Apex Exam Guide

Digital Solutions

Year 12 QCE

Queensland Curriculum

2025 Edition

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Apex Exam Guide
Digital Solutions
Year 12 QCE

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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

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.

2023 Paper 1 Section 1 Question 4 **Digital methods for exchanging data**	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 (A) jitter. (B) latency. (C) timeliness. (D) protocol standards.

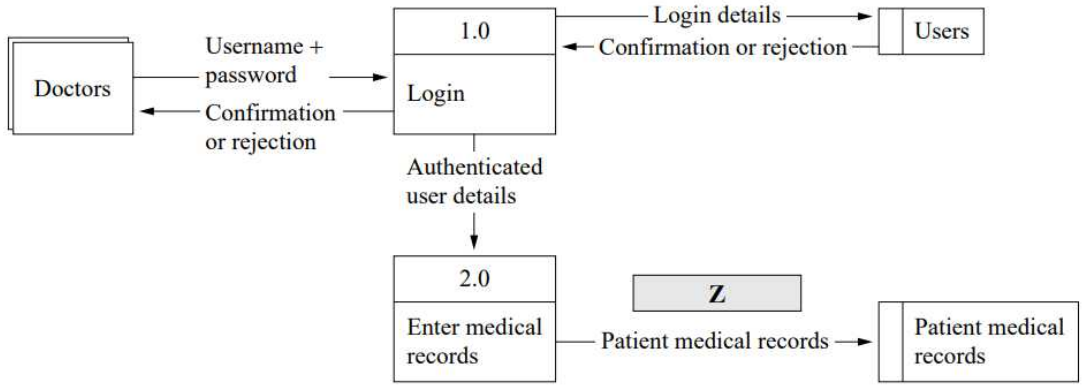
2023 Paper 1 Section 1 Question 5 **Digital methods for exchanging data**	Which encryption method uses a fixed shift of letters down the alphabet with a modulus operation? (A) Caesar (B) Vigenere (C) Gronsfeld (D) One-time pad

2023 Paper 1 Section 1 Question 6 Digital methods for exchanging data	Which statement correctly describes the relationship between JSON and REST? (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.

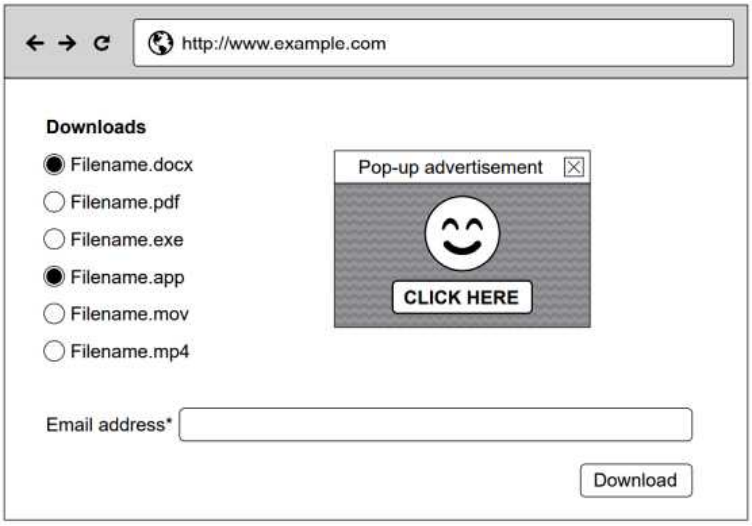
2022 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Hashing increases security for data (A) storage. (B) encryption. (C) compression. (D) authentication.

2022 Paper 1 Section 1 Question 2 Digital methods for exchanging data	Which encryption method is an example of asymmetric encryption? (A) DES (B) RSA (C) Blowfish (D) Triple DES

2022 Paper 1 Section 1 Question 4 Digital methods for exchanging data	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? (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

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.

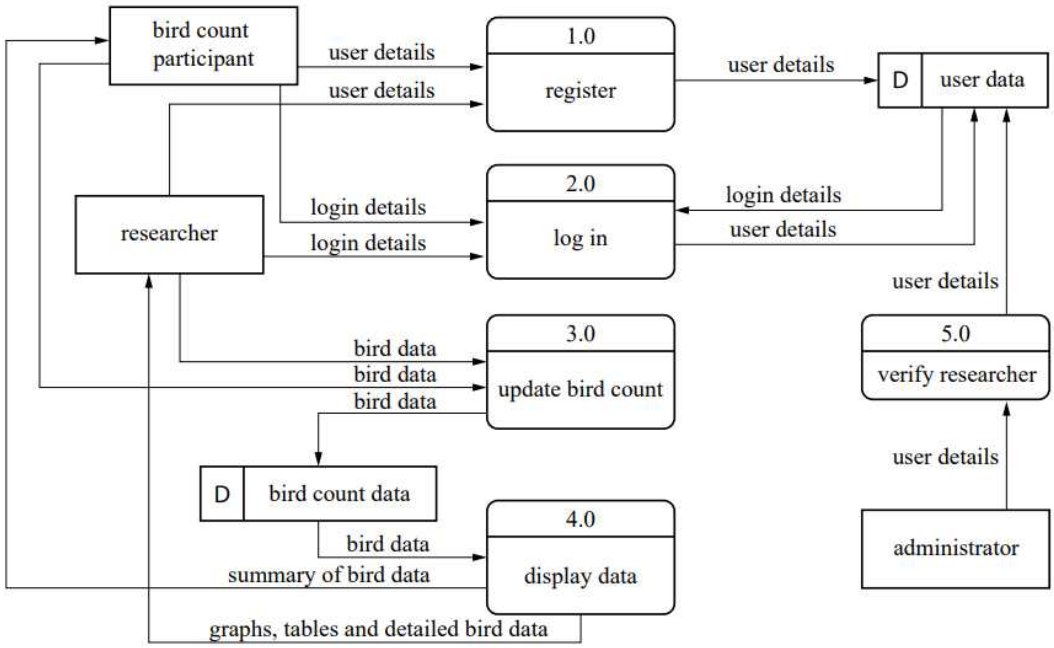
2022 Paper 1 Section 2 Question 11 **Digital methods for exchanging data**	Explain the features of two network transmission protocols for transferring data between websites. [2 marks]

2021 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Converting a variable-length set of data to a fixed-length hexadecimal value is known as (A) hashing. (B) checksum. (C) encryption. (D) authentication

2021 Paper 1 Section 1 Question 2 Digital methods for exchanging data	A developer has produced a user interface for data entry in a new online system and has used consistent colour, layout and typography throughout. The main purpose of doing this is to ensure the user interface is (A) easy to learn. (B) well organised. (C) visually appealing. (D) accessible to all users.

2021 Paper 1 Section 1 Question 3 Digital methods for exchanging data	The FTP network protocol is used to (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.

2021 Paper 1 Section 1 Question 4 Digital methods for exchanging data	JSON is an effective exchange method for customer data across a networked system because (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.

2021 Paper 1 Section 1 Question 5 Digital methods for exchanging data	The data flow diagram describes a system for recording bird sightings.  Which statement about the diagram is correct? (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.

2021 Paper 1 Section 1 Question 7 Digital methods for exchanging data	Screen-based user interfaces must be dynamically adjustable because mobile phones, televisions and other screens have different aspect ratios and dimensions. This is an example of which useability principle? (A) safety (B) utility (C) validity (D) reliability

2021 Paper 1 Section 1 Question 10 X	Which solution requirements help protect the integrity of customer order data when ordering online? (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.

2020 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Asymmetric encryption algorithms (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.

2020 **Paper 1** **Section 1** **Question 2** **X**	The useability principle of utility can best be described as the ability of (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.

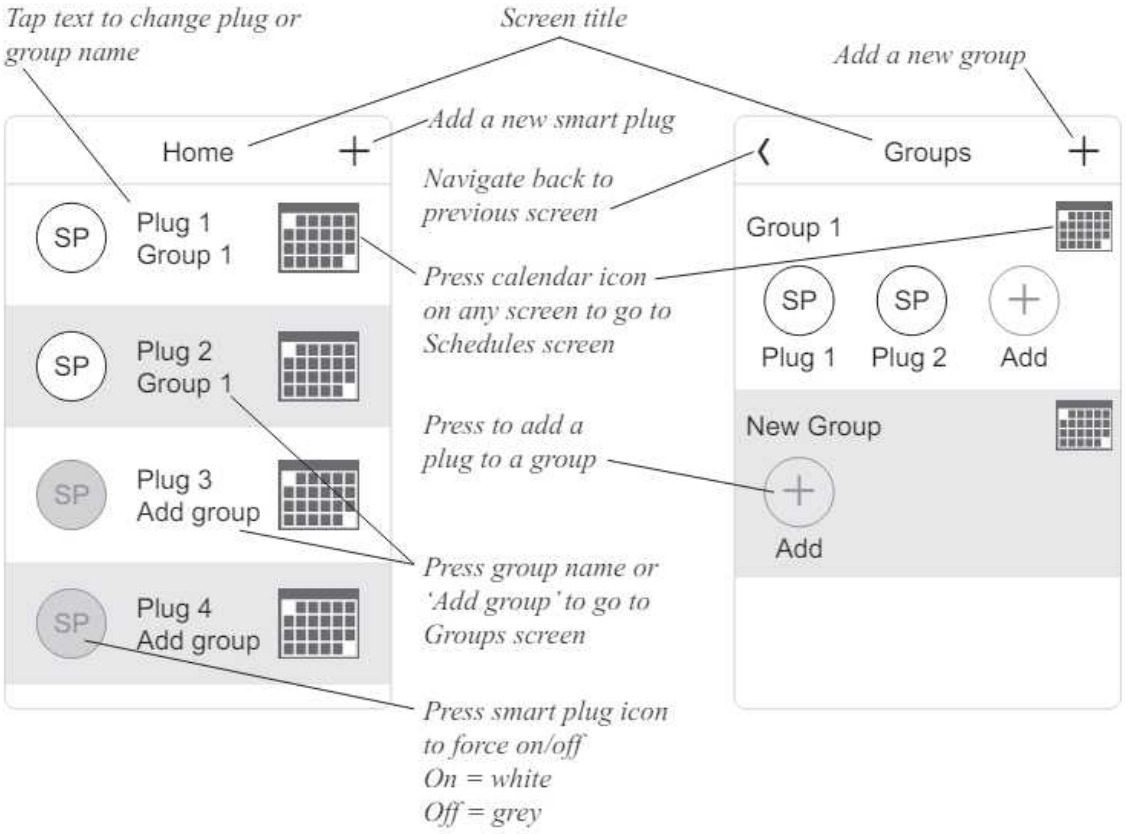
2020 **Paper 1** **Section 1** **Question 4** **Digital methods for exchanging data**	Streaming requires real-time delivery of video and audio data. To ensure high-quality streaming for the viewer, the frames must arrive in the correct order and with minimal delay. When developing such a system (A) latency 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.

2020 **Paper 1** **Section 1** **Question 5** **Digital methods for exchanging data**	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 (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.

Paper 1 Section 2

2023 Paper 1 Section 2 Question 12 **Digital methods for exchanging data**	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] 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]

2023 Paper 1 Section 2 Question 13 **Digital methods for exchanging 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)

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: Example: Iteration: Example: 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]

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.

2021 Paper 1 Section 2 Question 12 Digital methods for exchanging 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]

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

Australian Privacy Principle:

Ethical consideration:

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]

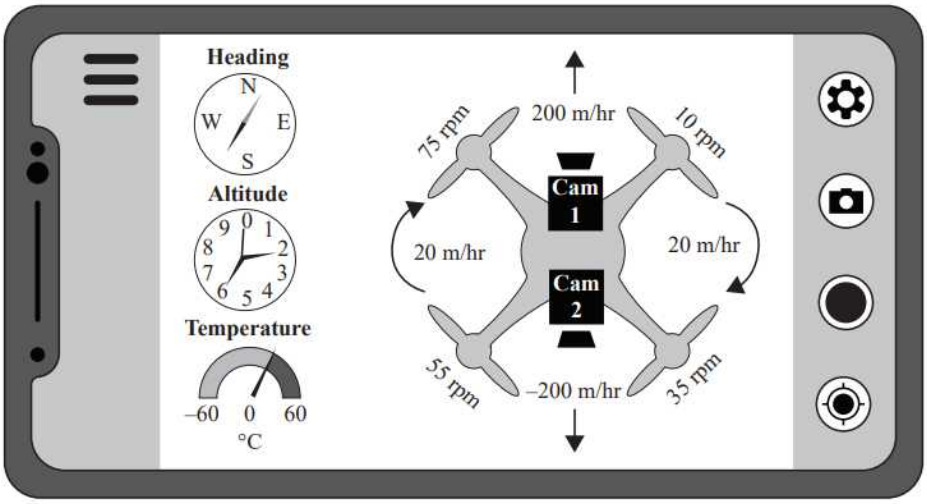
	d) A friend is interested in learning more about encryption. Use pseudocode to symbolise a simple Caesar cipher as a demonstration. [8 marks]

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

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]

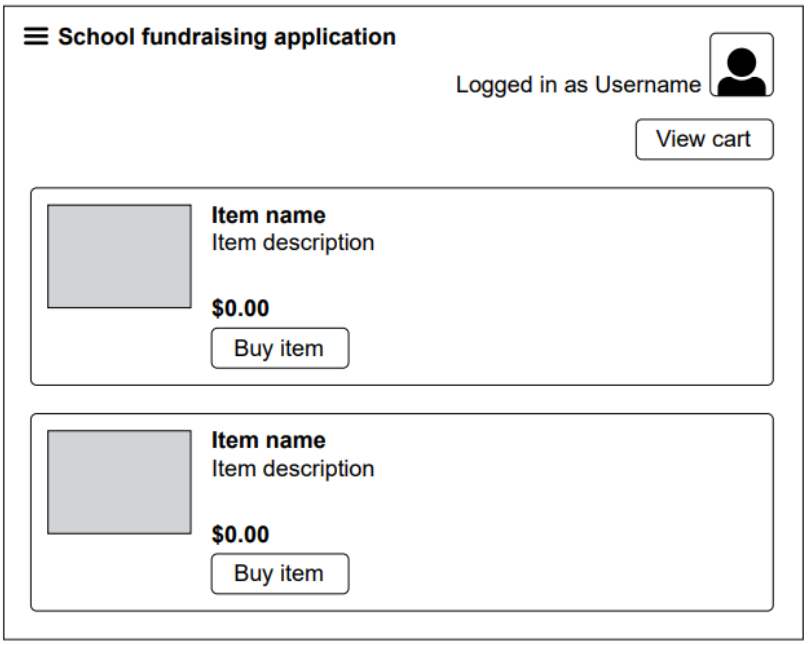
b) Further develop the user interface to include five new features: camera views for Cameras 1 and 2, and readings for speed, battery power and flight angle. [5 marks]

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]

Paper 1 Section 3

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]

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]



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]

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:

2021 Paper 1 Section 3 Question 14

Digital methods for exchanging data

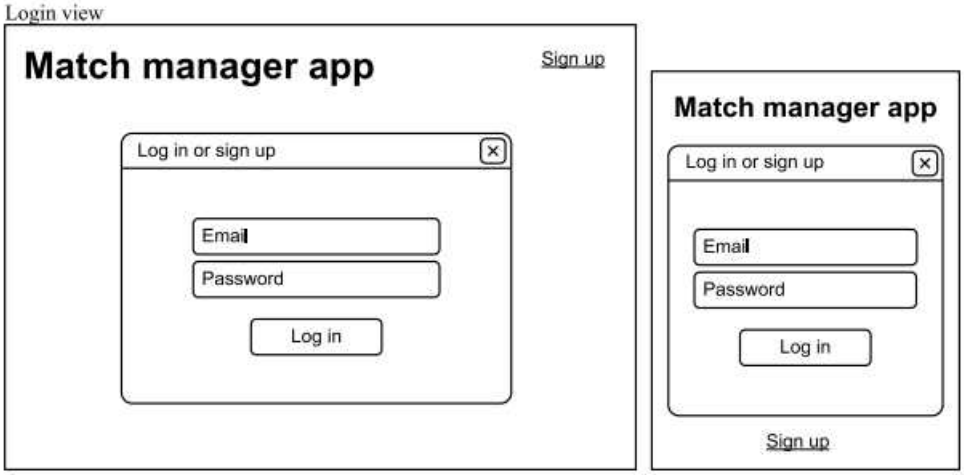
a) Analyse Stimulus 1 in the stimulus book. Describe all the ways space, line and tone are used and how visual hierarchy, proximity and alignment have informed development of the match manager user interface. [6 marks]

Stimulus 1

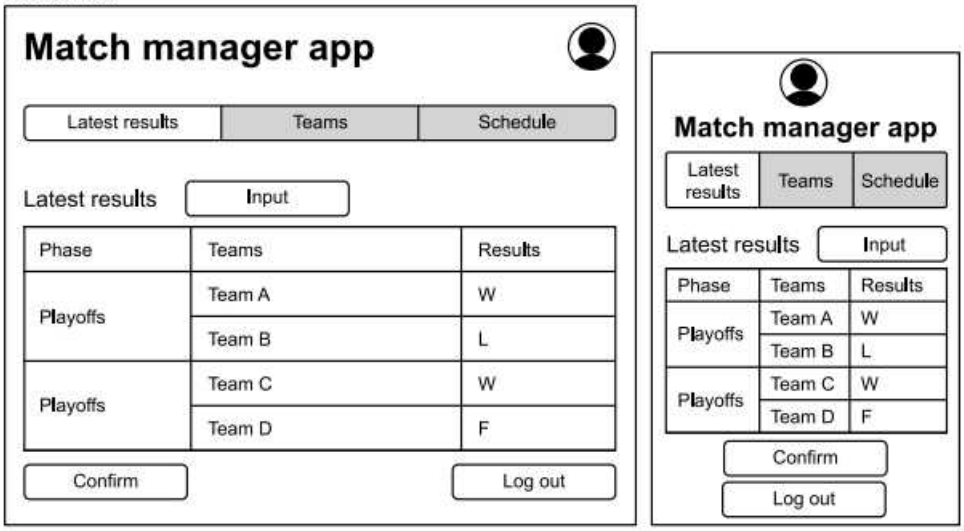
A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

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]

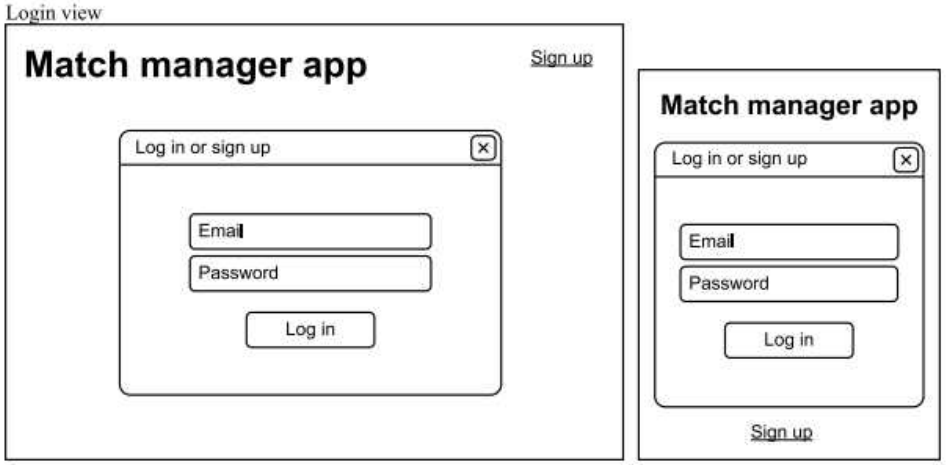
c) Using Stimulus 1 and 2 in the stimulus book, make three justified recommendations, based on survey feedback, to improve data security of the match manager system. [6 marks]

Stimulus 1

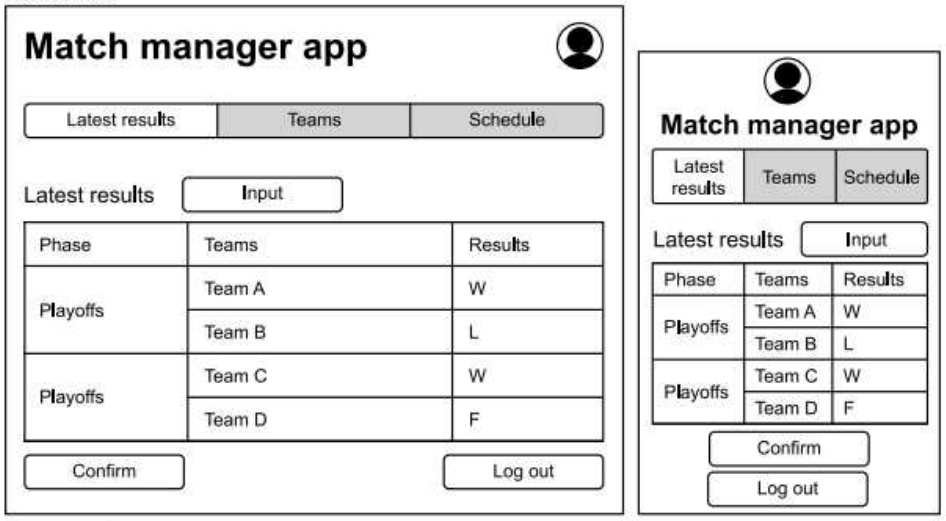
A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

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



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.

Recommendation and justification 1:

	Recommendation and justification 2: Recommendation and justification 3:

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]

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]

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]

	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]

Marking Guide – Paper 1 Section 1

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 – Answer** (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 – Answer** (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. – Answer** (D) a suitable programming environment.

2023 Paper 1 Section 1 Question 4 **Digital methods for exchanging data**	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 (A) jitter. **(B) latency. – Answer** (C) timeliness. (D) protocol standards.

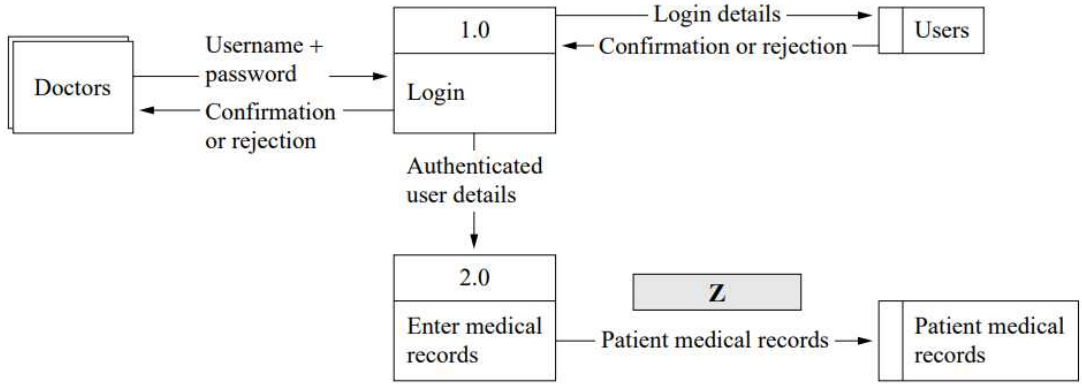
2023 Paper 1 Section 1 Question 5 **Digital methods for exchanging data**	Which encryption method uses a fixed shift of letters down the alphabet with a modulus operation? **(A) Caesar – Answer** (B) Vigenere (C) Gronsfeld (D) One-time pad

2023 Paper 1 Section 1 Question 6 **Digital methods for exchanging data**	Which statement correctly describes the relationship between JSON and REST? (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.

2022 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Hashing increases security for data **(A) storage. – Answer** (B) encryption. (C) compression. (D) authentication.

2022 Paper 1 Section 1 Question 2 Digital methods for exchanging data	Which encryption method is an example of asymmetric encryption? (A) DES **(B) RSA – Answer** (C) Blowfish (D) Triple DES

2022 Paper 1 Section 1 Question 4 Digital methods for exchanging data	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? (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

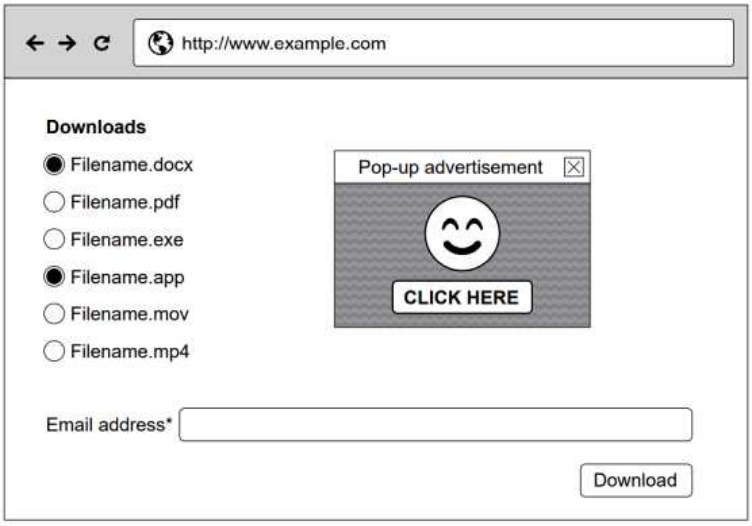
2022 Paper 1 Section 1 Question 5 Digital methods for exchanging data	Analyse the flow of data to identify the appropriate data security strategy to be performed at Z.  (A) authentication (B) checksum (C) hashing **(D) encryption – Answer**

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 – Answer** (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. – Answer

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
Two network transmission protocols are HTTP and HTTPS. 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. 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.	• explains features of - one valid network transmission protocol [1 mark] - another valid network transmission protocol [1 mark]

2021 Paper 1 Section 1 Question 1

Digital methods for exchanging data

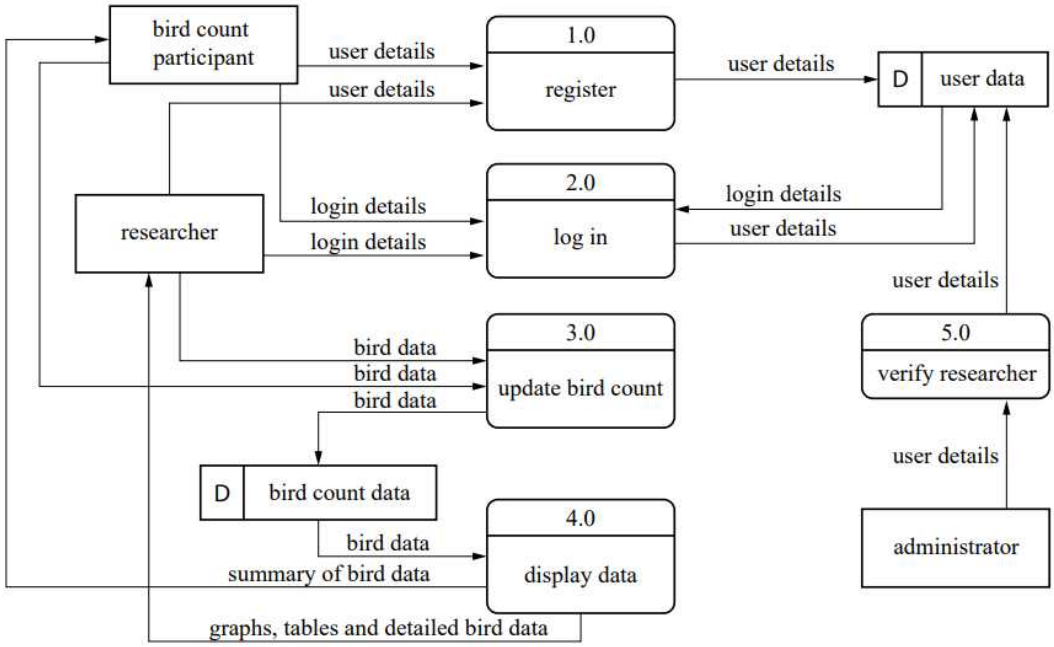
Converting a variable-length set of data to a fixed-length hexadecimal value is known as

(A) hashing. – Answer
(B) checksum.
(C) encryption.
(D) authentication

2021 Paper 1 Section 1 Question 2 Digital methods for exchanging data	A developer has produced a user interface for data entry in a new online system and has used consistent colour, layout and typography throughout. The main purpose of doing this is to ensure the user interface is **(A) easy to learn. – Answer** (B) well organised. (C) visually appealing. (D) accessible to all users.

2021 Paper 1 Section 1 Question 3 Digital methods for exchanging data	The FTP network protocol is used to **(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.

2021 Paper 1 Section 1 Question 4 Digital methods for exchanging data	JSON is an effective exchange method for customer data across a networked system because (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**

2021 Paper 1 Section 1 Question 5 Digital methods for exchanging data	The data flow diagram describes a system for recording bird sightings.  Which statement about the diagram is correct? (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.

2021 Paper 1 Section 1 Question 7 Digital methods for exchanging data	Screen-based user interfaces must be dynamically adjustable because mobile phones, televisions and other screens have different aspect ratios and dimensions. This is an example of which useability principle? (A) safety **(B) utility – Answer** (C) validity (D) reliability

2021 Paper 1 Section 1 Question 10 Digital methods for exchanging data	Which solution requirements help protect the integrity of customer order data when ordering online? (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.

2020 Paper 1 Section 1 Question 1 Digital methods for exchanging data	Asymmetric encryption algorithms (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**

2020 Paper 1 Section 1 Question 2 Digital methods for exchanging data	The useability principle of utility can best be described as the ability of (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.

2020 Paper 1 Section 1 Question 4 Digital methods for exchanging data	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. When developing such a system **(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.

2020 Paper 1 Section 1 Question 5 Digital methods for exchanging data	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 (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.

Marking Guide – Paper 1 Section 2

2023 Paper 1 Section 2 Question 12

Digital methods for exchanging data

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.	• 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.	• 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 methods for exchanging 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)

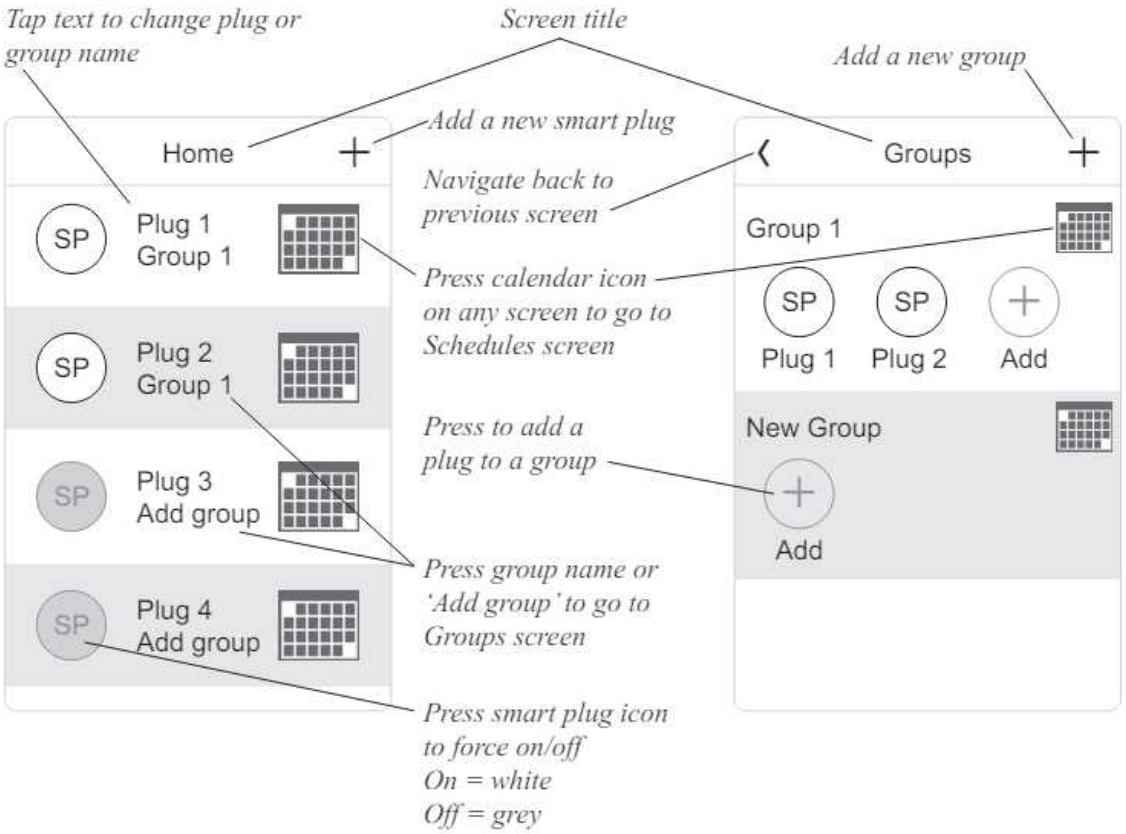
Sample response	The response

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.
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.
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).
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).
	• logically symbolises a solution for the error on
	– line 9 **[1 mark]**
	– line 12 **[1 mark]**
	– line 18 **[1 mark]**
	– line 21 **[1 mark]**
	• justifies symbolised solution for
	– line 9 **[1 mark]**
	– line 12 **[1 mark]**
	– line 18 **[1 mark]**
	– line 21 **[1 mark]**
	• does not introduce new logic errors **[1 mark]**

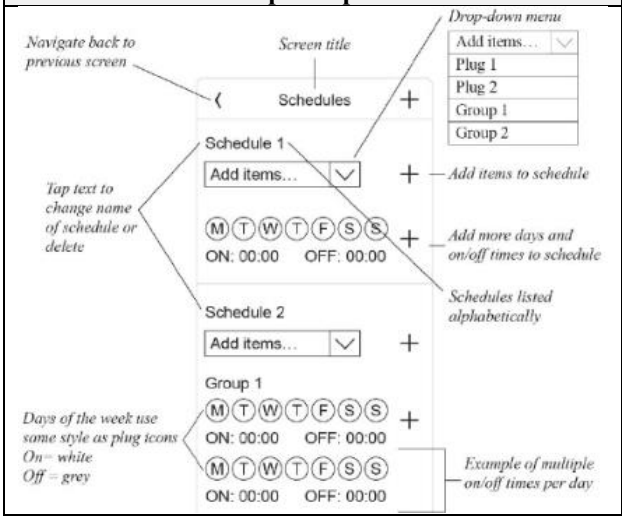
2023 Paper 1 Section 2 Question 14

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]

Sample response	The response
	• symbolises user interface elements that allow – scheduling for ▪ individual plugs **[1 mark]** ▪ groups **[1 mark]** – multiple on/off times per day for ▪ 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
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. 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.	• 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 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} 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 x 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

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
 	
`FOR i = 0 TO years`
`deposit = depositAmount + depositAmount x interestRate`
`NEXT i`
	• 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
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).	• 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 exchanging data

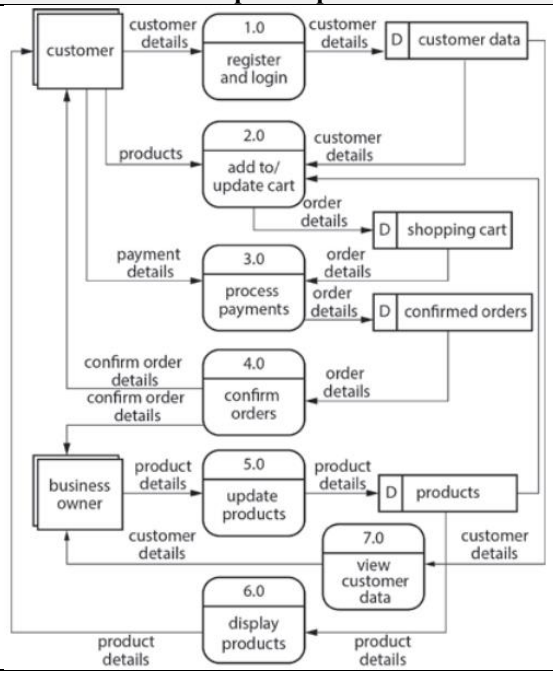
Business owners use an online platform to sell products. The essential features of the platform are listed.

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.

Sample Response	The response
	• 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 methods for exchanging 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
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. 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. 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.	• 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
Australian Privacy Principle: Security of personal information. Allow an administrator to de-identify or destroy personal information once it is no longer in use. 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.	• 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
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 KEY SHIFT | PASSWORD 0 | K Y I W W 1 | J X H V V 2 | I W G U U 3 | H V F T T 4 | G U E S S	• performs a desk check that - decrypts the password using iterations[1 mark] - contains no errors [1 mark]

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

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
	• 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
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. 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. 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.	• explains how the security of the data exchange would be improved through - checksums [1 mark] - encryption [1 mark] - authentication [1 mark]

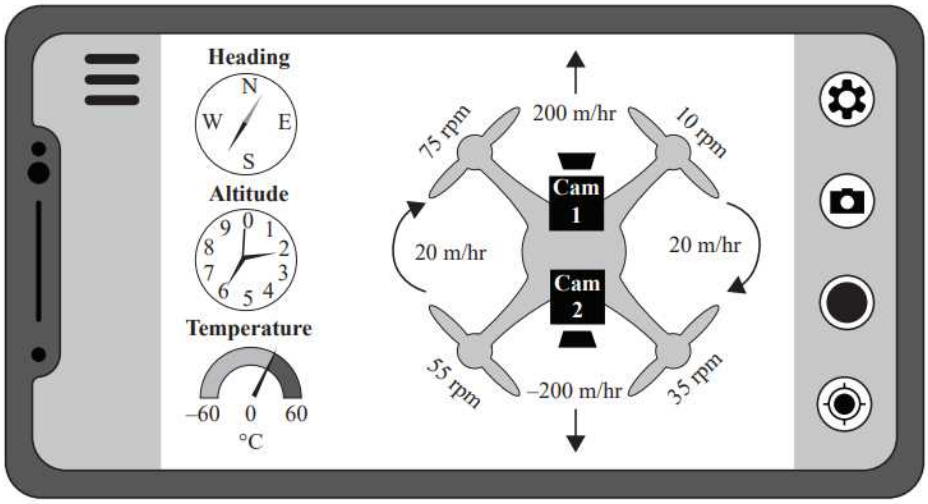
b) Recommend one encryption method to securely store auction data and justify your response. [2 marks]

Sample Response	The response
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.	• 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.

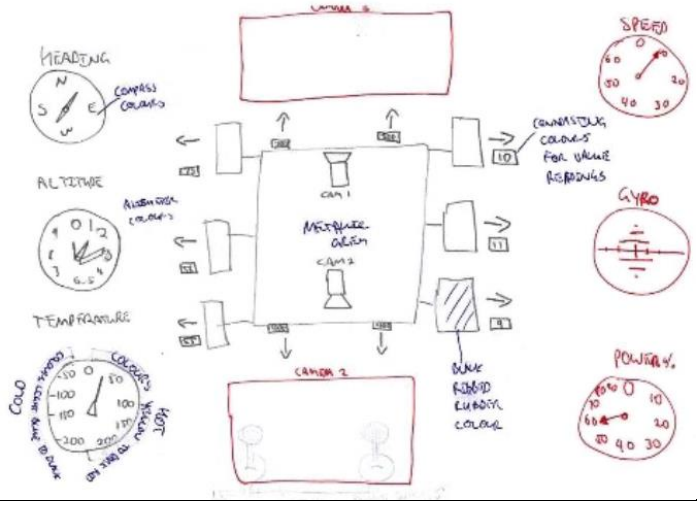


a) Explain how three elements and three principles of visual communication (excluding colour) have been used. [12 marks]

Sample Response	The response For elements of visual communication	The response For principles of visual communication
The elements of visual communication used in this UI are: • 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. The principles of visual communication used in this UI are: • 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.	[6 marks] • states 3 elements of visual communication and describes how these 3 elements have been used in the UI	[6 marks] • states 3 principles of visual communication and describes how these 3 principles have been used in the UI
	[5 marks] • states 3 elements of visual communication and describes how 2 of these elements have been used in the UI	[5 marks] • states 3 principles of visual communication and describes how 2 of these principles have been used in the UI
	[4 marks] • states 2 elements of visual communication and describes how these 2 elements have been used in the UI	[4 marks] • states 2 principles of visual communication and describes how these 2 principles have been used in the UI
	[3 marks] • states 2 elements of visual communication and describes how 1 of these elements has been used in the UI	[3 marks] • states 2 principles of visual communication and describes how 1 of these principles has been used in the UI
	[2 marks] • states 2 elements of visual communication OR • states 1 element of visual communication and describes how this element has been used in the UI	[2 marks] • states 2 principles of visual communication OR • states 1 principle of visual communication and describes how this principle has been used in the UI
	[1 mark] • states 1 element of visual communication OR	[1 mark] • states 1 principle of visual communication OR

	• describes how 1 element of visual communication has been used in the UI	• describes how 1 principle of visual communication has been used in the UI
	[0 marks] • does not satisfy any of the descriptors above.	[0 marks] • 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:
	• 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 For the justification of features
Note: Responses are annotations on the diagram from Question 11b). • 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)	• 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]

Marking Guide – Paper 1 Section 3

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.

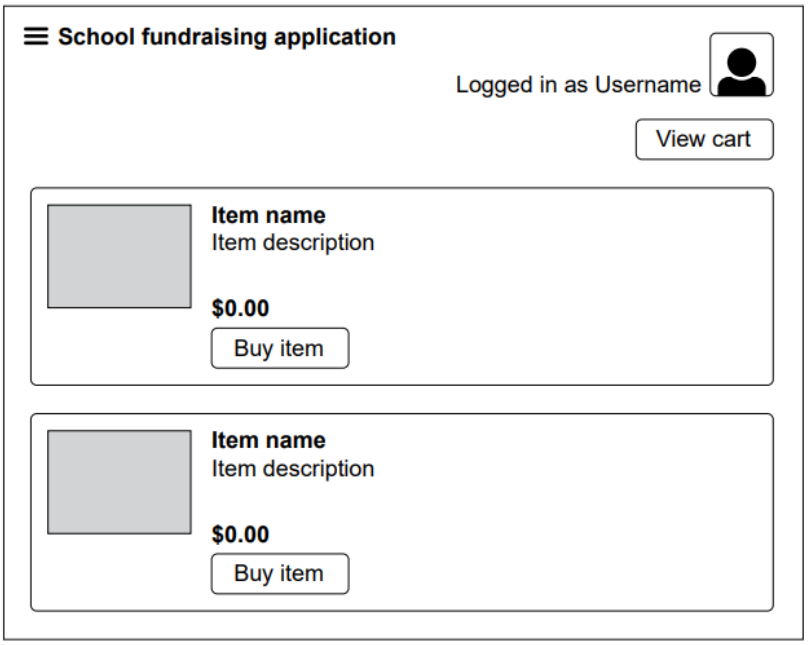
School administration staff manually add item details to the application as they are donated and purchased. Once an order has been placed, stock availability should automatically update.

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.	• correctly determines - a process that has occurred in the system [1 mark] - a second process that has occurred in the system [1 mark] • justifies - 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.	• determines processes and data flows will occur for - 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
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. 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. 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.	• 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]

2021 Paper 1 Section 3 Question 14

Digital methods for exchanging data

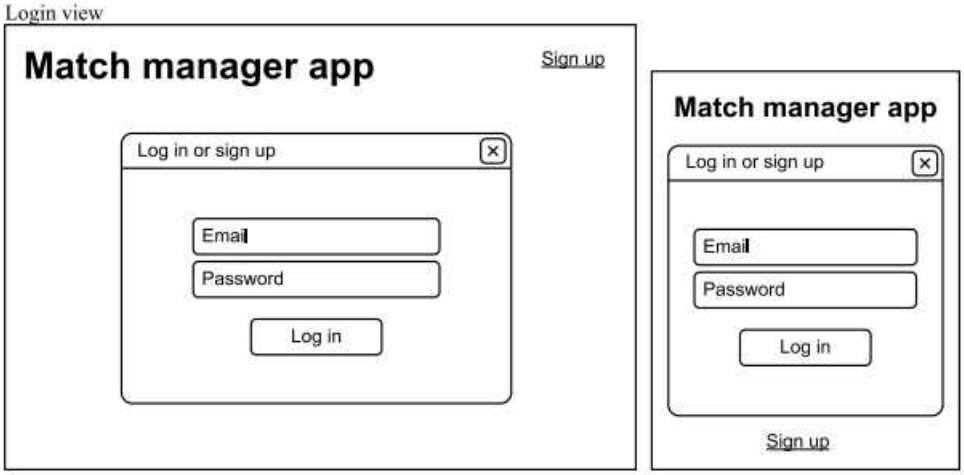
a) Analyse Stimulus 1 in the stimulus book. Describe all the ways space, line and tone are used and how visual hierarchy, proximity and alignment have informed development of the match manager user interface. [6 marks]

Stimulus 1

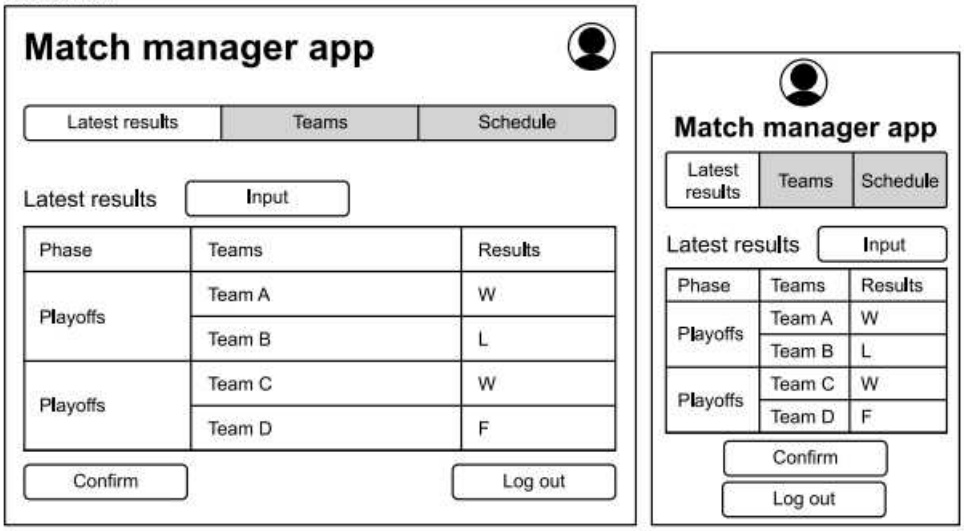
A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

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

Sample Response	The response
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.	• 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
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.	• 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]

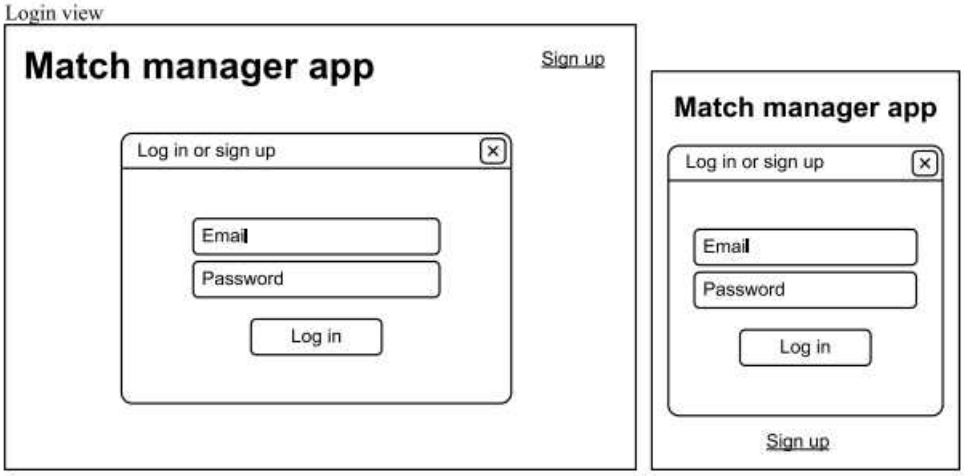
	c) Using Stimulus 1 and 2 in the stimulus book, make three justified recommendations, based on survey feedback, to improve data security of the match manager system. [6 marks]

Stimulus 1

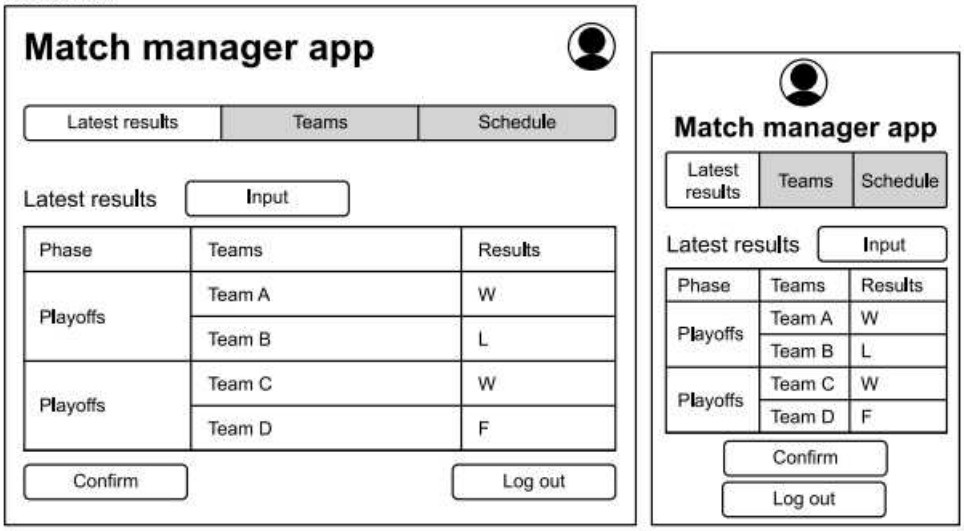
A web application (app) is developed to manage and display match data for esports tournaments. The wire frames for the desktop and mobile interfaces are shown.

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



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.

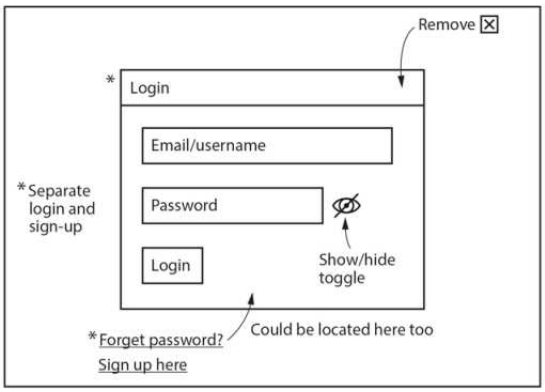
Question 4: What improvements are needed in this system?

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
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. 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. 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.	• recommends - password input security measure [1 mark] - user-level access security measure [1 mark] - password management security measure [1 mark] • logically justifies - 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
 1. Forget password link improves utility to allow users to reset their password when they have forgotten it. 2. Show/hide toggle for password input improves utility and accessibility so that users can hide and show the password, depending on their needs. 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. 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.	• symbolises - 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 - 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

`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`
	[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
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. 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.	For a usability principle: • 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] For a second useability principle: • 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
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. 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. 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. To improve security, it would be recommended to test the program that is written before using it to identify any issues prior to implementation. Another recommendation would be to consider the vulnerabilities of the range of programming languages and use the least vulnerable languages to optimise security.	• provides a valid conclusion about Blowfish [1 mark] for evaluating the steps used: • 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] for improving security: • 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

2023 Paper 1 Section 1 Question 7 **Prototype digital data exchanges**	The algorithm outputs a data set according to values a user inputs. ``` 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 ``` If the user inputs firstNum = 6 and secondNum = 10, how many times would line 6 be executed? (A) 1 (B) 6 (C) 10 (D) 60

2023 Paper 1 Section 1 Question 8 **Prototype digital data exchanges**	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 (A) retrieved, normalised and verified. (B) retrieved, normalised and validated. (C) normalised, validated and encrypted. (D) retrieved, modularised and validated.

2023 Paper 1 Section 1 Question 9 **Prototype digital data exchanges**	In a data dictionary where all the item types are numeric, which item would be stored as a float? (A) shoeID (B) quantity (C) numSold (D) wholesalePrice

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
```

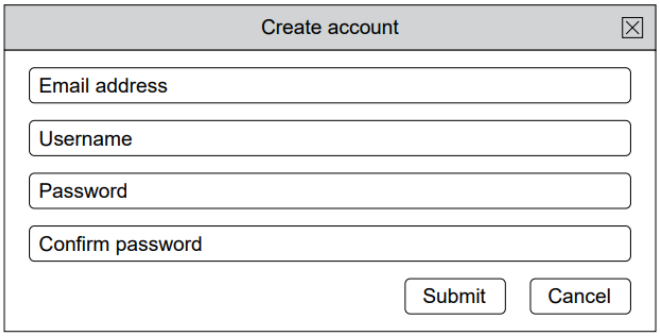
(C)
```
SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000
ORDER BY MeanTemperature DESC
```

(D)
```
SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000 AND
ORDER BY MeanTemperature DESC
```

2022 Paper 1 Section 1 Question 3

Prototype digital data exchanges

Analyse the wireframe to determine which principle of visual communication has been applied.



(A) proximity
(B) hierarchy
(C) alignment
(D) proportion

2022 Paper 1 Section 1 Question 6

Prototype digital data exchanges

Complete the Caesar encryption algorithm with the correct statement at line 5.

```
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
```

(A) `newCharacter = userText + userShift`

(B) `newCharacter = character + userShift`

(C) `newCharacter = character - userShift`

(D) `newCharacter = character + userShift MOD 26`

2022 Paper 1 Section 1 Question 9

Prototype digital data exchanges

Which algorithmic statement determines the value of y between 10 and 50 inclusive?

(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`

**2022
Paper 1
Section 1
Question 10
 	
Prototype digital data exchanges**
	Desk check the algorithm to determine its output.
	
	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
	
	The output value is
	(A) -10
	(B) 4
	(C) 8
	(D) 10

**2021
Paper 1
Section 1
Question 6
 	
Prototype digital data exchanges**
	Desk check the algorithm to predict the output for numX = 8 and numZ = 5.
	
	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
	
	(A) Condition 1
	(B) Condition 2
	(C) Condition 3
	(D) Condition 4

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 15/06/2019	Lui Chan	27
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

Paper 1 Section 2

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:
	
	Data security:
	
	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`

**2022
Paper 1
Section 2
Question 13**
 	
Prototype digital data exchanges
	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]

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]

2022 Paper 1 Section 2 Question 14

Prototype digital data exchanges

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**
• Plain text password	• Hashed value
Function call	`hashPassword(plaintext)`

Function	`checkLogin`
Description	Look up a student ID and hashed password in database
Input	**Return**
• Student ID • Hashed value	• True/False
Function call	`checkLogin(studentID, password)`

Function	`getResults`
Description	Retrieve all results for a student ID
Input	**Return**
• Student ID	• 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**
• Key • Line of encrypted data	• 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
```

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.

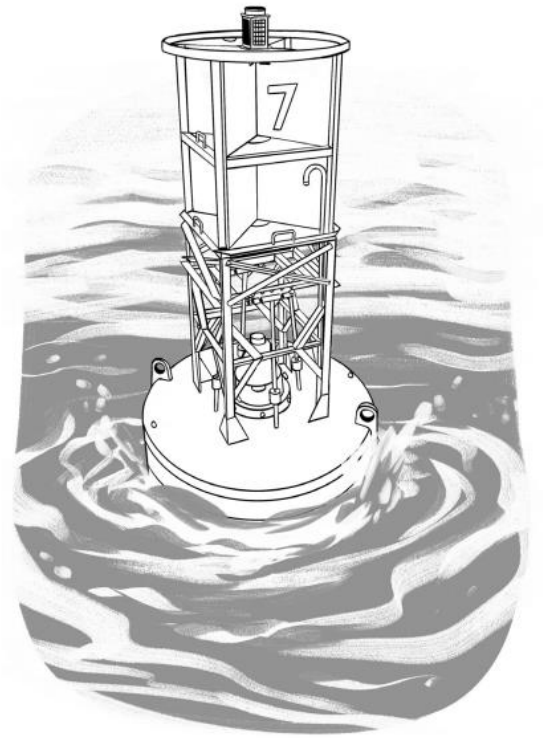
Each day, the IoT device checks the status of the marker. If a fault is detected, the device broadcasts the marker's unique identifier, a positive fault status flag and the fault occurrence date and time.

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:

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

Criterion:

Criterion:

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]

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]

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]

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

Paper 1 Section 3

2023 Paper 1 Section 3 Question 15 **Prototype digital data exchanges**	A school has developed a digital system to vote on student leadership positions. The system is incomplete, and a few unprogrammed processes remain. Programmed components include: • 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. Unprogrammed processes include site administration: • 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. 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] The voting rules for the system are: • 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. b) Explain system features that would ensure the implementation of the three voting rules. [3 marks]

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]

2023 Paper 1 Section 1 Question 7 **Prototype digital data exchanges**	The algorithm outputs a data set according to values a user inputs. ``` 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 ``` If the user inputs firstNum = 6 and secondNum = 10, how many times would line 6 be executed? (A) 1 (B) 6 (C) 10 **(D) 60 – Answer**

2023 Paper 1 Section 1 Question 8 **Prototype digital data exchanges**	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 (A) retrieved, normalised and verified. **(B) retrieved, normalised and validated. – Answer** (C) normalised, validated and encrypted. (D) retrieved, modularised and validated.

2023 Paper 1 Section 1 Question 9 **Prototype digital data exchanges**	In a data dictionary where all the item types are numeric, which item would be stored as a float? (A) shoeID (B) quantity (C) numSold **(D) wholesalePrice – Answer**

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
```

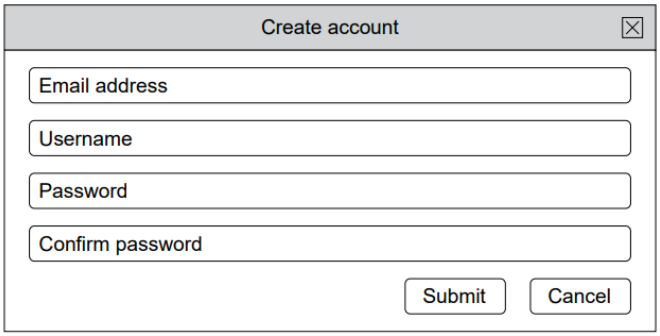
(D)
```
SELECT Name, MeanTemperature
FROM Planets
WHERE Diameter < 50000 AND
ORDER BY MeanTemperature DESC
```

Answer is C.

2022 Paper 1 Section 1 Question 3

Prototype digital data exchanges

Analyse the wireframe to determine which principle of visual communication has been applied.



(A) proximity
(B) hierarchy
(C) alignment – Answer
(D) proportion

2022 Paper 1 Section 1 Question 6

Prototype digital data exchanges

Complete the Caesar encryption algorithm with the correct statement at line 5.

```
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
```

(A) `newCharacter = userText + userShift`

(B) `newCharacter = character + userShift`

(C) `newCharacter = character - userShift`

(D) `newCharacter = character + userShift MOD 26`

Answer is D.

2022 Paper 1 Section 1 Question 9

Prototype digital data exchanges

Which algorithmic statement determines the value of y between 10 and 50 inclusive?

(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`

Answer is D.

**2022
Paper 1
Section 1
Question 10
 	
Prototype digital data exchanges**
	Desk check the algorithm to determine its output.
	
	`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`
	
	The output value is
	(A) -10
	(B) 4 – Answer
	(C) 8
	(D) 10

**2021
Paper 1
Section 1
Question 6
 	
Prototype digital data exchanges**
	Desk check the algorithm to predict the output for numX = 8 and numZ = 5.
	
	`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`
	
	(A) Condition 1
	(B) Condition 2 – Answer
	(C) Condition 3
	(D) Condition 4

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 15/06/2019	Lui Chan	27
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

Marking Guide – Paper 1 Section 2

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
Data size: Use data compression to reduce the size of data being stored, preventing the system from overloading to ensure user access is unaffected. Data security: Use encryption to maintain data security and integrity. Data that is encrypted when entered cannot be compromised if intercepted during transmission.	• 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

`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`
	• symbolises
	– hash password **[1 mark]**
	– username verification **[1 mark]**
	– password verification **[1 mark]**
	– successful account verification **[1 mark]**
	– unsuccessful account verification **[1 mark]**
	• demonstrates
	– safety for incorrect username **[1 mark]**
	– safety for incorrect password **[1 mark]**

2022 Paper 1 Section 2 Question 13

Prototype digital data exchanges

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

`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`
	• symbolises, without logic errors, an algorithmic statement for
	- 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
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	• 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]

2022 Paper 1 Section 2 Question 14

Prototype digital data exchanges

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**
• Plain text password	• Hashed value
Function call	`hashPassword(plaintext)`

Function	`checkLogin`
Description	Look up a student ID and hashed password in database
Input	**Return**
• Student ID • Hashed value	• True/False
Function call	`checkLogin(studentID, password)`

Function	`getResults`
Description	Retrieve all results for a student ID
Input	**Return**
• Student ID	• 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**
• Key • Line of encrypted data	• 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

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
	• 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.

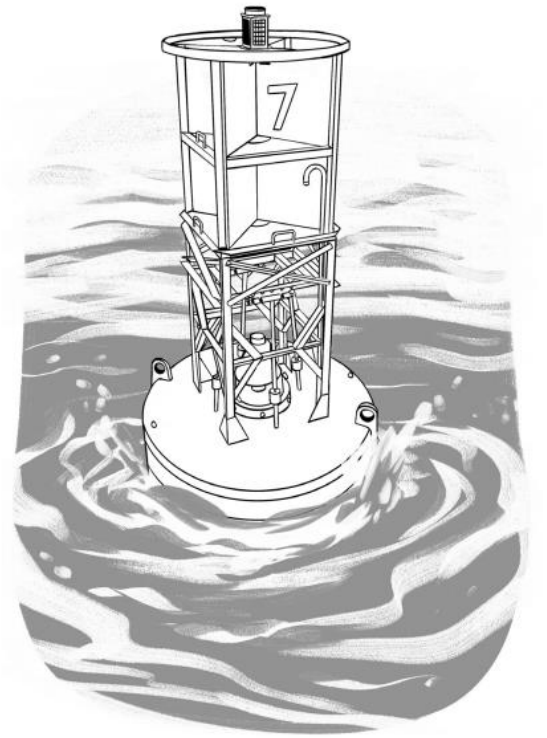
Each day, the IoT device checks the status of the marker. If a fault is detected, the device broadcasts the marker's unique identifier, a positive fault status flag and the fault occurrence date and time.

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
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. 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.	• 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: • states a relevant self-determined criterion [1 mark] • states a second relevant self-determined criterion [1 mark]
	for evaluation: • 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.	• 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
Response based on C#: BEGIN DECLARE string memberNames = {last_name, given_name} ORDER BY last_name OUTPUT memberNames END Response based on SQL: SELECT given_name, last_name FROM members ORDER BY last_name ASC	[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.

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

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
	[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

Response based on C#:
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
 	
Response based on SQL:
SELECT given_name, last_name, email, points_balance
FROM members
JOIN members_activity
ON members.id = members_activity.id
WHERE points_balance > 3000;
	[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

2023 Paper 1 Section 3 Question 15

Prototype digital data exchanges

A school has developed a digital system to vote on student leadership positions. The system is incomplete, and a few unprogrammed processes remain.

Programmed components include:
• 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.

Unprogrammed processes include site administration:
• 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.

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]

Sample response	The response

`<candidate>`
`  <name>Candidate X</name>`
`  <year>Year 11</year)`
`  <position>Esports captain</position>`
`</candidate>`
	• symbolises a parent container for candidate **[1 mark]**
	• symbolises a child container for
	– candidate **[1 mark]**
	– year **[1 mark]**
	– position **[1 mark]**

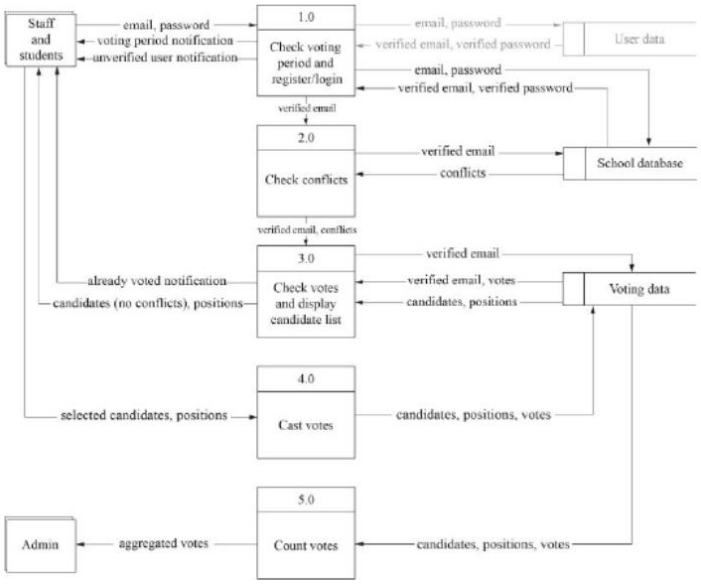
The voting rules for the system are:
• only students and staff can vote
• each user can only vote once
• voting takes place on a nominated day between 8:30 am and 4:00 pm.

b) Explain system features that would ensure the implementation of the three voting rules. [3 marks]

Sample response	The response
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. 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. 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.	• explains system features to ensure implementation of – 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
	• symbolises a process or processes that – 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 – voting data **[1 mark]** – users and school data **[1 mark]** • symbolises logical incoming and outgoing data flow for – 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 ▪ 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
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. 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. 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. Process 4.0 records the user's selected candidates and positions to the voting datastore where they are stored as votes. 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.	[4 marks] • justifies response by explaining system interrelationships between all – processes – datastores – external entities [3 marks] • justifies response by explaining system interrelationships between some – processes – datastores – external entities **OR** • justifies response by explaining system interrelationships between all – processes – datastores **OR** external entities [2 marks] • justifies response by explaining interrelationships between some – processes – datastores **OR** external entities [1 mark] • justifies response by explaining interrelationships between some – processes, datastores **OR** external entities [0 marks] • does not satisfy any of the descriptors above.