

2017 VCE Computing: Software Development examination report

General comments

The 2017 VCE Computing: Software Development examination comprised three sections: Section A, which contained 20 multiple-choice questions (worth a total of 20 marks); Section B, which had six short-answer questions (worth a total of 20 marks); and Section C, which was a case study with 15 questions (worth a total of 60 marks). Teachers and students should refer to the *VCE Computing Study Design 2016–2019* and the 2017 written examination while reading this report.

Section A was answered well by most students; however, some found it difficult to demonstrate sound theoretical knowledge and provide detailed and accurate responses to questions in Section B. In Section C, student responses were expected to refer to the case study. The key weakness in many responses in this section was a lack of detail and depth of understanding. Students are encouraged to consider the question stem (for example, 'describe', 'explain' or 'outline') in each question, the number of marks and the number of lines provided as a guide to the detail and depth of the required response.

Students should be encouraged to provide a response to all questions. Students could use past examinations to review and practise answering questions.

During the examination, students should:

- endeavour to use correct technical terminology
- discuss all options when asked to justify a choice or compare one option with another
- respond to the question stem, such as 'state', 'explain' and 'describe'
- re-read each question and their response to ensure that the question has been answered
- remove the case study insert from the question and answer book, and refer to it when completing Section C
- read the case study and questions carefully, and underline or highlight key words
- demonstrate their knowledge of the subject and apply that knowledge to the case study; general responses often resulted in low or no marks, but knowledgeable, clear and appropriate responses received high marks.

Specific information

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	2	2	12	85	
2	14	9	53	24	
3	24	7	4	65	
4	1	88	3	8	
5	5	9	10	76	
6	5	77	11	7	
7	86	2	6	7	
8	2	47	9	42	A significant number of students confused the purpose of a data flow diagram. The purpose of a data flow diagram is to display where data originates and where it is stored. It is not necessary for a data flow diagram to highlight the order in which processes occur – this is especially the case in complex systems where multiple data processes are depicted.
9	1	2	94	3	
10	29	28	38	5	On review, it was acknowledged that this question was ambiguous, so students were awarded a mark for any response.
11	10	9	7	73	
12	87	5	4	4	
13	30	43	8	19	The question stated that Luca created a project plan for the creation of a software solution from a new design, indicating that the project plan was created after the design stage. Therefore, the monitoring of the project plan began in the development stage of the problem-solving methodology.
14	5	14	71	10	
15	6	30	53	11	
16	2	11	22	65	
17	7	68	21	4	
18	1	5	4	90	
19	4	89	3	4	
20	69	1	16	14	

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Section B – Short-answer questions

Question 1

Marks	0	1	2	3	4	Average
%	27	19	42	5	7	1.5

The study design indicates ‘comments’ and ‘meaningful names’ as the two key characteristics of internal documentation, but a range of characteristics was accepted. Most students found it difficult to identify a characteristic, with many repeating the same comment for the explanation, such as ‘it makes it easier to read’. In addition, many missed the key to the second part of the question, to explain how each characteristic will help to test the code.

Below is a possible response.

Using a naming convention for variables

The use of a naming convention, such as Hungarian notation, throughout provides those reading the code with a better understanding of the variables, functions and procedures and their purpose. For Vanessa, meaningful names will assist her testing of the program by helping her to understand what each element represents.

Question 2

Marks	0	1	2	3	4	Average
%	6	9	25	34	25	2.7

Students needed to explain the risk to the database and suggest a way to protect data. A small number of students used key study design terms regarding threats – ‘accidental’, ‘deliberate’ and ‘event-based’ – which helped their discussion of the threats identified in the question.

The following is an example of a high-scoring response.

A power surge may cause all hardware to lose power and this pose an event-based threat with the potential of causing data loss. This system could be protected from power surges by implementing an “Uninterruptable Power Supply” or UPS to provide backup power.

A phishing email poses a deliberate threat in that it may allow phishers access to the records system by gaining credentials that can be used to login. This can be prevented by an email phishing filter or by educating staff about the dangers of phishing.

Question 3

Marks	0	1	2	Average
%	55	29	16	0.6

Many students struggled to explain public key cryptography. Students should be able to explain this process, including the need to use public and private keys. Many students confused symmetric and asymmetric cryptography. There are a number of software controls listed in the study design, and students should be able to explain each of these and identify where and when they can be appropriately used.

The following is an example of a high-scoring response.

They can do this through TLS which uses asymmetric encryption. The person requesting the data can send the other person a public key through which he can generate a ciphertext from plaintext and send to the first person who would be the only person able of reading the encryption through decrypting it with his unique private key. Hence data is sent securely.

Question 4

Marks	0	1	2	3	4	Average
%	47	19	10	12	11	1.3

Students are encouraged to read the prompt provided for any pseudocode question as it provides them with the ability to identify inputs, outputs and processes. It may be worth students using the space provided to develop a plan prior to writing the final pseudocode. Common errors included students not using an index when referencing an array location or wasting lines reading from files when an external file was not mentioned in the stimulus text. Many students did not answer this question, suggesting additional practice might be needed in this area.

There were many appropriate responses. Below is one possible response.

```

For i = 1 to numbermembers
    If date_of_birth[i] <= 31/12/1976 Then
        Print firstname[i], surname[i], gender[i],
        date_of_birth[i]
    EndIf
Next i

```

Question 5a.

Marks	0	1	Average
%	76	24	0.3

It was important to read the question carefully as it required students to identify the main role of TCP with transmitting **and** receiving data. Thus it was important students addressed that TCP divided data into segments (packets) and then reassembled data at the destination, with notification of any missing data.

The following is an example of a high-scoring response.

The TCP protocol initially divides the data into small packets with a checking sum, to be transmitted. At the receiving end, it uses the checking sum to verify the data is complete and undamaged. If data is delayed or damaged it sends a request for the data again.

Question 5b.

Marks	0	1	Average
%	74	26	0.3

IP is a set of rules or protocols that provide the standard for how packets travel from source to destination; however, many students confused this with IP addressing. Even though connected, the IP address is used to identify the destination; it does not outline the role of the IP protocol.

The following is an example of a high-scoring response.

IP dynamically determines a route across the internet and guides the data packets from router to router to get them from source to destination.

Question 6a.

Marks	0	1	Average
%	75	25	0.3

Data mining is a process of turning a collection of facts into knowledge by using a set of algorithms to search through the data to identify trends.

Most students appeared to struggle to give a clear definition and often responded with ‘a collection of data from multiple sources’, without linking it to the gaining of valuable trends or knowledge for the user.

The following is an example of a high-scoring response.

Data mining is the process of collecting mass amounts of data and examining for patterns.

Question 6b.

Marks	0	1	2	Average
%	41	35	24	0.9

Many students found it difficult to identify two different types of data that may be retrieved through data mining, with many identifying incorrect data such as bank account details or credit card history. However, the following types of internet data were all appropriate and when added to the organisation’s data they can allow more targeted marketing: the collection of purchase history in the store; social media history, likes, preferences and habits; search history; the MAC address of the device; and tracking its location in the department store.

The following is an example of a high-scoring response.

The department store can look at the customer’s internet queries. This allows the department store to advertise products to the customer that the customer is searching for. The department store can also look at how long they stay in the store (i.e. how long are they on Wi-Fi) and can tailor their store experience to that (e.g. if they are browsing for a long time have a coffee place).

Question 6c.

Marks	0	1	Average
%	39	61	0.6

Most students identified that data privacy issues may cause a conflict with customers and the department store. Students should remember to consider the command term, in this case, ‘outline’, which means to summarise the main points of an idea. Students who simply wrote ‘privacy of personal data’ did not meet the requirement of ‘outlining’ and insufficient information was provided to gain the mark.

Section C – Case study

Question 1

Marks	0	1	2	3	4	Average
%	17	34	32	8	8	1.6

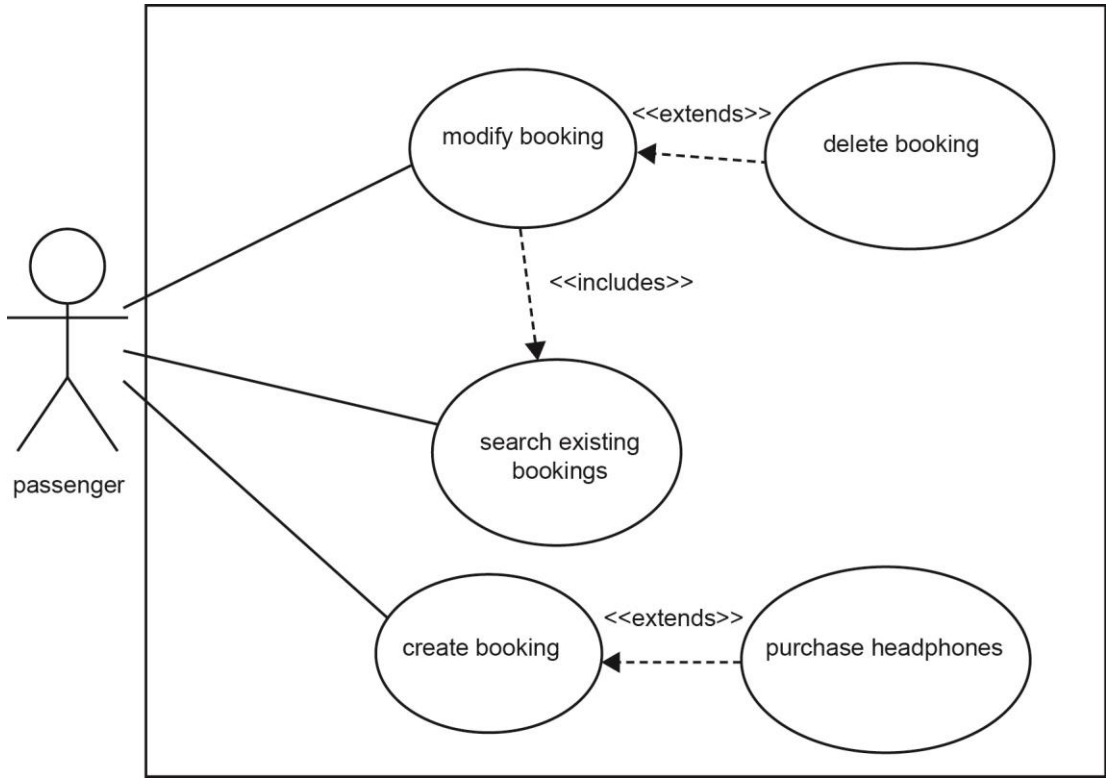
A range of responses was accepted, such as:

- A: booking data
- B: process a booking
- C: confirm booking
- D: Roads Department.

This question asked students to interpret details from the case study and apply their skills using the three elements of a data flow diagram: data flows, processes and entities. Students had to ensure they used the appropriate wording in each; for example, a process must start with a verb, such as ‘process’, ‘make’ or ‘confirm’. Many students struggled to use the correct language for each element. A range of responses was accepted.

Question 2

Marks	0	1	2	3	4	Average
%	25	1	4	1	69	2.9



Students were able to use the stimulus material provided to apply their skill in creating use case diagrams. Students would benefit from reviewing the details of ‘extends’ and ‘includes’ and how they are used in use case diagrams, as this was a common mistake.

Question 3

Marks	0	1	2	Average
%	34	28	38	1.1

Many students were able to identify an appropriate action to secure the data; however, many missed the need to describe this action. Simply stating ‘use encryption’ was insufficient.

The following is an example of a high-scoring response.

The passenger data can be encrypted so that even if someone such as a hacker gains access to the passenger data files they cannot be read and used, hence securing the data.

Question 4

Marks	0	1	2	3	4	Average
%	21	15	18	24	22	2.1

Students were required to propose a range of methods to collect data for analysis; however, many wrote about data collection after implementation – that is, data collection for evaluation. The most appropriate techniques were interview for MBS and survey for passengers. The justification

provided needed to identify what would be collected, by what method and how this might assist the development team.

The following is an example of a high-scoring response.

Stakeholder	Technique	Justification
minibus drivers	observation	Observing drivers on their routes would allow the development team to get an understanding of the time it takes to pick up and drop off passengers. The development team would see regular issues that may arise during the day. The development team would also see a driver's interaction with passengers and gain information that may influence the way the application may work.
MBS	<i>Interviews</i>	<i>Interviewing MBS would allow GCS to get a much deeper insight into what their client requirements are, as interviews allow for more in depth responses than surveys or other data collection techniques. It would also allow GCS to modify their questions or ask for elaborations on certain aspects, allowing them to more accurately understand the needs of the client.</i>
passengers	<i>Survey</i>	<i>Due to the large number of passengers, using surveys would allow a wide range of data to be collected, giving GCS a much broader picture of the needs and requirements of the passengers, so that their system can satisfy as many passengers as possible.</i>

Question 5a.

Marks	0	1	2	Average
%	50	10	40	0.9

Students needed to indicate two of the three milestones on the provided Gantt chart, preferably with a diamond-shaped symbol:

- completion of write, test and debug software on central computer (on 25|30)
- completion of install software and hardware, and test if central computer can communicate with passengers' mobile devices and with tablet in bus and its associated GPS sensor (on 35|40)
- completion of test DRT system (on 40|45).

Question 5b.

Marks	0	1	Average
%	13	87	0.9

Students could have indicated any of the following concurrent tasks:

- 1 and 2: Write, test and debug software on central computer/on tablet.
- 1 and 3: Write, test and debug software on central computer/on passengers' mobile devices.
- 2 and 3: Write, test and debug software on tablet/on passengers' mobile devices.

Question 5c.

Marks	0	1	Average
%	52	48	0.5

The following tasks are on the critical path: 1, 4 and 5.

Question 6

Marks	0	1	2	3	4	Average
%	45	15	27	5	8	1.2

Appropriate responses included a detailed logbook, annotating the Gantt chart, revising the Gantt chart with changes, etc.

A significant number of students did not attempt this question or did not receive any marks.

The following is an example of a high-scoring response.

Technique 1: Log Books

Explanation: Logan can keep a log book tracking the progress of all tasks undertaken on specific days and writing about them at the end of the day. This will allow him to manage resources as his log book can track who and where is certain resources being used.

Technique 2: Annotations to the gantt chart

Explanation: Logan could make annotation to the gantt chart to indicate any delays or changes to the project timeline. This would assist him by allowing him to better visualise the progress and the changes that may need to be made.

Question 7

Marks	0	1	2	3	4	Average
%	4	10	21	36	29	2.8

Variable name	Data type or structure	Explanation
Passenger_Name	String	the name of the passenger using the MBS application
Passenger_Phone_Number	String	the mobile phone number of the passenger using the MBS application, in the form +61 444 444 444
Passenger_List	Array	the list of passengers who have registered using the MBS application
Passenger_SMS_N	Boolean	a value representing whether the passenger would like an SMS notification when the minibus is approaching their pick-up location

Students should ensure that they read the explanation provided. Many students indicated that Passenger_Phone_Number should be an integer, but the explanation indicated a + and spaces would be included, which meant it needed to be a string.

Question 8a.

Marks	0	1	2	3	4	5	Average
%	32	14	8	10	14	22	2.3

Test no.	account_balance	topup	Expected result	Actual result
1	6	True	valid_booking ← True No message	valid_booking ← True No message
2	6 (>5)	False	valid_booking = True No message	valid_booking = False Low balance message
3	5 (=5)	True	valid_booking = True No message	valid_booking = False Low balance message
4	5 (= 5)	False	valid_booking = False No message	valid_booking = False Low balance message
5	4 (<5)	True	valid_booking = True No message	valid_booking = False Low balance message
6	4 (<5)	False	valid_booking = False Low balance message	valid_booking = False Low balance message

Students are reminded that in a testing table the most appropriate values to test are boundary conditions – a fare of \$5.00 was indicated in the stimulus material. Testing boundary conditions ensures that tests are not repeated, which students often did. A small number of students repeated the sample test that was given or did not utilise the sample test to assist them in their subsequent responses.

Question 8b.

Marks	0	1	2	Average
%	32	24	43	1.1

Many students knew the error but found it difficult to articulate the error clearly.

The two errors in the pseudocode were:

- the > sign should be a >= sign
- the AND should be an OR.

Question 8c.

Marks	0	1	2	Average
%	27	24	49	1.2

A large percentage of students were able to identify both errors and rewrite the pseudocode.

```

valid_booking ← False
If account_balance >= fare OR topup = True THEN
    valid_booking ← True
Else
    Print low balance message
EndIf

```

Question 9

Marks	0	1	2	Average
%	25	43	32	1.1

Most students were able to identify the extract from the data file as being XML (extensible mark-up language); however, many students were not able to describe an advantage of using this file format.

The following is an example of a high-scoring response.

The format being used is XML. The advantage of using XML is that it is a lot more readable, than other formats like CSV, as it is structured. This is because the field names are next to the data so you don't need to go searching like in CSV. This makes looking and interpreting data quicker and easier.

Question 10a.

Marks	0	1	Average
%	31	69	0.7

The search technique used was a linear search. Linear and binary searches are the only two searching techniques identified in the study design.

Question 10b.

Marks	0	1	2	Average
%	34	24	43	1.1

Students were not required to describe or explain in detail the advantage and disadvantage of linear searching – but to state, 'it's simple' was insufficient to gain a mark.

The following is an example of a high-scoring response.

Easy to code, hence less time consuming

Too slow when searching a large list which would most likely be the case for MBS application.

Question 10c.

Marks	0	1	2	3	Average
%	32	15	34	19	1.4

A few students confused searching (linear and binary) with sorting (selection and quick) techniques, possibly due to a binary search requiring the list to be sorted prior to searching. Student responses required a detailed description of a binary search and why it was more suitable, generally due to its efficiency. Some students were able to indicate it was quicker but were unable to correctly explain why it was quicker or that this was reliant on a sorted list. There was also a significant number of students who did not provide a response. As students are undertaking the coding samples in Unit 3 and the development of their solution in Unit 4, low stakes formative assessment on programming techniques could assist in further developing students' ability to provide detailed responses to coding related questions.

The following is an example of a high-scoring response.

Binary search – instead of comparing every value binary search compares target value to a midpoint and discards all values higher or lower than the target value, this results in significantly less comparisons as the array keeps getting halved until value is found, so the search is much faster for larger lists, because MBS is looking to expand their business for demand, their passenger numbers may grow to point where linear search is too slow so binary search should be used

Question 11

Marks	0	1	2	3	Average
%	40	11	31	19	1.3

Many students were able to identify privacy as being a possible issue; however, most students struggled with writing a detailed and accurate justification about why it might be an issue.

The following is an example of a high-scoring response.

Privacy Act

The Act states that personal data collected by an organization must only be used what was originally agreed upon by the user, and only for the intended purpose of the data. If MBS sell the personal data without permission of the passengers, they are in breach of the Privacy Act.

Question 12a.

Marks	0	1	Average
%	50	50	0.5

The role of the firewall is to monitor all incoming and outgoing internet/network traffic in order to protect the network from external threats to data and unauthorised access to the network, or to restrict outgoing packets.

The ability to write a technically correct response is key to providing appropriate responses to this style of question. Additional opportunities for formative assessment that require detailed written responses could assist students.

Question 12b.

Marks	0	1	Average
%	71	29	0.3

Many students responded with 'on the central computer'; however, the stimulus material indicated it was a physical firewall, so reference to a software version was not appropriate. The expected response needed to include that the firewall should be between the internet (external connection) and the central computer.

Question 12c.

Marks	0	1	2	Average
%	29	50	21	1

Many students were able to identify steps such as antivirus and encryption as options; however, many needed to describe the step identified. Simply stating 'install anti-virus software' was not sufficient.

The following is an example of a high-scoring response.

By installing up to date anti-malware software the network will be protected from malware. The software can detect isolate and destroy malware before it attacks the central computer.

Use encryption on the stored sensitive data so that even if hackers gain access to the data it cannot be read or used.

Question 13a.

Marks	0	1	2	Average
%	51	34	16	0.7

A strategy requires a plan of action to achieve an aim, so students were required to consider at least two actions that could be taken to backup data. The question also identified frequently changing and more stable data, so many students used this to make suggestions that combined incremental and full backup to a range of media, including cloud storage. When discussing backup strategies students should consider what data will be backed up, when this will occur and to what media it will be stored.

Question 13b.

Marks	0	1	2	Average
%	31	33	36	1.1

The following is an example of a high-scoring response.

Archiving involves moving data to an external storage device and removing from use on the main device for redundancy. Backups are simply duplicates of the data which can be restored if data is lost, but it is not removed from the use due to being current/recent.

Question 14a.

Marks	0	1	Average
%	22	78	0.8

The process described was range-checking validation.

Question 14b.

Marks	0	1	Average
%	32	68	

The following is an example of a high-scoring response.

The software calculates if input house number is higher than max house number or lower than min house number. If so it does not accept the input and asks the passenger to retry a valid input.

Question 15

Marks	0	1	2	3	4	Average
%	31	20	29	12	8	

Most students struggled with this question, often due to misunderstanding either the question or the criteria listed. Like Question 13a. this question required a strategy, so a number of steps that would be taken to evaluate each criterion. An evaluation strategy could include what data will be collected, the time frame for collection, the stakeholders involved and some comparison of data from the old system with the new system to provide a measure of success. In addition, students should have considered what data was already available through the system, such as the data provided during bookings, trip feedback through the app and GPS data.

The following is an example of a high-scoring response.

First look at the booking logs to see when the passenger requested to be picked up. Look at the GPS data for the busses to see when they were picked up. Do this for all bookings. Compare the percentage picked up within 5 minutes for the new system to the old system. Report the difference.

Look at the number of accounts with more than 1 booking. Compare this to the number of passengers with more than 1 booking on the previous system. Report on the increase or decrease.