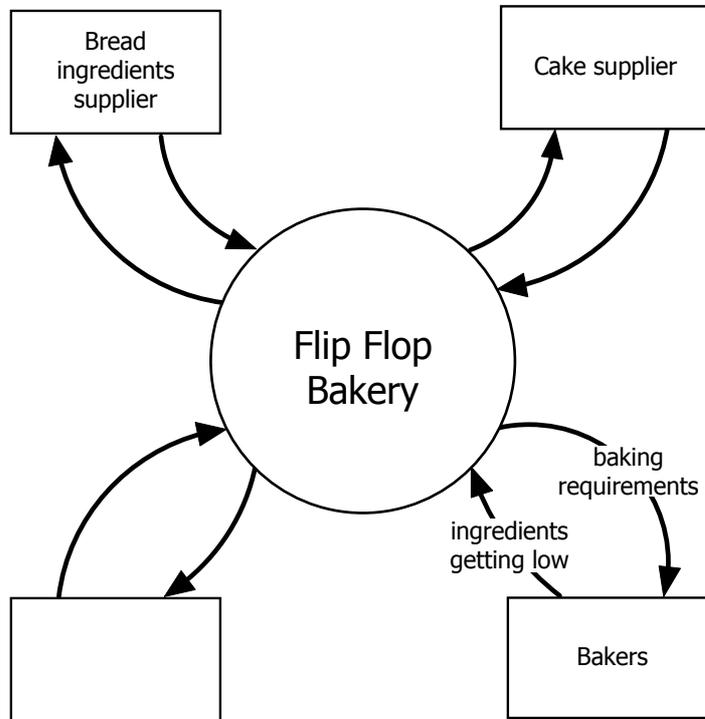
Answer **all** questions in the spaces provided. Remove the case study insert and read **all** the information provided before you answer these questions. Answers must apply to the case study.

Kayla knows that to help Sebastian she must first fully understand the problems, and then analyse the current system.

To start her system analysis, Kayla has drawn the diagram (Figure 1) **in the case study insert**. It shows the movement of goods, invoices and orders associated with Flip Flop Bakery’s operation, and the role of the various people involved. She now has to create a logical design for the bakery’s information system by drawing a context diagram and data flow diagrams, as well as constructing a data dictionary.

**Question 1**

Kayla has started the context diagram.



a. The label for the unnamed entity should be \_\_\_\_\_ 1 mark

b. Figure 1 in the case study insert shows three arrows going between the Cake supplier and the Bakery, but the context diagram only shows two. Explain this difference.

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1 mark

- c. Kayla has based her context diagram on Figure 1. Explain why she has drawn the Bakers as a separate entity.

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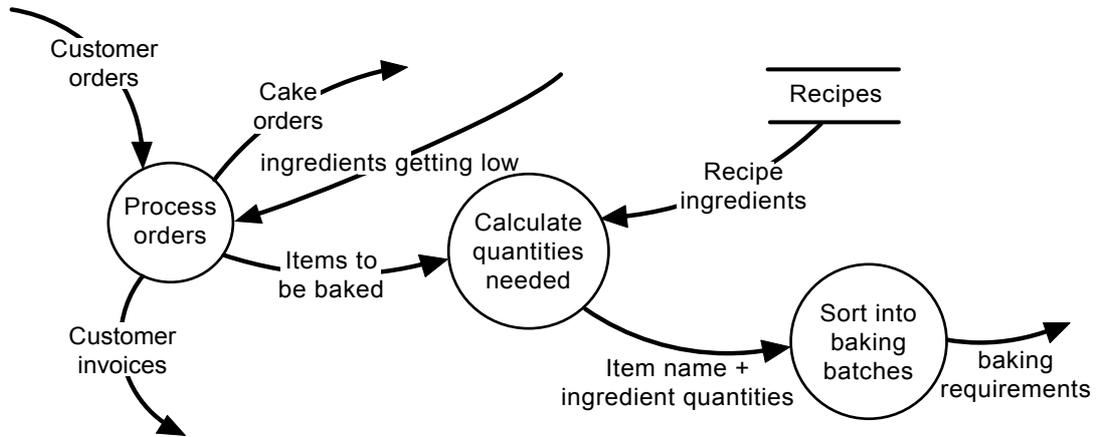
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1 mark

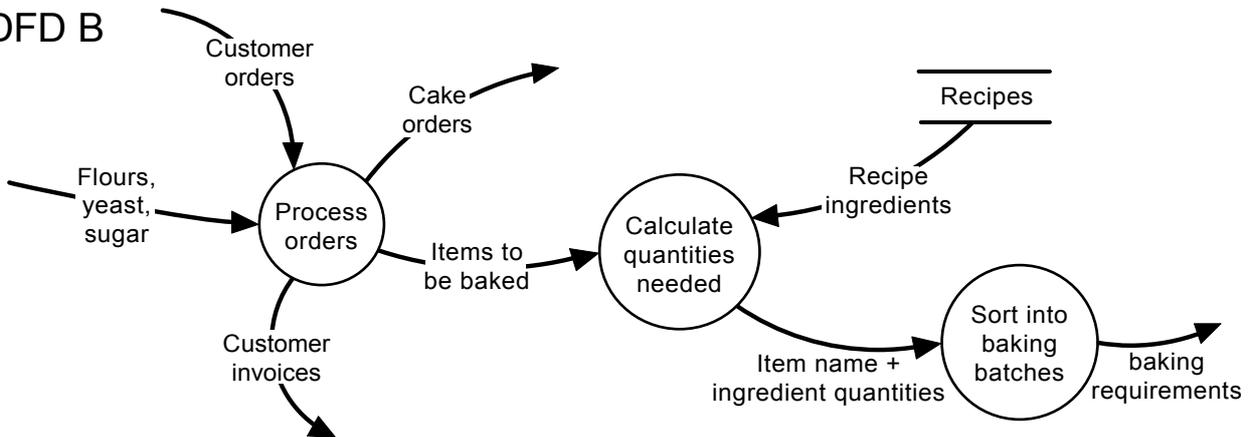
**Question 2**

Kayla has made three attempts to draw a data flow diagram for the processing of customer orders and determining the baking requirements. Consider the accuracy of the DFDs shown below.

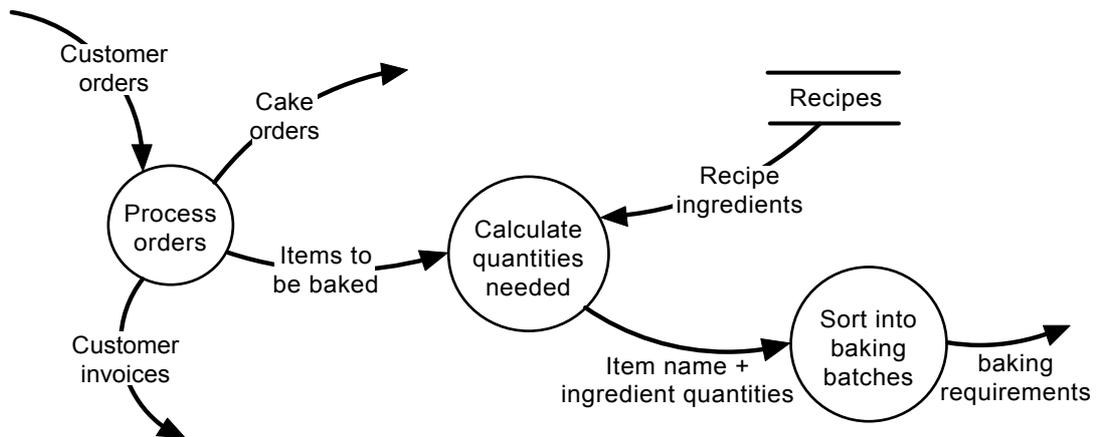
**DFD A**



**DFD B**



**DFD C**



- a. Identify the **most correct** data flow diagram.

DFD \_\_\_\_

1 mark

- b. Explain what the main error is in each of the other two data flow diagrams.

DFD \_\_\_\_ is incorrect because \_\_\_\_\_

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DFD \_\_\_\_ is incorrect because \_\_\_\_\_

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2 marks

Kayla has also created a data dictionary, part of which is shown below.

<b>Flip Flop data dictionary – page 3</b>	
<b>Name</b>	<b>Description</b>
Items to be baked	List of bread and bread rolls (items) to be baked for next day's requirements Composed of: Item name + quantity required
Recipe ingredients	Ingredients and quantities needed to bake a particular item Composed of: Item name + number made + ingredients list
Calculate quantities needed	Use recipe ingredients and items baked to work out how much of every ingredient is needed
Item name	Name of item to be baked; for example, multigrain loaf, bread roll

- c. Identify one inappropriate entry in the data dictionary and explain why it is inappropriate.

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2 marks

Kayla has completed her analysis of the system. She has decided to start the design of the new system with the design of the software. From her analysis she knows that one thing the system has to do is to calculate the required amount of each ingredient.

She designs an algorithm that

- reads a file to get the total number of different ingredients Sebastian keeps in stock (Num\_Ingredients)
- for each bread item (Product\_ID) ordered, uses recipe data and the number of items ordered (Num\_Ord) to calculate the amount of each ingredient required for that item (Amount\_Req)
- adds the ingredient amounts required for each item to get the total quantity needed for each ingredient Qty ( )

The procedure will have passed to it data that lists the amount of each ingredient required for every bread item made by the bakery (Product\_Recipes)

Here is Kayla's algorithm.

PROCEDURE Calc\_Qty(Product\_Recipes)

BEGIN

Open File

Ingredient\_ID  $\leftarrow$  1

READ Num\_Ingredients

REPEAT

Qty(Ingredient\_ID)  $\leftarrow$  0

Ingredient\_ID  $\leftarrow$  Ingredient\_ID + 1

UNTIL Ingredient\_ID > Num\_Ingredients

REPEAT

READ Product\_ID, Num\_Ord

Ingredient\_ID  $\leftarrow$  1

REPEAT

Ingredient\_ID  $\leftarrow$  Ingredient\_ID + 1

Amount\_Req  $\leftarrow$  Num\_Ord \* Product\_Recipes(Product\_ID, Ingredient\_ID)

Qty(Ingredient\_ID)  $\leftarrow$  Qty(Ingredient\_ID) + Amount\_Req

UNTIL Ingredient\_ID = Num\_Ingredients

UNTIL End Of File

Close File

END

### Question 3

- a. What is the purpose of the **first** REPEAT – UNTIL loop?

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1 mark

To test the algorithm Kayla decides to use some simplified test data with only 1 bread product and only 3 ingredients.

- b. Using the data below complete the test table.

**Test data**

Variable	Initial value
Num_Ingredients	3
Product_ID	1
Num_Ordered	10
Product_Recipes(1,1)	0.15
Product_Recipes(1,2)	0
Product_Recipes(1,3)	0.20

**Test table**

Variable	Expected value	Actual value
Qty(1)		
Qty(2)		
Qty(3)		

3 marks

- c. Describe the error in the algorithm.

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1 mark

- d. Suggest **one** way the algorithm could be altered to fix this error.

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2 marks

**Question 4**

Complete the following data table by inserting the correct data type from the options **integer**, **floating point**, **string**, **boolean**, **one dimensional array** and **two dimensional array**.

Variable	Use	Type
Ingredient_ID	Loop Control on Ingredient ID	integer
Num_Ingredients	Total Number of Ingredients	
Qty()	Quantity in kilos of an Ingredient	
Product_Recipes()	Quantity of a particular item required for a single product	

3 marks

**Question 5**

Kayla and her uncle Michael, an experienced programmer, were discussing the best file structure to use to store the orders for each day. Sebastian has 300 regular customers who have different orders for each day of the week. As well he can have 50 casual orders on any day. Twenty-five per cent of his regular customers alter their daily order from week to week. Kayla suggests using a simple **Serial** Access file while Michael argues that due to the number of changes each day, a **Random** Access file would be best.

For the bakery's application, explain the advantage of the Random file structure for the organisation of this data.

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2 marks

**Question 6**

As part of the design of the new system, Kayla must decide what kind of mobile device the drivers should use. She has a choice of the following.

- A laptop – this will be used to enter and store orders which will then be uploaded to the bakery’s computer on return.
- A Personal Digital Assistant (PDA) – this will be used to enter and immediately transmit orders from the van to the bakery’s computer.
- A mobile phone – this will be used to text or phone the orders from the van to Sebastian at the bakery.

State two advantages of each device for the **given use**.

Laptop

Advantage 1 \_\_\_\_\_

\_\_\_\_\_

Advantage 2 \_\_\_\_\_

\_\_\_\_\_

PDA

Advantage 1 \_\_\_\_\_

\_\_\_\_\_

Advantage 2 \_\_\_\_\_

\_\_\_\_\_

Mobile phone

Advantage 1 \_\_\_\_\_

\_\_\_\_\_

Advantage 2 \_\_\_\_\_

\_\_\_\_\_

6 marks

**Question 7**

Kayla has decided that the best device for the delivery drivers to take orders would be a Digital PDA. These will be used to transmit orders from the van to the Bakery’s computer. Sebastian agrees with this choice. Kayla has three PDA models to choose from. The specifications are given below.

Key features	Peach	Watermelon	Strawberry
RAM	8 MB	32 MB/expansion slot	16 MB
Display	65 000 colours	65 536 colours	65 536 colours
Input	touch screen	QWERTY keyboard; touch screen	QWERTY keyboard
Connectivity	Internet enabled mobile phone	Bluetooth	Internet enabled mobile phone
Battery	Rechargeable/replaceable	Rechargeable/replaceable; extra cell	Rechargeable/replaceable; extra cell
Processor	200 MHz	400 MHz	300 MHz
Resolution	320 × 320	480 × 640	480 × 640
Camera	no	yes	no

Considering the role that the PDAs will have, recommend the most suitable model. Give **two** reasons to justify your answer.

Recommended PDA \_\_\_\_\_

Reason 1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Reason 2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4 marks

**Question 8**

Kayla now plans to set up the new system.

She explains that buying the bakery computer and PDAs and setting them up will take about 3 days; writing, testing and debugging the programs for the bakery computer will take 20 days; writing, testing and debugging the programs for the PDAs will take 15 days; and testing the whole system and making sure it works could take 5 days.

a. Complete the Gantt chart below to show how the four tasks could be completed inside **30 days**.

Task	5	10	15	20	25	30	35	40	45	50
Buy and set up equipment										
Program computer										
Program PDAs										
Test system										

4 marks

b. The task ‘test system’ is dependent on both programming tasks being completed first. Show this on your Gantt chart above.

1 mark

**Question 9**

Michael has agreed to help write the programs for the new system. He has advised Kayla that he wants the programs to have good internal documentation: they should contain comment lines and all variables and procedures should have meaningful names. Kayla feels this is a waste of time as she can program much faster with short variable names and no comments.

Explain why Kayla should follow Michael’s advice.

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2 marks

**Question 10**

Kayla is writing the program for the PDAs. She is concerned that the drivers may accidentally enter the wrong information into the PDA.

Describe what type of data validation Kayla needs to code into her program to limit the following possible errors.

- a. A driver enters 100 dozen loaves instead of 1 dozen loaves

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1 mark

- b. A driver tries to enter an order for a bread product that Flip Flop Bakery does not make

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1 mark

**Question 11**



The diagram above shows Kayla’s first attempt at an interface for the PDAs.

- a. What design error has she made?

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1 mark

- b. How can it be improved?

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1 mark

**Question 12**

The diagram below shows a screen for the **bakery computer** that will alert Sebastian that there is an incoming message.



- a. What is the logical error with this screen?

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1 mark

- b. Describe how to change this screen to correct this error.

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1 mark



**Question 15**

The system is in its first week of operation: all the drivers have a PDA and the bakery computer is also operating as a web server. The PDAs are successfully accessing the bakery's website through the Internet and transmitting orders. Sebastian, however, has read an article about conducting business on the Internet.

He has discovered that

- his website could be accessed by unauthorised people
- there might be times when the PDAs are not able to connect to the web server.

For each of these situations, explain a strategy that the bakery could use to limit or eliminate the concern.

- a. The website can be accessed by unauthorised people

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2 marks

- b. There might be times when the PDAs are not able to connect to the web server

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2 marks

Total 53 marks

**CASE STUDY INSERT FOR SECTION C**

Please remove from the centre of this book during reading time.

## **Flip Flop Bakery**

Flip Flop Bakery is owned by Sebastian, who is a baker. He employs two assistant bakers, three delivery drivers and four part-time sales assistants.

Flip Flop Bakery makes bread and bread rolls that it sells to the public through a shop. It also sells its bread, and a range of cakes and pastries that are bought from a wholesale cake supplier, to local restaurants, coffee lounges and clubs.

A typical working day follows this sequence.

- Sebastian and the assistant bakers arrive at the bakery and start baking at 4.00 am.
- All breads and other bread products (bread rolls and so on) are baked by 7.00 am.
- The bakers identify any ingredients that are in low supply and inform Sebastian.
- The drivers arrive at the bakery and start loading their trucks at 8.00 am.
- Cake deliveries arrive at the bakery around 8.00 am.
- The bakery drivers deliver their goods and invoices to the customers from 9.00 am.
- Drivers handwrite orders from the regular customers and return these to the bakery by 1.00 pm.
- Sebastian manually combines the orders and writes a list of the next day's baking requirements.
- Sebastian telephones his orders for the necessary ingredients and cakes from his suppliers. Orders must be placed by 3.00 pm to ensure delivery for the next day's baking.
- The bakery closes at 5.00 pm.

### **The problems**

Sebastian has identified a number of problems that, because of the growth of his business, have now become critical.

- 1 When drivers return to the bakery later than 1.00 pm, Sebastian cannot complete the next day's list of baking requirements.
- 2 Some drivers have such bad handwriting that Sebastian has trouble reading the orders.
- 3 Sebastian now spends too much time combining the orders and completing the next day's baking requirements list.
- 4 Sometimes Sebastian cannot order extra ingredients on time therefore he cannot bake all of the next day's bread and so loses orders.

### **Proposed system**

To ensure the continued success of his business, Sebastian realises that he must make some changes to his ordering processes. Sebastian's daughter, Kayla, has just completed the first year of a university course in software engineering. She offers to look at how the problems might be solved.

Kayla believes that the only way to improve efficiency is to have a computerised ordering system. There would be a computer at the bakery and the delivery truck drivers would have some kind of mobile device. They would use this to collect and transfer data to the new computer.

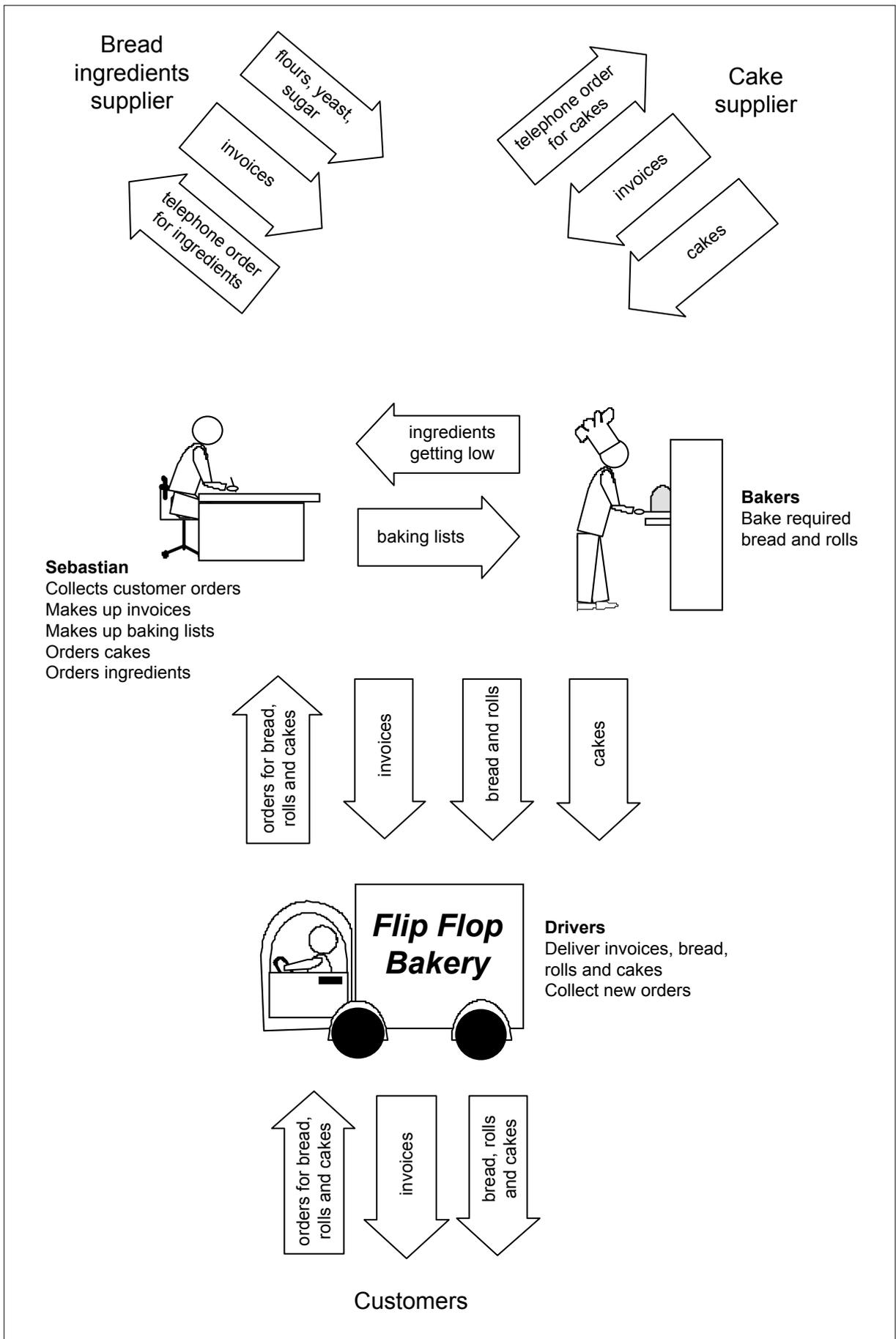


Figure 1