SUPERVISOR TO ATTACH
PROCESSING LABEL HERE

Write your **student number** in the boxes above. **Letter**

Applied Computing: Software Development

Question and Answer Book

VCE Examination – Friday 15 November 2024

- Reading time is **15 minutes**: 3.00 pm to 3.15 pm
- Writing time is **2 hours**: 3.15 pm to 5.15 pm

Materials supplied

- Question and Answer Book of 32 pages
- Detachable Insert containing a case study for Section C in the centrefold
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this book.

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

Contents

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

Section A – Multiple-choice questions

Instructions for Section A

- Answer **all** questions in pencil on the Multiple-Choice Answer Sheet.
- Choose the response that is **correct** or that **best answers** 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

Type checking is a validation technique that ensures that the

A. data entered falls within a certain range.

B. required field has data entered and is not empty or blank.

C. data entered has a minimum number of characters.

D. data entered is of a particular data type.

Question 2

Testing the usability of software solutions takes place in which stage of the problem-solving methodology?

A. analysis

B. design

C. development

D. evaluation

Use the following array of numbers to answer Questions 3 and 4.

77	29	92	13	95	3	49	82

Question 3

After the first pass of a selection sort algorithm, the contents of the array will be:

A.

3	13	29	49	77	82	92	95

B.

3	13	92	29	95	77	49	82

C.

3	29	92	13	95	77	49	82

D.

29	13	3	49	77	92	95	82

Question 4

Which of the following sets of pseudocode could successfully swap the positions of the first two values in the array?

A.
```
temp ← variable1
variable1 ← variable2
variable2 ← temp
```

B.
```
variable2 ← variable1
variable1 ← variable2
```

C.
```
anarray[1] ← anarray[0]
anarray[0] ← anarray[1]
```

D.
```
temp ← anarray[0]
anarray[0] ← anarray[1]
anarray[1] ← temp
```

Question 5

A factor that would relate to the scope of a new software solution would be

A. adding an AI chatbot to the help menu.

B. using software modules to allow for easier updates.

C. including both Apple and Microsoft operating systems.

D. increasing the budget to employ two more programmers.

Question 6

How many iterations does the binary search algorithm need to find the value 9 in the array of integers below?

3	7	9	13	15	16	29	29	100	124	203

A. 4

B. 3

C. 2

D. 1

Question 7

Protection against data loss for an organisation can be best provided by

A. offsite backups.

B. user authentication.

C. asymmetrical encryption.

D. two-factor authentication.

Question 8

What is a key consideration of organisations when developing software?

A. enhancing code readability

B. improving user authentication

C. streamlining software updates through automation

D. meeting the goals and objectives of the organisation

Question 9

The initial stages of a project plan are shown in the diagram below.

Task ID	Duration (days)	Dependencies	Day														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	–															
2	1	1															
3	2	1															
4	3	2															
5	1	3															
6	5	4, 5															
7	5	6															

Task 3 is delayed by two days. Assuming no other adjustments are made, which one of the following statements is true?

A. Both Task 5 and Task 7 finish as originally planned.

B. Both Task 5 and Task 7 finish later than originally planned.

C. Task 5 finishes as planned, but Task 7 finishes later than originally planned.

D. Task 5 finishes later than originally planned, but Task 7 still finishes as planned.

Question 10

Which is the **best** use of naming conventions for the user interface element shown?

A. drpState

B. selectyourstate

C. ui_select_State

D. dropDownSelect

Question 11

A local swimming school is planning to develop software to automatically pair students with teachers at the appropriate swimming level, and to create a timetable based on the availability of students, teachers and lanes of the pool. Which feature of the software requirements specification is the **most** relevant for determining which lane of the pool will be used for a lesson?

A. the technical constraints

B. the functional requirements

C. the assumptions of the solution

D. the non-functional requirements

Question 12

A software developer is identifying needs and requirements for an update to an application used by the police to check vehicle registration details. The developer believes that a good starting place is to analyse the existing application.

Which of the following data collection techniques would determine the efficiency of the existing application?

A. surveying police members about ways to make the updated application run more quickly

B. observing the number of errors police members make when using the existing application

C. reviewing the system logs printed as reports to determine the time taken for each check

D. interviewing police members to determine if they think updating their passwords every three months is too frequent

Question 13

Which of the following is **not** a technique to manage files effectively?

A. using version control

B. saving on a USB drive

C. using naming conventions

D. maintaining regular backups

Question 14

What is the expected output from the following pseudocode?

```
Begin
    x ← 1
    y ← 1
    While x < 5
        x ← x + y
        y ← x + y
    End While
    Print y
End
```

A. 5

B. 6

C. 7

D. 8

Question 15

A defining characteristic of a man-in-the-middle attack is

A. exploiting software vulnerabilities.

B. alteration of web application data.

C. unauthorised access to databases.

D. intercepting communication between two parties.

Question 16

A technique that would **not** form part of a risk management strategy during software development is

A. a software audit.

B. secure coding training.

C. an internal documentation review.

D. a third-party software compliance check.

Question 17

In a security strategy, what is an effective technique for managing risks associated with third-party software?

A. ignoring software updates provided by third-party vendors

B. allowing third-party software to run with administrative privileges

C. using third-party software without reviewing its source or provider

D. conducting thorough security audits of third-party software before integration

Question 18

A criterion for evaluating the effectiveness of software development security strategies could be

A. assurance of data integrity.

B. meeting organisational goals.

C. compliance with legal constraints.

D. enhancing the attractiveness of the design.

Question 19

During an e-commerce checkout operation, the process of validating a credit card typically takes about five seconds. Which of the following statements is most likely to be true?

A. The process is not efficient because of the timeliness of the inputs.

B. The process is effective because the validation performed is correct.

C. The process is not effective because the validation operation is not clear.

D. The process is efficient because a slower process is likely to be cheaper.

Question 20

A development team for a holiday booking company is calculating discounts that will be provided to customers based on their purchase history. Customers who spent $1000 to $4999 will receive a 5% discount, customers who spent $5000 to $9999 will receive a 10% discount, and customers who spent $10 000 or more will receive a 15% discount.

```
1  Begin
2       Input arrPurchases
3       Total ← 0
4       Discount ← 0%
5       For i ← 0 to arrPurchases.Length - 1
6            Total ← Total + arrPurchases[i]
7       End For
8
9            Discount ← 5%
10           If Total >= 5000 Then
11                Discount ← 10%
12                If Total >= 10000 Then
13                     Discount ← 15%
14                End If
15           End If
16      End If
17 End
```

The pseudocode that should appear on line 8 is

A. `If Total > 1000 Then`

B. `If Total >= 1000 Then`

C. `If Total > 1000 AND Total < 5000 Then`

D. `If Total >= 1000 AND Total < 5000 Then`

End of Section A

This page is blank.

Examination continues on the next page.

Section B – Short-answer questions

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.

Question 1 (3 marks)

A Year 7 level coordinator is organising a function to be attended by students, parents and grandparents.

The coordinator is in the process of developing a data dictionary and needs to determine the data types for three variables.

From the list of data types provided, choose the best one for each of the variables in the table below. The following data types **may** be used more than once.

- integer
- Boolean
- string

Variable	Data type	Description
Var 1		last name of student
Var 2		number of family members attending
Var 3		Paid – Yes or No

Question 2 (2 marks)

Hanni is working in a team for a software development organisation.

One of her responsibilities is to provide regular software updates to customers using the organisation's software.

State two advantages of providing regular software updates to customers.

a. Advantage 1 1 mark

b. Advantage 2 1 mark

Question 3 (4 marks)

When reviewing the development of a web-based application, a software company realised that they had spent too long designing the user interface and as a result ran out of time to develop a payment function.

a. Identify **one** tool that could be used to identify project tasks that are on the critical path. 1 mark

b. Discuss how identifying tasks on the critical path and recording the progress of the project could have prevented this problem from occurring. 3 marks

Question 4 (4 marks)

The statements below can be categorised as goals or objectives, and can apply to organisations or information systems. Categorise each statement below by writing one of the following statement numbers into the appropriate cell in the table.

Statement 1: Users can donate $5 using a single tap on their phone.

Statement 2: Become a world-leading charity.

Statement 3: Allow users to make donations online quickly and easily.

Statement 4: Increase the number of donations each year by 10%.

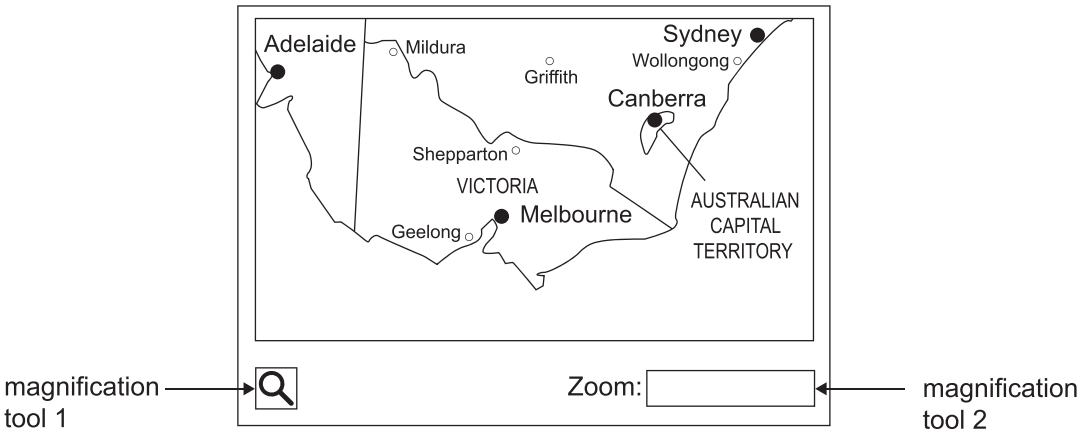
	Organisation	**Information system**
Goal		
Objective		

Question 5 (3 marks)

Mustafa is designing a software solution to enhance the resolution of satellite imagery of the Earth. The software solution allows users to zoom into any region of the world up to a distance of 1 metre. The software solution operates extremely quickly, producing an image at any zoom level in less than half a second.

a. State **one** functional requirement of this system. 1 mark

b. Compare the following two magnification tools. 2 marks



Magnification tool 1: When the user selects the magnifier tool, the cursor turns into a magnifying glass. Each left-click on the map will then zoom in by an additional 5%, while each right-click will zoom out by 5%.

Magnification tool 2: When the user types a zoom percentage into the text box, the map zooms in or out to that percentage.

Select **one** of the magnification tools, and state **one** reason why it has better affordance than the other magnification tool.

Magnification tool _____

Reason _____

Question 6 (4 marks)

Toby is creating a new e-commerce website for his employer. Various issues need to be addressed around web application risks. Cross-site scripting is one example.

a. Describe cross-site scripting. 1 mark

b. Suggest **one** technique that can be used to protect against cross-site scripting. 1 mark

c. Describe how cross-site scripting can diminish the integrity of data entered by a user into the website, and the impact this will have on the **owner** of the website. 2 marks

End of Section B

This page is blank.

Section C – Case study

Instructions

- Please remove the Insert from the centre of this book.
- Use the case study provided in the Insert to answer the questions in this section. Answers must apply to the case study.
- Answer **all** questions in the spaces provided.
- Write your responses in English.

Question 1 (3 marks)

The purpose of Café SD's rewards application is to replace the paper-based stamp card with a virtual card on the customer's mobile phone.

Vanja has been investigating non-functional requirements and has some questions regarding the possible reliability of the rewards application.

a. Why is the reliability of the rewards application important? 1 mark

b. Why is it important to consider the number of failures in relation to the reliability of the rewards application? 1 mark

c. When should the evaluation of the reliability of the rewards application take place? 1 mark

Question 2 (2 marks)

As part of the analysis for the Café SD rewards application, Taylor initially decides to focus on two constraints that have been provided to him.

He is unsure which is which, but he does know that one relates to a technical constraint and one relates to a usability constraint.

Classify each of the constraints in the table below.

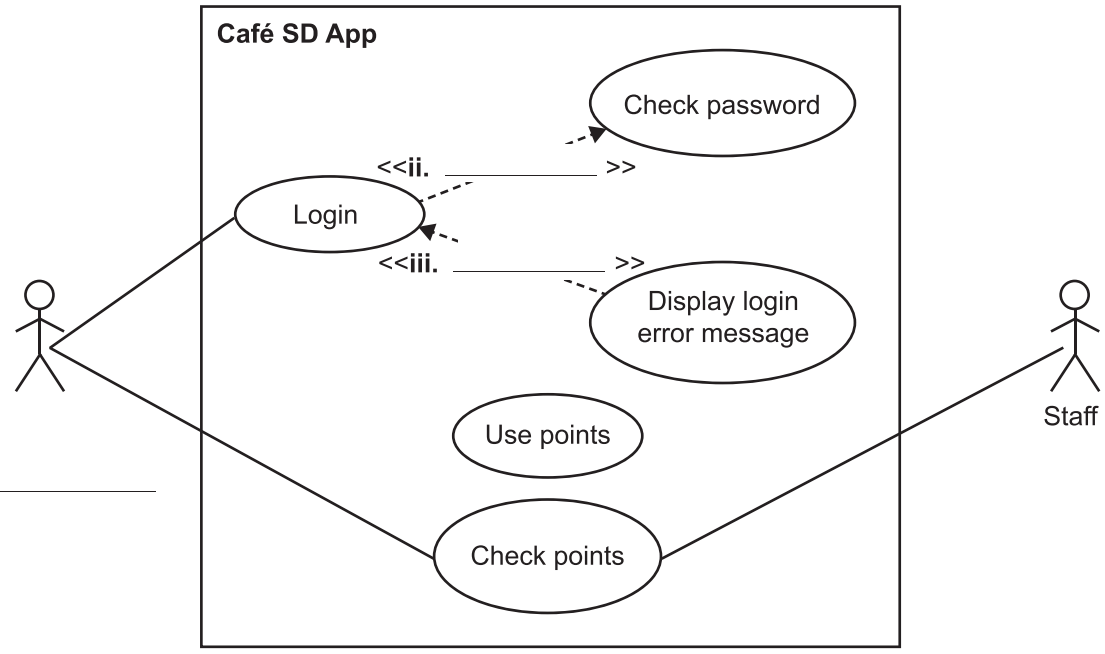
Classification	Constraint
	The rewards application will need to be easy to use for staff.
	The rewards application will need to run on existing equipment.

Question 3 (4 marks)

Vanja draws the partial use case diagram below to document the functionality of the proposed Café SD rewards application.

a. Complete the use case diagram by filling in the **three** missing labels. 3 marks

b. Draw an association to connect the **Use points** use case. 1 mark

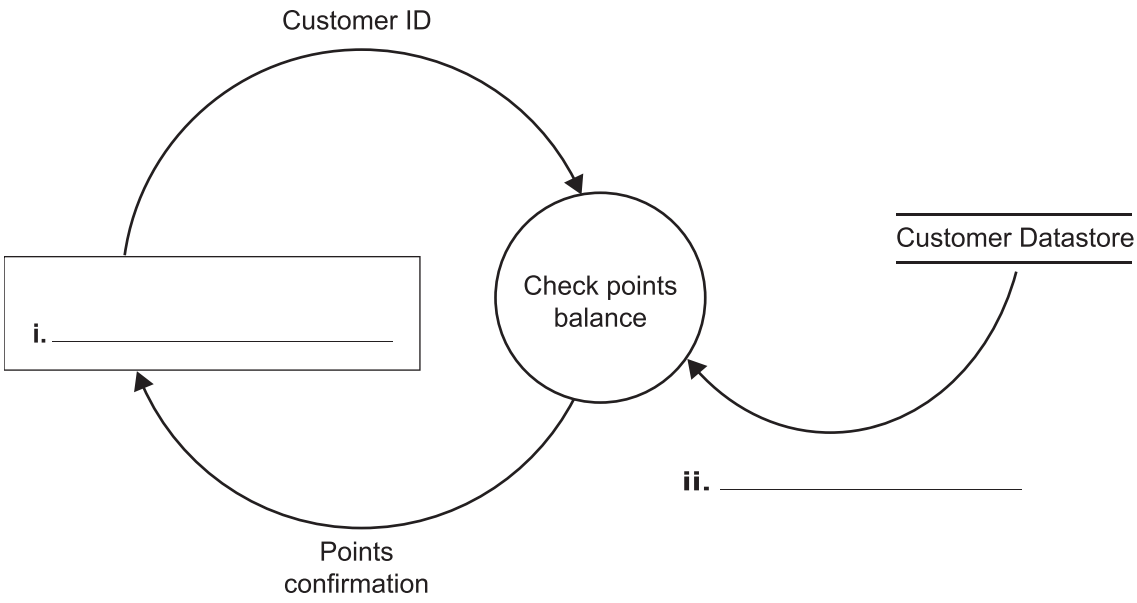


i. _____

Question 4 (4 marks)

When a customer wants to use their points to purchase a coffee, the staff member must first make sure there are enough points available. The rewards application checks the Customer ID and displays the customer's points balance.

a. The partial data flow diagram below illustrates the points balance enquiry. Complete the diagram by filling in the two missing labels. 2 marks



b. State whether the diagram above is a level 0 or level 1 data flow diagram, and state **one** reason why. 2 marks

_____

_____

_____

Question 5 (3 marks)

Refer to the Customer Record data dictionary in the case study provided in the Insert.

Justify why a record is a more suitable data structure to be used rather than a one-dimensional array or an associative array.

Question 6 (3 marks)

If a customer does not have the rewards application, their phone number can be used to retrieve their account information.

By considering the structure of the Customer Record data dictionary, justify whether a linear search or a binary search would be more appropriate to use.

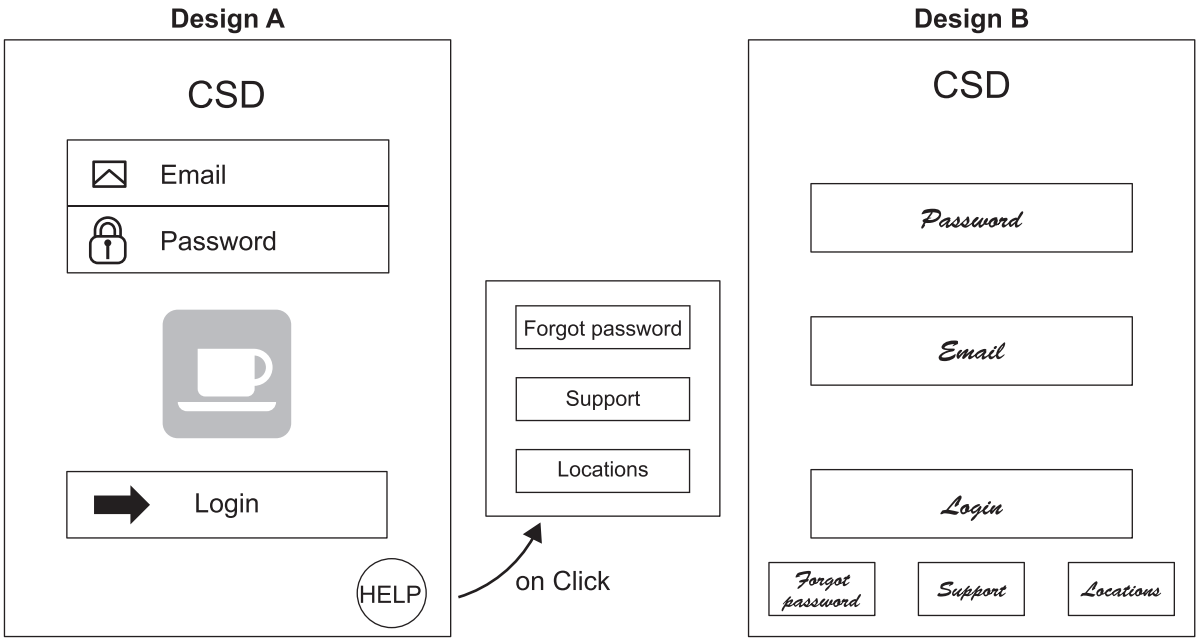
Question 7 (2 marks)

Taylor and Vanja discuss how to cancel a customer from the rewards application. Taylor suggests that changing the customer's password to lock them out would fulfil this functional requirement. Vanja disagrees, and suggests that all customer-related information, including purchase history, should be deleted from the rewards application. Provide **two** reasons why Taylor's suggestion might be better than Vanja's.

Question 8 (4 marks)

Vanja wants to design a login screen for the rewards application that she can trial with customers.

She develops the following two alternative designs.



Two criteria for evaluating the effectiveness of the alternative designs are shown below.

1. The fonts used must be easy for all customers to read.
2. Information is only shown when needed.

a. Write a third criterion that could be used to evaluate the accessibility of the designs. 1 mark

b. Which design would you select, A or B? 1 mark

c. Justify your design selection. 2 marks

Do not write in this area.

Question 9 (2 marks)

Customers will be able to redeem points at any Café SD store. The rewards application will need to save transactions in a central location at Café SD so that a customer's current points balance can be retrieved and then updated at any Café SD store.

Vanja is thinking about what file format to use to save this data. Currently she is deciding whether to use a CSV file or an XML file.

State **one** benefit of using a CSV file format and **one** benefit of using an XML file format to retrieve or update a customer's points balance.

CSV

XML

Question 10 (3 marks)

Café SD then decides that customers should also be allowed to use the rewards application to order other menu items rather than just coffee. This is a change from the original plan.

Justify whether SoDeBiz should persist with the agile development model approach or change to the waterfall development model approach to continue the development of the rewards application.

Question 11 (2 marks)

Vanja suggests that customers could be provided with a discount code, such as 'FREECAKE', that they could use to receive free items with their purchases once enough points have been earned. The code should be made invalid after it has been used. Data integrity would be diminished in terms of correctness if the code could be used more than once.

Identify a different characteristic of data integrity, and describe how a discount code that could be used more than once could impact on this characteristic.

Characteristic _____

Description _____

_____

_____

Question 12 (4 marks)

Taylor writes the following function, **CheckPoints**, in pseudocode below to check the number of points in a customer's account when they purchase using their points.

Below is a description of the input parameters to this function.

Parameter	Description
account	an object containing the account record for the paying customer
amount	the number of points needed to pay for the purchase

```
Begin CheckPoints(account, amount)
      points ← account.Points_balance
      enough_points ← False
      If points > amount Then
            enough_points ← True
      End If
      Return enough_points
End CheckPoints
```

a. Complete the test table below. The test result is the return value of the function.

Assume, for all tests, that the purchase amount is 5000 points. 2 marks

Test	Expected result	Actual result
account.Points_balance = 4000	False	False

b. Identify the line of pseudocode that produces the error. 1 mark

c. Rewrite the line of pseudocode identified in **part b** so that the correct output is produced. 1 mark

Do not write in this area.

Question 13 (3 marks)

The function, **CompletePayment**, is called after the customer successfully makes a payment. The payment can be made using Australian currency or by using points stored in the account.

Below is a description of the input parameters of this function.

Parameter	Type	Description
price	integer	the value of the payment in cents
points	integer	the current points balance
payByPoints	Boolean	whether the payment was made using points

Write pseudocode below to complete the function so that it correctly performs the following.

- If the payment was made using points, deduct the appropriate number of points from the transaction customer's account. **Assume the account has enough points to complete the payment**.
- When the payment was made using Australian currency, add one point for every cent spent.

```
Begin CompletePayment(price, points, payByPoints)
```

```
    Return points
End CompletePayment
```

Question 14 (4 marks)

At this point, Café SD has decided that they would like to add new features to the rewards application. As a result, SoDeBiz decides not to develop their own payment system. Instead, they will use the in-built payment feature on the customers' devices, or allow customers to pay using a physical credit card. Using the in-built payment feature will require a software audit.

a. State **two** purposes of a software audit. 2 marks

b. Explain how a software audit could support the Café SD rewards application when it connects to the in-built payment feature on customers' devices. 2 marks

Question 15 (4 marks)

The latest feature requested by Café SD is 'Family sharing', which would enable multiple customers to combine their points. Café SD thinks this feature will make it easier to recruit more customers, especially families, to their new stores. However, Vanja is concerned that this could potentially enable members of a family to see where and when other family members have made purchases. Vanja worries about the ethics of this.

a. Discuss the ethical issue involved in implementing the 'Family sharing' feature, including the impact the issue might have on Café SD. 2 marks

b. State **two** suggestions for how the rewards application could be designed to avoid this ethical issue. 2 marks

Question 16 (3 marks)

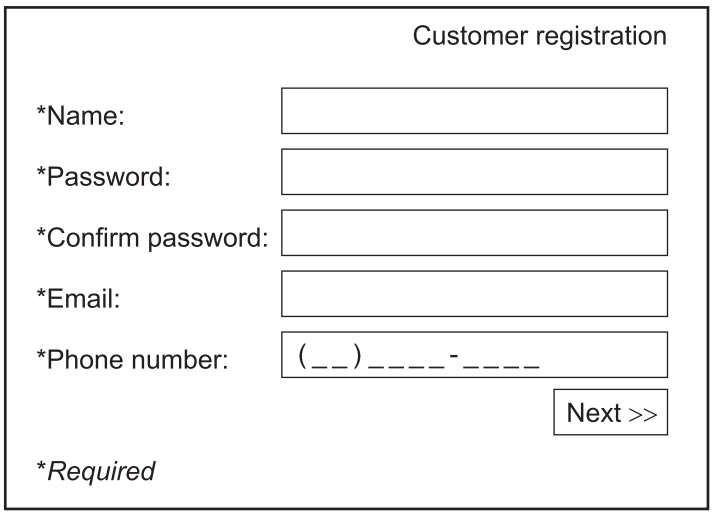
SoDeBiz has been considering the use of security controls to protect the software and data in the rewards application.

They are looking to incorporate the latest encryption standards for the login page. However, during the development stage, they found they had been using an outdated code library.

Explain the potential impact this might have on Café SD customers, and what SoDeBiz should do to fix the problem.

Question 17 (2 marks)

Vanja develops the mock-up below for the customer registration screen. The customer is expected to type in all the information.



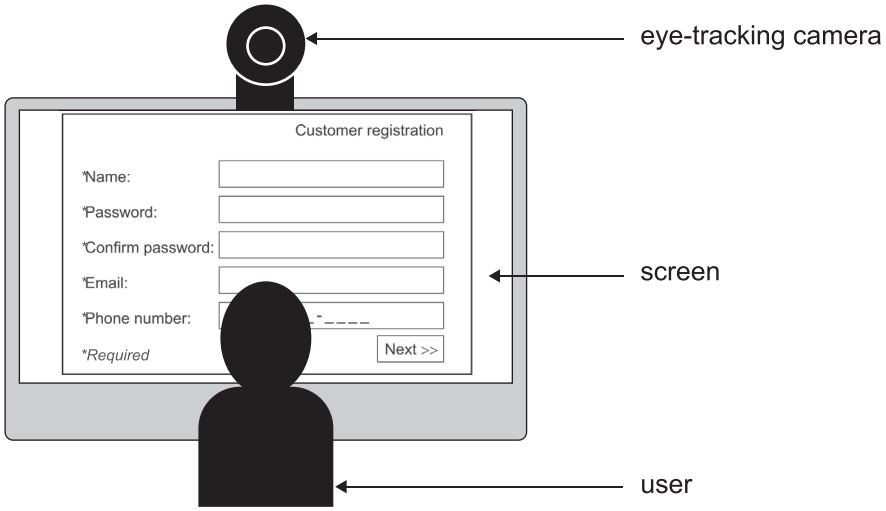
a. State why an existence check is needed for every field. 1 mark

b. State how an existence check can be applied to the Name field. 1 mark

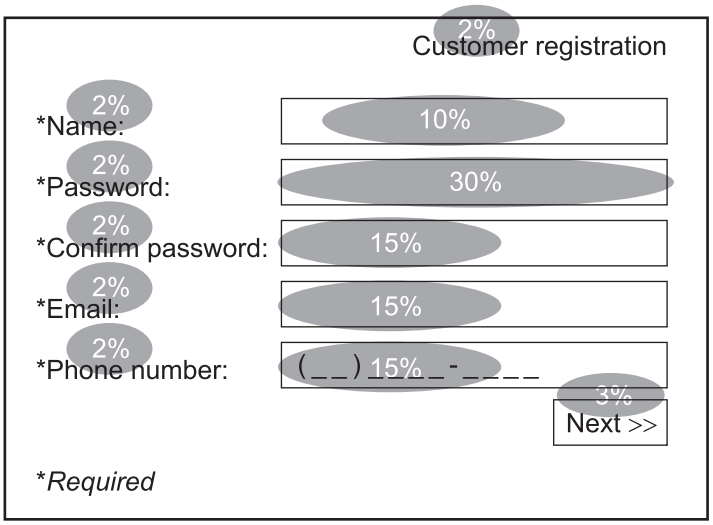
Do not write in this area.

Question 18 (4 marks)

Vanja would like to use a new technique for conducting a usability test on the customer registration screen. This would involve mounting a camera on the test screens and running software to detect where users focus their eyes on the screen and for how long. The software would then produce a report detailing the percentage of time each user looks at each section of the screen. The diagram below shows how the test is set up.



The following diagram is an example report showing the percentage of time a user's eyes were looking at the highlighted sections of the screen.



Do not write in this area.

Taylor thinks an observation-based usability test would work better than eye-tracking technology. During this test, an observer would sit behind a user and take notes about the time taken, mistakes made, and other notes about how the user interacts with each field on the screen.

a. Describe **two** advantages of using eye-tracking technology rather than an observation-based usability test. 2 marks

b. Describe **two** advantages an observation-based usability test would have over eye-tracking technology. 2 marks

Question 19 (4 marks)

As the rewards application nears completion, an employee of SoDeBiz resigns and takes a copy of the usability testing data to a competitor.

a. Identify the relevant legislation breached in this situation. 1 mark

b. State how this legislation has been breached. 1 mark

c. Suggest two steps SoDeBiz should have taken to prevent this breach from happening. 2 marks

Step 1

Step 2

End of examination questions

This page is blank.

Applied Computing: Software Development

Insert for Section C

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

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY
VICTORIA State Government

Case study

Café SD is a successful, family-owned café operating in a shopping strip in Melbourne. After being offered an opportunity to open a second café in a busy shopping centre, Café SD decides to open more cafés in other suburbs as well. To help with their expansion, Café SD hires a software development company, SoDeBiz, to digitise their customer rewards program, which currently exists as a stamp card. This rewards program enables customers to get a free coffee after every fifth coffee purchased.

In addition to storing a customer's name and contact details, the new rewards application will record how many coffees a customer has purchased. After five coffees have been purchased, the rewards application will alert the customer that they are eligible for a free coffee. If they choose to redeem their free coffee, five purchases are removed from the record.

After their initial meeting, SoDeBiz decides to follow the agile development model to develop the new rewards application. There are two lead developers assigned to the project, Taylor and Vanja. They begin the process of analysis by collecting data in order to develop the software requirements specification. After collecting data from Café SD staff and customers, Taylor and Vanja determine the following functional and non-functional requirements.

Functional requirements

- register customer details
- update customer details
- delete customer details
- search customer details
- display loyalty card
- update coffee record

Non-functional requirements

- must work on a wide range of Android and iOS devices
- must be easy to use
- must work 99.9% of the time

After completing the analysis stage, Taylor and Vanja move into the design stage. As part of the design stage they develop several data dictionaries, two of which are shown below.

Data dictionaries

Customer Record (sorted by Customer ID)

Field	Type	Description
Customer ID	integer	incremental value for each customer as they are registered
Customer Name	string	first name of the customer
Password	string	hashed password
Email	string	registered email address of the customer
Phone Number	string	the phone number of the customer

Purchase Record (sorted by Transaction ID)

Field	Type	Description
Transaction ID	integer	incremental value for each transaction as it is made
Store ID	string	ID of the store where the purchase was made
Customer ID	integer	ID of the customer making the purchase
Timestamp	floating point	numeric code indicating the date and time when the purchase was made
payByPoints	Boolean	whether points were used to pay for the purchase, or whether another method was used

SoDeBiz then moves into the development stage.

Changing specifications

Midway through the development stage, Café SD decides that customers should be able to use points to purchase items other than coffee when using the rewards application. This means that instead of simply tracking the number of coffees purchased, points should be assigned a monetary value. Café SD decides that customers could earn one point for each cent spent. When using points to make a purchase, 10 points should be worth the equivalent of one cent. Customers could then buy an item costing $5 by using 5000 points.

Later, to encourage more people to sign up to the rewards application, Café SD requests that family members should be able to share their points. Café SD calls this ‘Family sharing’. Points would be stored in the family record and not with the user who earned them. Any user in the family group could use any, or all, of the available points.

Additional functional requirements

- view points balance
- view purchase history
- select menu items
- select payment method
- set up family group
- edit family group

End of Insert