Digital Solutions

External assessment 2024

Practice examination and explained answers

About this booklet

This booklet combines the original stimulus, multiple-choice questions, question and response book, and marking guide with newly written teaching explanations. Complete the paper first, then use the official guide and the explanations to review your reasoning.

Topics covered

Visual communication and accessibility; impacts of data use; algorithms and JSON; useability; cybersecurity and data exchange; privacy; data-flow diagrams; and interface design.

How to use the booklet

Read the stimulus and answer the examination questions on paper. Then compare your work with the original marking guide. Finally, read the independent explanations at the end: they introduce the ideas, connect them to the scenario and explain what a strong response needs.

Source and status

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External assessment 2024

Stimulus book

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General instruction

- Work in this book will not be marked.

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Stimulus 1

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

Australian Privacy Principles (APPs) (2014)

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

Stimulus 2

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



References

Stimulus 1

Office of the Australian Information Commissioner 2022, 'Australian Privacy Principles quick reference', OAIC, www.oaic.gov.au/privacy/australian-privacy-principles/australian-privacy-principles-quick-reference. Provided under a Creative Commons Attribution 3.0 Australia licence. CC BY 3.0

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Multiple choice question book

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General instruction

- Work in this book will not be marked.

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Section 1

Instruction

- Respond to these questions in the question and response book.

QUESTION 1

Which element of visual communication, if not used appropriately, could risk the accessibility of a digital system?

(A) line

(B) form

(C) scale

(D) shape

QUESTION 2

A retail store uses facial recognition to send text messages about sale items to consenting customers while they are in the store.

This use of data personally impacts customers through

(A) invasion of privacy.

(B) increased data accuracy.

(C) improved store inventory management.

(D) a more personalised shopping experience.

QUESTION 3

How could a developer refine the following algorithm to improve maintainability?

```
/* Calculate the average value of an input array */
0 START
1   INPUT x AS ARRAY
2   SET sum = 0
3   FOR n IN x
4     sum = sum + n
5   ENDFOR
6   CALCULATE result = sum / length of x
7   OUTPUT result
8 END
```

(A) Use an error-checking function.

(B) Write code comments on every line.

(C) Rename variables n, x and result to be more descriptive.

(D) Incorporate a function from an available code library to sum the array.

QUESTION 4

An algorithm performs an operation.

```
0 BEGIN
1   SET x = 0
2   FOR i FROM 1 TO 100
3     IF is Prime(i) THEN
4       x = x + i
5     ENDIF
6   ENDFOR
7   OUTPUT x
8 END
```

What does the algorithm output?

(A) whether a given number is prime

(B) the sum of the first 100 prime numbers

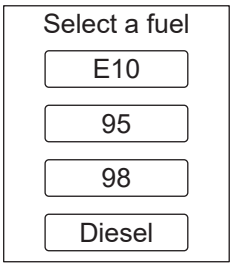
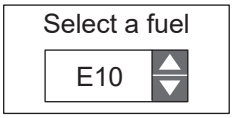
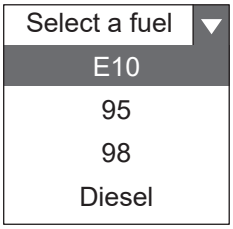
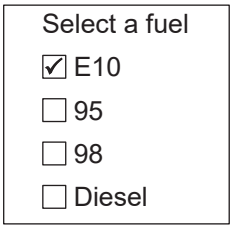
(C) the prime numbers between 1 and 100, including 100

(D) the sum of the prime numbers between 1 and 100, including 100

QUESTION 5

A new digital system is being developed that will allow customers to select a fuel type to activate the pump at service stations. The developer is considering interface options. The viewport is large enough to fit any of the four options.

Which interface option is the most usable?

	Interface options	
(A)	buttons	
(B)	a stepper	
(C)	a drop-down	
(D)	checkboxes	

QUESTION 6

A distributed denial-of-service (DDoS) attack is a malicious cyber attack in which a server is overloaded with incoming traffic from multiple sources, preventing some or all legitimate requests.

This is a risk to data

(A) privacy.

(B) integrity.

(C) availability.

(D) confidentiality.

QUESTION 7

Which technique do developers use to ensure that video content transmitted in real-time to user mobile devices has reduced load times and maintains quality?

(A) streaming

(B) compression

(C) broadcasting

(D) file transfer protocol

QUESTION 8

Match the correct code comment to line 2 of the pseudocode.

```
1 IMPORT JSON
2 SET x TO '{"name":"Ace", "age":30, "city":"Rockhampton"}'
3 SET y TO JSON.LOADS(x)
4 PRINT(x["age"])
```

(A) Assign a string to variable x.

(B) Assign a dictionary object to variable x.

(C) Convert the text object into a dictionary object.

(D) Convert the dictionary object into a text object.

QUESTION 9

A school is developing a class timetabling solution for their students.

Which is not an essential data store for the initial iteration of the app?

(A) teacher

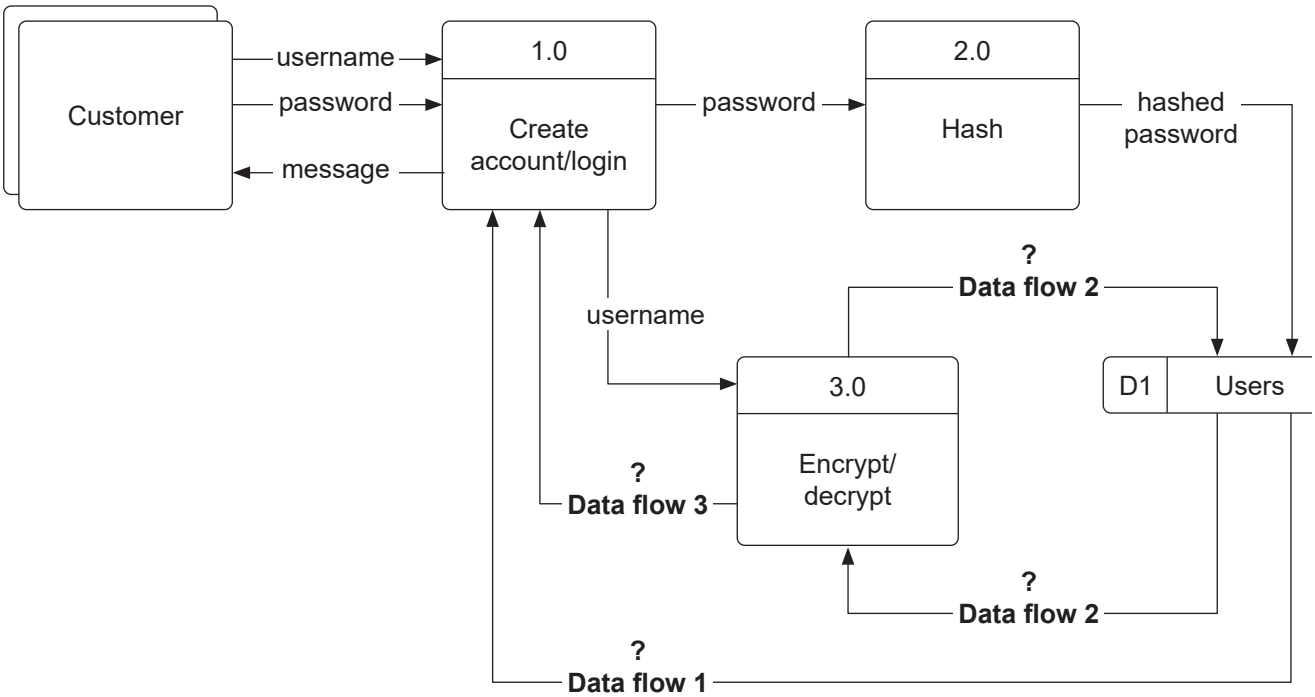
(B) subject

(C) student

(D) assessment

QUESTION 10

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



Identify the correct data flow labels.

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

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LUI | | | | | | | | | | | School code | | | | |

School name

Given name/s

Family name

Attach your
barcode ID label here

Book of books used

External assessment 2024

Question and response book

Digital Solutions

Time allowed

- Perusal time — 15 minutes
- Working time — 120 minutes

General instructions

- Answer all questions in this question and response book.
- Planning paper will not be marked.

Section 1 (10 marks)

- 10 multiple choice questions

Section 2 (36 marks)

- 4 short response questions

Section 3 (20 marks)

- 1 extended response question

Clear zone — margin trimmed off after completion of assessment

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Section 1

Instructions

- This section has 10 questions and is worth 10 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- Choose the best answer for Questions 1–10.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
7.	○	○	○	○
8.	○	○	○	○
9.	○	○	○	○
10.	○	○	○	○

Ensure you have filled an answer bubble for each question.

Do not write outside this box.

Section 2

Instructions

- Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has four questions and is worth 36 marks.

QUESTION 11 (9 marks)

Refer to Stimulus 1 in the stimulus book.

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

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

Australian Privacy Principle: _____

Implementation: _____

_____

_____

_____

_____

_____

_____

Do not write outside this box.

Australian Privacy Principle: _____

Implementation: _____

Australian Privacy Principle: _____

Implementation: _____

Do not write outside this box.

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

Confidentiality:

Integrity:

Do not write outside this box.

Availability:

Do not write outside this box.

QUESTION 12 (8 marks)

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

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

Use pseudocode to symbolise the algorithmic statements needed to display the required data.

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QUESTION 13 (9 marks)

Refer to Stimulus 2 in the stimulus book.

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

Criteria:

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

You find a code library with the following functions.

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

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

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

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QUESTION 14 (10 marks)

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

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

Note: If you make a mistake in the diagram, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

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Section 3

Instructions

- This section has one question and is worth 20 marks.

QUESTION 15 (20 marks)

A local high school is creating a map-based navigation app, catered to new staff and students in Years 7 to 10. Currently, the app does not include a login feature and does not require the user to be on campus to explore the map. The school has prescribed the following criteria to the developers:

User interface

The user interface of the app should display:

- a map of the school grounds only
- the current location of the user on the map
- labelled buildings and classrooms
- a search feature
- a navigation feature to show new staff and students which way to go to get to their classrooms.

Functionality

The app should be able to:

- locate and update the user's location as they move about the campus
- support a custom starting location for when users are off campus
- search for buildings and classrooms
- navigate to a desired location.

a) Develop a user interface prototype for the navigation app that addresses all prescribed criteria. The prototype should be intended for a mobile tablet user. Use annotations to explain how your user interface addresses all the functionality criteria. *[9 marks]*

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Note: If you make a mistake in the diagram, cancel it by ruling a single diagonal line through your work and use the additional response space at the back of this question and response book.

Do not write outside this box.

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

Visual communication principle 1: _____

Visual communication principle 2: _____

Do not write outside this box.

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

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

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

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

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ADDITIONAL PAGE FOR STUDENT RESPONSES

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Digital Solutions marking guide and response

External assessment 2024

Combination response (66 marks)

Assessment objectives

This assessment instrument is used to determine student achievement in the following objectives:

1. recognise and describe programming elements, components of exchange systems, privacy principles and data exchange processes
2. symbolise and explain programming ideas, data specifications, data exchange processes, and data flow within and between systems
3. analyse problems and information related to a digital problem
5. synthesise information and ideas to determine possible low-fidelity components of secure data exchange solutions
7. evaluate impacts, components, and solutions against criteria to make refinements and justified recommendations.

Note: Objectives 4, 6 and 8 are not assessed in this instrument.

Purpose

This document consists of a marking guide and a sample response.

The marking guide:

- provides a tool for calibrating external assessment markers to ensure reliability of results
- indicates the correlation, for each question, between mark allocation and qualities at each level of the mark range
- informs schools and students about how marks are matched to qualities in student responses.

The sample response:

- demonstrates the qualities of a high-level response
- has been annotated using the marking guide.

Mark allocation

Where a response does not meet any of the descriptors for a question or a criterion, a mark of ‘0’ will be recorded.

Where no response to a question has been made, a mark of ‘N’ will be recorded.

Marking guide

Multiple choice

Question	Response
1	C
2	D
3	C
4	D
5	A
6	C
7	B
8	A
9	D
10	A

Short response

Q	Sample response	The response:
11a)	Australian Privacy Principle: 1 Implementation: The hospital must be open and transparent about why it is collecting the data, how the data will be used and disclosed, and who will have access to the data. The hospital must also provide clear guidelines to staff about the collection and use of this information. Australian Privacy Principle: 2 Implementation: The hospital must consider whether it is possible for staff to use a pseudonym instead of their real names when accessing the car park. If this is not practical, the hospital must ensure that it handles the personal information it collects in a secure and confidential manner, and only uses it for the purposes for which it was collected. Australian Privacy Principle: 3 Implementation: The hospital must have a lawful reason for collecting staff driver information and inform staff of the purpose and use of the data collected.	• identifies and explains the implementation of – one Australian Privacy Principle **[1 mark]** – a second Australian Privacy Principle **[1 mark]** – a third Australian Privacy Principle **[1 mark]**

Q	Sample response	The response:
11b)	Confidentiality: The digital solution for capturing numberplate information and staff names poses risks for privacy, as personal data from various sources may be linked in unexpected ways. Only one trusted employee, like an IT manager, should have access to the database, and only after going through a review process approved by the hospital's recruitment and management staff. Information should only be shared between the IT manager and staff member in question, with no other parties privy to conversations or actions taken. Integrity: The data in the database must be error-free, but staff may attempt to abuse the system by providing access to family or friends by lending them their staff ID and obscuring their number plates to gain entry. To prevent staff from logging different numberplates, the system should crosscheck a list of permitted numberplates against IDs before granting access. Availability: The data may be vulnerable to hacking if allowed online, so a MicroSD card should be used for offline access by a trusted staff member. Physical security of the system and SD card should be maintained to prevent staff from damaging or destroying the digital solution. Data should be purged regularly, and the database should be detached and not accessible online. Numberplate data captured by the system should be encrypted and only accessible in extreme cases.	• analyses a risk to data – confidentiality **[1 mark]** – integrity **[1 mark]** – availability **[1 mark]** • makes a recommendation for reducing risks to data – confidentiality **[1 mark]** – integrity **[1 mark]** – availability **[1 mark]**

Q	The response:
12	• symbolises, without logic errors, algorithmic statements for – retrieving JSON data **[1 mark]** – looping through data **[1 mark]** – calculating age **[1 mark]** – calculating percentage won **[1 mark]** – displaying gamer tag **[1 mark]** – displaying age **[1 mark]** – displaying percentage won **[1 mark]** • effectively uses pseudocode conventions **[1 mark]**

Question 12)

Sample response

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

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

Initialise player array and read player data from JSON file.

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

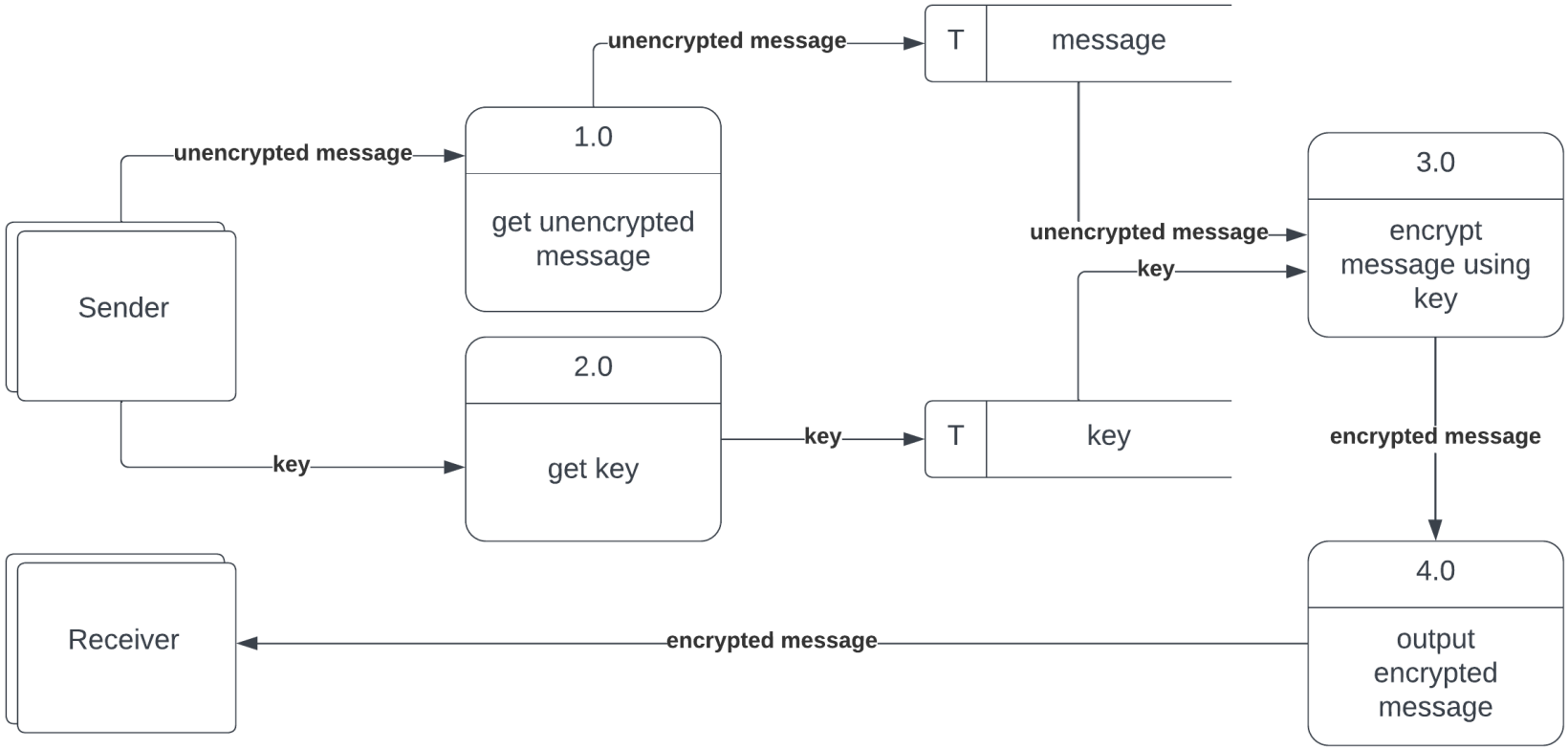
Calculate the percentage of games won by the player based on the number of games played and the number of games won to display the percentage of games won.

Q	Sample response	The response:
13a)	I would use GetRandomFromList(List) to select random items from a list of grocery items to be displayed. ShuffleList(List) does not seem necessary, as once items are randomised, it does not matter in what order they are displayed. GetRandomInt(a, b) requires more effort to code, as grocery or shopping list items would need to be assigned an integer value, whereas GetRandomFromList(List) would simply select an item from a list (e.g. image file or string). The relationship between the selected function and user interface is that the grocery images displayed would be selected by the function at random. The criteria states six grocery items, so the function would need to loop through six iterations — I would need to add programming to ensure there are no duplicates.	• justifies the selection of one code function **[1 mark]** • explains the relationship between the code function and – the user interface mock-up **[1 mark]** – the criteria **[1 mark]**
13b)	User input: A mechanism for user input should be implemented to allow the user to select food items from those displayed. This should be intuitive and easy to use, for example by using buttons, touch controls or keyboard inputs. Feedback mechanism: A clear and immediate feedback mechanism should be implemented to provide feedback to the user on whether their selection is correct or incorrect. This can be done through visual or audio cues, such as a pop-up message, change in colour of the selected item, check mark or tick next to the selected item, or audio feedback.	• recommends – one new programmed component **[1 mark]** – a second new programmed component **[1 mark]** • identifies related user interface elements for – one new programmed component **[1 mark]** – a second new programmed component **[1 mark]** • justifies recommendations for – one new programmed component and related user interface elements **[1 mark]** – a second new programmed component and related user interface elements **[1 mark]**

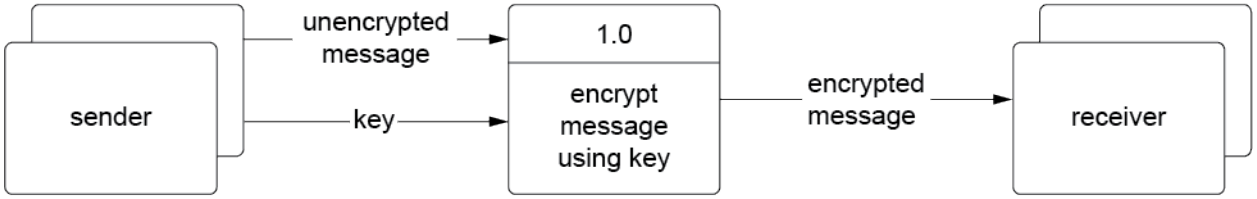
Q	The response:
14	• symbolises an external entity for – one user **[1 mark]** – a second user **[1 mark]** • symbolises a process for – encrypting a message with a key **[1 mark]** • symbolises logical data flows for – an unencrypted message **[1 mark]** – a key **[1 mark]** – an encrypted message **[1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

Question 14)

Sample response 1



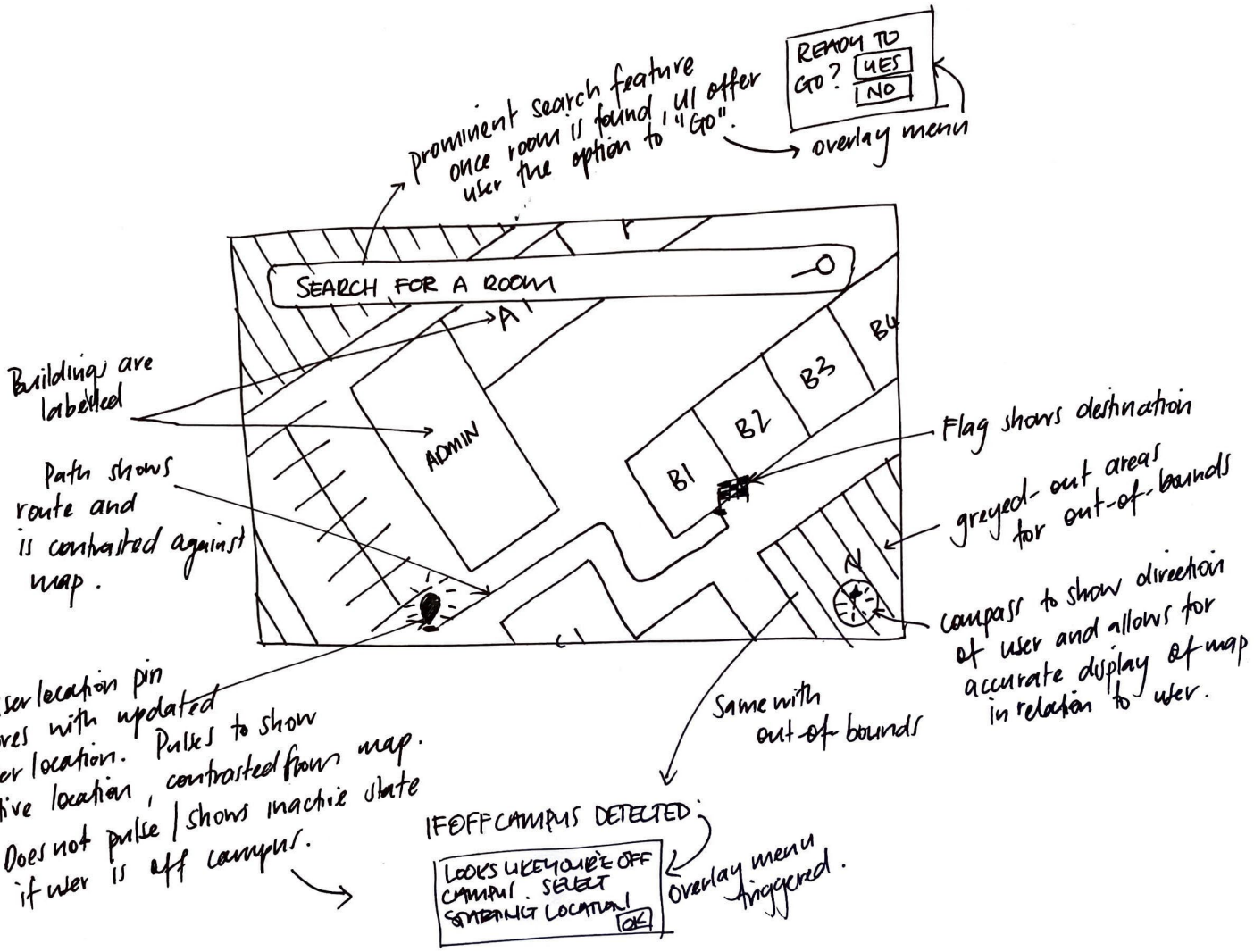
Sample response 2



Extended response: Question 15

Q	The response:	M	The response:	M
15a)	• symbolises user interface elements for all user interface criteria	5	• explains how the user interface addresses all functionality criteria	4
	• symbolises user interface elements for four user interface criteria	4	• explains how the user interface addresses three functionality criteria	3
	• symbolises user interface elements for three user interface criteria	3	• explains how the user interface addresses two functionality criteria	2
	• symbolises user interface elements for two user interface criteria	2	• explains how the user interface addresses one functionality criterion	1
	• symbolises user interface elements for one user interface criterion	1	• does not satisfy any of the descriptors above.	0
	• does not satisfy any of the descriptors above.	0		

Question 15a)



Q	Sample response	The response:
15b)	Visual communication principle 1: contrast – using colours with high contrast in the app will ensure that unique elements stand out and that both the text and map are easy to read for accessibility. Visual communication principle 2: harmony - maintaining a consistent theme by using similar icons e.g. squares / rectangles for buildings and consistent font style and sizes for headings and other elements will help to give the app a uniform and consistent feel.	• identifies – one visual communication principle **[1 mark]** – a second visual communication principle **[1 mark]** • explains how a good user experience could be ensured through the implementation of – one identified visual communication principle **[1 mark]** – a second identified visual communication principle **[1 mark]**
15c)	A possible social need would be for students and staff to interact with each other to share ideas and collaborate on projects to create a sense of community and social connection. If user data is disseminated to unintended parties, it could potentially lead to privacy violations, such as unauthorised access to personal information, and may also put users at risk of identity theft. This could negatively impact the sense of community and social connection that the app is intended to foster. If user data is not stored securely, it could be vulnerable to hacking or other malicious activity, potentially leading to sensitive information being compromised. This could erode trust in the app and the sense of community it aims to build.	• identifies a possible social need **[1 mark]** • evaluates the security impact of user data – dissemination **[1 mark]** – storage **[1 mark]**

Q	Sample response	The response:
15d)	A good security strategy would be implementing access control. Example: use access control measures to limit user access to specific features and data within the app, based on user roles and permissions e.g. school administration staff vs. students vs. visitors would have different levels of access.	• recommends an appropriate security strategy **[1 mark]** • justifies the recommended security strategy with an example **[1 mark]**
15e)	Two new features include personalisation and communication. Personalisation: with user authentication, the app can provide a personalised experience for each user based on their preferences, such as favourite locations or routes, or language settings. Communication: user authentication can facilitate communication between the school and users, such as sending notifications or alerts about school events, updates or emergencies.	• identifies and explains one new feature and functionality **[1 mark]** • identifies and explains a second new feature and functionality **[1 mark]**

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Independent explanations begin here

Explained answers - 2024

These independent teaching notes use the official marking guide as a starting point. They explain the ideas in accessible language; the original marking guide remains the authority for its sample responses and marking descriptors. Multiple-choice questions have one best answer in this paper, so each explanation also distinguishes the distractors. Written-response questions can have several valid answers; green panels show alternatives that meet the same criteria.

Section 1: Multiple choice

Question 1 - Answer C

Scale is the relative size of visual elements. If text, controls or labels are too small, people may be unable to read or select them. Line, form and shape can all contribute to design, but the question asks which option most directly risks access when sized inappropriately.

Question 2 - Answer D

A personal impact affects an individual customer. Matching offers to a consenting customer is a more personalised shopping experience. A describes a possible privacy concern, but consent and the stated purpose make it less direct here; B and C concern accuracy or store operations rather than the customer experience described.

Question 3 - Answer C

Maintainability is how easily someone can understand and change code. Names such as values, currentValue and average explain the role of each variable. A improves robustness; B adds unnecessary repetition; D might change implementation, but does not directly make the existing variables clearer.

Question 4 - Answer D

The loop tests every integer from 1 to 100. Only prime values are added to x, so the final output is their sum: 1060. It does not output a yes/no test (A), the first 100 primes (B), or a list of the qualifying primes (C).

Question 5 - Answer A

The customer must choose one fuel from four. Four clearly labelled buttons show all choices at once and enable a direct single selection. A stepper (B) hides alternatives; a drop-down (C) adds an opening step; checkboxes (D) normally allow multiple selections.

Question 6 - Answer C

Availability means authorised users can access a system or data when needed. Flooding the server prevents legitimate requests, so availability is affected. Privacy and confidentiality concern inappropriate exposure; integrity concerns unauthorised or accidental changes.

Question 7 - Answer B

Compression represents video with fewer bits, reducing the amount sent and helping reduce load time while balancing quality. Streaming (A) delivers media progressively but is not itself the size-reduction technique. Broadcasting (C) distributes content; FTP (D) transfers files.

Question 8 - Answer A

The quotation marks make the JSON text a string, and line 2 assigns that string to x. It has not yet been converted into a dictionary (B): that occurs at line 3 with JSON.LOADS, not at line 2 (C or D). A later property access would normally use y["age"]; the apparent use of x on line 4 does not change what line 2 does.

Question 9 - Answer D

A first timetable needs students, teachers and subjects to associate people with classes. Assessment data may be useful later but is not essential to producing a basic timetable. The question asks for the least essential initial data store, not a store that can never be useful.

Question 10 - Answer A

Hashing transforms the password into a hash for comparison or storage; it is not normally decrypted. Encryption protects the username and decryption restores it when needed. Following each arrow to and from the labelled processes gives hashed password, encrypted username and decrypted username, respectively. The other options mix these transformations or apply them to the wrong field.

Sections 2 and 3: Written responses

For each part, begin with the concept, then connect it to the information and criteria in the question. Compare your own response with the original guide as well as these notes.

Question 11a - Privacy principles

Personal information can identify a person, including when a name is linked to a numberplate. A principle is not just its name: connect it to an action in the car-park scenario. For example, APP 1: publish a clear policy explaining collection, use and access; APP 3: collect only information reasonably necessary for the purpose; APP 11: protect the records with access controls and secure storage. Other relevant principles can earn credit when accurately applied. The guide awards a mark for each of three principle-and-implementation pairs.

Alternative answers and guidance

Other valid answer: APP 2: allow a staff member to use a pseudonymous identifier where identifying the person is not required or practical. APP 5: tell staff what is collected, why it is collected and who may receive it when the system begins collecting the data. APP 10: provide a way to correct a plate or ID recorded incorrectly. APP 11: restrict access, encrypt stored records and dispose of records when no longer required.

Further examples or guidance: A response only needs three well-matched principles. APP 1, APP 3, APP 5, APP 6, APP 10, APP 11, APP 12 or APP 13 could all be relevant if the implementation is accurate and connected to this hospital scenario. APP 7 or APP 8 would need extra scenario evidence about direct marketing or overseas disclosure.

Question 11b - Confidentiality, integrity and availability

Confidentiality means only authorised people can see the records: an unauthorised employee might view names and plates; role-based access limits this. Integrity means data remains accurate: a wrong plate-to-ID match could grant access incorrectly; validate and audit updates. Availability means authorised access when needed: equipment or storage failure could prevent gate operation; maintain backups and a tested recovery or safe fallback. For each, link a specific risk to a suitable reduction, rather than merely naming a control.

Alternative answers and guidance

Other valid answer: Confidentiality alternative: encrypt the numberplate database and give decryption access only to authorised security staff. Integrity alternative: validate an ID-to-plate update against an approved staff record and keep an audit log. Availability alternative: use redundant power and a tested manual gate process so authorised staff can enter during an outage.

Further examples or guidance: Backups mainly help recovery and availability; validation and audit trails mainly support integrity; access controls and encryption mainly support confidentiality. A strong response matches each control to the risk it actually reduces.

Question 12 - JSON and player results

The top-level JSON object contains a players array. Each item is a player object with fields such as gamerTag, dateOfBirth, gamesPlayed and gamesWon. Read the data, visit each player, calculate age from the current date, calculate gamesWon / gamesPlayed * 100, and display the gamer tag, age and win percentage. Subtract one from the year difference if the birthday has not yet occurred this year. In the supplied records, the percentages are 40% for Madskills and approximately 94.8% for PezerGirl; ages depend on the date when the algorithm runs. The guide separately rewards retrieval, iteration, calculations, outputs and clear pseudocode conventions.

Illustrative pseudocode

```
BEGIN
  READ JSON data INTO data
  GET currentDay, currentMonth, currentYear
  FOR EACH player IN data.players
    SPLIT player.dateOfBirth INTO day, month, year
    SET age = currentYear - year
    IF currentMonth < month OR
       (currentMonth = month AND currentDay < day) THEN
      SET age = age - 1
    ENDIF
    IF player.gamesPlayed > 0 THEN
      SET percentage = player.gamesWon / player.gamesPlayed * 100
      OUTPUT player.gamerTag, age, percentage
    ELSE
      OUTPUT player.gamerTag, age, "No games played"
    ENDIF
  ENDFOR
END
```

Alternative answers and guidance

Other valid answer: The same logic can use an indexed loop instead of FOR EACH, or a trusted date function instead of manually comparing day and month. The calculated percentage may be shown unrounded or rounded appropriately, but 0.4 must be converted to 40% rather than displayed as 0.4%.

Further examples or guidance: If the supplied data guarantees at least one game, a zero-games branch is not essential for the marks. Including it is a reasonable robustness improvement, provided it does not replace any required step.

Question 13a - Choosing a library function

A library function is an existing named operation. One complete approach uses GetRandomFromList repeatedly on a master grocery list, rejecting or removing an item after selection until six unique display items exist. Then select four unique items from those six for the shopping list. The interface shows all six as pictures and the selected four as words, so every shopping-list item has a matching picture. Explain the whole connection between function, interface and all three criteria; selecting six pictures alone is incomplete.

Alternative answers and guidance

Other valid answer: ShuffleList is valid when the developer shuffles a list of unique grocery items and takes the first six; four of those six can then become the shopping list. Because the source list is unique, this avoids duplicates.

Further examples or guidance: GetRandomFromList is valid when each selected item is removed from the available list or rejected if already selected. GetRandomInt can also choose list indexes, but it needs the same duplicate-prevention logic and more supporting code. The quality of the justification matters more than copying the sample function.

Question 13b - Programmed components and interface

A programmed component is behaviour, while its interface element is what the user sees or uses. Example 1: selection handling paired with large tappable grocery pictures lets young children choose an item. Example 2: answer checking paired with a tick or clear message provides immediate feedback. For each recommendation state the behaviour, identify the matching visible control or feedback, and explain why it helps this audience.

Alternative answers and guidance

Other valid answer: Alternative pair 1: a text-to-speech component with a speaker button beside each shopping-list word, helping a child connect the spoken and written word. Alternative pair 2: a new-level component with a Next level button and progress indicator, showing what has been completed and generating a fresh set of items.

Further examples or guidance: Other defensible pairs include audio instructions with a speaker button, a reset component with a restart button, or a shopping-list generator with a clearly separated list panel. Each answer must identify programmed behaviour, its related interface element and why the pair improves useability for young children.

Question 14 - Data-flow diagram

A data-flow diagram shows how data moves, not the sequence of program statements. Draw two external entities (the two friends), a numbered encryption process, and labelled arrows. The sender supplies plaintext and a key to the process; the process outputs ciphertext to the receiver. Add a data store only if the proposed solution needs one, with legitimate flows to and from a process. Follow consistent entity, process, store and arrow conventions. A one-time pad requires a truly random, secret key at least as long as the message and never reused; secure key sharing is a separate practical challenge.

Teaching model: valid DFD without a data store



External entities are rectangles; the process is a numbered verb phrase; every arrow is labelled with the data it carries.

Alternative answers and guidance

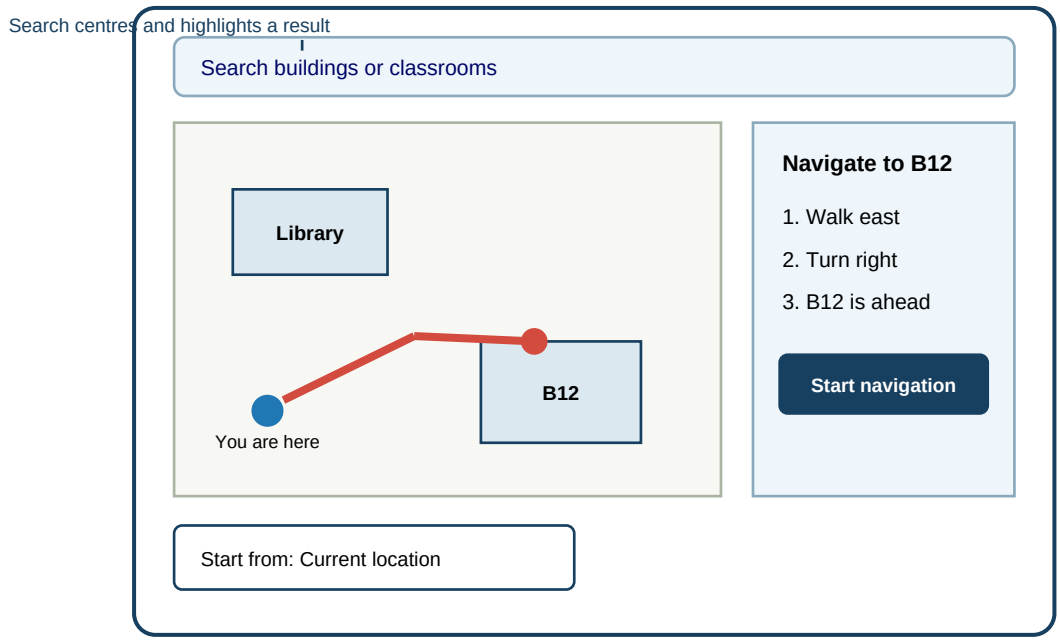
Other valid answer: Minimal valid design: Friend A sends plaintext and a key into an Encrypt message process; ciphertext flows to Friend B. The marking guide permits a solution without a data store if the flows are logically complete.

Further examples or guidance: More detailed valid design: Friend A sends plaintext and the one-time-pad key to an encryption process; ciphertext goes to a decryption process used by Friend B, while the matching key reaches that process through a separate secure flow or authorised key store. Never show plaintext travelling directly to Friend B as the protected message, and never reuse a one-time-pad key.

Question 15a - Navigation interface

A low-fidelity prototype is a labelled sketch of the proposed screen. Include a school-only map, current-location marker, labelled buildings and classrooms, search control and navigation route. Annotate how the location updates while the user moves; how an off-campus person enters a custom starting point; how searching finds a destination; and how the route guides the user. The guide scores the visible interface criteria separately from the explanations of functionality.

Teaching model: annotated tablet interface



Location updates while moving; an off-campus user can replace the current location with a custom campus start.

Alternative answers and guidance

Other valid answer: One layout can use a full-screen map with a search bar at the top, current-location button and route panel at the bottom. Another can use a split view with search results beside the map. Both can meet the criteria if every required element is visible and the annotations explain location updating, custom starts, search and navigation.

Further examples or guidance: Symbols, wording and placement may differ. Marks come from covering the criteria and explaining functionality, not from matching the sample drawing.

Question 15b - Visual communication

Contrast makes important text and routes distinguishable from their background, helping people read the map. Harmony creates a unified appearance through compatible colours, icons and type. The current syllabus limits visual communication principles to balance, contrast, proximity, harmony, alignment, repetition and hierarchy. Name two recognised principles and explain how each improves the actual navigation experience; naming them alone is not enough.

Alternative answers and guidance

Other valid answer: Contrast: use a route colour that remains distinct from the map and readable text against its background. Hierarchy: make the destination and next instruction more prominent than secondary controls. Proximity: place a building label beside its marker. Alignment: align search results and controls to make scanning predictable.

Further examples or guidance: Balance, harmony and repetition can also be used: distribute map controls without crowding, use compatible visual styles, and repeat the same marker and heading patterns. Choose any two recognised principles and explain a concrete benefit in this app.

Question 15c - Social needs and security

A suitable social need is connection and belonging: students and staff can create and share virtual-tour content, introduce important places and collaborate on information about the school. Dissemination makes that interaction possible, but third-party sharing might expose a face, voice, location or routine to unintended people. Storage means retaining the media and device data; weakly protected records might be accessed later through a breach or compromised account. These harms can reduce trust and participation, undermining the same social connection the feature is meant to support.

Alternative answers and guidance

Other valid answer: Alternative social needs include helping remote families become familiar with the campus, supporting new students to feel part of the school community, or enabling clubs to share activities. Dissemination risks could include location or image data reaching unintended recipients. Storage risks could include retained posts being accessed after an account is compromised.

Further examples or guidance: The conclusion may be positive or negative. For example, sharing can strengthen connection, but excessive third-party access may undermine the same trust and safety the feature is intended to support. The evaluation must connect both data impacts to the chosen need.

Question 15d - Security strategy

Recommend a specific control and show why it fits. For example, role-based access control gives staff access only to content needed for their role and prevents unauthorised users from accessing restricted records. This reduces unnecessary disclosure; it does not replace other measures such as secure storage and transport.

Alternative answers and guidance

Other valid answer: Valid alternatives include multifactor authentication for staff accounts, encryption in transit and at rest, role-based access, timely security updates, or data minimisation. Each needs a scenario-specific example and a reason it reduces a relevant risk.

Further examples or guidance: For example, multifactor authentication makes a stolen password less useful; encryption at rest protects stored tour content if storage is copied; data minimisation avoids retaining precise location data when it is not required.

Question 15e - Authentication and features

Authentication establishes which user is signed in. This can support saved favourite rooms or routes that follow that user, and personalised notifications or access to their own shared content. Give two distinct features and explain what each enables; a login screen by itself is not a full explanation of the added functionality.

Alternative answers and guidance

Other valid answer: Possible pairs include saved favourite locations plus synchronised route history; personalised alerts plus user-controlled notification preferences; staff-only editing plus role-specific content; or saved accessibility settings plus a personalised interface.

Further examples or guidance: For each feature, explain the new functionality made possible by knowing which authorised user is signed in. Two labels without that explanation are not enough.