Digital Solutions marking guide and response

External assessment 2025

Combination response (67 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.

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.

Marking guide

Multiple choice

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

Short response

Q	Sample response	The response:
11	The Student entity inputs a book ID into the Book delivery process, and the Book delivery process then releases the book from the manual Bookshelves data store and provides it to the Student. The Bookshelves data store is a manual data store, while the book ID and status data are digital, and the book data is the physical book object. book IDs and statuses are passed via the Book delivery process to the Search process, which combines this with the Authors, Titles and Topics data to check for a match to the keywords inputted by the student. The Search process then outputs the matching book IDs with their statuses to the Student, who then uses this to request books that are available from the manual Bookshelves datastore using their IDs.	• explains the relationships between the external Student entity and the – Book delivery process **[1 mark]** – Search process **[1 mark]** – Bookshelves data store **[1 mark]** – Authors data store **[1 mark]** – Titles data store **[1 mark]** – Topics data store **[1 mark]** • recognises the manual nature of the relationship between Bookshelves and Book delivery **[1 mark]**

Q	Sample response	The response:
12a)	Constraint 1: The coding club has less than four weeks to develop the app; this is a time constraint that may affect the club's ability to thoroughly test the system before rolling it out for use. Constraint 2: Using an existing school server for data storage. This may result in limited storage space, and developers will need to consider data compression, particularly for storing images of items. Constraint 3: Developing a mobile app may present some technical constraints in terms of compatibility across different platforms, e.g. iOS or Android.	• identifies and explains the impact of – one constraint **[1 mark]** – a second constraint **[1 mark]** – a third constraint **[1 mark]**
12b)	Risk to data confidentiality: There is no user authentication process implemented; therefore, updating account balances and accessing user details risks the confidentiality of private information of all users, staff and students, including financial information. Risk to data integrity: Updating inventory manually during a fundraising event would be a time-consuming process. There is a real risk to data integrity that could lead to overselling if the inventory data is not accurate at the point of sale. Risk to data availability: Manually updating account balances risks the availability of user account information due to the delay caused by manually processing calculations while managing other distractions during a fundraising event.	• determines and justifies – a risk to data confidentiality **[2 marks]** – a risk to data integrity **[2 marks]** – a risk to data availability **[2 marks]**

Q	Sample response	The response:
13	When the payment details are sent from the mobile app to the app server, this is vulnerable to man-in-the-middle attacks and should be secured by strong encryption such as SSL/TSL or with the use of a VPN. The user should avoid using public wi-fi to make payments and ensure that they are accessing the internet over a secured network connection that is password protected. The confirmation email and the second email containing the gift card are both at risk of being compromised if the user's email account is not secured. The user would need to ensure that their device is both free of malware, e.g. keylogger software, and adequately secured with a strong password and multifactor authentication to prevent unauthorised access.	• identifies and explains – one data exchange vulnerability **[1 mark]** – a second data exchange vulnerability **[1 mark]** • recommends and justifies a security strategy for – the first identified vulnerability **[1 mark]** – the second identified vulnerability **[1 mark]**

Q	Sample response	The response:
14	See sample response below.	• desk checks, for one movie, the values of – totalRating **[1 mark]** – numberOfReviews **[1 mark]** – review["rating"] **[1 mark]** • desk checks, for a second movie, the values of – totalRating **[1 mark]** – numberOfReviews **[1 mark]** – review["rating"] **[1 mark]** • correctly calculates averageRating for one movie **[1 mark]** • correctly calculates averageRating for a second movie **[1 mark]**

<table>
<tr><th>Q</th><th>Sample response</th><th>The response:</th></tr>
<tr><td>15a)</td><td>
<table>
<tr><td>_id</td><td>Field name</td><td>Data Type</td></tr>
<tr><td>1.</td><td>region</td><td>VARCHAR</td></tr>
<tr><td>2.</td><td>valid_licence</td><td>BOOLEAN</td></tr>
<tr><td>3.</td><td>licence_type</td><td>VARCHAR</td></tr>
<tr><td>4.</td><td>registration_period</td><td>INT</td></tr>
<tr><td>5.</td><td>date_of_birth</td><td>DATETIME</td></tr>
<tr><td>7.</td><td>registration_date</td><td>DATETIME</td></tr>
</table>
</td><td>• identifies a valid data type for
– region [1 mark]
– valid_licence [1 mark]
– licence_type [1 mark]
– registration_period [1 mark]
– date_of_birth [1 mark]
– registration_date [1 mark]</td></tr>
<tr><td>15b)</td><td>Selected question number: i)
Recommendation and justification: Add a new field called postcode with a data type of INT. Adding a postcode field lets the journalist compare driver ages in smaller, more specific areas, instead of just large regions. This makes it possible to find patterns in average age between different postcodes and answer the question more accurately.

OR

Selected question number: ii)
Recommendation and justification: Add one new field, called licence_number with a data type of VARCHAR to enable tracking of changes to a specific licence over time, and replace valid_licence with licence_status with a data type of VARCHAR to identify the status of a licence more easily, e.g. “active”, “expired”. These two data fields will enable tracking of the change of status for licences over time, combined with licence_type to filter the data accordingly.</td><td>• recommends a valid change [1 mark]
• justifies the recommendation [1 mark]</td></tr>
</table>

Extended response: Question 16

Q	Sample response	The response:
16a)	The data processing units would need to analyse sensor data to safely time stopping the flow of traffic intersecting with the path of the emergency vehicle while also keeping traffic moving to allow the emergency vehicle to pass through smoothly without delay. The system would need to use its predictive ability to change the timing of the adaptive traffic lights to prioritise green lights for the emergency vehicle's predicted path while managing the signals for all other vehicles to keep everyone safe and prevent accidents. It may be possible for the system to rely on known traffic patterns to guide the emergency vehicle along the fastest possible route. Since the system has access to real-time data, it can adapt as needed to ensure traffic is managed effectively to ensure passage for the emergency vehicle.	• explains the optimisation of traffic flow with the use of – adaptive traffic lights **[1 mark]** – sensor data **[1 mark]** – data processing units **[1 mark]** • explains how the system could prioritise passage for the emergency vehicle **[1 mark]**
16b)	See pages 10–12 for sample response. Accept other suitable responses consistent with a reasonable understanding.	• uses pseudocode to symbolise an unambiguous algorithm that – implements control structures consistent with a coherent and logical solution **[1 mark]** – detects hazard locations **[1 mark]** – prioritises passage for emergency vehicles **[1 mark]** – keeps pedestrians safe **[1 mark]** • incorporates – one code library function **[1 mark]** – a second code library function **[1 mark]** – a third code library function **[1 mark]** • includes code comments to identify where criteria are addressed **[1 mark]**

Q	Sample response	The response:
16c)	Adding a feature for enhanced object recognition would enable the system to recognise more obstacles. Adding cameras in additional strategic locations, such as non-crossings where pedestrians frequently cross, would improve the system's ability to trigger necessary actions to protect all parties. These additions would improve the safety of both pedestrians and vehicles, as runaway animals or obstacles that have fallen off the back of utes pose a threat to drivers on the road. Cameras could better identify such hazards and integrate with other system components to keep all pedestrians and vehicles safe.	• recommends one new system feature **[1 mark]** • recommends one new system component **[1 mark]** • justifies the recommendations **[1 mark]**
16d)	Useability principle 1: Safety. If workers are experiencing errors, the system is not safe to use, and based on the current user interface, it is likely that users are making errors when selecting and updating pothole records. They will need to remember the filename and/or the location of a job they have just completed–especially if they are unable to complete the jobs in a sequential order, from top to bottom, because the locations may not make this possible. Useability principle 2: Effectiveness. Listing the locations of the potholes as longitude and latitude is not useful to the maintenance workers and is almost certainly why they are experiencing delays. They would not be able to use the search function as there is no clear way to filter the list e.g. by suburb, post code or date logged. Workers would need to convert longitude and latitude location data into an address to determine the distance of a pothole to their current location. They would then need to work through the list of potholes in order, travelling a suboptimal route, or waste time converting all the locations to addresses to determine the fastest route.	• identifies one useability principle **[1 mark]** • justifies the useability principle **[1 mark]** • identifies a second useability principle **[1 mark]** • justifies the second useability principle **[1 mark]**
16e)	See page 13 for sample response.	• symbolises and explains features that improve the implementation of – one identified useability principle **[1 mark]** – a second identified useability principle **[1 mark]**

Question 16b)

```
#Define the intersection roads and crossings
SET roads = ["LillyE", "LillyW","FaberS","FaberN"]
SET crossings = [“LillyE_cross", "LillyW_cross","FaberS_cross", “FaberN_cross"]
SET hazard = False
SET hazardLocation = None
SET vehicleDirection = True #vehicles are facing the right way
SET emergencyVehicle = False

#Detect hazard locations
IF (distance between two vehicles ≤ 0) AND
   (speed of both vehicles = 0) OR (vehicleDirection for any non-emergency vehicles = False)
   SET hazardLocation = detect the emergency location using sensor data
   SET hazard = True
ENDIF

#Detect emergency vehicle
IF (speed of emergency vehicles > 0)
   SET emergencyVehicle = True
ENDIF
```

```
#Evaluate congestion on each road
FOR each road in roads
   IF emergencyVehicle = False AND hazard = False THEN
      IF evaluateCongestion(road) = "high" THEN
         setAdaptiveSignal(road, "green") #prioritise flow on congested road
      ENDIF
   ENDIF
ENDFOR

#Keep pedestrians safe
WHILE hazard = True DO
   FOR each crossing in hazardLocation
       setAdaptiveSignal(crossing, "danger")
   ENDFOR
ENDWHILE

#Prioritise passage for emergency vehicles
IF emergencyVehicle = True
   GET emergencyVehicle predicted path #use data processing units to calculate
   FOR each crossing along predicted path
       status = getAdaptiveSignal(crossing)
       IF status = "walking" THEN
         setAdaptiveSignal(crossing, "danger")
       ELSE
         setAdaptiveSignal(crossing, "stop")
       ENDIF
   ENDFOR


   SORT roads along predicted path from furthest away to closest
```

```
   FOR each road along predicted path
      setAdaptiveSignal(road, "yellow")
      WAIT 30 seconds #Sudden changes could risk harm to motorists or pedestrians
      setAdaptiveSignal(road, "green") #prioritise passage for emergency vehicles
   ENDFOR

ELSE # emergencyVehicle = False
  Commence regular smart management of traffic using adaptive traffic and pedestrian signals.
ENDIF
```

Question 16e)