

Apex Exam Guidebook

Digital Solutions
Year 12 QCE
Queensland Curriculum

2026 Edition

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Apex Exam Guidebook

Digital Solutions

Year 12 QCE

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Acknowledgements

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Unit 4 Digital impacts

Note: Exam questions are primarily relevant to Unit 4, Topic 1 and Topic 3.

Unit 4 – Topic 1: Digital methods for exchanging data

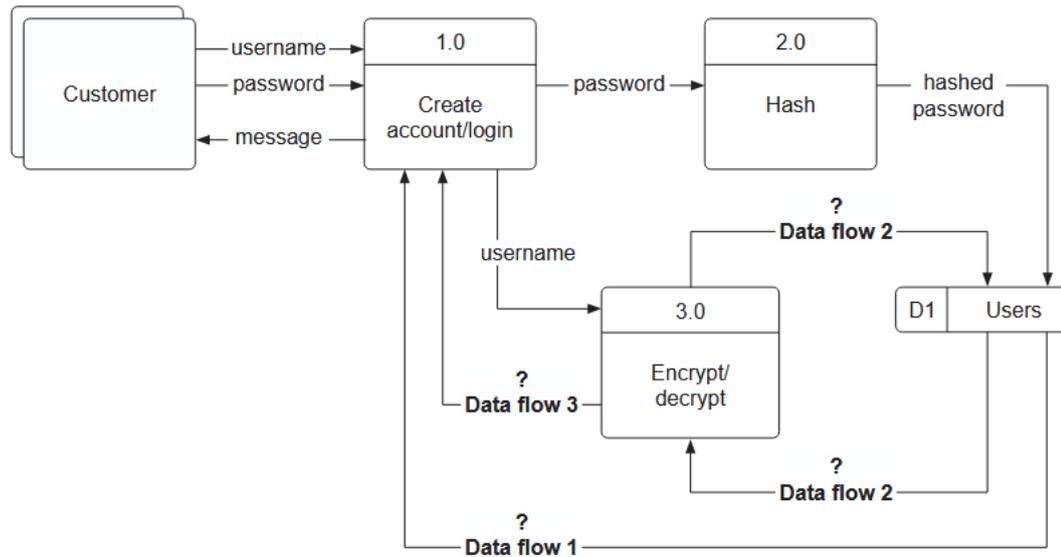
Paper 1 Section 1

2024 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Which element of visual communication, if not used appropriately, could risk the accessibility of a digital system? (A) line (B) form (C) scale (D) shape
2024 Paper 1 Section 1 Question 6 Digital methods for exchanging data	A distributed denial-of-service (DDoS) attack is a malicious cyber attack in which a server is overloaded with incoming traffic from multiple sources, preventing some or all legitimate requests. This is a risk to data (A) privacy. (B) integrity. (C) availability. (D) confidentiality.
2024 Paper 1 Section 1 Question 7 Digital methods for exchanging data	Which technique do developers use to ensure that video content transmitted in real-time to user mobile devices has reduced load times and maintains quality? (A) streaming (B) compression (C) broadcasting (D) file transfer protocol

2024
Paper 1
Section 1
Question 10

Digital methods for exchanging data

The data flow diagram symbolises data flow for secure user authentication.



Identify the correct data flow labels.

	Data flow 1	Data flow 2	Data flow 3
(A)	hashed password	encrypted username	decrypted username
(B)	hashed password	decrypted username	encrypted username
(C)	encrypted username	encrypted username	decrypted username
(D)	decrypted username	encrypted password	decrypted password

2023
Paper 1
Section 1
Question 1

Digital methods for exchanging data

Which encryption method uses a private and public key to secure data during transmission over the internet?

- (A) AES
- (B) DES
- (C) RSA
- (D) Twofish

2023
Paper 1
Section 1
Question 2

Digital methods for exchanging data

Screen-based user interfaces must dynamically adjust for different screen sizes because devices such as mobile phones and televisions have different aspect ratios and dimensions.

Which useability principle does this demonstrate?

- (A) utility
- (B) safety
- (C) validity
- (D) reliability

2023
Paper 1
Section 1
Question 3

Digital methods for exchanging data

Arranging and organising the UI elements of a user interface demonstrates use of

- (A) useability and accessibility.
- (B) elements of visual communication.
- (C) principles of visual communication.
- (D) a suitable programming environment.

<p>2023 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>During a video call with a friend, you notice a long delay between asking a question and your friend responding. This is most likely due to</p> <p>(A) jitter. (B) latency. (C) timeliness. (D) protocol standards.</p>
<p>2023 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>Which encryption method uses a fixed shift of letters down the alphabet with a modulus operation?</p> <p>(A) Caesar (B) Vigenere (C) Gronsfeld (D) One-time pad</p>
<p>2023 Paper 1 Section 1 Question 6</p> <p>Digital methods for exchanging data</p>	<p>Which statement correctly describes the relationship between JSON and REST?</p> <p>(A) Both JSON and REST are formats used to exchange data. (B) JSON uses JavaScript object notation and REST uses XML. (C) JSON is a format used to exchange data through REST architecture. (D) JSON refers to the client side and REST refers to the server side of a data exchange.</p>
<p>2022 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Hashing increases security for data</p> <p>(A) storage. (B) encryption. (C) compression. (D) authentication.</p>
<p>2022 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>Which encryption method is an example of asymmetric encryption?</p> <p>(A) DES (B) RSA (C) Blowfish (D) Triple DES</p>
<p>2022 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>A librarian uses a digital system to manage and monitor book borrowing. A friend of the librarian is desperate to borrow a book that is unavailable and asks the librarian for the details of the customer who has borrowed the book. Which Australian Privacy Principle would be breached if the librarian provided these details to their friend?</p> <p>(A) APP 2: Anonymity and pseudonymity (B) APP 4: Dealing with unsolicited personal information (C) APP 6: Use or disclosure of personal information (D) APP 13: Correction of personal information</p>

2022 Paper 1 Section 1 Question 5
Digital methods for exchanging data

Analyse the flow of data to identify the appropriate data security strategy to be performed at Z.

(A) authentication
 (B) checksum
 (C) hashing
 (D) encryption

2022 Paper 1 Section 1 Question 7
Digital methods for exchanging data

Which data format supports structures including strings, arrays, numbers and Booleans in UTF-8 encoding?

(A) SQL
 (B) XML
 (C) JSON
 (D) HTML

2022 Paper 1 Section 1 Question 8
Digital methods for exchanging data

Analyse the user interface to determine a visible risk that affects the data security of the webpage owner.

(A) The user interface has pop-up advertising.
 (B) The user interface hosts several documents for download.
 (C) The user interface requires user input of personal information.
 (D) The user interface uses the HTTP network transmission protocol.

<p>2021 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Converting a variable-length set of data to a fixed-length hexadecimal value is known as</p> <p>(A) hashing. (B) checksum. (C) encryption. (D) authentication</p>
<p>2021 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>A developer has produced a user interface for data entry in a new online system and has used consistent colour, layout and typography throughout.</p> <p>The main purpose of doing this is to ensure the user interface is</p> <p>(A) easy to learn. (B) well organised. (C) visually appealing. (D) accessible to all users.</p>
<p>2021 Paper 1 Section 1 Question 3</p> <p>Digital methods for exchanging data</p>	<p>The FTP network protocol is used to</p> <p>(A) exchange files over the internet. (B) encrypt files exchanged over the internet. (C) tunnel data packets between a client and server. (D) create a secure connection between a client and server.</p>
<p>2021 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>JSON is an effective exchange method for customer data across a networked system because</p> <p>(A) data structures are hierarchical and easily displayed on a website. (B) data can be tagged to associate with specific structures in a programming language. (C) data is human readable with code comments, making it easier to understand in programming. (D) data is easily converted into various data structures suitable for specific programming languages.</p>

<p>2021 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>The data flow diagram describes a system for recording bird sightings.</p> <p>Which statement about the diagram is correct?</p> <p>(A) Participants can access detailed bird count data. (B) Login screens for researchers and participants will be different. (C) The data interface for researchers and participants will be different. (D) Administrators need to verify all users before they can access the system.</p>
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<p>2021 Paper 1 Section 1 Question 7</p> <p>Digital methods for exchanging data</p>	<p>Screen-based user interfaces must be dynamically adjustable because mobile phones, televisions and other screens have different aspect ratios and dimensions.</p> <p>This is an example of which useability principle?</p> <p>(A) safety (B) utility (C) validity (D) reliability</p>
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<p>2021 Paper 1 Section 1 Question 10</p> <p>X</p>	<p>Which solution requirements help protect the integrity of customer order data when ordering online?</p> <p>(A) Customers can only track their own parcels. (B) Customers can track parcels using a parcel ID. (C) All delivery messages contain a valid checksum. (D) All delivery messages contain a valid hash function.</p>
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<p>2020 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Asymmetric encryption algorithms</p> <p>(A) all use one key. (B) only use private keys. (C) have a block size of 64. (D) use different keys for encryption and decryption.</p>
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2020 Paper 1 Section 1 Question 2 X	<p>The useability principle of utility can best be described as the ability of</p> <p>(A) different systems to present information in different ways to a single user. (B) different systems to present information in the same way to a single user. (C) a system to be used by many different users. (D) a system to do the work a user needs to do.</p>
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2020 Paper 1 Section 1 Question 4 Digital methods for exchanging data	<p>Streaming requires real-time delivery of video and audio data. To ensure high-quality streaming for the viewer, the frames must arrive in the correct order and with minimal delay.</p> <p>When developing such a system</p> <p>(A) latency and jitter must be minimised. (B) latency and jitter must be maximised. (C) latency must be maximised and jitter must be minimised. (D) latency must be minimised and jitter must be maximised.</p>
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2020 Paper 1 Section 1 Question 5 Digital methods for exchanging data	<p>A business uses an online form to collect information about its customers. A customer has entered their tax file number in a comment area, even though they were not required to provide this information. To comply with the Australian Privacy Principles (2014), the business should</p> <p>(A) encrypt this data. (B) delete this data immediately. (C) notify the customer that the data has been received. (D) notify the tax department that a data breach has occurred.</p>
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Refer to Stimulus 1 in the stimulus book.

Stimulus 1

The table shown provides an overview of the Australian Privacy Principles and the acronyms used to identify them.

Australian Privacy Principles (APPs) (2014)

APP 1	Open and transparent management of personal information
APP 2	Anonymity and pseudonymity
APP 3	Collection of solicited personal information
APP 4	Dealing with unsolicited personal information
APP 5	Notification of the collection of personal information
APP 6	Use or disclosure of personal information
APP 7	Direct marketing
APP 8	Cross-border disclosure of personal information
APP 9	Adoption, use or disclosure of government related identifiers
APP 10	Quality of personal information
APP 11	Security of personal information
APP 12	Access to personal information
APP 13	Correction of personal information

A hospital has installed a state-of-the-art boom gate at the entrance to the staff car park. The boom gate scans and records numberplates and requires drivers to swipe their ID card for access.

a) Identify three Australian Privacy Principles that apply to the use of personally identifiable or sensitive data and explain how the hospital could implement each principle. [3 marks]

Australian Privacy Principle: _____

Implementation:

Australian Privacy Principle: _____

Implementation:

Australian Privacy Principle: _____

Implementation:

b) Analyse the scenario to determine a risk to data confidentiality, integrity and availability and make a recommendation for reducing each of these risks. [6 marks]

Confidentiality:

Refer to Stimulus 2 in the stimulus book.

Stimulus 2

The user interface mock-up shown represents a simple, educational matching game being developed for young children for use on a mobile tablet. The goal is for children to identify and select the grocery items on the shopping list to proceed through different levels in the game. The purpose of the game is to teach children to associate pictures with words, to help expand children’s reading vocabulary.



A small game development company has approached you to make a simple matching game for young children. They have provided a mock-up of the user interface along with three criteria.

Criteria:

- six unique grocery items are displayed randomly
- four unique shopping list items are generated randomly
- four grocery items match with the generated shopping list items.

You find a code library with the following functions.

Function call	Purpose
<code>GetRandomInt(a, b)</code>	This function takes two integers — a and b — and returns an integer between a and b (inclusive).
<code>ShuffleList(List)</code>	This function takes a list and returns a new list in which the elements have been arranged randomly.
<code>GetRandomFromList(List)</code>	This function takes a list and returns an element that has been selected randomly.

a) Analyse the user interface mock-up and criteria to select one code function you would use to develop the game. Justify your choice and explain the relationship between the code function, user interface mock-up and criteria. [3 marks]

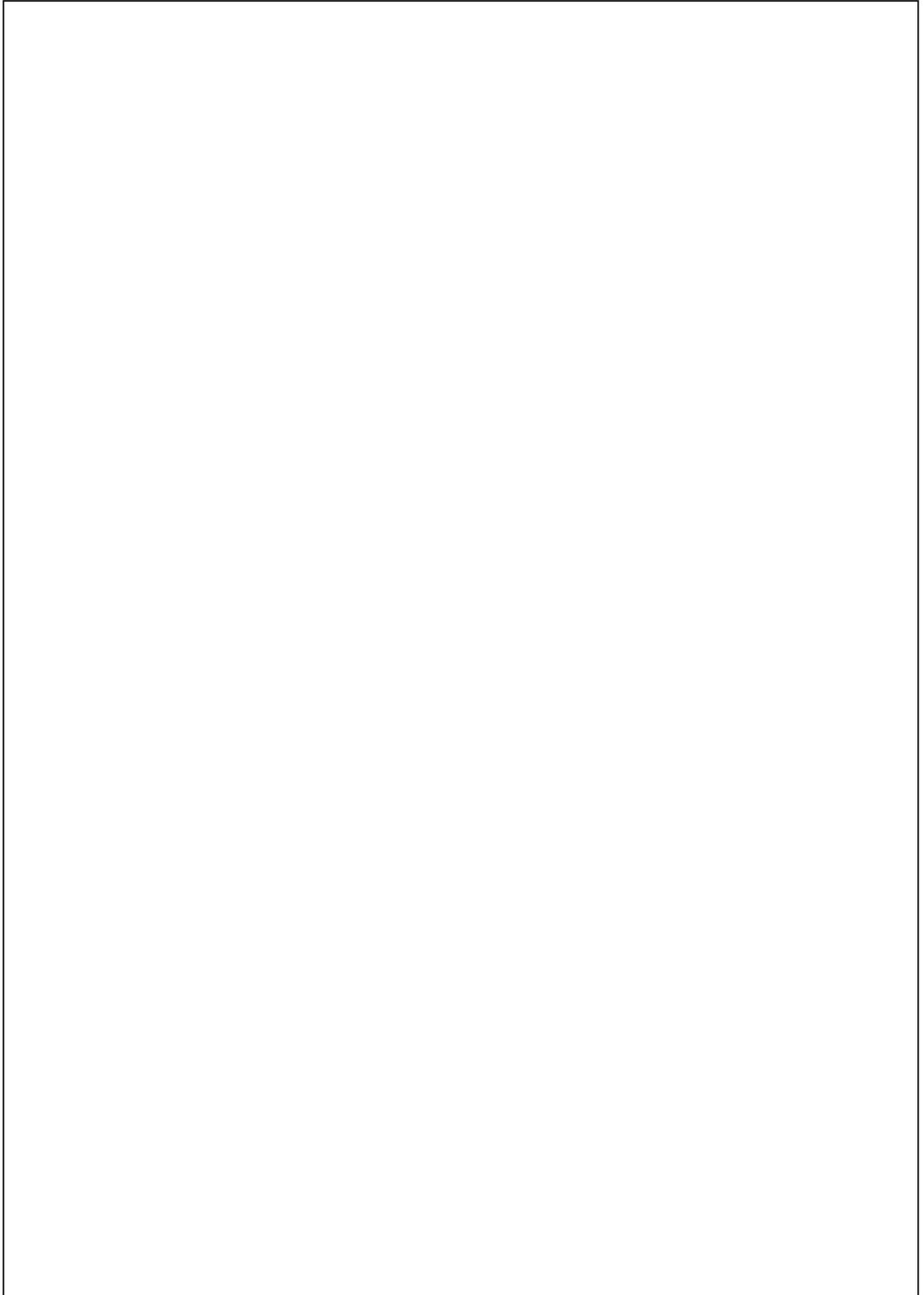
b) Based on your knowledge of useability principles, recommend two new programmed components and their related user interface elements for the game. Justify your response. [6 marks]

**2024
Paper 1
Section 2
Question 14**

**Digital
methods for
exchanging
data**

Two friends want to send each other encrypted messages. They have decided to use a one-time pad encryption algorithm.

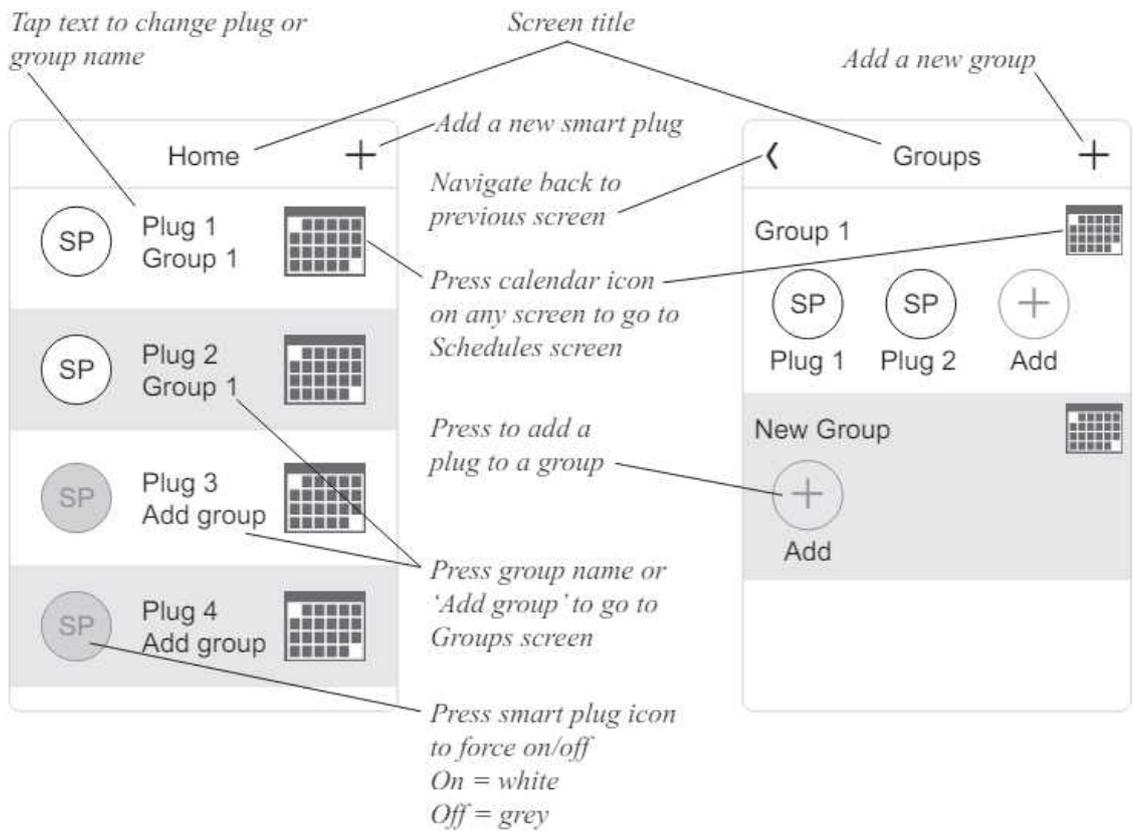
Use a data flow diagram to symbolise the data flows required for one friend to send an encrypted message to the other friend. Include external entities, processes and any relevant data stores in your response.



**2023
Paper 1
Section 2
Question 14**

**Digital
methods for
exchanging
data**

The user interface symbolises a new smart home system that manages plugs to allow for efficient energy use. The home screen lists plugs alphabetically and annotations describe the function of each element. Schedules allow users to set on/off schedules for individual smart plugs and groups.



a) Symbolise the user interface for the Schedules screen, allowing for multiple on/off times per day and selecting any day of the week. Describe the function of each element. [7 marks]



b) Evaluate the user interface of the smart home system to recommend two additional features that could improve accessibility. Justify your response. [4 marks]

2022
Paper 1
Section 2
Question 12

Digital
methods for
exchanging
data

Refer to Stimulus 1 in the stimulus book.

Stimulus 1

This algorithm calculates the interest on a savings account based on the amount deposited and the number of years this amount remains in the account.

```
1 BEGIN
2 INPUT depositAmount
3 INPUT years
4
5 CALCULATE interestRate = calculateInterestRate(depositAmount)
6 CALCULATE savings = calculateSavings(depositAmount, years,
  interestRate)
7
8 OUTPUT ("For a deposit of ${depositAmount} for {years} year/s at an
  interest rate of ((interestRate) × 100)%, your total savings would be
  ${savings}.")
9 END
10
11 BEGIN calculateInterestRate (depositAmount)
12 IF depositAmount <= 10000
13   value = 0.04
14 ELSE IF depositAmount > 10000 AND depositAmount <= 50000 THEN
15   value = 0.03
16 ELSE
17   value = 0.02
18 ENDIF
19 ENDIF
20 RETURN value
21 END calculateInterestRate
22
23 BEGIN calculateSavings(depositAmount, years, interestRate)
24 FOR i = 1 TO years
25   deposit = depositAmount + depositAmount × interestRate
26 NEXT i
27 ENDFOR
28 RETURN deposit
29 END calculateSavings
```

a) Describe the listed algorithm constructs and identify one example of each from the stimulus. Use corresponding line numbers to identify examples. [6 marks]

Assignment:

Example:

	Condition: <hr/>
	Example: <hr/>
	Iteration: <hr/>
	Example: <hr/>
	b) Explain the purpose of modularisation and identify an example of how it is used in the stimulus. Use corresponding line numbers in your response. [2 marks]
	<hr/>

**2021
Paper 1
Section 2
Question 11**

**Digital
methods for
exchanging
data**

Business owners use an online platform to sell products. The essential features of the platform are listed.

Platform:

- allows customers and business owners to register and log in
- has four data stores (customer data, products, shopping cart and orders)
- processes order payments
- confirms orders with customers and business owners after successful payment.

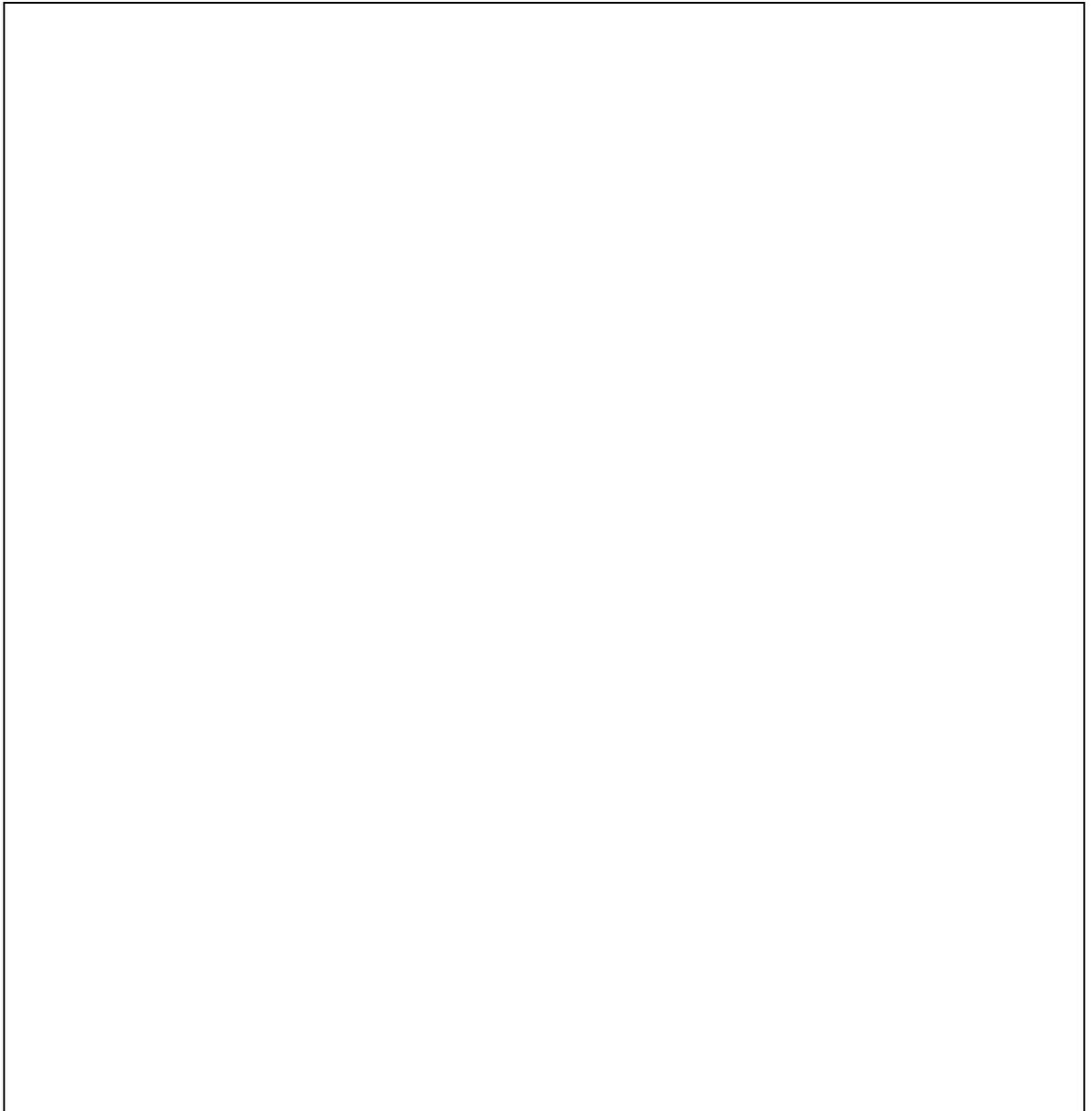
Customers:

- register an account
- select products that appear in the shopping cart
- may continue shopping after viewing the shopping cart.

Business owners:

- access confirmed orders
- access customer account details
- update products and prices.

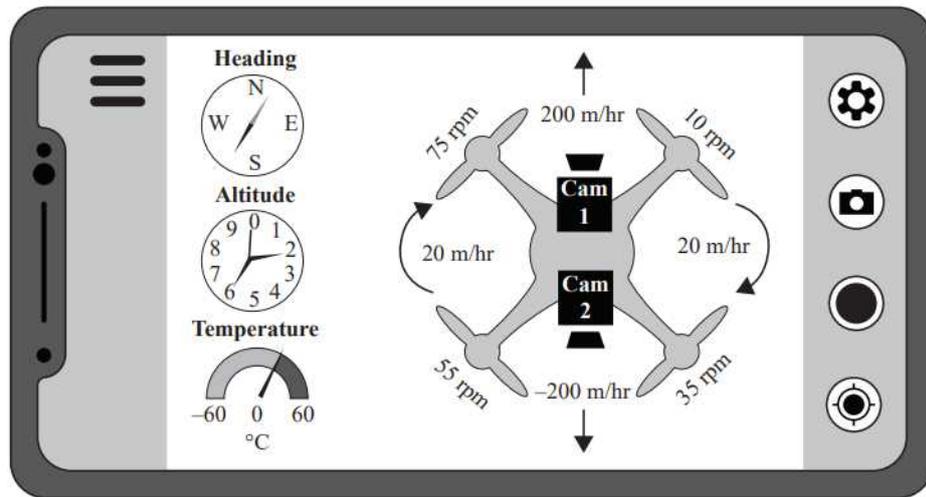
Symbolise data flow for this system using a diagram that includes all essential features listed.



2020
Paper 1
Section 2
Question 11

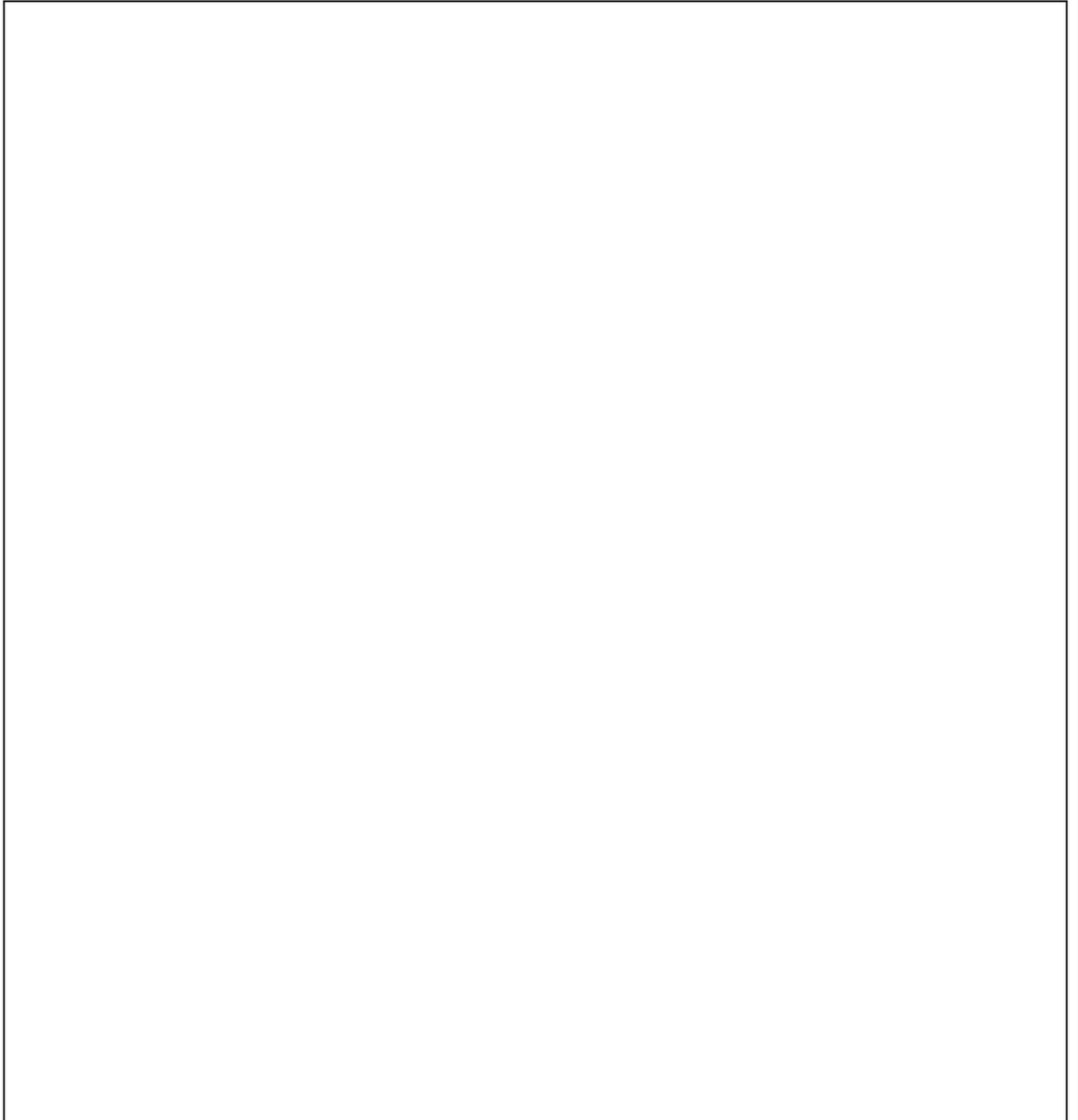
Digital
methods for
exchanging
data

The diagram shows the user interface for a drone control panel.



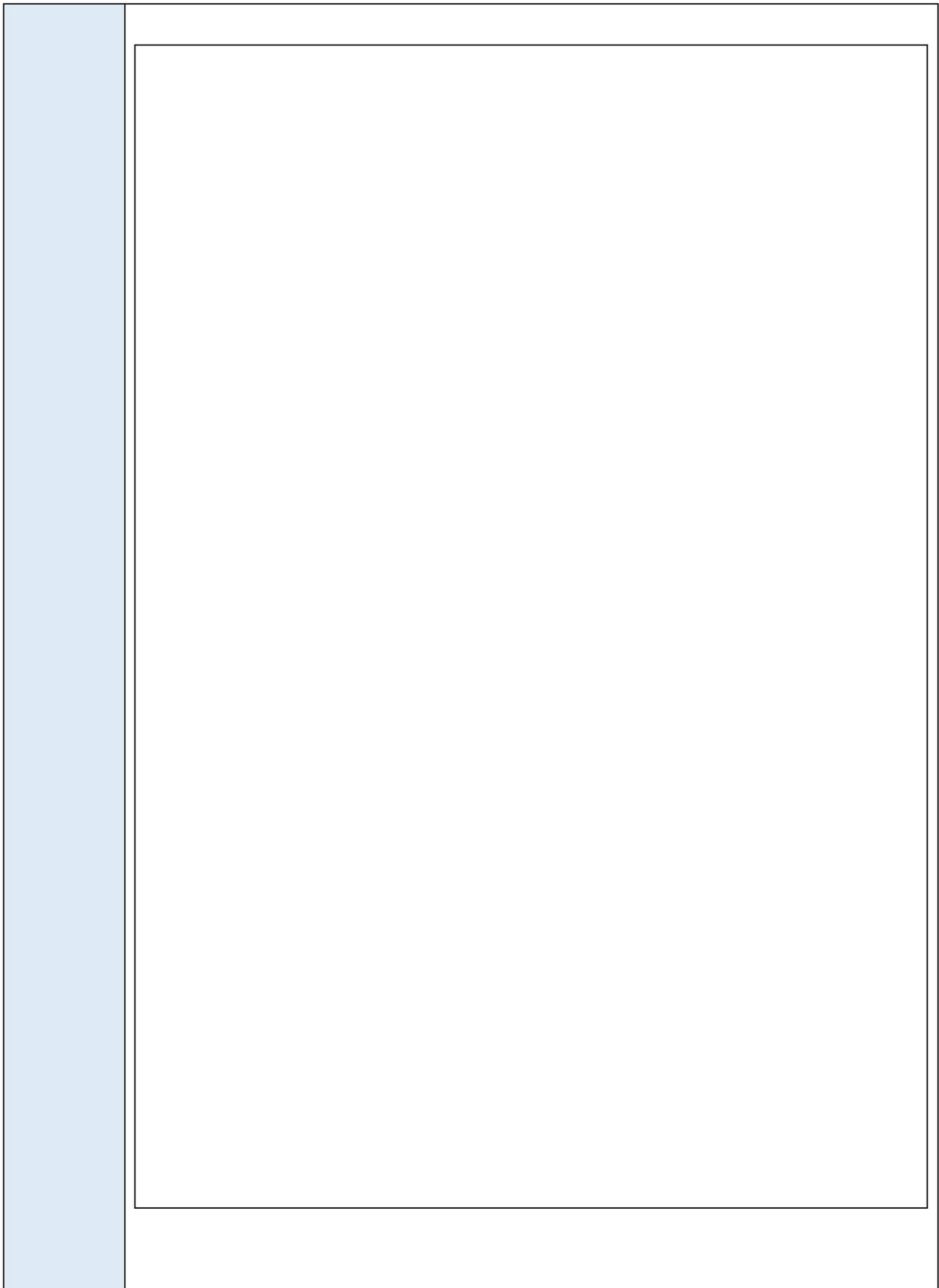
a) Explain how three elements and three principles of visual communication (excluding colour) have been used. [12 marks]

b) Further develop the user interface to include five new features: camera views for Cameras 1 and 2, and readings for speed, battery power and flight angle. [5 marks]



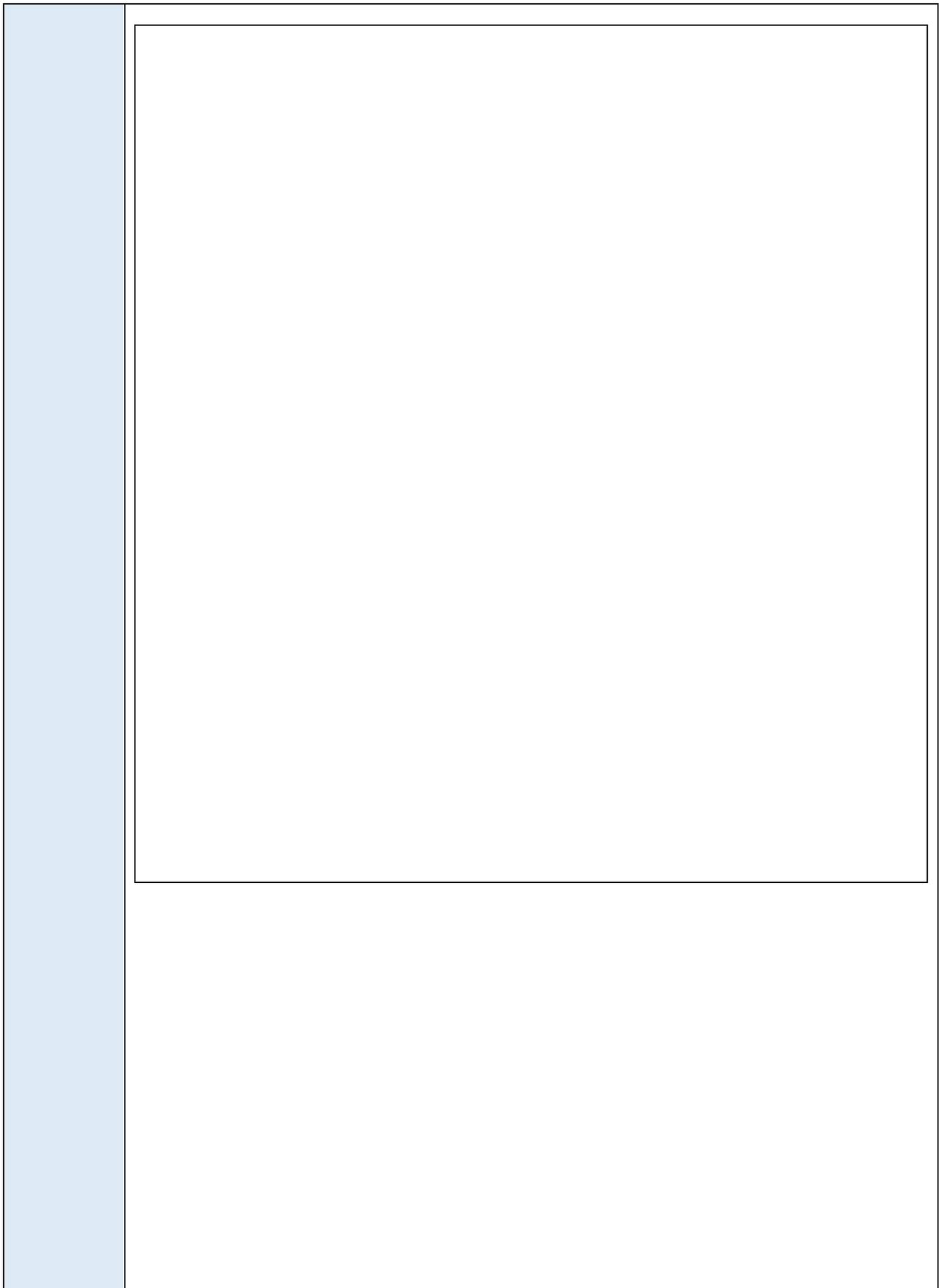
c) Use four elements and principles of visual communication to justify, in annotations on your diagram in 11b), the placement and visual appearance of the five new features of the user interface. [4 marks]

<p>2024 Paper 1 Section 3 Question 15</p> <p>Digital methods for exchanging data</p>	<p>A local high school is creating a map-based navigation app, catered to new staff and students in Years 7 to 10. Currently, the app does not include a login feature and does not require the user to be on campus to explore the map. The school has prescribed the following criteria to the developers:</p> <p>User interface</p> <p>The user interface of the app should display:</p> <ul style="list-style-type: none">• a map of the school grounds only• the current location of the user on the map• labelled buildings and classrooms• a search feature• a navigation feature to show new staff and students which way to go to get to their classrooms. <p>Functionality</p> <p>The app should be able to:</p> <ul style="list-style-type: none">• locate and update the user's location as they move about the campus• support a custom starting location for when users are off campus• search for buildings and classrooms• navigate to a desired location. <p>a) Develop a user interface prototype for the navigation app that addresses all prescribed criteria. The prototype should be intended for a mobile tablet user. Use annotations to explain how your user interface addresses all the functionality criteria. [9 marks]</p>
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d) Recommend a data security strategy for the app and provide an example to justify your response. [2 marks]

<p>2022 Paper 1 Section 3 Question 15</p> <p>Digital methods for exchanging data</p>	<p>Digital Solutions students decide to generate an application to manage fundraising activities for their school. Students and staff need to be able to log in, view items and their prices, and select items for purchase. Payments will not be processed by the web application; payment details will be recorded in a database and processed manually by school administration staff.</p> <p>School administration staff manually add item details to the application as they are donated and purchased. Once an order has been placed, stock availability should automatically update.</p> <p>School administration staff would also like to view order history to determine the popularity of items.</p> <p>a) Develop a data flow diagram to address all user needs and application requirements, using the response space on the next page. [19 marks]</p>
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d) Assuming the system is successfully implemented, evaluate the personal, social and economic impacts of this application. Refer to specific features of the application in your response. [3 marks]

Personal:

Social:

Economic:

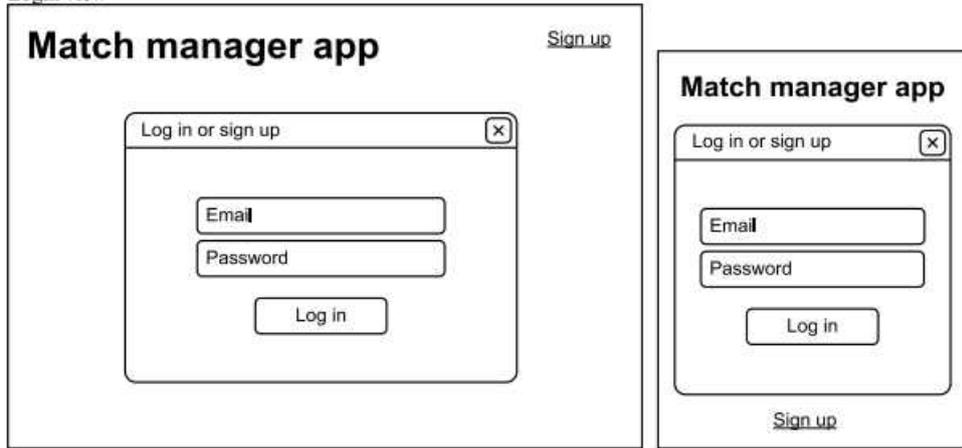
a) Analyse Stimulus 1 in the stimulus book. Describe all the ways space, line and tone are used and how visual hierarchy, proximity and alignment have informed development of the match manager user interface. [6 marks]

Stimulus 1

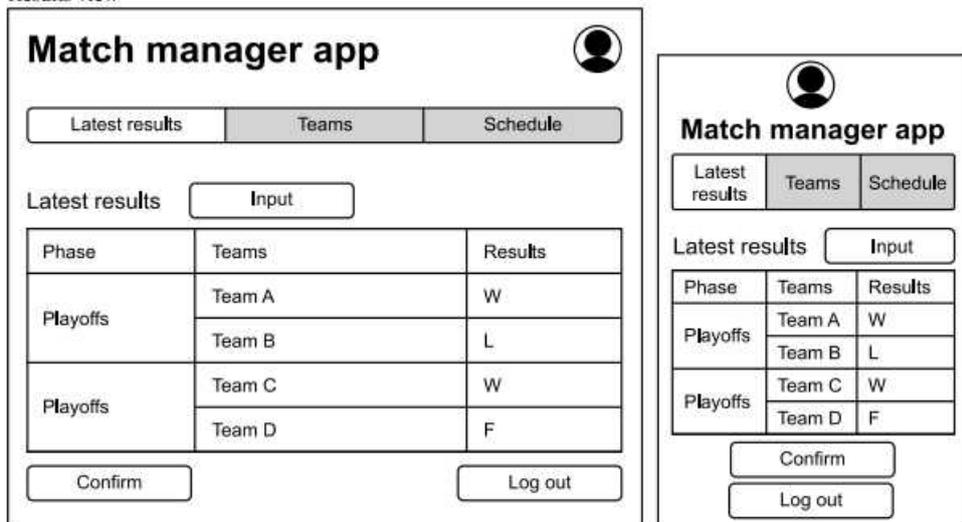
A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

The app supports large international tournaments as well as smaller local events for a range of popular games. Teams and match data are managed by tournament administrators.

Login view



Results view



Key	
W	Win
L	Lose
F	Forfeit

b) Evaluate Stimulus 1 to determine the data exchange components required for the app and explain the relationship between them. [6 marks]

c) Using Stimulus 1 and 2 in the stimulus book, make three justified recommendations, based on survey feedback, to improve data security of the match manager system. [6 marks]

Stimulus 1

A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

The app supports large international tournaments as well as smaller local events for a range of popular games. Teams and match data are managed by tournament administrators.

Login view

Results view

Phase	Teams	Results
Playoffs	Team A	W
	Team B	L
Playoffs	Team C	W
	Team D	F

Key	
W	Win
L	Lose
F	Forfeit

Stimulus 2

User feedback survey

Question 1: What features made it easy or hard to log in or access match results?

8 responses:

1. Not enough results displayed.
2. When I clicked 'input', I received a 401 'Unauthorised' error.
3. When I clicked 'confirm', I received a 401 'Unauthorised' error.
4. Forgot password.
5. There are two options for signing up — which one do I use?
6. My match result was not there.
7. The pop-up was clear and easy to access.
8. The most recent results were the first thing I saw, which is what I wanted.

Question 2: What concerns did you have when using the system?

8 responses:

1. When I log in, my password is visible to others.
2. None.
3. I don't understand why there is a confirm button.
4. No way of resetting password.
5. When I closed the login window, I got stuck and couldn't log in, so had to refresh.
6. Some results were wrong, but I can't provide feedback or make contact.
7. The confirm button didn't work for me.
8. I couldn't change my password.

b) The programmers make the solution publicly available on their website as a web application. Explain and justify how they could implement two useability principles to optimise user experience. [6 marks]

Marking Guide – Paper 1 Section 1

<p>2024 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Which element of visual communication, if not used appropriately, could risk the accessibility of a digital system?</p> <p>(A) line (B) form (C) scale - Answer (D) shape</p>
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<p>2024 Paper 1 Section 1 Question 6</p> <p>Digital methods for exchanging data</p>	<p>A distributed denial-of-service (DDoS) attack is a malicious cyber attack in which a server is overloaded with incoming traffic from multiple sources, preventing some or all legitimate requests.</p> <p>This is a risk to data</p> <p>(A) privacy. (B) integrity. (C) availability. - Answer (D) confidentiality.</p>
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<p>2024 Paper 1 Section 1 Question 7</p> <p>Digital methods for exchanging data</p>	<p>Which technique do developers use to ensure that video content transmitted in real-time to user mobile devices has reduced load times and maintains quality?</p> <p>(A) streaming (B) compression - Answer (C) broadcasting (D) file transfer protocol</p>
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<p>2024 Paper 1 Section 1 Question 10</p> <p>Digital methods for exchanging data</p>	<p>The data flow diagram symbolises data flow for secure user authentication.</p> <p>Identify the correct data flow labels.</p>
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	Data flow 1	Data flow 2	Data flow 3
(A)	hashed password	encrypted username	decrypted username
(B)	hashed password	decrypted username	encrypted username
(C)	encrypted username	encrypted username	decrypted username
(D)	decrypted username	encrypted password	decrypted password

Answer is A.

<p>2023 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Which encryption method uses a private and public key to secure data during transmission over the internet?</p> <p>(A) AES (B) DES (C) RSA – Answer (D) Twofish</p>
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<p>2023 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>Screen-based user interfaces must dynamically adjust for different screen sizes because devices such as mobile phones and televisions have different aspect ratios and dimensions.</p> <p>Which useability principle does this demonstrate?</p> <p>(A) utility – Answer (B) safety (C) validity (D) reliability</p>
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<p>2023 Paper 1 Section 1 Question 3</p> <p>Digital methods for exchanging data</p>	<p>Arranging and organising the UI elements of a user interface demonstrates use of</p> <p>(A) useability and accessibility. (B) elements of visual communication. (C) principles of visual communication. – Answer (D) a suitable programming environment.</p>
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<p>2023 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>During a video call with a friend, you notice a long delay between asking a question and your friend responding. This is most likely due to</p> <p>(A) jitter. (B) latency. – Answer (C) timeliness. (D) protocol standards.</p>
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<p>2023 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>Which encryption method uses a fixed shift of letters down the alphabet with a modulus operation?</p> <p>(A) Caesar – Answer (B) Vigenere (C) Gronsfeld (D) One-time pad</p>
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<p>2023 Paper 1 Section 1 Question 6</p> <p>Digital methods for exchanging data</p>	<p>Which statement correctly describes the relationship between JSON and REST?</p> <p>(A) Both JSON and REST are formats used to exchange data. (B) JSON uses JavaScript object notation and REST uses XML. (C) JSON is a format used to exchange data through REST architecture. – Answer (D) JSON refers to the client side and REST refers to the server side of a data exchange.</p>
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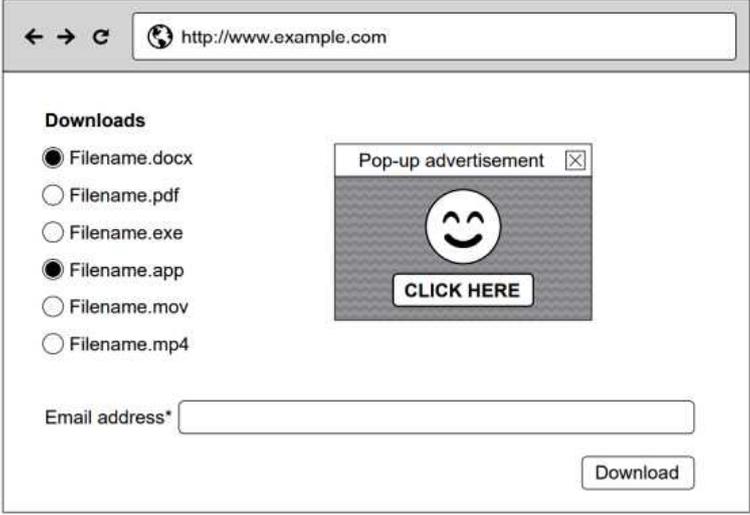
<p>2022 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Hashing increases security for data</p> <p>(A) storage. – Answer (B) encryption. (C) compression. (D) authentication.</p>
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<p>2022 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>Which encryption method is an example of asymmetric encryption?</p> <p>(A) DES (B) RSA – Answer (C) Blowfish (D) Triple DES</p>
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<p>2022 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>A librarian uses a digital system to manage and monitor book borrowing. A friend of the librarian is desperate to borrow a book that is unavailable and asks the librarian for the details of the customer who has borrowed the book. Which Australian Privacy Principle would be breached if the librarian provided these details to their friend?</p> <p>(A) APP 2: Anonymity and pseudonymity (B) APP 4: Dealing with unsolicited personal information (C) APP 6: Use or disclosure of personal information – Answer (D) APP 13: Correction of personal information</p>
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<p>2022 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>Analyse the flow of data to identify the appropriate data security strategy to be performed at Z.</p> <pre> graph TD Doctors[Doctors] -- "Username + password" --> Login[1.0 Login] Login -- "Confirmation or rejection" --> Doctors Login -- "Confirmation or rejection" --> Users[Users] Login -- "Authenticated user details" --> Enter[2.0 Enter medical records] Enter -- "Patient medical records" --> Z[Z] Z --> Records[Patient medical records] </pre> <p>(A) authentication (B) checksum (C) hashing (D) encryption – Answer</p>
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<p>2022 Paper 1 Section 1 Question 7</p> <p>Digital methods for exchanging data</p>	<p>Which data format supports structures including strings, arrays, numbers and Booleans in UTF-8 encoding?</p> <p>(A) SQL (B) XML (C) JSON – Answer (D) HTML</p>
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<p>2022 Paper 1 Section 1 Question 8</p> <p>Digital methods for exchanging data</p>	<p>Analyse the user interface to determine a visible risk that affects the data security of the webpage owner.</p> <div style="text-align: center; border: 1px solid gray; padding: 10px; margin: 10px auto; width: 80%;">  <p>The screenshot shows a web browser window with the address bar displaying 'http://www.example.com'. Below the address bar is a 'Downloads' section with a list of files: 'Filename.docx', 'Filename.pdf', 'Filename.exe', 'Filename.app', 'Filename.mov', and 'Filename.mp4'. The 'Filename.app' file is selected. To the right of the download list is a 'Pop-up advertisement' window with a smiley face icon and a 'CLICK HERE' button. Below the download list is an 'Email address*' input field and a 'Download' button.</p> </div> <p>(A) The user interface has pop-up advertising. (B) The user interface hosts several documents for download. (C) The user interface requires user input of personal information. (D) The user interface uses the HTTP network transmission protocol. – Answer</p>
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<p>2021 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Converting a variable-length set of data to a fixed-length hexadecimal value is known as</p> <p>(A) hashing. – Answer (B) checksum. (C) encryption. (D) authentication</p>
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<p>2021 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>A developer has produced a user interface for data entry in a new online system and has used consistent colour, layout and typography throughout.</p> <p>The main purpose of doing this is to ensure the user interface is</p> <p>(A) easy to learn. – Answer (B) well organised. (C) visually appealing. (D) accessible to all users.</p>
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<p>2021 Paper 1 Section 1 Question 3</p> <p>Digital methods for exchanging data</p>	<p>The FTP network protocol is used to</p> <p>(A) exchange files over the internet. – Answer (B) encrypt files exchanged over the internet. (C) tunnel data packets between a client and server. (D) create a secure connection between a client and server.</p>
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<p>2021 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>JSON is an effective exchange method for customer data across a networked system because</p> <p>(A) data structures are hierarchical and easily displayed on a website. (B) data can be tagged to associate with specific structures in a programming language. (C) data is human readable with code comments, making it easier to understand in programming. (D) data is easily converted into various data structures suitable for specific programming languages. – Answer</p>
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<p>2021 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>The data flow diagram describes a system for recording bird sightings.</p> <p>Which statement about the diagram is correct?</p> <p>(A) Participants can access detailed bird count data. (B) Login screens for researchers and participants will be different. (C) The data interface for researchers and participants will be different. – Answer (D) Administrators need to verify all users before they can access the system.</p>
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<p>2021 Paper 1 Section 1 Question 7</p> <p>Digital methods for exchanging data</p>	<p>Screen-based user interfaces must be dynamically adjustable because mobile phones, televisions and other screens have different aspect ratios and dimensions.</p> <p>This is an example of which useability principle?</p> <p>(A) safety (B) utility – Answer (C) validity (D) reliability</p>
<p>2021 Paper 1 Section 1 Question 10</p> <p>Digital methods for exchanging data</p>	<p>Which solution requirements help protect the integrity of customer order data when ordering online?</p> <p>(A) Customers can only track their own parcels. (B) Customers can track parcels using a parcel ID. (C) All delivery messages contain a valid checksum. – Answer (D) All delivery messages contain a valid hash function.</p>
<p>2020 Paper 1 Section 1 Question 1</p> <p>Digital methods for exchanging data</p>	<p>Asymmetric encryption algorithms</p> <p>(A) all use one key. (B) only use private keys. (C) have a block size of 64. (D) use different keys for encryption and decryption. – Answer</p>
<p>2020 Paper 1 Section 1 Question 2</p> <p>Digital methods for exchanging data</p>	<p>The useability principle of utility can best be described as the ability of</p> <p>(A) different systems to present information in different ways to a single user. (B) different systems to present information in the same way to a single user. – Answer (C) a system to be used by many different users. (D) a system to do the work a user needs to do.</p>
<p>2020 Paper 1 Section 1 Question 4</p> <p>Digital methods for exchanging data</p>	<p>Streaming requires real-time delivery of video and audio data. To ensure high-quality streaming for the viewer, the frames must arrive in the correct order and with minimal delay.</p> <p>When developing such a system</p> <p>(A) latency and jitter must be minimised. – Answer (B) latency and jitter must be maximised. (C) latency must be maximised and jitter must be minimised. (D) latency must be minimised and jitter must be maximised.</p>
<p>2020 Paper 1 Section 1 Question 5</p> <p>Digital methods for exchanging data</p>	<p>A business uses an online form to collect information about its customers. A customer has entered their tax file number in a comment area, even though they were not required to provide this information. To comply with the Australian Privacy Principles (2014), the business should</p> <p>(A) encrypt this data. (B) delete this data immediately. – Answer (C) notify the customer that the data has been received. (D) notify the tax department that a data breach has occurred.</p>

2024
Paper 1
Section 2
Question 11

Digital
methods for
exchanging
data

Refer to Stimulus 1 in the stimulus book.

Stimulus 1

The table shown provides an overview of the Australian Privacy Principles and the acronyms used to identify them.

Australian Privacy Principles (APPs) (2014)

APP 1	Open and transparent management of personal information
APP 2	Anonymity and pseudonymity
APP 3	Collection of solicited personal information
APP 4	Dealing with unsolicited personal information
APP 5	Notification of the collection of personal information
APP 6	Use or disclosure of personal information
APP 7	Direct marketing
APP 8	Cross-border disclosure of personal information
APP 9	Adoption, use or disclosure of government related identifiers
APP 10	Quality of personal information
APP 11	Security of personal information
APP 12	Access to personal information
APP 13	Correction of personal information

A hospital has installed a state-of-the-art boom gate at the entrance to the staff car park. The boom gate scans and records numberplates and requires drivers to swipe their ID card for access.

a) Identify three Australian Privacy Principles that apply to the use of personally identifiable or sensitive data and explain how the hospital could implement each principle. [3 marks]

Sample response	The response
<p>Australian Privacy Principle: 1 Implementation: The hospital must be open and transparent about why it is collecting the data, how the data will be used and disclosed, and who will have access to the data. The hospital must also provide clear guidelines to staff about the collection and use of this information.</p> <p>Australian Privacy Principle: 2 Implementation: The hospital must consider whether it is possible for staff to use a pseudonym instead of their real names when accessing the car park. If this is not practical, the hospital must ensure that it handles the personal information it collects in a secure and confidential manner, and only uses it for the purposes for which it was collected.</p> <p>Australian Privacy Principle: 3 Implementation: The hospital must have a lawful reason for collecting staff driver information and inform staff of the purpose and use of the data collected.</p>	<ul style="list-style-type: none"> • identifies and explains the implementation of <ul style="list-style-type: none"> – one Australian Privacy Principle [1 mark] – a second Australian Privacy Principle [1 mark] – a third Australian Privacy Principle [1 mark]

b) Analyse the scenario to determine a risk to data confidentiality, integrity and availability and make a recommendation for reducing each of these risks. [6 marks]

Sample response	The response
<p>Confidentiality: The digital solution for capturing numberplate information and staff names poses risks for privacy, as personal data from various sources may be linked in unexpected ways. Only one trusted employee, like an IT manager, should have access to the database, and only after going through a review process approved by the hospital's recruitment and management staff. Information should only be shared between the IT manager and staff member in question, with no other parties privy to conversations or actions taken.</p> <p>Integrity: The data in the database must be error-free, but staff may attempt to abuse the system by providing access to family or friends by lending them their staff ID and obscuring their number plates to gain entry. To prevent staff from logging different numberplates, the system should crosscheck a list of permitted numberplates against IDs before granting access.</p> <p>Availability: The data may be vulnerable to hacking if allowed online, so a MicroSD card should be used for offline access by a trusted staff member. Physical security of the system and SD card should be maintained to prevent staff from damaging or destroying the digital solution. Data should be purged regularly, and the database should be detached and not accessible online. Numberplate data captured by the system should be encrypted and only accessible in extreme cases.</p>	<ul style="list-style-type: none"> • analyses a risk to data <ul style="list-style-type: none"> – confidentiality [1 mark] – integrity [1 mark] – availability [1 mark] • makes a recommendation for reducing risks to data <ul style="list-style-type: none"> – confidentiality [1 mark] – integrity [1 mark] – availability [1 mark]

2024
Paper 1
Section 2
Question 13

Digital methods for exchanging data

Refer to Stimulus 2 in the stimulus book.

Stimulus 2

The user interface mock-up shown represents a simple, educational matching game being developed for young children for use on a mobile tablet. The goal is for children to identify and select the grocery items on the shopping list to proceed through different levels in the game. The purpose of the game is to teach children to associate pictures with words, to help expand children's reading vocabulary.



A small game development company has approached you to make a simple matching game for young children. They have provided a mock-up of the user interface along with three criteria.

Criteria:

- six unique grocery items are displayed randomly
- four unique shopping list items are generated randomly
- four grocery items match with the generated shopping list items.

You find a code library with the following functions.

Function call	Purpose
GetRandomInt (a, b)	This function takes two integers — a and b — and returns an integer between a and b (inclusive).
ShuffleList (List)	This function takes a list and returns a new list in which the elements have been arranged randomly.
GetRandomFromList (List)	This function takes a list and returns an element that has been selected randomly.

a) Analyse the user interface mock-up and criteria to select one code function you would use to develop the game. Justify your choice and explain the relationship between the code function, user interface mock-up and criteria. [3 marks]

Sample response	The response
<p>I would use GetRandomFromList(List) to select random items from a list of grocery items to be displayed. ShuffleList(List) does not seem necessary, as once items are randomised, it does not matter in what order they are displayed. GetRandomInt(a, b) requires more effort to code, as grocery or shopping list items would need to be assigned an integer value, whereas GetRandomFromList(List) would simply select an item from a list (e.g. image file or string). The relationship between the selected function and user interface is that the grocery images displayed would be selected by the function at random. The criteria states six grocery items, so the function would need to loop through six iterations — I would need to add programming to ensure there are no duplicates.</p>	<ul style="list-style-type: none"> • justifies the selection of one code function [1 mark] • explains the relationship between the code function and <ul style="list-style-type: none"> – the user interface mock-up [1 mark] – the criteria [1 mark]

b) Based on your knowledge of useability principles, recommend two new programmed components and their related user interface elements for the game. Justify your response. [6 marks]

Sample response	The response
<p>User input: A mechanism for user input should be implemented to allow the user to select food items from those displayed. This should be intuitive and easy to use, for example by using buttons, touch controls or keyboard inputs.</p> <p>Feedback mechanism: A clear and immediate feedback mechanism should be implemented to provide feedback to the user on whether their selection is correct or incorrect. This can be done through visual or audio cues, such as a pop-up message, change in colour of the selected item, check mark or tick next to the selected item, or audio feedback.</p>	<ul style="list-style-type: none"> • recommends <ul style="list-style-type: none"> – one new programmed component [1 mark] – a second new programmed component [1 mark] • identifies related user interface elements for <ul style="list-style-type: none"> – one new programmed component [1 mark] – a second new programmed component [1 mark] • justifies recommendations for <ul style="list-style-type: none"> – one new programmed component and related user interface elements [1 mark] – a second new programmed component and related user interface elements [1 mark]

**2024
Paper 1
Section 2
Question 14**

**Digital
methods for
exchanging
data**

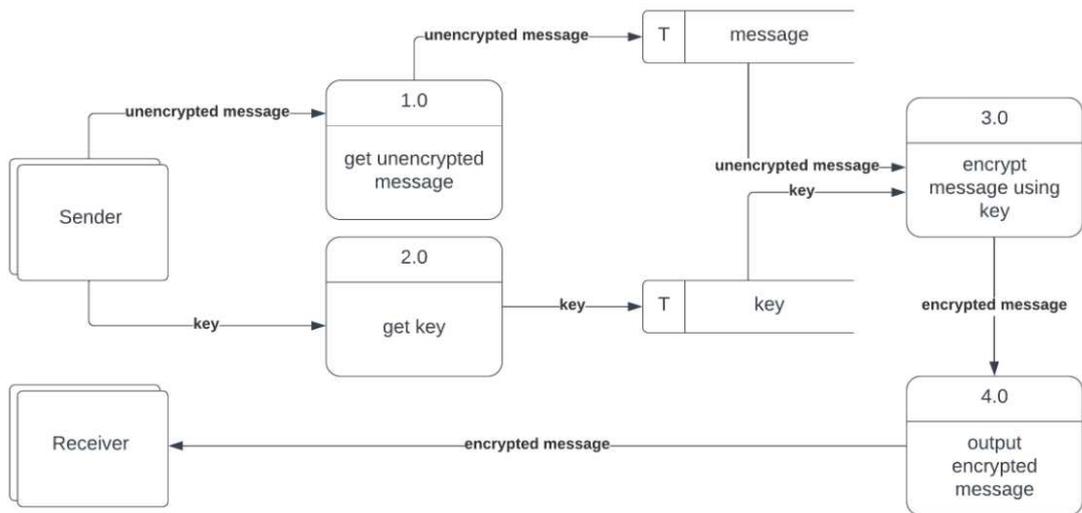
Two friends want to send each other encrypted messages. They have decided to use a one-time pad encryption algorithm.

Use a data flow diagram to symbolise the data flows required for one friend to send an encrypted message to the other friend. Include external entities, processes and any relevant data stores in your response.

The response

- symbolises an external entity for
 - one user [1 mark]
 - a second user [1 mark]
 - symbolises a process for
 - encrypting a message with a key [1 mark]
 - symbolises logical data flows for
 - an unencrypted message [1 mark]
 - a key [1 mark]
 - an encrypted message [1 mark]
 - symbolises data store or a solution that works without one [1 mark]
 - uses
 - conventions of the data flow diagram with no errors [2 marks]
- OR**
- conventions of the data flow diagram with 1 error [1 mark]
 - shows overall understanding of the problem with no logic errors [1 mark]

Sample response



Sample response 2



**2023
Paper 1
Section 2
Question 12**

**Digital
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A dentist runs a mobile van for dental check-ups at school. Patient details and dental treatments are recorded on a computer in the van, and patient data is transferred daily to a central server in the practice by email. The computer does not have a secure log-in system, and all staff can access the email account, since there is a rotating roster of staff. Patient confidentiality is important as some staff are parents of students at the school. Multiple personal data security needs are not being met by the current system.

a) Evaluate the security impacts of the system to identify two personal data security needs. [3 marks]

Sample response	The response
The current system poses a significant risk to patient privacy and data security due to the lack of a secure log-in system. All staff, including those who may be parents of students at the school, are able to access the email account containing patient data, and this could lead to a confidentiality breach. Two personal data security needs are a secure log-in system to restrict access to the computer in the van and a system for encrypting patient data when transferring to the central server in the practice.	<ul style="list-style-type: none"> • evaluates the security impacts of the system [1 mark] • identifies one personal data security need [1 mark] • identifies a second personal data security need [1 mark]

b) A VPN has been proposed to secure the van's system. Describe a secure feature of a VPN and explain how this could improve data security. [2 marks]

Sample response	The response
A VPN could improve this situation by establishing a private connection between the van and the dental practice. This prevents unauthorised hackers from intercepting communications between the two networks. A VPN is also encrypted, so the data is protected even if it is intercepted.	<ul style="list-style-type: none"> • describes a secure feature of a VPN [1 mark] • explains how a VPN could improve security [1 mark]

**2023
Paper 1
Section 2
Question 13**

**Digital
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data**

A one-time pad algorithm encrypts an 8-character word and outputs the result. The algorithm uses 0 as the first index in an array. There are four errors on lines 9 to 21 inclusive.

```

1 BEGIN
2 INPUT word
3 word = word converted to lowercase
4 plainText = word converted to an array
5 //The GenerateOTPKey function will return an array of 8 random
  numbers
6 key = GenerateOTPKey()
7 cipherText = array of 8 blank characters
8 alphabet = lowercase alphabet converted to an array
9 FOR i = 0 to 9
10  alphabetLocation = -1
11  FOR j = 0 to 25
12    IF plainText[j] = alphabet[i]
13      alphabetLocation = j
14    ENDIF
15  ENDFOR
16  //Check if not found
17  IF alphabetLocation ≥ 0 THEN
18    cipherText[i] = alphabet(alphabetLocation + key[i])mod 26
19  ENDIF
20 ENDFOR
21 OUTPUT cipherText[i]
22 END

```

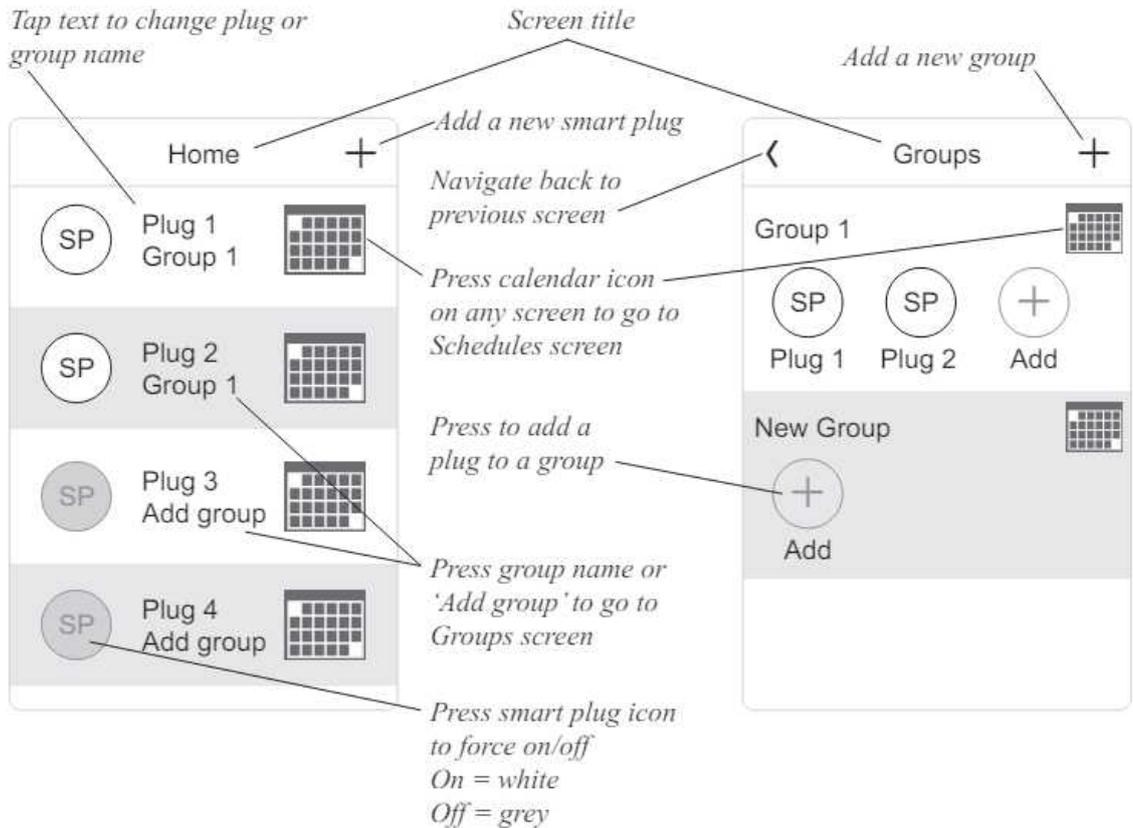
Use pseudocode to correct the four errors on lines 9 to 21. Justify your response. (9 marks)

Sample response	The response
<p>Line 9: FOR i = 0 to 7 Upper boundary of FOR Loop should be 7, otherwise it will look for values that don't exist in the plainText array.</p> <p>Line 12: IF plainText[i] = alphabet[j] Indexes in the IF statement should be switched — the variable i is the index for the plaintext, the variable j is for the alphabet. If this is not corrected, the pseudocode will be looking for letters in the plainText array that don't exist.</p> <p>Line 18: cipherText[i] = alphabet[(alphabetLocation + key[i]) mod 26] Bracket should be added to after the mod (otherwise it will be trying to perform a mod operation on a letter of the alphabet).</p> <p>Line 21: OUTPUT cipherText Index should be removed from output statement as this will cause it to only output one character (or none due to scoping issues).</p>	<ul style="list-style-type: none"> • logically symbolises a solution for the error on <ul style="list-style-type: none"> – line 9 [1 mark] – line 12 [1 mark] – line 18 [1 mark] – line 21 [1 mark] • justifies symbolised solution for <ul style="list-style-type: none"> – line 9 [1 mark] – line 12 [1 mark] – line 18 [1 mark] – line 21 [1 mark] • does not introduce new logic errors [1 mark]

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The user interface symbolises a new smart home system that manages plugs to allow for efficient energy use. The home screen lists plugs alphabetically and annotations describe the function of each element. Schedules allow users to set on/off schedules for individual smart plugs and groups.



a) Symbolise the user interface for the Schedules screen, allowing for multiple on/off times per day and selecting any day of the week. Describe the function of each element. [7 marks]

Sample response	The response
<p>Annotations for the Sample response:</p> <ul style="list-style-type: none"> Navigate back to previous screen Screen title Drop-down menu Tap text to change name of schedule or delete Days of the week use same style as plug icons On = white Off = grey Example of multiple on/off times per day Schedules listed alphabetically Add items to schedule Add more days and on/off times to schedule 	<ul style="list-style-type: none"> • symbolises user interface elements that allow <ul style="list-style-type: none"> - scheduling for <ul style="list-style-type: none"> ▪ individual plugs [1 mark] ▪ groups [1 mark] - multiple on/off times per day for <ul style="list-style-type: none"> ▪ individual plugs [1 mark] ▪ groups [1 mark] - selection of days [1 mark] • describes the function of all elements [1 mark] • demonstrates understanding of visual communication principles [1 mark]

	b) Evaluate the user interface of the smart home system to recommend two additional features that could improve accessibility. Justify your response. [4 marks]	
	Sample response	The response
	<p>Accessibility could be improved if voice recognition features are added to the smart home system. This would allow persons with visual or physical impairments to use voice commands to check the status and settings of plugs, turn plugs on and off, and set schedules.</p> <p>Another accessibility improvement would be if the user interface could be modified to change the colour of UI elements to cater to conditions such as colour blindness.</p>	<ul style="list-style-type: none"> • evaluates the user interface to recommend one feature that improves accessibility [1 mark] • justifies this recommendation [1 mark] • evaluates the user interface to recommend a second feature that improves accessibility [1 mark] • justifies this recommendation [1 mark]

2022 Paper 1 Section 2 Question 11 Digital methods for exchanging data	Explain the features of two network transmission protocols for transferring data between websites. [2 marks]	
	Sample Response	The response
	<p>Two network transmission protocols are HTTP and HTTPS.</p> <p>HTTP (hypertext transfer protocol) transfers data as text and offers no encryption and no authentication. This can be intercepted so should not be used for transferring data between websites.</p> <p>In contrast, HTTPS (HTTP secure) uses a range of encryption protocols, e.g. TLS standard and certificates to confirm the identity of the server, making it the more secure option.</p>	<ul style="list-style-type: none"> • explains features of <ul style="list-style-type: none"> - one valid network transmission protocol [1 mark] - another valid network transmission protocol [1 mark]

Refer to Stimulus 1 in the stimulus book.

Stimulus 1

This algorithm calculates the interest on a savings account based on the amount deposited and the number of years this amount remains in the account.

```
1 BEGIN
2 INPUT depositAmount
3 INPUT years
4
5 CALCULATE interestRate = calculateInterestRate(depositAmount)
6 CALCULATE savings = calculateSavings(depositAmount, years,
interestRate)
7
8 OUTPUT ("For a deposit of ${depositAmount} for {years} year/s at an
interest rate of {(interestRate) x 100}%, your total savings would be
${savings}.")
9 END
10
11 BEGIN calculateInterestRate (depositAmount)
12 IF depositAmount <= 10000
13     value = 0.04
14 ELSE IF depositAmount > 10000 AND depositAmount <= 50000 THEN
15     value = 0.03
16 ELSE
17     value = 0.02
18 ENDIF
19 ENDIF
20 RETURN value
21 END calculateInterestRate
22
23 BEGIN calculateSavings(depositAmount, years, interestRate)
24 FOR i = 1 TO years
25     deposit = depositAmount + depositAmount * interestRate
26 NEXT i
27 ENDFOR
28 RETURN deposit
29 END calculateSavings
```

a) Describe the listed algorithm constructs and identify one example of each from the stimulus. Use corresponding line numbers to identify examples. [6 marks]

Sample Response	The response
<p>Assignment: A value (stated or calculated) stored in a variable/memory location. Example: Line 13, value = 0.04. Condition: A comparison that retrieves a true or false value (or the value of a Boolean variable). Example: Line 12, IF depositAmount <= 10000. Iteration: A group of algorithmic statements that are repeated while a condition is met. Example: Lines 25–27</p> <pre>FOR i = 0 TO years deposit = depositAmount + depositAmount x interestRate NEXT i</pre>	<ul style="list-style-type: none"> • describes - assignment [1 mark] - iteration [1 mark] - condition [1 mark] • identifies an example of - assignment [1 mark] - condition [1 mark] - iteration [1 mark]

b) Explain the purpose of modularisation and identify an example of how it is used in the stimulus. Use corresponding line numbers in your response. [2 marks]

Sample Response	The response
<p>Modularisation breaks sections of code into smaller chunks so the algorithm is easier to understand, and allows the same code to be used in different parts of the application. For example, calculateInterestRate is a separate module (lines 11–22) and is called/used at line 5. It returns a value (line 21) which is stored in interestRate (line 5).</p>	<ul style="list-style-type: none"> • explains the purpose of modularisation [1 mark] • identifies an example of how modularisation is used [1 mark]

**2021
Paper 1
Section 2
Question 11**

**Digital
methods for
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data**

Business owners use an online platform to sell products. The essential features of the platform are listed.

Platform:

- allows customers and business owners to register and log in
- has four data stores (customer data, products, shopping cart and orders)
- processes order payments
- confirms orders with customers and business owners after successful payment.

Customers:

- register an account
- select products that appear in the shopping cart
- may continue shopping after viewing the shopping cart.

Business owners:

- access confirmed orders
- access customer account details
- update products and prices.

Symbolise data flow for this system using a diagram that includes all essential features listed.

Sample Response	The response
	<ul style="list-style-type: none"> • symbolises - customer external entity [1 mark] - business owner external entity [1 mark] - customer data store [1 mark] - shopping cart data store [1 mark] - orders data store [1 mark] - products data store [1 mark] - register and login process [1 mark] - payments process [1 mark] - confirm order process [1 mark] - update shopping cart process [1 mark] - update products process [1 mark] • logically symbolises data flow [1 mark] • effectively uses syllabus conventions for data flow diagrams [1 mark]

**2021
Paper 1
Section 2
Question 12**

**Digital
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data**

A mobile application (app) allows car owners to remotely unlock their cars if they lock the keys inside or their keys malfunction. Once users have created an account, they can request a remote unlock by entering their username and password.

The user data that is required to set up an account includes:

- full name
- date of birth
- home address
- driver licence number
- vehicle make, model and colour
- vehicle registration.

a) Analyse the information and evaluate risks to data confidentiality, integrity and availability for this app. Justify your response with three examples. [6 marks]

Sample Response	The response
<p>A data confidentiality risk is the possibility that an unauthorised person could observe the user data in transit. For example, the app requires a password for the user to log in and the data would need to be encrypted so that it cannot be stolen.</p> <p>A data integrity risk is the possibility that the data could become corrupted, lost or be maliciously manipulated. For example, the wrong car might be unlocked or a hacker might use the data to cause distress.</p> <p>A data availability risk is the possibility that someone may interfere with transmission to prevent data packets from reaching the intended destination, allowing them to access the person's car so that they can steal it.</p>	<ul style="list-style-type: none"> • logically evaluates risks to data - confidentiality [1 mark] - integrity [1 mark] - availability [1 mark] • justifies this evaluation by providing a coherent example of a risk to data - confidentiality [1 mark] - integrity [1 mark] - availability [1 mark]

b) Identify a relevant Australian Privacy Principle and explain an ethical consideration when using app data. [2 marks]

Sample Response	The response
<p>Australian Privacy Principle: Security of personal information. Allow an administrator to de-identify or destroy personal information once it is no longer in use.</p> <p>Ethical consideration: Security of personal information is important if the user sells their car, or if the car is no longer in use. The user should not be getting unnecessary calls or marketing materials for a service they no longer use or for a car they no longer own, and it would be unsafe for the original owner to still have access to the vehicle once it has been sold.</p>	<ul style="list-style-type: none"> • identifies a relevant Australian Privacy Principle (APP) [1 mark] • logically explains an ethical consideration relating to the identified APP [1 mark]

c) You discover that the app uses a Caesar cipher to encrypt data, allowing you to intercept a password in transit. Perform a desk check for five iterations to decrypt the password 'KYIWW'. [2 marks]

Sample Response	The response												
<p>ABCDEFGHIJKLMNOPQRSTUVWXYZ</p> <table border="1"> <thead> <tr> <th>KEY SHIFT</th> <th>PASSWORD</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>KYIWW</td> </tr> <tr> <td>1</td> <td>JXHVV</td> </tr> <tr> <td>2</td> <td>IWGUU</td> </tr> <tr> <td>3</td> <td>HVFTT</td> </tr> <tr> <td>4</td> <td>GRUESS</td> </tr> </tbody> </table>	KEY SHIFT	PASSWORD	0	KYIWW	1	JXHVV	2	IWGUU	3	HVFTT	4	GRUESS	<ul style="list-style-type: none"> performs a desk check that decrypts the password using iterations [1 mark] contains no errors [1 mark]
KEY SHIFT	PASSWORD												
0	KYIWW												
1	JXHVV												
2	IWGUU												
3	HVFTT												
4	GRUESS												

d) A friend is interested in learning more about encryption. Use pseudocode to symbolise a simple Caesar cipher as a demonstration. [8 marks]

Sample Response	The response
<pre> BEGIN INPUT string plainText INPUT int keyShift SET string alphabet = ABCDEFGHIJKLMNOPQRSTUVWXYZ SET encryptedText = "" FOR each character in plainText SHIFT character by keyShift APPEND letter to encryptedText END FOR RETURN encryptedText END </pre>	<ul style="list-style-type: none"> symbolises INPUT for password string [1 mark] INPUT for key or shift integer [1 mark] declarative statement for alphabet [1 mark] a FOR loop to traverse password one character at a time [1 mark] a function to encrypt password one character at a time, using the key [1 mark] RETURN for encrypted password [1 mark] an algorithm with no logic errors [1 mark] effectively uses pseudocode conventions [1 mark]

**2021
Paper 1
Section 2
Question 13**

**Digital
methods for
exchanging
data**

In an online silent auction, items are posted on a public website and participants post a secret bid on the items they would like to purchase. Bidders cannot see each other's bids. The bidding period is 7 consecutive days.

At the end of the auction, all bid values are revealed on the website and the highest bidder pays the amount they posted to obtain the item.

a) Explain how checksums, encryption and authentication would improve the security of the data exchange in this scenario. [3 marks]

Sample Response	The response
<p>A checksum algorithm would be used to inspect the binary representation of auction data. If the checksum from the user is different from the checksum on the server, it means that the data has been corrupted or manipulated.</p> <p>Encryption would be used to scramble the auction data to make it impossible to read in transit, but allowing it to be decrypted by the authorised recipient with a secret key.</p> <p>Authentication would be used to verify the identity of the participant by using a digital signature or authentication code. A digital signature confirms that the bidder is who they say they are.</p>	<ul style="list-style-type: none"> • explains how the security of the data exchange would be improved through - checksums [1 mark] - encryption [1 mark] - authentication [1 mark]

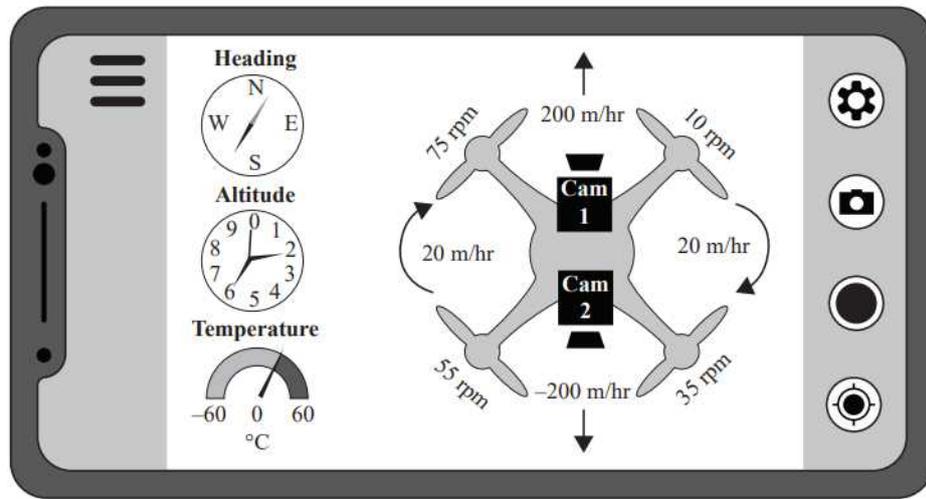
b) Recommend one encryption method to securely store auction data and justify your response. [2 marks]

Sample Response	The response
<p>I would recommend AES for encrypting auction data to avoid a security breach. AES supersedes DES and 3DES and uses 128-bit blocks with 128, 192 and 256-bit encryption keys, whereas DES and 3DES use 64-bit blocks and key encryption. DES and 3DES are older ciphers and easily cracked in as little as one day, which would provide an opportunity for a hacker to gain access to auction data before the bids are revealed.</p>	<ul style="list-style-type: none"> • recommends a valid encryption method [1 mark] • effectively justifies the recommended encryption method [1 mark]

2020
Paper 1
Section 2
Question 11

Digital methods for exchanging data

The diagram shows the user interface for a drone control panel.



a) Explain how three elements and three principles of visual communication (excluding colour) have been used. [12 marks]

Sample Response	The response	The response
	For elements of visual communication	For principles of visual communication
<p>The elements of visual communication used in this UI are:</p> <ul style="list-style-type: none"> spacing is even and there is lots of clear space between elements to avoid clutter shapes are consistent with readings from other sources and are familiar to many users size of readings makes them easy to read. <p>The principles of visual communication used in this UI are:</p> <ul style="list-style-type: none"> contrast in dial needles and distance values with background — makes information clear and accessible readings are aligned on both sides and are mirrored repetition of shapes, spacing and alignment throughout allows ease of use and pleasing arrangement of information. 	<p>[6 marks]</p> <ul style="list-style-type: none"> states 3 elements of visual communication and describes how these 3 elements have been used in the UI 	<p>[6 marks]</p> <ul style="list-style-type: none"> states 3 principles of visual communication and describes how these 3 principles have been used in the UI
	<p>[5 marks]</p> <ul style="list-style-type: none"> states 3 elements of visual communication and describes how 2 of these elements have been used in the UI 	<p>[5 marks]</p> <ul style="list-style-type: none"> states 3 principles of visual communication and describes how 2 of these principles have been used in the UI
	<p>[4 marks]</p> <ul style="list-style-type: none"> states 2 elements of visual communication and describes how these 2 elements have been used in the UI 	<p>[4 marks]</p> <ul style="list-style-type: none"> states 2 principles of visual communication and describes how these 2 principles have been used in the UI
	<p>[3 marks]</p> <ul style="list-style-type: none"> states 2 elements of visual communication and describes how 1 of these elements has been used in the UI 	<p>[3 marks]</p> <ul style="list-style-type: none"> states 2 principles of visual communication and describes how 1 of these principles has been used in the UI
	<p>[2 marks]</p> <ul style="list-style-type: none"> states 2 elements of visual communication <p>OR</p> <ul style="list-style-type: none"> states 1 element of visual communication and describes how this element has been used in the UI 	<p>[2 marks]</p> <ul style="list-style-type: none"> states 2 principles of visual communication <p>OR</p> <ul style="list-style-type: none"> states 1 principle of visual communication and describes how this principle has been used in the UI
	<p>[1 mark]</p> <ul style="list-style-type: none"> states 1 element of visual communication <p>OR</p>	<p>[1 mark]</p> <ul style="list-style-type: none"> states 1 principle of visual communication <p>OR</p>

	<ul style="list-style-type: none"> describes how 1 element of visual communication has been used in the UI 	<ul style="list-style-type: none"> describes how 1 principle of visual communication has been used in the UI
	[0 marks] <ul style="list-style-type: none"> does not satisfy any of the descriptors above. 	[0 marks] <ul style="list-style-type: none"> does not satisfy any of the descriptors above.

b) Further develop the user interface to include five new features: camera views for Cameras 1 and 2, and readings for speed, battery power and flight angle. [5 marks]

Sample Response	The response
	For further development of the UI: <ul style="list-style-type: none"> symbolises a feature that accurately aligns with the existing interface [1 mark] symbolises a second feature that accurately aligns with the existing interface [1 mark] symbolises a third feature that accurately aligns with the existing interface [1 mark] symbolises a fourth feature that accurately aligns with the existing interface [1 mark] symbolises a fifth feature that accurately aligns with the existing interface [1 mark]

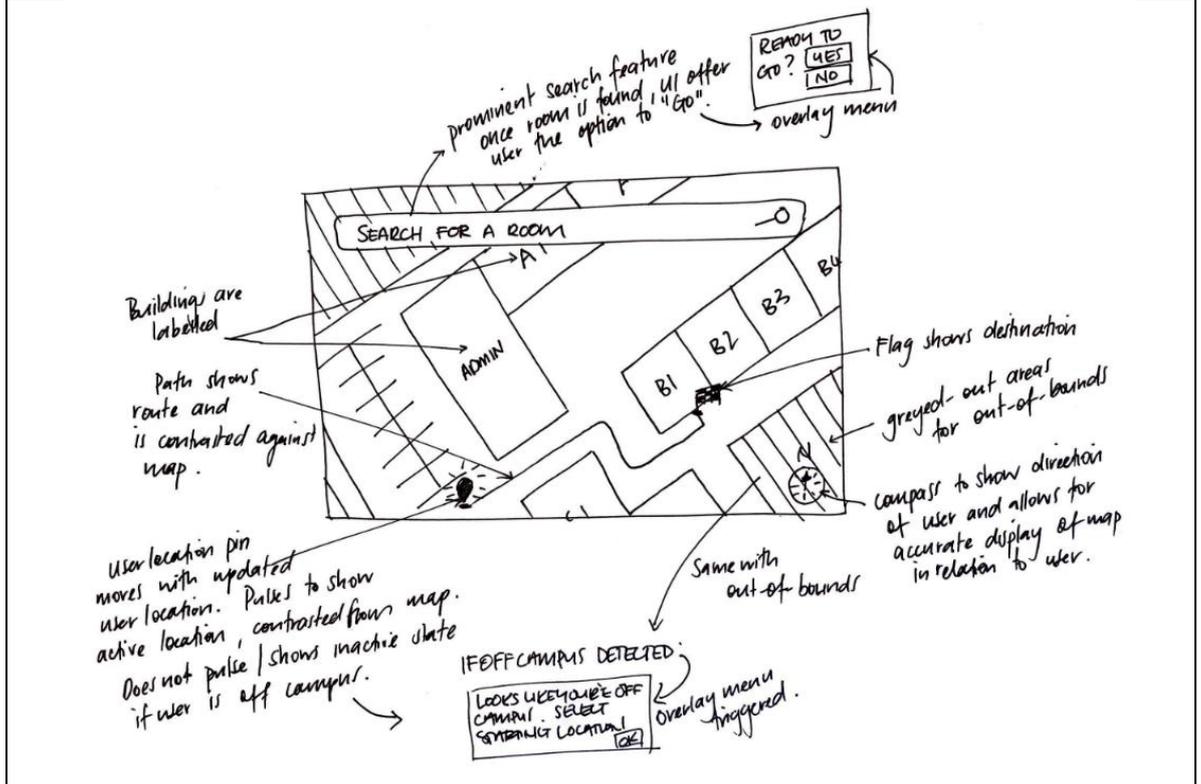
c) Use four elements and principles of visual communication to justify, in annotations on your diagram in 11b), the placement and visual appearance of the five new features of the user interface. [4 marks]

Sample Response	The response
<p>Note: Responses are annotations on the diagram from Question 11b).</p> <ul style="list-style-type: none"> shape (consistent with readings from the existing interface and familiar to many users) repetition (repetition of shapes, spacing) alignment (readings are aligned on both sides and are mirrored) proximity (camera views are located close to the actual locations of cameras on the drone) 	For the justification of features <ul style="list-style-type: none"> justifies the symbolised features using an element OR principle of visual communication [1 mark] justifies the symbolised features using a second element OR principle of visual communication [1 mark] justifies the symbolised features using a third element OR principle of visual communication [1 mark] justifies the symbolised features using a fourth element OR principle of visual communication [1 mark]

<p>2024 Paper 1 Section 3 Question 15</p> <p>Digital methods for exchanging data</p>	<p>A local high school is creating a map-based navigation app, catered to new staff and students in Years 7 to 10. Currently, the app does not include a login feature and does not require the user to be on campus to explore the map. The school has prescribed the following criteria to the developers:</p> <p>User interface</p> <p>The user interface of the app should display:</p> <ul style="list-style-type: none">• a map of the school grounds only• the current location of the user on the map• labelled buildings and classrooms• a search feature• a navigation feature to show new staff and students which way to go to get to their classrooms. <p>Functionality</p> <p>The app should be able to:</p> <ul style="list-style-type: none">• locate and update the user’s location as they move about the campus• support a custom starting location for when users are off campus• search for buildings and classrooms• navigate to a desired location. <p>a) Develop a user interface prototype for the navigation app that addresses all prescribed criteria. The prototype should be intended for a mobile tablet user. Use annotations to explain how your user interface addresses all the functionality criteria. [9 marks]</p>
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The response			
• symbolises user interface elements for all user interface criteria	5	• explains how the user interface addresses all functionality criteria	4
• symbolises user interface elements for four user interface criteria	4	• explains how the user interface addresses three functionality criteria	3
• symbolises user interface elements for three user interface criteria	3	• explains how the user interface addresses two functionality criteria	2
• symbolises user interface elements for two user interface criteria	2	• explains how the user interface addresses one functionality criterion	1
• symbolises user interface elements for one user interface criterion	1	• does not satisfy any of the descriptors above.	0
• does not satisfy any of the descriptors above.	0		

Sample response



b) Identify and explain two visual communication principles that could be implemented to ensure a good user experience while using the navigation app. [4 marks]

Sample response	The response
<p>Visual communication principle 1: contrast – using colours with high contrast in the app will ensure that unique elements stand out and that both the text and map are easy to read for accessibility.</p> <p>Visual communication principle 2: harmony - maintaining a consistent theme by using similar icons e.g. squares / rectangles for buildings and consistent font style and sizes for headings and other elements will help to give the app a uniform and consistent feel.</p>	<ul style="list-style-type: none"> identifies <ul style="list-style-type: none"> one visual communication principle [1 mark] a second visual communication principle [1 mark] explains how a good user experience could be ensured through the implementation of <ul style="list-style-type: none"> one identified visual communication principle [1 mark] a second identified visual communication principle [1 mark]

After a period of testing, an interactive virtual tour of the campus is added to the app. The virtual tour feature allows users to create and share content through third-party integrations. Third-party apps require access to device data and hardware components to enable sharing of content.

c) Identify a possible social need for the interactive tour feature and evaluate the security impacts of the dissemination and storage of user data in relation to this need. [3 marks]

Sample response	The response
A possible social need would be for students and staff to interact with each other to share ideas and collaborate on projects to create a sense of community and social connection. If user data is disseminated to unintended parties, it could potentially lead to privacy violations, such as unauthorised access to personal information, and may also put users at risk of identity theft. This could negatively impact the sense of community and social connection that the app is intended to foster. If user data is not stored securely, it could be vulnerable to hacking or other malicious activity, potentially leading to sensitive information being compromised. This could erode trust in the app and the sense of community it aims to build.	<ul style="list-style-type: none"> identifies a possible social need [1 mark] evaluates the security impact of user data <ul style="list-style-type: none"> dissemination [1 mark] storage [1 mark]

d) Recommend a data security strategy for the app and provide an example to justify your response. [2 marks]

Sample response	The response
A good security strategy would be implementing access control. Example: use access control measures to limit user access to specific features and data within the app, based on user roles and permissions e.g. school administration staff vs. students vs. visitors would have different levels of access.	<ul style="list-style-type: none"> recommends an appropriate security strategy [1 mark] justifies the recommended security strategy with an example [1 mark]

e) Identify two new app features that are possible if user authentication is added and explain the added functionality. [2 marks]

Sample response	The response
Two new features include personalisation and communication. Personalisation: with user authentication, the app can provide a personalised experience for each user based on their preferences, such as favourite locations or routes, or language settings. Communication: user authentication can facilitate communication between the school and users, such as sending notifications or alerts about school events, updates or emergencies.	<ul style="list-style-type: none"> identifies and explains one new feature and functionality [1 mark] identifies and explains a second new feature and functionality [1 mark]

**2022
Paper 1
Section 3
Question 15**

**Digital
methods for
exchanging
data**

Digital Solutions students decide to generate an application to manage fundraising activities for their school. Students and staff need to be able to log in, view items and their prices, and select items for purchase. Payments will not be processed by the web application; payment details will be recorded in a database and processed manually by school administration staff.

School administration staff manually add item details to the application as they are donated and purchased. Once an order has been placed, stock availability should automatically update.

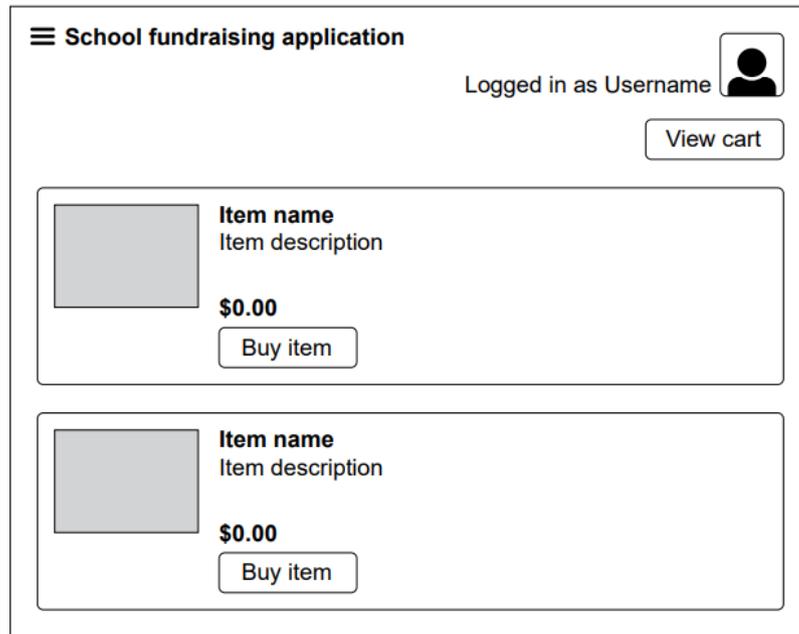
School administration staff would also like to view order history to determine the popularity of items.

a) Develop a data flow diagram to address all user needs and application requirements, using the response space on the next page. [19 marks]

The response

- symbolises process for
 - login/user authentication [1 mark]
 - viewing/displaying items [1 mark]
 - selecting items [1 mark]
 - collecting payment details [1 mark]
 - adding item details [1 mark]
 - updating stock [1 mark]
- symbolises admin-only access for
 - adding item details [1 mark]
 - viewing payment details [1 mark]
 - viewing order history [1 mark]
- symbolises datastore for
 - users [1 mark]
 - items [1 mark]
 - orders [1 mark]
 - payment details [1 mark]
- and effectively uses data flow diagram conventions [1 mark]
- symbolises incoming and outgoing data flow for
 - login/user authentication [1 mark]
 - viewing/displaying items [1 mark]
 - selecting items [1 mark]
 - collecting payment details [1 mark]
 - updating stock [1 mark]

b) The wireframe represents a user interface component of the fundraising application. Synthesise this wireframe and your response for Question 15a) to determine which processes have occurred in the system to result in this user interface. Justify your response with relevant interface elements. [4 marks]



Sample Response	The response
The wireframe depicts the item view page/screen. For this to occur, the 'view items' process would have occurred. Before reaching this screen, they would have had to log in as indicated by the 'Logged in' element in the top right of the screen.	<ul style="list-style-type: none"> • correctly determines <ul style="list-style-type: none"> - a process that has occurred in the system [1 mark] - a second process that has occurred in the system [1 mark] • justifies <ul style="list-style-type: none"> - one determined process [1 mark] - a second determined process [1 mark]

c) What processes and data flows will occur when a user interacts with the user interface? Justify your response with relevant interface elements. [5 marks]

Sample Response	The response
The item tiles request details from the datastore, while the 'Buy item' button would initiate the selection process and push selected items to the shopping cart datastore. Users can view the shopping cart and initiate checkout to confirm the order. As users are shopping, if another user finalises an order, either the item tiles or the shopping cart of other users should request updated item data to ensure the items are still available for purchase.	<ul style="list-style-type: none"> • determines processes and data flows will occur for <ul style="list-style-type: none"> - adding items to shopping cart [1 mark] - viewing shopping cart [1 mark] - updating items [1 mark] • another valid process or data flow [1 mark] justifies all processes and data flows using relevant user interface elements [1 mark]

d) Assuming the system is successfully implemented, evaluate the personal, social and economic impacts of this application. Refer to specific features of the application in your response. [3 marks]

Sample Response	The response
<p>Personal: Students have the ability to create an account and purchase items for fundraising. The social impact is that of intrinsic motivation and reward for using the application.</p> <p>Social: The application could ignite a healthy level of competition among students to see who can fundraise the most money. Depending on the items available for purchase, the social impact may include the start of a new trend, or an increase/decrease in the popularity of certain items, especially sensory or wearable items.</p> <p>Economic: The application allows users to purchase items to raise money. There is an obvious economic impact with this feature; the purpose of the app is to make an economic impact to raise money for various school activities or events.</p>	<ul style="list-style-type: none"> • evaluates the personal impact of at least one feature [1 mark] • evaluates the social impact of at least one feature [1 mark] • evaluates the economic impact of at least one feature [1 mark]

a) Analyse Stimulus 1 in the stimulus book. Describe all the ways space, line and tone are used and how visual hierarchy, proximity and alignment have informed development of the match manager user interface. [6 marks]

Stimulus 1

A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

The app supports large international tournaments as well as smaller local events for a range of popular games. Teams and match data are managed by tournament administrators.

Login view

Match manager app Sign up

Log in or sign up x

Email

Password

Log in

Results view

Match manager app [Profile Icon]

Latest results | Teams | Schedule

Latest results Input

Phase	Teams	Results
Playoffs	Team A	W
	Team B	L
Playoffs	Team C	W
	Team D	F

Confirm Log out

Key

W	Win
L	Lose
F	Forfeit

Sample Response	The response
<p>Space is used to achieve visual hierarchy in the login view as you must log in or sign up to continue. Space also differentiates UI features in the results view by positioning similar elements in closer proximity, while separating unrelated elements (such as the Confirm and Log out buttons). Line is used to tabulate and separate information for a clear barrier between Phase, Teams and Results content. Horizontal lines separate menu items across the top and are used to outline all features, including the user icon. Visual hierarchy is achieved in the nav with tone where the current or active view is white while other views are greyed-out to show they are inactive. The login overlay and button text are centre-aligned with left-aligned text for the title and user input fields.</p>	<ul style="list-style-type: none"> • effectively describes - how space is used [1 mark] - how line is used [1 mark] - how tone is used [1 mark] • effectively describes how the development of the user interface is informed by - visual hierarchy [1 mark] - proximity [1 mark] - alignment [1 mark]

b) Evaluate Stimulus 1 to determine the data exchange components required for the app and explain the relationship between them. [6 marks]

Sample Response	The response
<p>The data exchange components required for the app include a user interface, server interface and data interface. The user interface includes the user's device, the web app and the website itself. The user device could be a phone or laptop and the browser could be Safari or Google Chrome. On the front end, the website would be built with HTML, CSS and JavaScript and would be stored on a web server that is part of the server interface. The web server stores the static content of the website and manages requests between the user and the DBMS. If the user triggers a request for data stored externally in the database, the web server processes that request with a relevant data server for processing server-side language requests, e.g. PHP or Node.js. The request is sent to the DBMS, which retrieves and sends the required data to and from the web server to display to the user. SQL queries in the website code may be used to manipulate data in the database via the DBMS. To summarise, the user interacts with the user interface, managed by the server interface, which processes all send/receive data requests between the user and the data interface.</p>	<ul style="list-style-type: none"> • determines - a user interface or presentation component [1 mark] - a server interface or logic component [1 mark] - a data interface or data component [1 mark] • provides a discerning explanation of the relationship between - user interface and another component [1 mark] - server interface or logic component and another component [1 mark] - data interface and another component [1 mark]

c) Using Stimulus 1 and 2 in the stimulus book, make three justified recommendations, based on survey feedback, to improve data security of the match manager system. [6 marks]

Stimulus 1

A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

The app supports large international tournaments as well as smaller local events for a range of popular games. Teams and match data are managed by tournament administrators.

Login view

Results view

Phase	Teams	Results
Playoffs	Team A	W
	Team B	L
Playoffs	Team C	W
	Team D	F

Key
W Win
L Lose
F Forfeit

Stimulus 2

User feedback survey

Question 1: What features made it easy or hard to log in or access match results?

8 responses:

1. Not enough results displayed.
2. When I clicked 'input', I received a 401 'Unauthorised' error.
3. When I clicked 'confirm', I received a 401 'Unauthorised' error.
4. Forgot password.
5. There are two options for signing up — which one do I use?
6. My match result was not there.
7. The pop-up was clear and easy to access.
8. The most recent results were the first thing I saw, which is what I wanted.

Question 2: What concerns did you have when using the system?

8 responses:

1. When I log in, my password is visible to others.
2. None.
3. I don't understand why there is a confirm button.
4. No way of resetting password.
5. When I closed the login window, I got stuck and couldn't log in, so had to refresh.
6. Some results were wrong, but I can't provide feedback or make contact.
7. The confirm button didn't work for me.
8. I couldn't change my password.

Question 3: What features do you like about this system?

8 responses:

1. Not cluttered.
2. Everything.
3. Able to access results straight after the match.
4. Layout.
5. The layout is nice.
6. Nothing.
7. I like the uncluttered layout.
8. I like that it works on my tablet and phone.

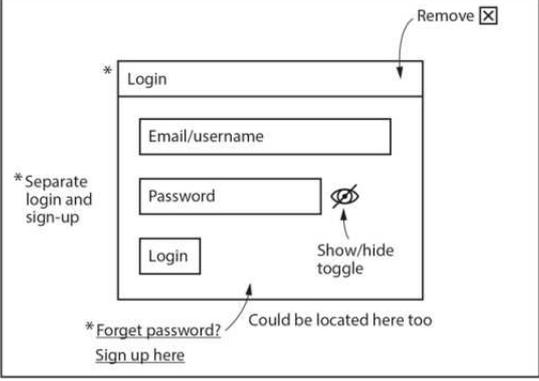
Question 4: What improvements are needed in this system?

8 responses:

1. More filtering and sorting options.
2. Nothing.
3. Ability to view previous results or an overview or expanded results table.
4. Way to reset password.
5. Scroll through match results.
6. Better sorting options.
7. Layout.
8. Change the layout.

Sample Response	The response
<p>Recommendation and justification 1: Question 2, survey response 1 indicates the password input field does not obscure the user’s password. This is a data security risk and can be overcome by providing a ‘show/hide’ option to provide more privacy.</p> <p>Recommendation and justification 2: Question 1, survey responses 2 and 3 indicate users were able to interact with data-driven components that require authorised access. Adding user-level access to differentiate between administrators and generic users will improve data security.</p> <p>Recommendation and justification 3: Questions 1, 2 and 4, survey response 4 indicate there is no way for a user to reset or change their password. This poses a security risk if the password is compromised, allowing anyone to log in and gain unauthorised access. Adding a reset or forget password link will enable all users to change their passwords.</p>	<ul style="list-style-type: none">• recommends<ul style="list-style-type: none">- password input security measure [1 mark]- user-level access security measure [1 mark]- password management security measure [1 mark]• logically justifies<ul style="list-style-type: none">- first recommendation [1 mark]- second recommendation [1 mark]- third recommendation [1 mark]

d) Symbolise four changes to the login view that address all useability issues identified in Stimulus 2. Justify how useability principles have informed your changes. [8 marks]

Sample Response	The response
 <p>1. Forget password link improves utility to allow users to reset their password when they have forgotten it.</p> <p>2. Show/hide toggle for password input improves utility and accessibility so that users can hide and show the password, depending on their needs.</p> <p>3. Removing close button on login window prevents user from getting stuck and having to refresh the page to try again. This improves safety by minimising errors.</p> <p>4. Separating sign-up links clearly differentiates between sign-up and login. This improves accessibility and safety by reducing potential confusion or misdirection. It also improves learnability because it is easier to understand where to go for either reason.</p>	<ul style="list-style-type: none"> • symbolises <ul style="list-style-type: none"> - password reset feature [1 mark] - show/hide password feature [1 mark] - removal of close button OR removal of login window feature [1 mark] - clear differentiation between login and sign-up features [1 mark] • justifies how useability principles have informed <ul style="list-style-type: none"> - one change [1 mark] - a second change [1 mark] - a third change [1 mark] - a fourth change [1 mark]

**2020
Paper 1
Section 3
Question 14**

**Digital
methods for
exchanging
data**

Two novice programmers who live in different locations want to develop a method for securing their email communication. They have decided to:

1. meet in the same location
2. use a generic code library that contains functions relating to a set of cryptology algorithms called 'Blowfish'
3. use only UTF-8 data encoding, e.g. the character '%' is considered to have a length of 8 bits in total
4. create their own programs using different languages
5. generate encrypted text using their programs
6. copy and paste encrypted text into their emails.

Function name	Blowfish key expansion	Blowfish crypt
Function code	BlowfishInitiate(key)	Blowfish(Value, KeySet, Process-Type)
Purpose	Completes the initial key expansion processes. Returns a data structure called Blowfish KeySets.	Completes the block algorithm process for encryption or decryption. Accepts a 64-bit-length set of values in the form of text, along with the pre-processed Blowfish KeySets.
Inputs	Key: text-based, 64-bit in length	Value: text-based, 64-bit in length KeySet: returned data structure from the BlowfishInitiate function Process-Type: 1 for encrypt, 2 for decrypt
Returns	KeySet	Text-based value
Example	BlowfishInitiate("J\$8%*\$#d")	Blowfish("abcdefg",MyKeySet,1)

Note: If any input does not meet a function's length requirements, the function will fail and potentially cause a runtime error.

a) Symbolise an algorithm that the programmers could use to encrypt their Unicode set of text. The algorithm should use the function library calls in the table as required. [6 marks]

Sample Response	The response for the solution
<pre> BEGIN INPUT key; IF key contains letter characters AND Length of key = 8 THEN MyKeySet = Blowfish_Initiate(key) INPUT user_text SET cipher_text = "" IF Length of user_text ≥ 8 THEN IF Length of user_text MOD 8 > 0 THEN FOR index = 1 TO Length of user_text MOD 8 user_text = user_text + " " NEXT index ENDIF FOR EACH set of 8 character BlockSet in user_text cipher_text = Blowfish(BlockSet, MyKeySet, 1) ENDFOR OUTPUT cipher_text ENDIF ENDIF END </pre>	[6 marks]
	• solves the problem without errors
	[5 marks]
	• could have solved the problem except for 1 logic error OR
	• could have solved the problem except for syntax errors
	[4 marks]
• could have solved the problem except for 2 logic errors OR	
• could have solved the problem except for 1 logic error and syntax errors	
[3 marks]	
• could have solved the problem except for 3 logic errors OR	
• could have solved the problem except for 2 logic errors and syntax errors	
[2 marks]	
• could have solved the problem except for 4 logic errors OR	
• could have solved the problem except for 3 logic errors and syntax errors	
[1 mark]	
• could have solved the problem except for 5 logic errors OR	
• could have solved the problem except for 4 logic errors and syntax errors	
[0 marks]	
• does not satisfy any of the descriptors above.	

b) The programmers make the solution publicly available on their website as a web application. Explain and justify how they could implement two useability principles to optimise user experience. [6 marks]

Sample Response	The response
<p>An important usability principle is utility. The web app user interface should be responsive as it needs to adjust to all viewport sizes (display device). As users will use various devices, such as mobile phones and laptops, to access the app, the solution needs to adjust appropriately to ensure it is practical and accessible. Responsiveness can be implemented by using breakpoints and a grid for the layout of interface elements.</p> <p>The solution also needs to be accessible. It should use suitable colours and font (typeface, size and style) to ensure it is accessible to all users, regardless of visual or physical disability. Accessibility can be implemented by checking the colours and fonts with an accessibility checker, available online, to ensure they meet accessibility standards.</p>	<p>For a usability principle:</p> <ul style="list-style-type: none"> • states a relevant useability principle [1 mark] • describes the useability principle in relation to the solution [1 mark] • justifies how to implement the useability principle [1 mark] <p>For a second useability principle:</p> <ul style="list-style-type: none"> • states a relevant useability principle [1 mark] • describes the useability principle in relation to the solution [1 mark] • justifies how to implement the useability principle [1 mark]

c) Evaluate whether the programmers have developed the most secure method to encrypt an email message by identifying two strengths and two weaknesses in the steps. Support all statements with examples. Provide two recommendations and justify how each recommendation would improve security. [9 marks]

Sample Response	The response
<p>The method used is relatively secure as Blowfish is a well-known and trusted method of encryption. The method could be made more secure with some recommendations to improve security.</p> <p>The strength of meeting in the same location is that they reduce the risk of a security breach by not using technology that could be digitally intercepted. The weakness is that someone could overhear their conversation — this depends on the security of the location.</p> <p>The strength of using different languages is that if one program is breached, it is contained, because the same method of breaching may not work for a program written in another language. A weakness may be the language used, as different languages have different levels of vulnerability.</p> <p>To improve security, it would be recommended to test the program that is written before using it to identify any issues prior to implementation.</p> <p>Another recommendation would be to consider the vulnerabilities of the range of programming languages and use the least vulnerable languages to optimise security.</p>	<ul style="list-style-type: none"> • provides a valid conclusion about Blowfish [1 mark] <p>for evaluating the steps used:</p> <ul style="list-style-type: none"> • states a valid weakness [1 mark] • states a second valid weakness [1 mark] • states a valid strength [1 mark] • states a second valid strength [1 mark] <p>for improving security:</p> <ul style="list-style-type: none"> • provides a relevant recommendation [1 mark] • justifies the provided recommendation [1 mark] • provides a second relevant recommendation [1 mark] • justifies the second provided recommendation [1 mark]

Unit 4 – Topic 3: Prototype digital data exchanges

Paper 1 Section 1

<p>2024 Paper 1 Section 1 Question 2</p> <p>Prototype digital data exchanges</p>	<p>A retail store uses facial recognition to send text messages about sale items to consenting customers while they are in the store.</p> <p>This use of data personally impacts customers through</p> <p>(A) invasion of privacy. (B) increased data accuracy. (C) improved store inventory management. (D) a more personalised shopping experience</p>
<p>2024 Paper 1 Section 1 Question 3</p> <p>Prototype digital data exchanges</p>	<p>How could a developer refine the following algorithm to improve maintainability?</p> <pre>/* Calculate the average value of an input array */ 0 START 1 INPUT x AS ARRAY 2 SET sum = 0 3 FOR n IN x 4 sum = sum + n 5 ENDFOR 6 CALCULATE result = sum / length of x 7 OUTPUT result 8 END</pre> <p>(A) Use an error-checking function. (B) Write code comments on every line. (C) Rename variables n, x and result to be more descriptive. (D) Incorporate a function from an available code library to sum the array</p>
<p>2024 Paper 1 Section 1 Question 4</p> <p>Prototype digital data exchanges</p>	<p>An algorithm performs an operation.</p> <pre>0 BEGIN 1 SET x = 0 2 FOR i FROM 1 TO 100 3 IF is Prime(i) THEN 4 x = x + i 5 ENDIF 6 ENDFOR 7 OUTPUT x 8 END</pre> <p>What does the algorithm output?</p> <p>(A) whether a given number is prime (B) the sum of the first 100 prime numbers (C) the prime numbers between 1 and 100, including 100 (D) the sum of the prime numbers between 1 and 100, including 100</p>

<p>2024 Paper 1 Section 1 Question 5</p> <p>Prototype data solutions</p>	<p>A new digital system is being developed that will allow customers to select a fuel type to activate the pump at service stations. The developer is considering interface options. The viewport is large enough to fit any of the four options.</p> <p>Which interface option is the most usable?</p> <table border="1" data-bbox="309 293 762 1052"> <thead> <tr> <th colspan="3">Interface options</th> </tr> </thead> <tbody> <tr> <td data-bbox="309 342 389 555">(A)</td> <td data-bbox="389 342 549 555">buttons</td> <td data-bbox="549 342 762 555"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> <input type="text" value="95"/> <input type="text" value="98"/> <input type="text" value="Diesel"/> </div> </td> </tr> <tr> <td data-bbox="309 555 389 667">(B)</td> <td data-bbox="389 555 549 667">a stepper</td> <td data-bbox="549 555 762 667"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> </div> </td> </tr> <tr> <td data-bbox="309 667 389 869">(C)</td> <td data-bbox="389 667 549 869">a drop-down</td> <td data-bbox="549 667 762 869"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel ▼ <div style="border: 1px solid black; padding: 2px;"> E10 95 98 Diesel </div> </div> </td> </tr> <tr> <td data-bbox="309 869 389 1052">(D)</td> <td data-bbox="389 869 549 1052">checkboxes</td> <td data-bbox="549 869 762 1052"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div> </td> </tr> </tbody> </table>	Interface options			(A)	buttons	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> <input type="text" value="95"/> <input type="text" value="98"/> <input type="text" value="Diesel"/> </div>	(B)	a stepper	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> </div>	(C)	a drop-down	<div style="border: 1px solid black; padding: 5px;"> Select a fuel ▼ <div style="border: 1px solid black; padding: 2px;"> E10 95 98 Diesel </div> </div>	(D)	checkboxes	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div>
Interface options																
(A)	buttons	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> <input type="text" value="95"/> <input type="text" value="98"/> <input type="text" value="Diesel"/> </div>														
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(C)	a drop-down	<div style="border: 1px solid black; padding: 5px;"> Select a fuel ▼ <div style="border: 1px solid black; padding: 2px;"> E10 95 98 Diesel </div> </div>														
(D)	checkboxes	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div>														

<p>2024 Paper 1 Section 1 Question 8</p> <p>Prototype digital data exchanges</p>	<p>Match the correct code comment to line 2 of the pseudocode.</p> <pre> 1 IMPORT JSON 2 SET x TO '{"name": "Ace", "age": 30, "city": "Rockhampton"}' 3 SET y TO JSON.LOADS(x) 4 PRINT(x["age"]) </pre> <p>(A) Assign a string to variable x. (B) Assign a dictionary object to variable x. (C) Convert the text object into a dictionary object. (D) Convert the dictionary object into a text object.</p>
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<p>2024 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>A school is developing a class timetabling solution for their students.</p> <p>Which is not an essential data store for the initial iteration of the app?</p> <p>(A) teacher (B) subject (C) student (D) assessment</p>
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<p>2023 Paper 1 Section 1 Question 7</p> <p>Prototype digital data exchanges</p>	<p>The algorithm outputs a data set according to values a user inputs.</p> <pre> 1 BEGIN 2 INPUT firstNum 3 INPUT secondNum 4 FOR i = 1 TO firstNum 5 FOR j = 1 TO secondNum 6 CALCULATE result = i * j 7 OUTPUT i "*" j "=" result 8 ENDFOR 9 ENDFOR 10 END </pre> <p>If the user inputs firstNum = 6 and secondNum = 10, how many times would line 6 be executed?</p> <p>(A) 1 (B) 6 (C) 10 (D) 60</p>
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<p>2023 Paper 1 Section 1 Question 8</p> <p>Prototype digital data exchanges</p>	<p>An open data set contains plain text of the facilities available in Queensland parks. To develop a mobile application that identifies basketball courts in a suburb, it is necessary for data to be</p> <p>(A) retrieved, normalised and verified. (B) retrieved, normalised and validated. (C) normalised, validated and encrypted. (D) retrieved, modularised and validated.</p>
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<p>2023 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>In a data dictionary where all the item types are numeric, which item would be stored as a float?</p> <p>(A) shoeID (B) quantity (C) numSold (D) wholesalePrice</p>
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**2023
Paper 1
Section 1
Question 10**

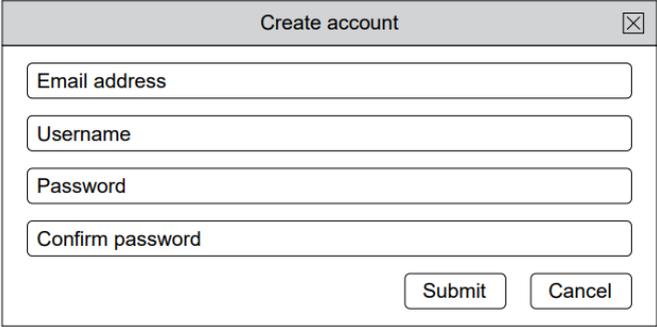
**Prototype
digital data
exchanges**

The table shown is named 'Planets' and is stored in a database.

Name	Moons	Diameter	Gravity	Mean temperature
Mercury	0	4 879	3.7	167
Venus	0	12 104	8.9	464
Earth	1	12 756	9.8	15
Mars	2	6 792	3.7	-65

Which SQL query will return the name and mean temperature of any planet with a diameter less than 50 000, ordered in descending order of mean temperature?

- (A) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
AND ORDER BY MeanTemperature DESC`
- (B) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
ORDER BY MeanTemperature DESCENDING`
- (C) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
ORDER BY MeanTemperature DESC`
- (D) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000 AND
ORDER BY MeanTemperature DESC`

<p>2022 Paper 1 Section 1 Question 3</p> <p>Prototype digital data exchanges</p>	<p>Analyse the wireframe to determine which principle of visual communication has been applied.</p> <div style="text-align: center;">  </div> <p>(A) proximity (B) hierarchy (C) alignment (D) proportion</p>
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<p>2022 Paper 1 Section 1 Question 6</p> <p>Prototype digital data exchanges</p>	<p>Complete the Caesar encryption algorithm with the correct statement at line 5.</p> <pre> 0 BEGIN 1 INPUT userText AS STRING 2 INPUT userShift AS INTEGER 3 4 FOR each character IN userText 5 6 result = result + newCharacter 7 ENDFOR 8 OUTPUT result 9 END </pre> <p>(A) newCharacter = userText + userShift (B) newCharacter = character + userShift (C) newCharacter = character - userShift (D) newCharacter = character + userShift MOD 26</p>
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<p>2022 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>Which algorithmic statement determines the value of y between 10 and 50 inclusive?</p> <p>(A) IF 10 > y OR y > 50 (B) IF 10 > y AND y < 50 (C) IF y >= 10 OR y <= 50 (D) IF y >= 10 AND y <= 50</p>
---	--

<p>2022 Paper 1 Section 1 Question 10</p> <p>Prototype digital data exchanges</p>	<p>Desk check the algorithm to determine its output.</p> <pre> BEGIN SET X = 6 SET Y = 12 WHILE (X < Y) INCREMENT X Y = PROCESS1 (X, Y) ENDWHILE OUTPUT Y END BEGIN PROCESS1 (A, B) CALCULATE C = (B - A) × 2 RETURN C END PROCESS1 </pre> <p>The output value is (A) -10 (B) 4 (C) 8 (D) 10</p>
--	--

<p>2021 Paper 1 Section 1 Question 6</p> <p>Prototype digital data exchanges</p>	<p>Desk check the algorithm to predict the output for numX = 8 and numZ = 5.</p> <pre> BEGIN SET numX user input SET numZ user input IF numX < 10 AND numZ > 10 THEN OUTPUT "Condition 1" ELSE numX > 5 OR numZ < 5 THEN OUTPUT "Condition 2" ELSE numX > 5 OR numZ < 10 THEN OUTPUT "Condition 3" ELSE OUTPUT "Condition 4" ENDIF END </pre> <p>(A) Condition 1 (B) Condition 2 (C) Condition 3 (D) Condition 4</p>
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**2021
Paper 1
Section 1
Question 8**

**Prototype
digital data
exchanges**

An algorithm is developed to establish a seating plan in a movie theatre so that individual bookings are always separated by two seats. To maximise ticket sales, bookings of four or more guests are accepted immediately.

Bookings for smaller groups are not confirmed until 2 hours before the movie starts.

```
BEGIN
SET seats = true //assume seats are available
SET bookingConfirmed = false
SET DateTime //current date and time
INPUT movieStartTime
INPUT guestNumber
IF guestNumber < 4 AND
  IF movieStartTime - DateTime >= 2 hours
    SET bookingPending = true
  ELSE
    IF guestNumber >= 4 THEN
      SET bookingConfirmed = true
    ENDIF
  ENDIF
ENDIF
BEGIN bookingPending
  //module to handle bookings for fewer than 4 guests
END
BEGIN bookingConfirmed
  //module to handle bookings for 4 or more guests
END
END
```

The algorithm is incomplete. What is the best way to make the algorithm more efficient?

- (A) Use modularisation to suggest an alternative movieStartTime for bookingPending.
- (B) Add an algorithm to determine seat allocation, ensuring groups sit two seats apart.
- (C) Calculate movieStartTime - DateTime and set as a Boolean.
- (D) Use a FOR loop to check the parameters for bookingConfirmed.

**2021
Paper 1
Section 1
Question 9**

**Prototype
digital data
exchanges**

The table describes a sample of the personalised numberplate range for Queensland.

Range	Classic	Emoji
Description	Combination of 3 numeric characters and 3 alphabetic characters	Combination of 5 alphanumeric characters and 1 emoji

Which SQL statement is correct for ordering a new personalised numberplate?

- (A)

```
CREATE TABLE orders
product_range = 'classic_theme',
combination = 'YIP333'
customerId = 123;
```
- (B)

```
INSERT INTO orders (customerId, product_range, combination)
VALUES (123, 'classic_theme', 'YIP333')
```
- (C)

```
UPDATE orders
SET product_range = 'classic_theme', combination = 'YIP333'
WHERE customerId = 123;
```
- (D)

```
ALTER TABLE orders
SET product_range = 'classic_theme', combination = 'YIP333'
WHERE customerId = 123;
```

**2020
Paper 1
Section 1
Question 3**

**Prototype
digital data
exchanges**

This data dictionary is for a table containing data on basketball players in a professional league.

Table: players			
Column name	Data type	Primary key?	Length
playernumber	VARCHAR	Yes	2
playerheight	INTEGER		
playername	TEXT		
teamname	VARCHAR	Yes	10

The following SQL query returned an error on execution:

```
INSERT INTO players (teamname, playernumber, playername, playerheight)
VALUES ('Raptors', '2', 'Edward Lee', 183.5);
```

Which column needs to be adjusted for the query to work?

- (A) playernumber
- (B) playerheight
- (C) playername
- (D) teamname

**2020
Paper 1
Section 1
Question 6**

**Prototype
digital data
exchanges**

This algorithm determines the total points a player receives from rolling a standard six-sided dice three times.

```
BEGIN  
  SET points = 0  
  SET count = 0  
  REPEAT  
    SET result = random number between 1 and 6 inclusive (roll die)  
    SET number on die as result  
    IF result = 1 THEN  
      points = points + 100  
    ELSE  
      IF result = 5  
        points = points + 50  
      ENDIF  
    ENDIF  
    INCREMENT count  
  UNTIL count = 3  
END
```

How many points will a player receive if they roll a 2, then a 3, followed by a 5?

- (A) 50
- (B) 100
- (C) 150
- (D) 200

**2020
Paper 1
Section 1
Question 7**

**Prototype
digital data
exchanges**

An application accesses an API that obtains data relating to books read by users. The data that needs to be stored locally includes:

- one or more images of each book's cover
- book recommendation notes
- a comment on each book.

Book data is located using the ISBN — a unique identifier for each published book. When searching for a book, the returned JSON data is outputted:

```
{
  "volumeInfo":{
    "title": "Designing Relational Databases",
    "subtitle": "A beginner's guide",
    "authors": [
      "Joan Janson",
      "Katy Pratt"
    ],
    "isbn": "1440569239562",
    "publisher": "Books Ltd",
    "publishedDate": "2016-05",
    "pageCount":367,
    "imageLinks": {
      "smallThumbnail":
"http://books.abcd.com/books?id=jedfoYprny465&image=1&source=gbs_api",
      "thumbnail":
"http://books.abcd.com/books?id=jedfoYprny465&image=3&source=gbs_api",
    }
  }
}
```

What is the most appropriate method to store the data in local tables so it can be easily retrieved for display?

(A) **Table: book**

Field	Type
ISBN	Text
title	Text
pages	Integer
authors	Text
comments	Text
recommendation	Boolean

Table: images

Field	Type
type	Text
image_link	Jpg
ISBN	Integer

(B) **Table: books**

Field	Type
ISBN	Text
title	Text
pages	Integer
comments	Text
recommendation	Text
image_link	Text

Table: authors

Field	Type
ISBN	Text
name	Text

(C) **Table: book**

Field	Type
ISBN	Integer
title	Text
pages	Integer
comments	Text
recommendation	Boolean

Table: images

Field	Type
ISBN	Integer
image_type	Text
image_link	Text

Table: authors

Field	Type
ISBN	Integer
name	Text

(D) **Table: books**

Field	Type
ISBN	Integer
title	Text
pages	Text
comments	Text
recommendation	Text
publisher	Text
published_date	Text

Table: authors

Field	Type
title	Text
name	Text

Table: images

Field	Type
ISBN	Integer
image_link	Text

**2020
Paper 1
Section 1
Question 8**

Prototype digital data exchanges

A soccer club needs to develop a system for storing members' data, including:

- name
- address
- team
- membership type
- email address
- phone number

The secretary wants to email weekly newsletters to members. The treasurer wants to print membership lists and store yearly payment information.

To produce this system, the developer will need to generate a database, design interfaces and develop coded modules to send emails. After adding and updating member details, they will also need to

(A) generate reports and process payments.
 (B) generate reports and provide secure logins for users.
 (C) process payments and provide secure logins for users.
 (D) generate reports, process payments and provide secure logins for users.

**2020
Paper 1
Section 1
Question 9**

Prototype digital data exchanges

This table contains the posts published to a rock climbing group on a social networking site.

Table: posts			
Date	Author	Content	Likes
15/06/2019	Lui Chan	Would anyone like to rock climb tomorrow?	5
15/06/2019	Lui Chan	Who is going to the boulder festival?	15
14/06/2019	Lui Chan	Who wants to go to yoga tonight?	7
14/06/2019	Amy Smith	Has anyone picked up a chalk bag?	9

An SQL query is executed:

```
SELECT Date, Author, SUM(Likes)
FROM Posts
GROUP BY Date, Author
```

What is the output of this query?

(A)

Date	Author	Content	SUM(Likes)
15/06/2019	Lui Chan	Would anyone like to rock climb tomorrow?	20
14/06/2019	Lui Chan	Who wants to go to yoga tonight?	7
14/06/2019	Amy Smith	Has anyone picked up a chalk bag?	9

(B)

Date	Author	SUM(Likes)
15/06/2019	Lui Chan	27
14/06/2019	Amy Smith	9

(C)

Date	Author	SUM(Likes)
14/06/2019	Lui Chan	27
15/06/2019		
14/06/2019	Amy Smith	9

(D)

Date	Author	SUM(Likes)
15/06/2019	Lui Chan	20
14/06/2019	Lui Chan	7
14/06/2019	Amy Smith	9

**2020
Paper 1
Section 1
Question 10**

**Prototype
digital data
exchanges**

In a game, scores are averaged for players in the same team. Each team consists of five players. Player names and scores are to be stored in arrays.

The referee was given the first version of the algorithm, which they then improved to create the second version.

First version

```
ProcessGroup (name[], score[])  
BEGIN  
  SET total = 0  
  PRINT name[1]  
  CALCULATE total = total + score[1]  
  PRINT name[2]  
  CALCULATE total = total + score[2]  
  PRINT name[3]  
  CALCULATE total = total + score[3]  
  PRINT name[4]  
  CALCULATE total = total + score[4]  
  PRINT name[5]  
  CALCULATE total = total + score[5]  
  CALCULATE average = total / 5  
  PRINT average  
END
```

Second version

```
ProcessGroup (name[], score[])  
BEGIN  
  SET groupSize = 5  
  SET count = 0  
  SET total = 0  
  WHILE count < groupSize  
    PRINT name[count]  
    CALCULATE total = total + score[count]  
    INCREMENT count  
  ENDWHILE  
  CALCULATE average = total / groupSize  
  PRINT average  
END
```

Which features of good algorithms have been improved in the second version?

- (A) efficiency, effectiveness
- (B) reliability, effectiveness
- (C) maintainability, efficiency
- (D) reliability, maintainability

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**2023
Paper 1
Section 2
Question 11**

**Prototype
digital data
exchanges**

A digital ticketing system has been created to manage ticket sales for a popular event, where thousands of people are expected to log in over a short timeframe. To reduce load and keep user data secure, the system follows the criteria:

- data size in data stores should be kept to a minimum
- data should be securely transmitted.

a) Describe how data size and security can be managed to fulfil these criteria. [2 marks]

Data size:

<hr/> <hr/> <hr/> <hr/>

Data security:

<hr/> <hr/> <hr/> <hr/>

b) Evaluate the encryption algorithm developed in Question 13a) by performing a desk check. Use the plain text and key provided. Specify all inputs and outputs in table form.

Plain text: `Queens`

Key: `ryjwah`

Example output: `hsnanz`

[5 marks]

Refer to Stimulus 3 in the stimulus book.

Stimulus 3

This code library of functions enables secure access to student results in a database.

Function	hashPassword	
Description	Apply a hash function to a password	
Input		Return
	<ul style="list-style-type: none"> Plain text password 	<ul style="list-style-type: none"> Hashed value
Function call	hashPassword(plaintext)	

Function	checkLogin	
Description	Look up a student ID and hashed password in database	
Input		Return
	<ul style="list-style-type: none"> Student ID Hashed value 	<ul style="list-style-type: none"> True/False
Function call	checkLogin(studentID, password)	

Function	getResults	
Description	Retrieve all results for a student ID	
Input		Return
	<ul style="list-style-type: none"> Student ID 	<ul style="list-style-type: none"> Array of line of encrypted data
Function call	getResults(studentID)	

Function	decryptData	
Description	Apply a decryption algorithm to the data using the supplied key	
Input		Return
	<ul style="list-style-type: none"> Key Line of encrypted data 	<ul style="list-style-type: none"> Line of decrypted data
Function call	decryptData(key, resultsLine)	

A secondary school stores encrypted student results in a database. To access their results, students must log in using their student ID and password. Login details are checked against the database to ensure only authorised students can gain access.

Passwords are encrypted for added security. Once logged in, students must enter a public decryption key to have their results displayed.

The database contains overall results for all subjects and students. Only results linked to the relevant student ID are displayed; students cannot view other students' results.

**2020
Paper 1
Section 2
Question 12**

**Prototype
digital data
exchanges**

Marine markers are placed throughout Queensland waterways. Each marine marker is fitted with an Internet of Things (IoT) device that can broadcast a fault status via a satellite internet link.

Each day, the IoT device checks the status of the marker. If a fault is detected, the device broadcasts the marker's unique identifier, a positive fault status flag and the fault occurrence date and time.

This is an example data structure provided by a marine marker's IoT device:

```
{  
  "QldMarineMarkerId" : "3446",  
  "QldMarineMarkerFault" : "True",  
  "QldMarineMarkerDateTime" : "2020-02-02T18:00:00.000Z",  
}
```

A request has been made for a quarterly release of an ongoing summary of fault issues per area. The information will be centrally stored in this way:

```
MarineMarkerStatus [MarkerID, MarkerType, AreaDescription, Latitude, Longitude,  
Fault _ Detected]
```



a) Evaluate the proposed solution against the criteria of reliability and accuracy. [2 marks]

Reliability:

	Accuracy:
	<hr/>
	<hr/>
	<hr/>
	b) State two additional criteria and evaluate the proposed solution against these criteria. [4 marks]
	Criterion:
	<hr/>
	<hr/>
	<hr/>
	Criterion:
	<hr/>
	<hr/>
	<hr/>
	c) Justify why JSON is an effective method of data exchange between the marine markers and the central database system. Provide two reasons to justify your response. [2 marks]
	<hr/>
<hr/>	
<hr/>	
<hr/>	

To maintain data integrity, the school plans to integrate the voting system with the existing school database to access student and staff profiles. The school database contains all active user profiles and will enable identification of any conflicts of interest. A conflict of interest exists where a voter is related to a candidate, e.g. staff cannot vote for their own children.

c) Symbolise data flow for a programmed component that will allow all voting rules to be enforced while integrating the existing school database. [14 marks]



d) Justify your response to Question 15c) by explaining the system interrelationships. [4 marks]

Marking Guide – Paper 1 Section 1

<p>2024 Paper 1 Section 1 Question 2</p> <p>Prototype digital data exchanges</p>	<p>A retail store uses facial recognition to send text messages about sale items to consenting customers while they are in the store.</p> <p>This use of data personally impacts customers through</p> <p>(A) invasion of privacy. (B) increased data accuracy. (C) improved store inventory management. (D) a more personalised shopping experience - Answer</p>
<p>2024 Paper 1 Section 1 Question 3</p> <p>Prototype digital data exchanges</p>	<p>How could a developer refine the following algorithm to improve maintainability?</p> <pre>/* Calculate the average value of an input array */ 0 START 1 INPUT x AS ARRAY 2 SET sum = 0 3 FOR n IN x 4 sum = sum + n 5 ENDFOR 6 CALCULATE result = sum / length of x 7 OUTPUT result 8 END</pre> <p>(A) Use an error-checking function. (B) Write code comments on every line. (C) Rename variables n, x and result to be more descriptive. - Answer (D) Incorporate a function from an available code library to sum the array</p>
<p>2024 Paper 1 Section 1 Question 4</p> <p>Prototype digital data exchanges</p>	<p>An algorithm performs an operation.</p> <pre>0 BEGIN 1 SET x = 0 2 FOR i FROM 1 TO 100 3 IF is Prime(i) THEN 4 x = x + i 5 ENDIF 6 ENDFOR 7 OUTPUT x 8 END</pre> <p>What does the algorithm output?</p> <p>(A) whether a given number is prime (B) the sum of the first 100 prime numbers (C) the prime numbers between 1 and 100, including 100 (D) the sum of the prime numbers between 1 and 100, including 100 - Answer</p>

<p>2024 Paper 1 Section 1 Question 5</p> <p>Prototype data solutions</p>	<p>A new digital system is being developed that will allow customers to select a fuel type to activate the pump at service stations. The developer is considering interface options. The viewport is large enough to fit any of the four options.</p> <p>Which interface option is the most usable?</p> <table border="1" data-bbox="309 293 764 1059"> <thead> <tr> <th colspan="3">Interface options</th> </tr> </thead> <tbody> <tr> <td data-bbox="309 342 389 555">(A)</td> <td data-bbox="389 342 549 555">buttons</td> <td data-bbox="549 342 764 555"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="button" value="E10"/> <input type="button" value="95"/> <input type="button" value="98"/> <input type="button" value="Diesel"/> </div> </td> </tr> <tr> <td data-bbox="309 555 389 667">(B)</td> <td data-bbox="389 555 549 667">a stepper</td> <td data-bbox="549 555 764 667"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> </div> </td> </tr> <tr> <td data-bbox="309 667 389 869">(C)</td> <td data-bbox="389 667 549 869">a drop-down</td> <td data-bbox="549 667 764 869"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel ▼ <div style="border: 1px solid black; padding: 2px;"> E10 95 98 Diesel </div> </div> </td> </tr> <tr> <td data-bbox="309 869 389 1059">(D)</td> <td data-bbox="389 869 549 1059">checkboxes</td> <td data-bbox="549 869 764 1059"> <div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div> </td> </tr> </tbody> </table> <p>Answer is A.</p>	Interface options			(A)	buttons	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="button" value="E10"/> <input type="button" value="95"/> <input type="button" value="98"/> <input type="button" value="Diesel"/> </div>	(B)	a stepper	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input type="text" value="E10"/> </div>	(C)	a drop-down	<div style="border: 1px solid black; padding: 5px;"> Select a fuel ▼ <div style="border: 1px solid black; padding: 2px;"> E10 95 98 Diesel </div> </div>	(D)	checkboxes	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div>
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(D)	checkboxes	<div style="border: 1px solid black; padding: 5px;"> Select a fuel <input checked="" type="checkbox"/> E10 <input type="checkbox"/> 95 <input type="checkbox"/> 98 <input type="checkbox"/> Diesel </div>														

<p>2024 Paper 1 Section 1 Question 8</p> <p>Prototype digital data exchanges</p>	<p>Match the correct code comment to line 2 of the pseudocode.</p> <pre> 1 IMPORT JSON 2 SET x TO '{"name":"Ace", "age":30, "city":"Rockhampton"}' 3 SET y TO JSON.LOADS(x) 4 PRINT(x["age"]) </pre> <p>(A) Assign a string to variable x. - Answer (B) Assign a dictionary object to variable x. (C) Convert the text object into a dictionary object. (D) Convert the dictionary object into a text object.</p>
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<p>2024 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>A school is developing a class timetabling solution for their students.</p> <p>Which is not an essential data store for the initial iteration of the app?</p> <p>(A) teacher (B) subject (C) student (D) assessment - Answer</p>
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<p>2023 Paper 1 Section 1 Question 7</p> <p>Prototype digital data exchanges</p>	<p>The algorithm outputs a data set according to values a user inputs.</p> <pre> 1 BEGIN 2 INPUT firstNum 3 INPUT secondNum 4 FOR i = 1 TO firstNum 5 FOR j = 1 TO secondNum 6 CALCULATE result = i * j 7 OUTPUT i "*" j "=" result 8 ENDFOR 9 ENDFOR 10 END </pre> <p>If the user inputs firstNum = 6 and secondNum = 10, how many times would line 6 be executed?</p> <p>(A) 1 (B) 6 (C) 10 (D) 60 – Answer</p>
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<p>2023 Paper 1 Section 1 Question 8</p> <p>Prototype digital data exchanges</p>	<p>An open data set contains plain text of the facilities available in Queensland parks. To develop a mobile application that identifies basketball courts in a suburb, it is necessary for data to be</p> <p>(A) retrieved, normalised and verified. (B) retrieved, normalised and validated. – Answer (C) normalised, validated and encrypted. (D) retrieved, modularised and validated.</p>
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<p>2023 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>In a data dictionary where all the item types are numeric, which item would be stored as a float?</p> <p>(A) shoeID (B) quantity (C) numSold (D) wholesalePrice – Answer</p>
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**2023
Paper 1
Section 1
Question 10**

**Prototype
digital data
exchanges**

The table shown is named 'Planets' and is stored in a database.

Name	Moons	Diameter	Gravity	Mean temperature
Mercury	0	4 879	3.7	167
Venus	0	12 104	8.9	464
Earth	1	12 756	9.8	15
Mars	2	6 792	3.7	-65

Which SQL query will return the name and mean temperature of any planet with a diameter less than 50 000, ordered in descending order of mean temperature?

- (A) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
AND ORDER BY MeanTemperature DESC`
- (B) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
ORDER BY MeanTemperature DESCENDING`
- (C) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
ORDER BY MeanTemperature DESC`
- (D) `SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000 AND
ORDER BY MeanTemperature DESC`

Answer is C.

<p>2022 Paper 1 Section 1 Question 3</p> <p>Prototype digital data exchanges</p>	<p>Analyse the wireframe to determine which principle of visual communication has been applied.</p> <div style="text-align: center; border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <div style="background-color: #cccccc; padding: 2px; border: 1px solid black; display: flex; justify-content: space-between; align-items: center;"> Create account ✕ </div> <div style="margin-top: 5px;"> <input style="width: 100%; border: 1px solid #ccc; margin-bottom: 5px;" type="text" value="Email address"/> <input style="width: 100%; border: 1px solid #ccc; margin-bottom: 5px;" type="text" value="Username"/> <input style="width: 100%; border: 1px solid #ccc; margin-bottom: 5px;" type="text" value="Password"/> <input style="width: 100%; border: 1px solid #ccc; margin-bottom: 10px;" type="text" value="Confirm password"/> <div style="display: flex; justify-content: flex-end; gap: 10px;"> <input style="border: 1px solid #ccc; padding: 2px 10px;" type="button" value="Submit"/> <input style="border: 1px solid #ccc; padding: 2px 10px;" type="button" value="Cancel"/> </div> </div> </div> <p>(A) proximity (B) hierarchy (C) alignment – Answer (D) proportion</p>
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<p>2022 Paper 1 Section 1 Question 6</p> <p>Prototype digital data exchanges</p>	<p>Complete the Caesar encryption algorithm with the correct statement at line 5.</p> <pre> 0 BEGIN 1 INPUT userText AS STRING 2 INPUT userShift AS INTEGER 3 4 FOR each character IN userText 5 6 result = result + newCharacter 7 ENDFOR 8 OUTPUT result 9 END </pre> <p>(A) newCharacter = userText + userShift (B) newCharacter = character + userShift (C) newCharacter = character - userShift (D) newCharacter = character + userShift MOD 26</p> <p>Answer is D.</p>
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<p>2022 Paper 1 Section 1 Question 9</p> <p>Prototype digital data exchanges</p>	<p>Which algorithmic statement determines the value of y between 10 and 50 inclusive?</p> <p>(A) IF 10 > y OR y > 50 (B) IF 10 > y AND y < 50 (C) IF y >= 10 OR y <= 50 (D) IF y >= 10 AND y <= 50</p> <p>Answer is D.</p>
---	---

<p>2022 Paper 1 Section 1 Question 10</p> <p>Prototype digital data exchanges</p>	<p>Desk check the algorithm to determine its output.</p> <pre> BEGIN SET X = 6 SET Y = 12 WHILE (X < Y) INCREMENT X Y = PROCESS1 (X, Y) ENDWHILE OUTPUT Y END BEGIN PROCESS1 (A, B) CALCULATE C = (B - A) × 2 RETURN C END PROCESS1 </pre> <p>The output value is (A) -10 (B) 4 – Answer (C) 8 (D) 10</p>
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<p>2021 Paper 1 Section 1 Question 6</p> <p>Prototype digital data exchanges</p>	<p>Desk check the algorithm to predict the output for numX = 8 and numZ = 5.</p> <pre> BEGIN SET numX user input SET numZ user input IF numX < 10 AND numZ > 10 THEN OUTPUT "Condition 1" ELSE numX > 5 OR numZ < 5 THEN OUTPUT "Condition 2" ELSE numX > 5 OR numZ < 10 THEN OUTPUT "Condition 3" ELSE OUTPUT "Condition 4" ENDIF END </pre> <p>(A) Condition 1 (B) Condition 2 – Answer (C) Condition 3 (D) Condition 4</p>
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**2021
Paper 1
Section 1
Question 8**

**Prototype
digital data
exchanges**

An algorithm is developed to establish a seating plan in a movie theatre so that individual bookings are always separated by two seats. To maximise ticket sales, bookings of four or more guests are accepted immediately.

Bookings for smaller groups are not confirmed until 2 hours before the movie starts.

```
BEGIN
SET seats = true //assume seats are available
SET bookingConfirmed = false
SET DateTime //current date and time
INPUT movieStartTime
INPUT guestNumber
IF guestNumber < 4 AND
  IF movieStartTime - DateTime >= 2 hours
    SET bookingPending = true
  ELSE
    IF guestNumber >= 4 THEN
      SET bookingConfirmed = true
    ENDIF
  ENDIF
ENDIF
BEGIN bookingPending
  //module to handle bookings for fewer than 4 guests
END
BEGIN bookingConfirmed
  //module to handle bookings for 4 or more guests
END
END
```

The algorithm is incomplete. What is the best way to make the algorithm more efficient?

- (A) Use modularisation to suggest an alternative movieStartTime for bookingPending.
- (B) Add an algorithm to determine seat allocation, ensuring groups sit two seats apart.
- (C) Calculate movieStartTime - DateTime and set as a Boolean.
- (D) Use a FOR loop to check the parameters for bookingConfirmed.

Answer is D.

**2021
Paper 1
Section 1
Question 9**

**Prototype
digital data
exchanges**

The table describes a sample of the personalised numberplate range for Queensland.

Range	Classic	Emoji
Description	Combination of 3 numeric characters and 3 alphabetic characters	Combination of 5 alphanumeric characters and 1 emoji

Which SQL statement is correct for ordering a new personalised numberplate?

- (A)

```
CREATE TABLE orders
product_range = 'classic_theme',
combination = 'YIP333'
customerId = 123;
```
- (B)

```
INSERT INTO orders (customerId, product_range, combination)
VALUES (123, 'classic_theme', 'YIP333')
```
- (C)

```
UPDATE orders
SET product_range = 'classic_theme', combination = 'YIP333'
WHERE customerId = 123;
```
- (D)

```
ALTER TABLE orders
SET product_range = 'classic_theme', combination = 'YIP333'
WHERE customerId = 123;
```

Answer is B.

**2020
Paper 1
Section 1
Question 3**

**Prototype
digital data
exchanges**

This data dictionary is for a table containing data on basketball players in a professional league.

Table: players			
Column name	Data type	Primary key?	Length
playernumber	VARCHAR	Yes	2
playerheight	INTEGER		
playername	TEXT		
teamname	VARCHAR	Yes	10

The following SQL query returned an error on execution:

```
INSERT INTO players (teamname, playernumber, playername, playerheight)
VALUES ('Raptors', '2', 'Edward Lee', 183.5);
```

Which column needs to be adjusted for the query to work?

- (A) playernumber
- (B) playerheight – Answer**
- (C) playername
- (D) teamname

**2020
Paper 1
Section 1
Question 6**

**Prototype
digital data
exchanges**

This algorithm determines the total points a player receives from rolling a standard six-sided dice three times.

```
BEGIN
  SET points = 0
  SET count = 0
  REPEAT
    SET result = random number between 1 and 6 inclusive (roll die)
    SET number on die as result
    IF result = 1 THEN
      points = points + 100
    ELSE
      IF result = 5
        points = points + 50
      ENDIF
    ENDIF
    INCREMENT count
  UNTIL count = 3
END
```

How many points will a player receive if they roll a 2, then a 3, followed by a 5?

- (A) 50 – Answer**
- (B) 100
- (C) 150
- (D) 200

**2020
Paper 1
Section 1
Question 7**

Prototype digital data exchanges

An application accesses an API that obtains data relating to books read by users. The data that needs to be stored locally includes:

- one or more images of each book's cover
- book recommendation notes
- a comment on each book.

Book data is located using the ISBN — a unique identifier for each published book. When searching for a book, the returned JSON data is outputted:

```
{
  "volumeInfo":{
    "title": "Designing Relational Databases",
    "subtitle": "A beginner's guide",
    "authors": [
      "Joan Janson",
      "Katy Pratt"
    ],
    "isbn": "1440569239562",
    "publisher": "Books Ltd",
    "publishedDate": "2016-05",
    "pageCount":367,
    "imageLinks": {
      "smallThumbnail":
"http://books.abcd.com/books?id=jedfoYprny465&image=1&source=gbs_api",
      "thumbnail":
"http://books.abcd.com/books?id=jedfoYprny465&image=3&source=gbs_api",
    }
  }
}
```

What is the most appropriate method to store the data in local tables so it can be easily retrieved for display?

(A) **Table: book**

Field	Type
ISBN	Text
title	Text
pages	Integer
authors	Text
comments	Text
recommendation	Boolean

Table: images

Field	Type
type	Text
image_link	Jpg
ISBN	Integer

(B) **Table: books**

Field	Type
ISBN	Text
title	Text
pages	Integer
comments	Text
recommendation	Text
image_link	Text

Table: authors

Field	Type
ISBN	Text
name	Text

(C) **Table: book**

Field	Type
ISBN	Integer
title	Text
pages	Integer
comments	Text
recommendation	Boolean

Table: images

Field	Type
ISBN	Integer
image_type	Text
image_link	Text

Table: authors

Field	Type
ISBN	Integer
name	Text

(D) **Table: books**

Field	Type
ISBN	Integer
title	Text
pages	Text
comments	Text
recommendation	Text
publisher	Text
published_date	Text

Table: authors

Field	Type
title	Text
name	Text

Table: images

Field	Type
ISBN	Integer
image_link	Text

Answer is C.

2020 Paper 1 Section 1 Question 8
Prototype digital data exchanges

A soccer club needs to develop a system for storing members' data, including:

- name
- address
- team
- membership type
- email address
- phone number

The secretary wants to email weekly newsletters to members. The treasurer wants to print membership lists and store yearly payment information.

To produce this system, the developer will need to generate a database, design interfaces and develop coded modules to send emails. After adding and updating member details, they will also need to

(A) generate reports and process payments.
 (B) generate reports and provide secure logins for users.
 (C) process payments and provide secure logins for users.
(D) generate reports, process payments and provide secure logins for users. – Answer

2020 Paper 1 Section 1 Question 9
Prototype digital data exchanges

This table contains the posts published to a rock climbing group on a social networking site.

Table: posts			
Date	Author	Content	Likes
15/06/2019	Lui Chan	Would anyone like to rock climb tomorrow?	5
15/06/2019	Lui Chan	Who is going to the boulder festival?	15
14/06/2019	Lui Chan	Who wants to go to yoga tonight?	7
14/06/2019	Amy Smith	Has anyone picked up a chalk bag?	9

An SQL query is executed:

```
SELECT Date, Author, SUM(Likes)
FROM Posts
GROUP BY Date, Author
```

What is the output of this query?

(A)

Date	Author	Content	SUM(Likes)
15/06/2019	Lui Chan	Would anyone like to rock climb tomorrow?	20
14/06/2019	Lui Chan	Who wants to go to yoga tonight?	7
14/06/2019	Amy Smith	Has anyone picked up a chalk bag?	9

(B)

Date	Author	SUM(Likes)
15/06/2019	Lui Chan	27
14/06/2019	Amy Smith	9

(C)

Date	Author	SUM(Likes)
14/06/2019	Lui Chan	27
15/06/2019		
14/06/2019	Amy Smith	9

(D)

Date	Author	SUM(Likes)
15/06/2019	Lui Chan	20
14/06/2019	Lui Chan	7
14/06/2019	Amy Smith	9

Answer is D.

**2020
Paper 1
Section 1
Question 10**

**Prototype
digital data
exchanges**

In a game, scores are averaged for players in the same team. Each team consists of five players. Player names and scores are to be stored in arrays.

The referee was given the first version of the algorithm, which they then improved to create the second version.

First version

```
ProcessGroup (name[], score[])  
BEGIN  
  SET total = 0  
  PRINT name[1]  
  CALCULATE total = total + score[1]  
  PRINT name[2]  
  CALCULATE total = total + score[2]  
  PRINT name[3]  
  CALCULATE total = total + score[3]  
  PRINT name[4]  
  CALCULATE total = total + score[4]  
  PRINT name[5]  
  CALCULATE total = total + score[5]  
  CALCULATE average = total / 5  
  PRINT average  
END
```

Second version

```
ProcessGroup (name[], score[])  
BEGIN  
  SET groupSize = 5  
  SET count = 0  
  SET total = 0  
  WHILE count < groupSize  
    PRINT name[count]  
    CALCULATE total = total + score[count]  
    INCREMENT count  
  ENDWHILE  
  CALCULATE average = total / groupSize  
  PRINT average  
END
```

Which features of good algorithms have been improved in the second version?

- (A) efficiency, effectiveness
- (B) reliability, effectiveness
- (C) maintainability, efficiency – Answer**
- (D) reliability, maintainability

2024
Paper 1
Section 2
Question 12

Prototype
digital data
exchanges

An esports club records player details and results for playing a popular online game. The data is stored in JSON format. The club wants to display the gamer tag of each player, their age and the percentage of games won. A sample of the JSON data is shown.

```
{
  'players': [
    {
      'name': 'Brandon Rioli',
      'gamerTag': 'Madskills',
      'dateOfBirth': '22/12/2007',
      'gamesPlayed': 10,
      'gamesWon': 4
    },
    {
      'name': 'Chloe Pezer',
      'gamerTag': 'PezerGirl',
      'dateOfBirth': '03/04/2007',
      'gamesPlayed': 58,
      'gamesWon': 55
    }
  ]
}
```

Use pseudocode to symbolise the algorithmic statements needed to display the required data. [8 marks]

The response

- symbolises, without logic errors, algorithmic statements for
 - retrieving JSON data [1 mark]
 - looping through data [1 mark]
 - calculating age [1 mark]
 - calculating percentage won [1 mark]
 - displaying gamer tag [1 mark]
 - displaying age [1 mark]
 - displaying percentage won [1 mark]
- effectively uses pseudocode conventions [1 mark]

Sample response

```
BEGIN
  GET currentDay
  GET currentMonth
  GET currentYear
  SET playerArray = []
  READ json file into playerArray
  FOR count = 0 to playerArray.length
    DISPLAY playerArray[count].gamerTag
    SPLIT playerArray[count].dateOfBirth into birthday, birthMonth, birthYear
    SET age to currentYear - birthYear
    IF currentMonth < birthMonth THEN
      age = age - 1
    ELSE IF currentMonth = birthMonth THEN
      IF currentDay < birthDay THEN
        age = age - 1
      ENDIF
    ENDIF
    DISPLAY age
    CALCULATE percentWon = playerArray[count].gamesWon / playerArray[count].gamesPlayed * 100
    DISPLAY percentWon
  NEXT count
END
```

Get the current day, month and year, which will be used to calculate the player's age.

Initialise player array and read player data from JSON file.

Loop through each player in the array to display the gamer tag, then split the date of birth into separate day, month and year variables to calculate the player's age based on the current date and the player's date of birth to display the age.

Calculate the percentage of games won by the player based on the number of games played and the number of games won to display the percentage of games won.

**2023
Paper 1
Section 2
Question 11**

**Prototype
digital data
exchanges**

A digital ticketing system has been created to manage ticket sales for a popular event, where thousands of people are expected to log in over a short timeframe. To reduce load and keep user data secure, the system follows the criteria:

- data size in data stores should be kept to a minimum
- data should be securely transmitted.

a) Describe how data size and security can be managed to fulfil these criteria. [2 marks]

Sample response	The response
<p>Data size: Use data compression to reduce the size of data being stored, preventing the system from overloading to ensure user access is unaffected.</p> <p>Data security: Use encryption to maintain data security and integrity. Data that is encrypted when entered cannot be compromised if intercepted during transmission.</p>	<ul style="list-style-type: none"> • describes how data size can be managed [1 mark] • describes how data security can be managed [1 mark]

b) Complete the algorithm using pseudocode to symbolise securing the user password and verifying the account username and password for the system. The algorithm must demonstrate the useability principle of safety. [7 marks]

```
BEGIN
    INPUT username
    INPUT password
```

Sample response	The response
<pre>BEGIN INPUT username INPUT password HASH password IF username exists in Datastore THEN IF hashed password matches field Datastore for username THEN [[Enter System]] ELSE OUTPUT "Wrong password, try again" ENDIF ELSE OUTPUT "Wrong username and/or password, try again" ENDIF END</pre>	<ul style="list-style-type: none"> • symbolises <ul style="list-style-type: none"> – hash password [1 mark] – username verification [1 mark] – password verification [1 mark] – successful account verification [1 mark] – unsuccessful account verification [1 mark] • demonstrates <ul style="list-style-type: none"> – safety for incorrect username [1 mark] – safety for incorrect password [1 mark]

Refer to Stimulus 2 in the stimulus book.

Stimulus 2

These are sample procedures and programming structures for a one-time pad encryption algorithm.

Pseudocode sub-procedures

`indexOf(<character>, <array>)`

Purpose: To return the index of the located character in the array.

`lengthOf(<string of characters>)`

Purpose: To return the number of characters in a string.

`checkLowerCase(<string of characters>)`

Purpose: To return 1 if only lower case characters exist or return 0 otherwise.

SET

`lowerCaseAlphabet ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w', 'x', 'y', 'z']`

Example of usage: `lowerCaseAlphabet[4]` is equal to 'e'

a) Use pseudocode to symbolise a one-time pad encryption algorithm with any lower case letters. Users must input the plain text and key. [7 marks]

Sample Response	The response
<pre> SET lowerCaseAlphabet['a','b','c','d','e' ... 'z'] indexOf(<character>, <array>) lengthOf(<string of characters>) checkLowerCase(<string of characters>) BEGIN INPUT (userText) INPUT (otpKey) SET outputCipher = "" IF checkLowerCase(userText) = 1 AND checkLowerCase(otpKey) = 1 IF lengthOf(userText) > 0 AND (lengthOf(userText) = lengthOf(otpKey)) THEN FOR letterIndex = 0 TO lengthOf(userText) - 1 SET shiftIndex = (indexOf(userText [letterIndex] , lowerCaseAlphabet) + indexOf(otpKey [letterIndex] , lowerCaseAlphabet) MOD 26 SET outputCipher = outputCipher + lowerCaseAlphabet[shiftIndex] NEXT letterIndex ENDIF ENDIF OUTPUT outputCipher END </pre>	<ul style="list-style-type: none"> • symbolises, without logic errors, an algorithmic statement for <ul style="list-style-type: none"> - user input of text [1 mark] - user input of key [1 mark] - 'indexOf' sub-procedure [1 mark] - 'lengthOf' sub-procedure [1 mark] - 'checkLowerCase' sub-procedure [1 mark] - 'lowerCaseAlphabet' [1 mark] • effectively uses pseudocode conventions [1 mark]

b) Evaluate the encryption algorithm developed in Question 13a) by performing a desk check. Use the plain text and key provided. Specify all inputs and outputs in table form.

Plain text: Queens

Key: ryjwah

Example output: hsnanz

[5 marks]

Sample Response	The response
<pre> userText = queens opyKey = ryjwah Letter of userText = q u e e n s userText letter index= 16 20 4 4 13 18 Letter of optKey = r y j w a h otpKey letter index = 17 24 9 22 0 7 Encryption index = 7 18 13 0 13 25 cipherOutput = h s n a n z </pre>	<ul style="list-style-type: none"> • demonstrates accurate use of - one programming feature that specifies all inputs and outputs in table form [1 mark] - a second programming feature that specifies all inputs and outputs in table form [1 mark] - a third programming feature that specifies all inputs and outputs in table form [1 mark] - a fourth programming feature that specifies all inputs and outputs in table form [1 mark] - a fifth programming feature that specifies all inputs and outputs in table form [1 mark]

Refer to Stimulus 3 in the stimulus book.

Stimulus 3

This code library of functions enables secure access to student results in a database.

Function	hashPassword	
Description	Apply a hash function to a password	
Input		Return
	<ul style="list-style-type: none"> Plain text password 	<ul style="list-style-type: none"> Hashed value
Function call	hashPassword(plaintext)	

Function	checkLogin	
Description	Look up a student ID and hashed password in database	
Input		Return
	<ul style="list-style-type: none"> Student ID Hashed value 	<ul style="list-style-type: none"> True/False
Function call	checkLogin(studentID, password)	

Function	getResults	
Description	Retrieve all results for a student ID	
Input		Return
	<ul style="list-style-type: none"> Student ID 	<ul style="list-style-type: none"> Array of line of encrypted data
Function call	getResults(studentID)	

Function	decryptData	
Description	Apply a decryption algorithm to the data using the supplied key	
Input		Return
	<ul style="list-style-type: none"> Key Line of encrypted data 	<ul style="list-style-type: none"> Line of decrypted data
Function call	decryptData(key, resultsLine)	

A secondary school stores encrypted student results in a database. To access their results, students must log in using their student ID and password. Login details are checked against the database to ensure only authorised students can gain access.

Passwords are encrypted for added security. Once logged in, students must enter a public decryption key to have their results displayed.

The database contains overall results for all subjects and students. Only results linked to the relevant student ID are displayed; students cannot view other students' results.

The algorithm for this system is incomplete. Complete the algorithm using the supplied code library. [6 marks]

```
BEGIN
    GET studentID from input form
    GET password from input form
    GET key from input form
```

Sample Response	The response
<pre>BEGIN IF checkLogin(studentID, hashPassword(password)) THEN Results = getResults(studentID) FOR i = 0 to (size of Results)-1 Display decryptData(key, results[i]) ENDFOR ELSE Display "Access denied" ENDIF END</pre>	<ul style="list-style-type: none"> • symbolises, without logic errors, an algorithmic statement for - password encryption using 'hashPassword' [1 mark] - checking student ID and hashed password using 'checkLogin' [1 mark] - handling login errors [1 mark] - retrieving data for specific student ID using 'getResults' [1 mark] - outputting data for specific student ID using 'decryptData' [1 mark] • effectively uses pseudocode conventions [1 mark]

**2020
Paper 1
Section 2
Question 12**

**Prototype
digital data
exchanges**

Marine markers are placed throughout Queensland waterways. Each marine marker is fitted with an Internet of Things (IoT) device that can broadcast a fault status via a satellite internet link.

Each day, the IoT device checks the status of the marker. If a fault is detected, the device broadcasts the marker's unique identifier, a positive fault status flag and the fault occurrence date and time.

This is an example data structure provided by a marine marker's IoT device:

```
{
  "QldMarineMarkerId" : "3446",
  "QldMarineMarkerFault" : "True",
  "QldMarineMarkerDateTime" : "2020-02-02T18:00:00.000Z",
}
```

A request has been made for a quarterly release of an ongoing summary of fault issues per area. The information will be centrally stored in this way:

```
MarineMarkerStatus [MarkerID, MarkerType, AreaDescription, Latitude, Longitude,
Fault _ Detected]
```



a) Evaluate the proposed solution against the criteria of reliability and accuracy. [2 marks]

Sample Response	The response
<p>Reliability: The data is unreliable as a log of fault events over time because the proposed data structure in the central store does not allow for date and time, so historical data is not stored and therefore provides no ongoing summary.</p> <p>Accuracy: The only logical threat to accuracy is the absence of date and time data in the solution. This is an issue as it would not meet the criteria of the quarterly report request.</p>	<ul style="list-style-type: none"> • correctly evaluates the solution against a criterion [1 mark] • correctly evaluates the solution against a second criterion [1 mark]

b) State two additional criteria and evaluate the proposed solution against these criteria. [4 marks]

Sample Response	The response
Maintainability (self-determined criterion): The current data store is not maintainable as it requires human intervention to update the fault status once a marker is repaired. Security (self-determined criterion): Security would be an issue as there is no mention of encryption of the data broadcast, how it will be securely stored and user authentication.	for self-determined criteria: <ul style="list-style-type: none"> • states a relevant self-determined criterion [1 mark] • states a second relevant self-determined criterion [1 mark]
	for evaluation: <ul style="list-style-type: none"> • correctly evaluates against a stated self-determined criterion [1 mark] • correctly evaluates against a second stated self-determined criterion [1 mark]

c) Justify why JSON is an effective method of data exchange between the marine markers and the central database system. Provide two reasons to justify your response. [2 marks]

Sample Response	The response
JSON is an effective method of exchange between the marine markers and the central database system because it is efficient and retains all of its human readability, so it's easy to interpret even from a non-coding perspective.	<ul style="list-style-type: none"> • justifies the use of JSON with a valid reason [1 mark] • justifies the use of JSON with a second valid reason [1 mark]

**2020
Paper 1
Section 2
Question 13**

**Prototype
digital data
exchanges**

A games arcade has developed a digital solution for recording members' points. Members receive a membership card, which they scan when they play games at the arcade. The card records how many points a member receives from winning a game. A sample of the data is shown.

members				
id	given_name	last_name	email	phone
24	Adalai	Akkad	adacutiepie@email.com	0491 570 006
25	Michael	McNealy	mikemcnealy@email.com	0491 571 266
26	Shruti	Flynn	shrutikins@email.com	0491 574 118
27	Adam	Steinberg	steintheman@email.com	0491 577 644
28	Julia	Wong	juliawong@email.com	0491 579 455

members_activity				
id	card_number	join_date	last_visit	points_balance
24	789987	2005-08-12	2020-01-20	570
25	456654	2009-02-15	2019-12-20	80
26	753951	2010-05-05	2020-02-25	249
27	654123	2019-10-19	2020-03-10	1200

a) Develop an algorithm to list all members by name. Sort the list alphabetically by last name. [4 marks]

Sample Response	The response
	for the solution
<p>Response based on C#:</p> <pre>BEGIN DECLARE string memberNames = {last_name, given_name} ORDER BY last_name OUTPUT memberNames END</pre> <p>Response based on SQL:</p> <pre>SELECT given_name, last_name FROM members ORDER BY last_name ASC</pre>	[4 marks]
	<ul style="list-style-type: none"> solves the problem without errors
	[3 marks]
	<ul style="list-style-type: none"> could have solved the problem except for 1 logic error OR <ul style="list-style-type: none"> could have solved the problem except for syntax errors
	[2 marks]
<ul style="list-style-type: none"> could have solved the problem except for 2 logic errors OR <ul style="list-style-type: none"> could have solved the problem except for 1 logic error and syntax errors 	
[1 mark]	
<ul style="list-style-type: none"> could have solved the problem except for 3 logic errors OR <ul style="list-style-type: none"> could have solved the problem except for 2 logic errors and syntax errors 	
[0 marks]	
<ul style="list-style-type: none"> does not satisfy any of the descriptors above. 	

b) Develop an algorithm to list member IDs and join dates for memberships of 10 or more years. Sort the list by join date in ascending order. [4 marks]

Sample Response	The response
<pre> Response based on C#: BEGIN DECLARE DateTime currentDate DECLARE DateTime joinDate DECLARE int memberId DECLARE int membershipYears = currentDate - joinDate FOR EACH int in memberId IF membershipYears >= 10 years ORDER BY joinDate OUTPUT joinDate, memberId ENDIF ENDFOR END </pre>	[4 marks] • solves the problem without errors
	[3 marks] • could have solved the problem except for 1 logic error OR • could have solved the problem except for syntax errors
	[2 marks] • could have solved the problem except for 2 logic errors OR • could have solved the problem except for 1 logic error and syntax errors
	[1 mark] • could have solved the problem except for 3 logic errors OR • could have solved the problem except for 2 logic errors and syntax errors
	[0 marks] • does not satisfy any of the descriptors above

c) Develop an algorithm to provide the contact details for members who currently have more than 3000 points. [4 marks]

Sample Response	The response for the solution
<p>Response based on C#:</p> <pre>BEGIN DECLARE string memberDetails = {given_name, last_name, email} DECLARE string memberPhone DECLARE int pointsBalance FOR EACH int in pointsBalance IF pointsBalance > 3000 OUPUT memberDetails, memberPhone ENDIF ENDFOR END</pre> <p>Response based on SQL:</p> <pre>SELECT given_name, last_name, email, points_balance FROM members JOIN members_activity ON members.id = members_activity.id WHERE points_balance > 3000;</pre>	<p>[4 marks]</p> <ul style="list-style-type: none"> • solves the problem without errors
	<p>[3 marks]</p> <ul style="list-style-type: none"> • could have solved the problem except for 1 logic error OR • could have solved the problem except for syntax errors
	<p>[2 marks]</p> <ul style="list-style-type: none"> • could have solved the problem except for 2 logic errors OR • could have solved the problem except for 1 logic error and syntax errors
	<p>[1 mark]</p> <ul style="list-style-type: none"> • could have solved the problem except for 3 logic errors OR • could have solved the problem except for 2 logic errors and syntax errors
	<p>[0 marks]</p> <ul style="list-style-type: none"> • does not satisfy any of the descriptors above

<p>2023 Paper 1 Section 3 Question 15</p> <p>Prototype digital data exchanges</p>	<p>A school has developed a digital system to vote on student leadership positions. The system is incomplete, and a few unprogrammed processes remain.</p> <p>Programmed components include:</p> <ul style="list-style-type: none"> • a registration and login feature using a universal password provided on voting day and their student or staff email address • a list of candidates organised by nominated leadership positions • the ability to cast votes • the ability to count votes. <p>Unprogrammed processes include site administration:</p> <ul style="list-style-type: none"> • distributing a universal password to registered users via email on voting day • importing candidate details and nominations in XML format • checking/verifying votes • publishing results. <p>a) In XML format, symbolise how data would be structured for "Candidate X", who is in Year 11 and has been nominated for esports captain. [4 marks]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sample response</th> <th style="text-align: center;">The response</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <pre><candidate> <name>Candidate X</name> <year>Year 11</year> <position>Esports captain</position> </candidate></pre> </td> <td style="padding: 5px;"> <ul style="list-style-type: none"> • symbolises a parent container for candidate [1 mark] • symbolises a child container for <ul style="list-style-type: none"> – candidate [1 mark] – year [1 mark] – position [1 mark] </td> </tr> </tbody> </table> <p>The voting rules for the system are:</p> <ul style="list-style-type: none"> • only students and staff can vote • each user can only vote once • voting takes place on a nominated day between 8:30 am and 4:00 pm. <p>b) Explain system features that would ensure the implementation of the three voting rules. [3 marks]</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sample response</th> <th style="text-align: center;">The response</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"> <p>To ensure only students and staff vote, the system would need a list of current students and staff using their email addresses for verification. This data could be imported the same way as the candidate details and nominations and would be stored in its own table on the database.</p> <p>To ensure users only vote once, the system could check the database for any voting data against the login email address. If voting data exists, the user should get an error message and the list of candidates should not be accessible to them.</p> <p>To ensure voting only occurs on the nominated day between 8:30 am and 4:00 pm, the system administration could block access to the system outside this time or include a parameter that only allows login at a certain time.</p> </td> <td style="padding: 5px;"> <ul style="list-style-type: none"> • explains system features to ensure implementation of <ul style="list-style-type: none"> – one voting rule [1 mark] – a second voting rule [1 mark] – a third voting rule [1 mark] </td> </tr> </tbody> </table>	Sample response	The response	<pre><candidate> <name>Candidate X</name> <year>Year 11</year> <position>Esports captain</position> </candidate></pre>	<ul style="list-style-type: none"> • symbolises a parent container for candidate [1 mark] • symbolises a child container for <ul style="list-style-type: none"> – candidate [1 mark] – year [1 mark] – position [1 mark] 	Sample response	The response	<p>To ensure only students and staff vote, the system would need a list of current students and staff using their email addresses for verification. This data could be imported the same way as the candidate details and nominations and would be stored in its own table on the database.</p> <p>To ensure users only vote once, the system could check the database for any voting data against the login email address. If voting data exists, the user should get an error message and the list of candidates should not be accessible to them.</p> <p>To ensure voting only occurs on the nominated day between 8:30 am and 4:00 pm, the system administration could block access to the system outside this time or include a parameter that only allows login at a certain time.</p>	<ul style="list-style-type: none"> • explains system features to ensure implementation of <ul style="list-style-type: none"> – one voting rule [1 mark] – a second voting rule [1 mark] – a third voting rule [1 mark]
Sample response	The response								
<pre><candidate> <name>Candidate X</name> <year>Year 11</year> <position>Esports captain</position> </candidate></pre>	<ul style="list-style-type: none"> • symbolises a parent container for candidate [1 mark] • symbolises a child container for <ul style="list-style-type: none"> – candidate [1 mark] – year [1 mark] – position [1 mark] 								
Sample response	The response								
<p>To ensure only students and staff vote, the system would need a list of current students and staff using their email addresses for verification. This data could be imported the same way as the candidate details and nominations and would be stored in its own table on the database.</p> <p>To ensure users only vote once, the system could check the database for any voting data against the login email address. If voting data exists, the user should get an error message and the list of candidates should not be accessible to them.</p> <p>To ensure voting only occurs on the nominated day between 8:30 am and 4:00 pm, the system administration could block access to the system outside this time or include a parameter that only allows login at a certain time.</p>	<ul style="list-style-type: none"> • explains system features to ensure implementation of <ul style="list-style-type: none"> – one voting rule [1 mark] – a second voting rule [1 mark] – a third voting rule [1 mark] 								

To maintain data integrity, the school plans to integrate the voting system with the existing school database to access student and staff profiles. The school database contains all active user profiles and will enable identification of any conflicts of interest. A conflict of interest exists where a voter is related to a candidate, e.g. staff cannot vote for their own children.

c) Symbolise data flow for a programmed component that will allow all voting rules to be enforced while integrating the existing school database. [14 marks]

Sample response	The response
	<ul style="list-style-type: none"> • symbolises a process or processes that <ul style="list-style-type: none"> - setup the voting system [1 mark] - checks conflicts [1 mark] - casts and counts votes [1 mark] - enforces all three voting rules [1 mark] • symbolises datastores for <ul style="list-style-type: none"> - voting data [1 mark] - users and school data [1 mark] • symbolises logical incoming and outgoing data flow for <ul style="list-style-type: none"> - user registration/login [1 mark] - displaying candidate list [1 mark] - checking conflicts [1 mark] - casting votes [1 mark] - counting votes [1 mark] - all three voting rules <ul style="list-style-type: none"> ▪ only staff and students can vote [1 mark] ▪ each user can only vote once [1 mark] ▪ the voting period [1 mark]

d) Justify your response to Question 15c) by explaining the system interrelationships. [4 marks]

Sample response	The response
<p>Process 1.0 checks the date and time to determine whether the login attempt is within the voting period, if within the voting period, the process checks the email and password against the school database to authenticate the user to ensure they are a valid student or staff member. If the user email or password cannot be verified, they receive an error message. If the user attempts to login outside the voting period they receive a notification about the voting period and cannot login.</p>	<p>[4 marks]</p> <ul style="list-style-type: none"> • justifies response by explaining system interrelationships between all <ul style="list-style-type: none"> – processes – datastores – external entities
<p>Process 2.0 occurs if the user email is verified as being a valid student or staff member. It uses the email address to check the school database for any conflicts of interest. The result is sent back from the school database to Process 2.0 which sends the conflicts associated with the user to Process 3.0 to update the candidate list for voting.</p>	<p>[3 marks]</p> <ul style="list-style-type: none"> • justifies response by explaining system interrelationships between some <ul style="list-style-type: none"> – processes – datastores – external entities OR • justifies response by explaining system interrelationships between all <ul style="list-style-type: none"> – processes – datastores OR external entities
<p>Process 3.0 checks if any votes exist by retrieving data from the voting datastore to ensure the current user only votes once and if vote data exists, they are notified that they have already voted. If no vote data exists, the process displays a list of candidates with all conflicts removed by retrieving candidates and their positions from the voting datastore and removing the conflicts.</p>	<p>[2 marks]</p> <ul style="list-style-type: none"> • justifies response by explaining interrelationships between some <ul style="list-style-type: none"> – processes – datastores OR external entities
<p>Process 4.0 records the user's selected candidates and positions to the voting datastore where they are stored as votes.</p>	<p>[1 mark]</p> <ul style="list-style-type: none"> • justifies response by explaining interrelationships between some <ul style="list-style-type: none"> – processes, datastores OR external entities
<p>Process 5.0 retrieves from the voting datastore and counts the votes for each candidate and positions at the end of the voting period which is only accessible by the school admin.</p>	<p>[0 marks]</p> <ul style="list-style-type: none"> • does not satisfy any of the descriptors above.