DLTV Resource Kit

For use with the VCE Applied Computing 2020–2024 Study Design

Applied Computing: Software Development

Units 3 and 4 Trial Examination 2 for 2020

> **Note:**
> The questions in this exam are based on *the VCE Applied Computing: Data Analytics Adjusted Study Design for 2020 only*.

While this is a trial examination, teachers are still encouraged to make some modifications to it before use.

Applied Computing: Software Development

Trial Written Examination 2: 2020

Reading time: 15 minutes

Writing time: 120 minutes

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	30
C	8	8	50
			Total 100

Allowed resources
- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, an approved graphics calculator memory cleared) and/or 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 booklet of 22 pages
- Answer sheet for multiple choice questions
- Section C: Case study

Instructions
- Write your **student name** in the space provided above on this page.
- Write your **name** in the space provided on your answer sheet for multiple-choice questions
- All written responses must be English.

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

Section A: Multiple choice questions

Choose the best response from the choices given

Question 1

What information does a data dictionary provide to the developer?

A.   a glossary of terms that might be unfamiliar in the code

B.   the names and purposes of the functions written in the code

C.   the structure of any relevant database tables referenced in the code

D.   the name, type, length and purpose of variables used in the solution

Question 2

Formal testing and auditing of a software solution helps to:

A.   identify and minimise risks.

B.   provide proof that the software meets organisational goals.

C.   identify places where the user has difficulty using the software.

D.   provide feedback to the developer as to where code could be more efficient.

Question 3

Methods for collecting data in the analysis stage of a creating a software solution include:

A.   creating mock-ups.

B.   verification and validation.

C.   surveys, interviews, reports and observations.

D.   writing evaluation criteria from a set of functional requirements.

Question 4

Which of the following actions would increase risks when downloading and installing software from a third-party vendor?

A.   scanning the incoming file with dependable antivirus software

B.   keeping the operating system up-to-date with the latest version

C.   'jail-breaking' the device to enable you to access and monitor the system logs

D.   ensuring that the credentials of the third-party vendor providing the software are legitimate

Question 5

If a task on a project plan is on the critical path and is delayed, which of the following will definitely be true?

A.   all milestones will be delayed

B.   the completion of the project will not be affected

C.   slack time on another task will compensate for the delay

D.   the completion of the project will be delayed by the same amount

Question 6

An effective physical security measure is:

A.   an audit trail.

B.   authentication by username and password.

C.   a biometric lock to gain access to a server room.

D.   file encryption for data transmitted over the internet.

Question 7

Adherence to good design principles contributes to a solution's:

A.   time, cost and effort.

B.   functionality, usability and appearance.

C.   functionality, portability and appearance.

D.   functionality, market acceptance and profit.

Question 8

In a use case diagram, an extending use case is shown by:

A.   a solid line with the text ""«extends»"" next to it, pointing towards the use case it extends.

B.   a dotted line with the text ""«extends»"" next to it, pointing towards the use case it extends.

C.   a solid line with the text ""«extends»"" next to it, pointing away from the use case it extends.

D.   a dotted line with the text ""«extends»"" next to it, pointing away from the use case it extends.

Question 9

In a user interface, affordance refers to:

A. a high-contrast display.

B. subtle clues as to the function of a control.

C. how much it would cost to implement the system.

D. whether or not the interface will work with different operating systems.
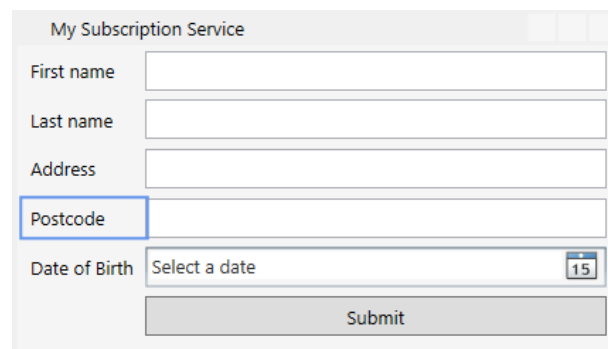
Question 10

Internal documentation in the form of comments in a program:

A. causes a program to run slower.

B. is included in the final compiled output.

C. allows others to better understand the code.

D. gives the impression of a larger, more complex program.

Question 11

Kye is writing a program to capture user information for a subscription service, but only for Victorians. The user interface is shown below.

In order to ensure that only Victorians can enter their data, the postcode field will only allow Victorian postcodes that begin with '3' or '8', i.e. from 3000 to 3999 and 8000 to 8999. This is an example of:

A. type checking.

B. range checking.

C. existence checking.

D. reasonableness checking.

Use the following information to answer Questions 12 and 13.

The following pseudocode is designed to remove all integers from an array whose square is greater than 225, and shuffle the remaining integers up. The array is zero-based.

```
1       BEGIN
2        MyNumbers <- [12, 13, 15, 3, 20, 1]
3        FOR I = 0 TO ARRAY LENGTH - 1
4         IF MyNumbers[I] * MyNumbers[I] > 225
5          FOR J = I TO ARRAY LENGTH - 1
6            MyNumbers[J] <- MyNumbers[J + 1]
7              END FOR
8          END IF
9         END FOR
10      END
```

Question 12

The code at line 4 is an example of:

A. selection.

B. sequence.

C. iteration.

D. modularisation.

Question 13

The final output from the array will be:

A.

12	13	3	1	0	0

B.

12	13	3	1	20	1

C.

12	13	15	3	1	1

D.

12	13	15	3	1	0

Question 14

Which of the following software development practice is the **least** effective in reducing software vulnerabilities?

A.   comprehensive validation of user input

B.   using encryption for all transmission and storage of data

C.   integrating tested code from the internet into your own software

D.   keeping the software development tools updated with the latest patches

Question 15

Which of the following data types would be best for storing an Australian postcode?

A.   string

B.   double

C.   integer

D.   Boolean

Question 16

A particular software product requires the user to enter an age between 18 and 99 inclusive. What would be the most efficient set of test data for this purpose?

A.   18, 19, 98, 99

B.   17, 18, 50, 99, 100

C.   1, 15, 18, 99, 114, 115

D.   17, 18, 19, 50, 98, 99, 100

Question 17

In which stage of the problem-solving methodology is evaluation criteria written?

A.   design

B.   analysis

C.   evaluation

D.   development

Question 18

A level 0 data flow diagram is also known as a:

A.   flowchart.

B.   context diagram.

C.   use case diagram.

D.   requirements diagram.

Question 19

Which of the following Acts does **not** specifically relate to the storage and access of data?

A. *Spam Act 2003*

B. *Privacy Act 1988*

C. *Copyright Act 1968*

D. *Health Records Act 2001*

Question 20

Which of the following columns would you likely find in a trace table?

A. action

B. pass/fail

C. actual result

D. variable name

END OF SECTION A

Section B: Short-answer questions

Instructions for Section B

Answer all questions in the spaces provided.

Question 1 (4 marks)

Flunkies is a fast food organisation that started in a small country town. It genuinely cares for its customers, providing good, tasty and affordable food and its motto is 'Live long, eat well'. As its reputation has spread, the business has opened up restaurants all around country Victoria; however, increased inefficiencies and errors across the different stock levels and staff wages has put prices up for customers. The original premises have expanded and now include the central administration for the organisation with a new computer system to help it better manage multiple sites.

Identify the organisational goal for Flunkies and two organisational objectives related this goal.

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Question 2 (6 marks)

Creative differences have broken out between two employees of Gretasoft, a local software company specialising in business-to-business (B2B) software. Gretasoft employs a large team of developers both in Australia and overseas.

Larry, a developer with 20 years' experience, suggests that the best way to protect the company's file assets is to maintain an incremental backup strategy with files held on a secure server offsite.

Newcomer Ralph suggests that they are better off using an online version control system that will address the need for backup and better serve the team who are often working simultaneously on the same files.

a. Discuss the merits of an incremental backup method versus online version control for data security and backup.   4 marks

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b. Select your preferred method (Larry's or Ralph's) for securing and backing up Gretasoft's data and justify your choice.   2 marks

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Question 3 (5 marks)

The following Gantt chart has been created to help manage a particular software project. The software product consists of a back end, which provides data through an API (Application Programming Interface) and the front end, which is a responsive webpage that will work equally well on a personal computer, a tablet or smart phone, hence the longer development time. There are two people to conduct the interviews and two developers who specialise in the required areas of web and back end.

Complete the chart adding appropriate milestones and dependencies. Label your milestones.

Task	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Interview client	■											
2. Interview stakeholders	■	■										
3. Create SRS			■									
4. Create design 1				■								
5. Create design 2				■								
6. Select preferred design					■							
7. Develop web interface						■	■	■				
8. Develop back end						■	■					
9. Test web interface									■			
10. Test back end								■				
11. User acceptance test										■		
12. Deployment											■	

13. Evaluate with customer												
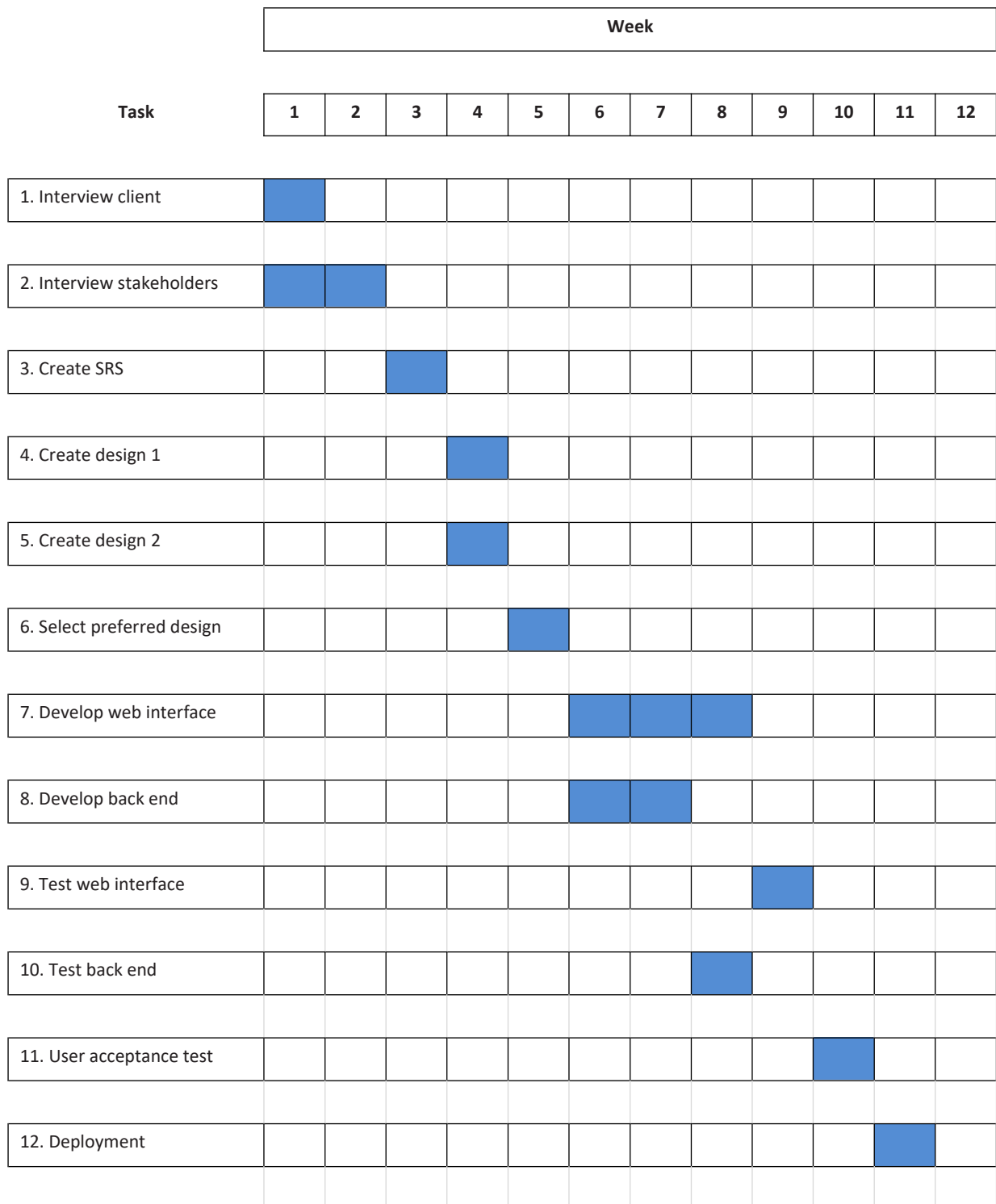
Question 4 (6 marks)

The user interface for a scientific application is shown below. Scientists in the field enter observation data into the software via this interface and create a new record when the 'Submit' button is clicked.

Create a record or associative array that will address the needs of the program. You must use an appropriate and consistent naming scheme, specifying the data type, data length and any other relevant information regarding the members of the data structure.

Note: The scientists observing will enter their three initials in the space provided and the list of ducks are found in an array, which has an integer index and the species' name. The 'Notes' section is hidden behind the drop-down, which is shown dropped down for completeness.

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Question 5 (9 marks)

A new function is to be written that will extract all the pairs of integer factors for a number entered by a user, and then list them one after another with an 'x' in between.

For example, the user enters 20, the system will output:

>1 x 20
>
>2 x 10
>
>4 x 5
>
>5 x 4
>
>10 x 1
>
>20 x 1

The function should repeatedly divide the input number by every number from 1 to itself. If there is no remainder, a factor has been found. Dividing the input number by this factor will derive the other.

a. Write the pseudocode to achieve this outcome. 7 marks

BEGIN

  InputValue <- INPUT FROM USER

END

b. Create a data dictionary for the variables used in this application including their type.   2 marks

END OF SECTION B

Section C: Case study

Instructions for Section C

You will be provided with the case study for Section C in a separate document.

Use the case study to answer the questions in this section. Answers must apply to the case study.

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

Question 1 (6 marks)

a.   Identify the organisational goals of Cooperative Grocers' Association of Victoria.   2 marks

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b.   Give **two** examples of organisational objectives that could be used to evaluate the success of the project.   2 marks

Example 1

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Example 2

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c.   Provide **one** example of how the system would contribute to the efficiency of the businesses.   2 marks

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Question 2 (4 marks)

Based on the case study, identify **two** functional requirements (FR) and **two** non-functional requirements (NFR).

FR 1

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FR 2

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NFR 1

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NFR 2

_____

Question 3 (6 marks)

At the beginning of the development phase, Samilla, Ralou, Parker and Alex meet to decide on coding standards and other project-related processes to be adopted. All members of the team are experienced developers but have learnt different ways of working due to their varied employment experiences.

The first issue to address is the naming conventions for variables, controls and data structures. Ralou suggests that the team adopt Hungarian notation e.g. strFirstName; however, Alex suggests using Object Notation e.g. FirstNameString.

a. Outline what information is important when designing a naming convention. 2 marks

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b. State **one** reason why it is important for the development team to all use the same naming convention. 1 mark

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Samilla and all the developers agree that internal documentation, such as comments, should be included in all code written.

c. How would comments help the team? 1 mark

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d. State **two** characteristics needed to make comments useful. 2 marks

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Question 4 (13 marks)

Data from each unit is sent in plain text to head office after each transaction. Transaction data includes:

- time and date of the transaction

- supermarket code: 1 for Richville and 2 for Homelytown

- receipt number, which is a sequential number generated by the software

- list of purchases, each of which includes:

  o the name of the item

  o the barcode of the item

  o the price charged

- number of the credit card used and the expiry date in the form 'mmyy' e.g. 0221 for February 2021

- bank's confirmation code, which consists of 32 letters and digits.

a. Describe a security risk that is posed by this design and explain how it could be mitigated.

3 marks

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b. Data is transmitted to the head office using XML and this is created in the software. The software in the head office computer then reads this XML and stores the data in a database. In order to test the head office system some test data is required.

Complete the XML output for the following transaction so it can be used as test data.

8 marks

1	DateTime	1 July 2020 3:46 pm		
	StoreCode	1		
	ReceiptNumber	2120991		
	Items	ItemName	ItemBarcode	ItemPrice
		American Mustard 250ml	9310012007104	2.50
		Light Milk	9101998218291	2.56
	CreditCardNo	5105105105105100		
	CreditCardExpiry	0224		
	BankCode	CO1KMQ80901X77Z8		

_____

_____

<transaction datetime="20200701154600" _____ receiptnumber="2120991">

 <items>

  <item name="American Mustard 250ml" barcode="9310012007104" price="2.50"/>

_____

_____

 </items>

_____

_____

  <number>5105105105105100</number>

_____

_____

 </creditcard>

 <bankcode>CO1KMQ80901X77Z8</bankcode>

_____

_____

c. Complete the following segment of the test table for sending data to the head office.   2 marks

Action	Expected Result	Actual Result	Pass/Fail
Send XML data to head office		Head office system responds with "Error – bad format".	

Question 5 (3 marks)

After several months of operation, the supermarkets that have installed the equipment ask for feedback from their customers. At the self-checkout areas there are clear signs inviting shoppers to access a website to complete a survey on their experience. As a reward, each person completing the survey will receive a $20.00 shopping voucher. The website states:

- there is only one reward per customer, though they may fill the survey out many times.

- information is to be collected for the purpose of improving the system.

- customer's information will remain anonymous.

- each customer must provide the unique code from their purchase receipt as proof that they used the system.

Data collected is used to improve the system. Head office has decided that the data is very valuable, since the customers' purchases can be linked to their survey responses via the receipt code. The data is then used by the head office for marketing purposes.

State what aspect of the Australian Privacy Principles in the *Privacy Act, 1988* has been breached by head office and explain why this has occurred.

Question 6 (4 marks)

The system is commissioned and the trial runs for about three months. After this time, the managers analyse the data and find that one of the trial supermarkets has a lot more users for the new system than the other.

a. What could account for this difference in the number of users? 2 marks

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b. Propose **one** evaluation criterion that would measure the effectiveness of the new system.

2 marks

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Question 7 (10 marks)

a. List the use cases for the design. 2 marks

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b. Using your answer from **part a**. complete the use case diagram for the system in the space below. 6 marks

Customer

Bank

System
Admin

Head Office
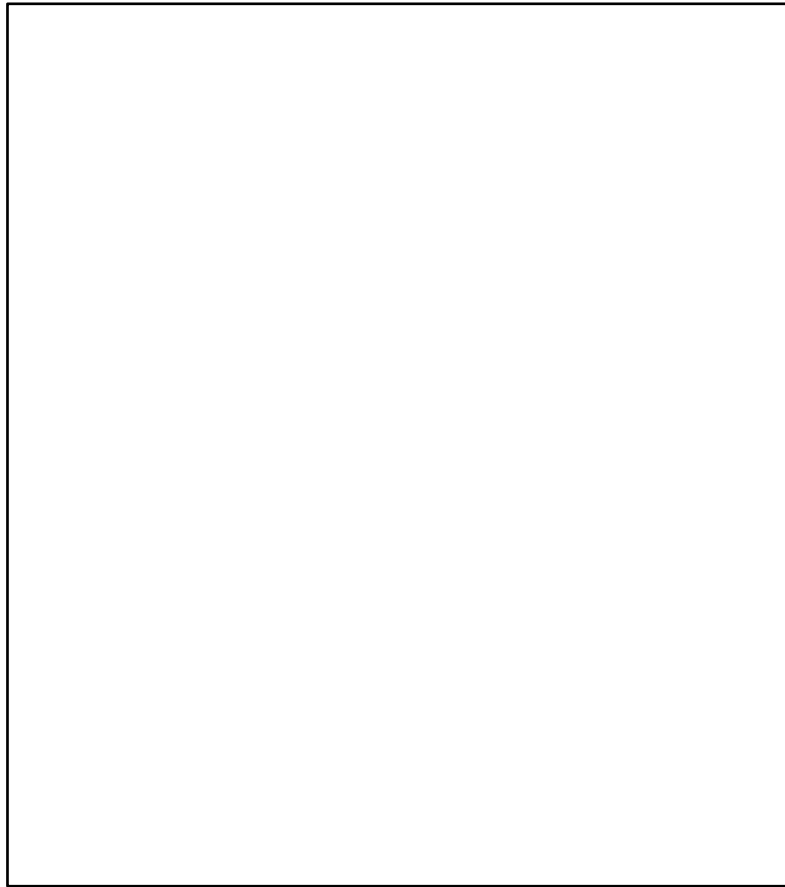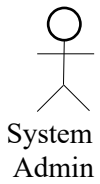
c. Consider how a customer will use the system and the constraints of the design.

Identify what use case is not catered for and explain how it could be addressed without the need for extending the scope of the project. 2 marks

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Question 8 (4 marks)

The following two designs (Design A and Design B) have been put forward for the screen layout.

Design A

Design B

a. Given the demographics of the areas selected for the trial, what design would be appropriate for implementation in Homelytown? 1 mark

_____

b. On the basis of effectiveness, propose **two** criteria that would justify your decision in **part a.**
3 marks

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END OF QUESTION AND ANSWER BOOK

Insert for Section C: Case study (Examination 2)

To compete with the larger chain supermarkets, smaller independent supermarkets band together in cooperatives. This gives them benefits, such as combining their administrative areas and saving money, and also, by buying in greater bulk, they can save money on stock. One such cooperative is the Cooperative Grocers' Association of Victoria (CGAV). Being a cooperative adds some complexity because they need their own distribution network; however, overall there are savings.

A difference between a cooperative (co-op) and a franchise is that, in a co-op, the individual members have more say over the way they run their business. Members meet regularly to discuss innovation with the aims of providing better customer service, competitive prices to customers and lowering business costs.

At a recent meeting, the subject of installing self-checkout facilities at all the supermarkets was discussed, with about half the members in favour of the suggestion. It was agreed that a trial of a new system would be the best way to understand the strengths and weaknesses of the proposal, and two supermarkets volunteered to try it out. The first trial supermarket is in Richville, a trendy area with many young singles, and the second in Homelytown, a suburb further out with mainly older residents and some retirees.

CGAV have approached Fortis Grande Computer Systems (Fortis) to create a prototype system for the trial. Samilla Brown, the lead developer, is tasked with creating the design specification and together with her team Ralou, Parker and Alex they will develop the prototype. This will be a self-contained computer unit in a secure housing with a barcode reader, bank card reading unit and a touch screen. Each unit will be connected via an internet connection to the head office. It has been decided that the machines will *only* accept bank/credit cards for payment—no cash. They describe the system as a context diagram shown in Figure 1.
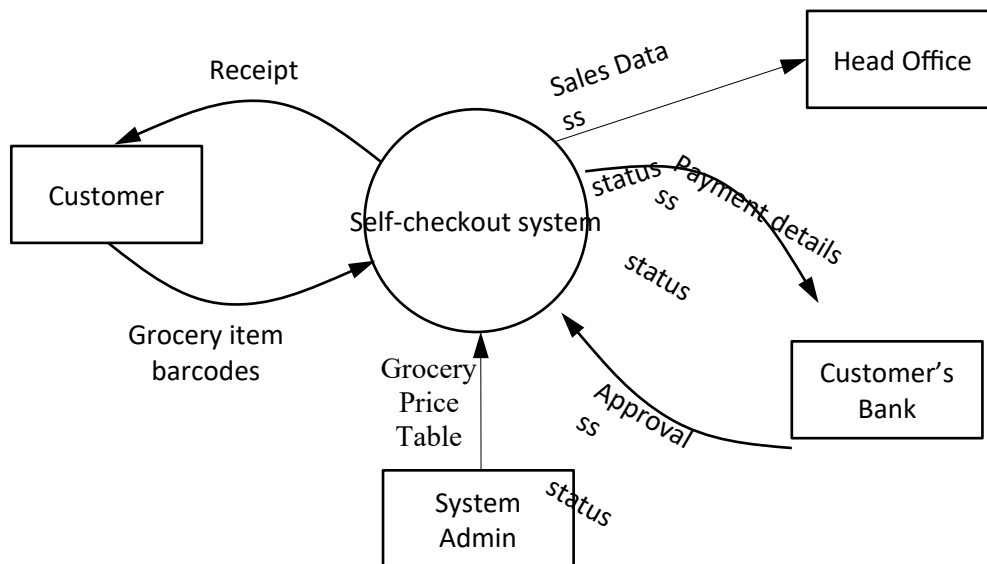

Figure 1: Self-checkout system context diagram

In order to keep development and hardware costs down, the prototype units will not be fitted with scales.

The screen display will be quite simple. It will provide a picture of the item with its full description and price. It will also display the list of purchased items and a grand total. It will provide a button to pay by card via the external bank unit, and an option to print a receipt. Lastly, the system will provide an audible beep when a product is scanned.