Digital Solutions marking guide and response

External assessment 2023

Combination response (69 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.

Allow FT mark/s — refers to 'follow through', where an error in the prior section of working is used later in the response, a mark (or marks) for the rest of the response can still be awarded so long as it still demonstrates the correct conceptual understanding or skill in the rest of the response.
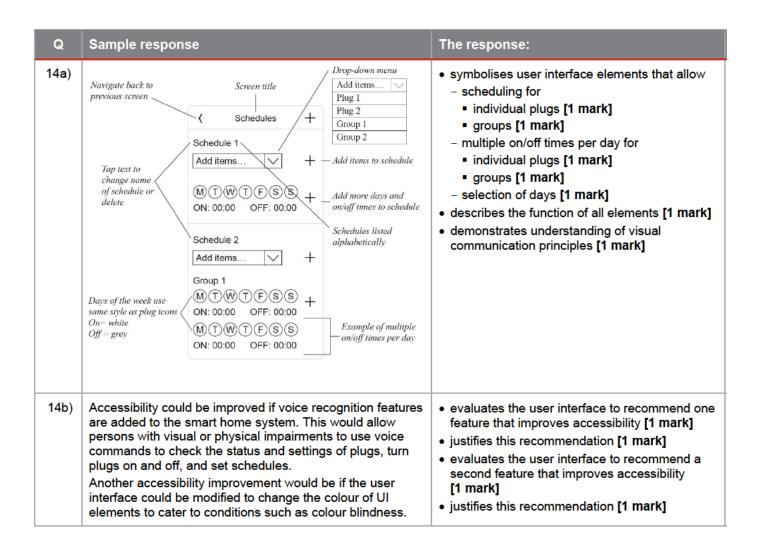
Marking guide

Multiple choice

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

Short response

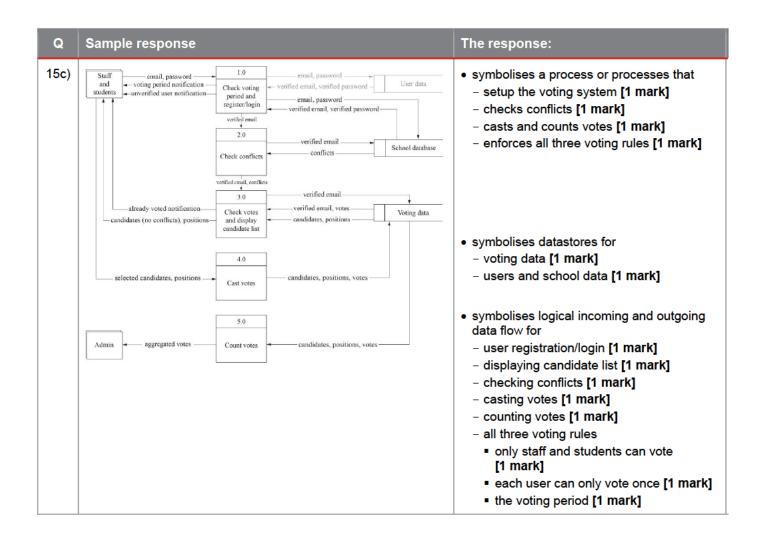| Q	Sample response	The response:
11a)	Data size: Use data compression to reduce the size of data being stored, preventing the system from overloading to ensure user access is unaffected. Data security: Use encryption to maintain data security and integrity. Data that is encrypted when entered cannot be compromised if intercepted during transmission.	• describes how data size can be managed **[1 mark]** • describes how data security can be managed **[1 mark]**

11b)	```
	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]**

Q	Sample response	The response:
12a)	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]**
12b)	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]**

Q	Sample response	The response:

13	**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]**

Q	Sample response	The response:

14a)		• 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]**

14b)	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]**

Extended response — Question 15

Q	Sample response	The response:

15a)	```<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]**

15b)	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]**

Q	Sample response	The response:

15c)		• 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]**

Q	Sample response	The response:	M

15d)	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.
		• justifies response by explaining system interrelationships between all
		  – processes
		  – datastores
		  – external entities
			4

		• 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
			3

		• justifies response by explaining interrelationships between some
		  – processes
		  – datastores **OR** external entities
			2

		• justifies response by explaining interrelationships between some – processes, datastores **OR** external entities	1
		• does not satisfy any of the descriptors above.	0