

# Digital Solutions marking guide and response

External assessment 2021

## Combination response (72 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	A
2	A
3	A
4	D
5	C
6	B
7	B
8	D
9	B
10	C

## Short response

Q	Sample response	The response:
11	<pre> graph TD     customer[customer]     business_owner[business owner]     1.0((1.0 register and login))     2.0((2.0 add to/update cart))     3.0((3.0 process payments))     4.0((4.0 confirm orders))     5.0((5.0 update products))     6.0((6.0 display products))     7.0((7.0 view customer data))     customer_data[D customer data]     shopping_cart[D shopping cart]     confirmed_orders[D confirmed orders]     products[D products]      customer -- customer details --&gt; 1.0     customer -- customer details --&gt; 2.0     1.0 -- customer details --&gt; customer_data     2.0 -- products --&gt; customer     2.0 -- order details --&gt; shopping_cart     customer -- payment details --&gt; 3.0     shopping_cart -- order details --&gt; 3.0     customer -- confirm order details --&gt; 4.0     confirmed_orders -- order details --&gt; 4.0     business_owner -- product details --&gt; 5.0     5.0 -- product details --&gt; products     7.0 -- customer details --&gt; business_owner     6.0 -- product details --&gt; business_owner     products -- product details --&gt; 6.0 </pre>	<ul style="list-style-type: none"> <li>• symbolises             <ul style="list-style-type: none"> <li>– customer external entity <b>[1 mark]</b></li> <li>– business owner external entity <b>[1 mark]</b></li> <li>– customer data store <b>[1 mark]</b></li> <li>– shopping cart data store <b>[1 mark]</b></li> <li>– orders data store <b>[1 mark]</b></li> <li>– products data store <b>[1 mark]</b></li> <li>– register and login process <b>[1 mark]</b></li> <li>– payments process <b>[1 mark]</b></li> <li>– confirm order process <b>[1 mark]</b></li> <li>– update shopping cart process <b>[1 mark]</b></li> <li>– update products process <b>[1 mark]</b></li> </ul> </li> <li>• logically symbolises data flow <b>[1 mark]</b></li> <li>• effectively uses syllabus conventions for data flow diagrams <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:
12a)	<p>A data confidentiality risk is the possibility that an unauthorised person could observe the user data in transit. For example, the app requires a password for the user to log in and the data would need to be encrypted so that it cannot be stolen.</p> <p>A data integrity risk is the possibility that the data could become corrupted, lost or be maliciously manipulated. For example, the wrong car might be unlocked or a hacker might use the data to cause distress.</p> <p>A data availability risk is the possibility that someone may interfere with transmission to prevent data packets from reaching the intended destination, allowing them to access the person's car so that they can steal it.</p>	<ul style="list-style-type: none"> <li>logically evaluates risks to data <ul style="list-style-type: none"> <li>confidentiality <b>[1 mark]</b></li> <li>integrity <b>[1 mark]</b></li> <li>availability <b>[1 mark]</b></li> </ul> </li> <li>justifies this evaluation by providing a coherent example of a risk to data <ul style="list-style-type: none"> <li>confidentiality <b>[1 mark]</b></li> <li>integrity <b>[1 mark]</b></li> <li>availability <b>[1 mark]</b></li> </ul> </li> </ul>
12b)	<p><b>Australian Privacy Principle:</b> Security of personal information. Allow an administrator to de-identify or destroy personal information once it is no longer in use.</p> <p><b>Ethical consideration:</b> Security of personal information is important if the user sells their car, or if the car is no longer in use. The user should not be getting unnecessary calls or marketing materials for a service they no longer use or for a car they no longer own, and it would be unsafe for the original owner to still have access to the vehicle once it has been sold.</p>	<ul style="list-style-type: none"> <li>identifies a relevant Australian Privacy Principle (APP) <b>[1 mark]</b></li> <li>logically explains an ethical consideration relating to the identified APP <b>[1 mark]</b></li> </ul>

Q	Sample response	The response:												
12c)	<p>          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</p> <table><tr><th>KEY SHIFT</th><th>PASSWORD</th></tr><tr><td>0</td><td>K Y I W W</td></tr><tr><td>1</td><td>J X H V V</td></tr><tr><td>2</td><td>I W G U U</td></tr><tr><td>3</td><td>H V F T T</td></tr><tr><td>4</td><td>G U E S S</td></tr></table>	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	<ul style="list-style-type: none"><li>• performs a desk check that<ul style="list-style-type: none"><li>– decrypts the password using iterations[1 mark]</li><li>– contains no errors [1 mark]</li></ul></li></ul>
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													
12d)	<pre>BEGIN INPUT string plainText INPUT int keyShift SET string alphabet = ABCDEFGHIJKLMNOPQRSTUVWXYZ SET encryptedText = ""  FOR each character in plainText     SHIFT character by keyShift     APPEND letter to encryptedText END FOR  RETURN encryptedText END</pre>	<ul style="list-style-type: none"><li>• symbolises<ul style="list-style-type: none"><li>– INPUT for password string [1 mark]</li><li>– INPUT for key or shift integer [1 mark]</li><li>– declarative statement for alphabet [1 mark]</li><li>– a FOR loop to traverse password one character at a time [1 mark]</li><li>– a function to encrypt password one character at a time, using the key [1 mark]</li><li>– RETURN for encrypted password [1 mark]</li><li>– an algorithm with no logic errors [1 mark]</li></ul></li><li>• effectively uses pseudocode conventions [1 mark]</li></ul>												

Q	Sample response	The response:
13a)	<p>A checksum algorithm would be used to inspect the binary representation of auction data. If the checksum from the user is different from the checksum on the server, it means that the data has been corrupted or manipulated.</p> <p>Encryption would be used to scramble the auction data to make it impossible to read in transit, but allowing it to be decrypted by the authorised recipient with a secret key.</p> <p>Authentication would be used to verify the identity of the participant by using a digital signature or authentication code. A digital signature confirms that the bidder is who they say they are.</p>	<ul style="list-style-type: none"> <li>· explains how the security of the data exchange would be improved through               <ul style="list-style-type: none"> <li>– checksums <b>[1 mark]</b></li> <li>– encryption <b>[1 mark]</b></li> <li>– authentication <b>[1 mark]</b></li> </ul> </li> </ul>
13b)	<p>I would recommend AES for encrypting auction data to avoid a security breach. AES supersedes DES and 3DES and uses 128-bit blocks with 128, 192 and 256-bit encryption keys, whereas DES and 3DES use 64-bit blocks and key encryption. DES and 3DES are older ciphers and easily cracked in as little as one day, which would provide an opportunity for a hacker to gain access to auction data before the bids are revealed.</p>	<ul style="list-style-type: none"> <li>· recommends a valid encryption method <b>[1 mark]</b></li> <li>· effectively justifies the recommended encryption method <b>[1 mark]</b></li> </ul>

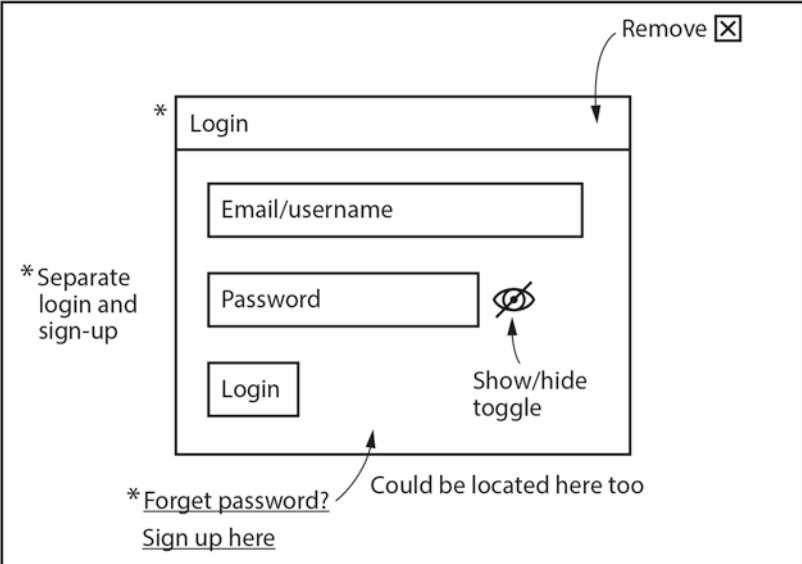
## Extended response — Question 14

Q	Sample response	The response:
14a)	<p>Space is used to achieve visual hierarchy in the login view as you must log in or sign up to continue. Space also differentiates UI features in the results view by positioning similar elements in closer proximity, while separating unrelated elements (such as the Confirm and Log out buttons). Line is used to tabulate and separate information for a clear barrier between Phase, Teams and Results content. Horizontal lines separate menu items across the top and are used to outline all features, including the user icon. Visual hierarchy is achieved in the nav with tone where the current or active view is white while other views are greyed-out to show they are inactive. The login overlay and button text are centre-aligned with left-aligned text for the title and user input fields.</p>	<ul style="list-style-type: none"> <li>• effectively describes               <ul style="list-style-type: none"> <li>– how space is used <b>[1 mark]</b></li> <li>– how line is used <b>[1 mark]</b></li> <li>– how tone is used <b>[1 mark]</b></li> </ul> </li> <li>• effectively describes how the development of the user interface is informed by               <ul style="list-style-type: none"> <li>– visual hierarchy <b>[1 mark]</b></li> <li>– proximity <b>[1 mark]</b></li> <li>– alignment <b>[1 mark]</b></li> </ul> </li> </ul>



Q	Sample response	The response
14b)	<p>The data exchange components required for the app include a user interface, server interface and data interface. The user interface includes the user's device, the web app and the website itself. The user device could be a phone or laptop and the browser could be Safari or Google Chrome. On the front end, the website would be built with HTML, CSS and JavaScript and would be stored on a web server that is part of the server interface. The web server stores the static content of the website and manages requests between the user and the DBMS. If the user triggers a request for data stored externally in the database, the web server processes that request with a relevant data server for processing server-side language requests, e.g. PHP or Node.js. The request is sent to the DBMS, which retrieves and sends the required data to and from the web server to display to the user. SQL queries in the website code may be used to manipulate data in the database via the DBMS. To summarise, the user interacts with the user interface, managed by the server interface, which processes all send/receive data requests between the user and the data interface.</p>	<ul style="list-style-type: none"> <li>• determines <ul style="list-style-type: none"> <li>– a user interface or presentation component <b>[1 mark]</b></li> <li>– a server interface or logic component <b>[1 mark]</b></li> <li>– a data interface or data component <b>[1 mark]</b></li> </ul> </li> <li>• provides a discerning explanation of the relationship between <ul style="list-style-type: none"> <li>– user interface and another component <b>[1 mark]</b></li> <li>– server interface or logic component and another component <b>[1 mark]</b></li> <li>– data interface and another component <b>[1 mark]</b></li> </ul> </li> </ul>

Q	Sample response	The response:
14c)	<p>Recommendation and justification 1: Question 2, survey response 1 indicates the password input field does not obscure the user's password. This is a data security risk and can be overcome by providing a 'show/hide' option to provide more privacy.</p> <p>Recommendation and justification 2: Question 1, survey responses 2 and 3 indicate users were able to interact with data-driven components that require authorised access. Adding user-level access to differentiate between administrators and generic users will improve data security.</p> <p>Recommendation and justification 3: Questions 1, 2 and 4, survey response 4 indicate there is no way for a user to reset or change their password. This poses a security risk if the password is compromised, allowing anyone to log in and gain unauthorised access. Adding a reset or forget password link will enable all users to change their passwords.</p>	<ul style="list-style-type: none"> <li>• recommends <ul style="list-style-type: none"> <li>– password input security measure <b>[1 mark]</b></li> <li>– user-level access security measure <b>[1 mark]</b></li> <li>– password management security measure <b>[1 mark]</b></li> </ul> </li> <li>• logically justifies <ul style="list-style-type: none"> <li>– first recommendation <b>[1 mark]</b></li> <li>– second recommendation <b>[1 mark]</b></li> <li>– third recommendation <b>[1 mark]</b></li> </ul> </li> </ul>

Q	Sample response	The response:
14d)	 <ol style="list-style-type: none"> <li>1. Forget password link improves utility to allow users to reset their password when they have forgotten it.</li> <li>2. Show/hide toggle for password input improves utility and accessibility so that users can hide and show the password, depending on their needs.</li> <li>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.</li> <li>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.</li> </ol>	<ul style="list-style-type: none"> <li>• symbolises <ul style="list-style-type: none"> <li>– password reset feature <b>[1 mark]</b></li> <li>– show/hide password feature <b>[1 mark]</b></li> <li>– removal of close button <b>OR</b> removal of login window feature <b>[1 mark]</b></li> <li>– clear differentiation between login and sign-up features <b>[1 mark]</b></li> </ul> </li> <li>• justifies how useability principles have informed <ul style="list-style-type: none"> <li>– one change <b>[1 mark]</b></li> <li>– a second change <b>[1 mark]</b></li> <li>– a third change <b>[1 mark]</b></li> <li>– a fourth change <b>[1 mark]</b></li> </ul> </li> </ul>



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