2018 VCE Computing: Software Development examination report

General comments

The 2018 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 five short-answer questions (worth a total of 20 marks); and Section C, which was a case study with 12 questions (worth a total of 60 marks).

Section A was answered well by most students. In Section B, some students found it difficult to demonstrate sound theoretical knowledge and provide detailed and accurate responses to questions. 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 command word of the question (for example, 'describe', 'explain' or 'outline'), the number of marks and the number of lines provided as a guide to the detail and depth of the required response for each question. Students are encouraged to consider study design key knowledge points and ensure they can respond to questions accurately and with an appropriate amount of detail.

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 command word, such as 'outline, 'explain', 'compare' and 'describe'
- reread 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 identify key words such as command words, e.g. 'describe', and the key computing knowledge required, e.g. 'use case diagram'
- 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	1	88	9	2	
2	32	19	32	17	Many students selected use case diagrams to be drawn as an example of a non-functional requirement. However, a non-functional requirement describes the attributes the solution should possess. Option C, which states that online ordering must be available 24 hours a day, seven days a week, does this.
3	1	10	69	20	
4	13	67	15	5	
5	26	65	7	2	
6	5	10	17	68	
7	61	15	13	10	
8	6	12	74	7	
9	3	1	6	90	
10	83	9	6	2	
11	8	14	61	17	
12	8	14	30	47	Many students selected existence check as the validation check. Existence checks are used to see if data is entered, not if data exists in a list. Option C, range check, is the validation technique used to check against a list of valid ID numbers.
13	29	24	23	24	Option A is the only answer that satisfies the collection of solicited personal information. The personal information collected is used for, or is directly related to, the organisation's activities.
14	61	2	33	4	
15	7	62	2	29	
16	11	63	9	17	
17	21	15	62	2	
18	80	5	3	13	
19	47	27	1	25	Many students selected the *Spam Act*, however, as the organisation shared private data it may be breaching the *Privacy Act*.
20	2	36	61	1	

Section B – Short-answer questions

Question 1

Marks	0	1	2	3	Average
%	54	20	7	19	**0.9**

A trace table is a technique for checking that a module meets design specifications. It simulates the execution of the module; as each statement is executed the variables change and this data is recorded in a table. Many students had limited knowledge of this technique. Students should be

able to construct a table with appropriate variables/conditions/output/input headings and be able to record data as they step through the algorithm.

Below is a possible response.

Classsize	Count	Sum	Avemark	WHILE loop
3	0	0	0	T
	1	52	0	T
	2	141	0	T
	3	162	0	F
			162/3=54	

Question 2a.

Marks	0	1	2	Average
%	44	40	16	**0.8**

Many students found difficulty in providing an explanation of why reading from RAM could improve the performance of the software application. This question, which asked students to 'explain', required a consideration of cause and effect. For example, if 'quicker access' was stated as the reason performance could be improved, details about access speed compared to hard disks was required.

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

> *Random Access Memory has faster read and write speeds than permanent storage (hard disk). This means that the software app will be able to search the records faster, improving its efficiency.*

Question 2b.

Marks	0	1	2	Average
%	43	35	22	**0.8**

Most students were able to make a comment that there would be some compatibility issues if the number of fields changes. However, many did not explain why there might be issues or explain if coding also changed that data would be fully accessible.

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

> *If the number of fields changes, certain elements/values may be processed by the wrong section of the program, causing type errors or other errors. Eg The postcode may be processed as a phone number.*

Question 2ci.

Marks	0	1	2	Average
%	21	30	49	**1.3**

Many students showed some understanding of these data types but struggled to express the key characteristics clearly and accurately. There were a number of possible responses; however, many responded with a collection of individual characters (ASCII) and a whole number that could be used in mathematical calculations, as the key characteristics for string and integer.

Question 2cii.

Marks	0	1	2	Average
%	29	12	59	1.3

Students generally selected string as the most appropriate data type due to the possibility of brackets or spaces in the variable.

Question 3

Marks	0	1	2	3	Average
%	50	28	16	5	0.8

Many students found this question difficult. Students needed to be able to describe an associative array, outline how it is used and explain why a one-dimensional array was not appropriate in this circumstance.

The following are two examples of high-scoring responses.

Example 1

An associative array contains a key and value. In this case the staff member's name would be the value and the key would be the title of the report. Using an associative array means that staff will be able to search for who has borrowed the report since each report is assigned a value (staff member's name). This option is better than a one-dimensional array since there are two categories needed to be recorded, the staff name and the report title, which a one-dimensional array cannot do.

Example 2

An associative array allows for two values to be paired, and lookups to be performed based on one specific value (in this case, the report title). If the data were to be stored in a one-dimensional array, it would not be possible to link reports with the staff member's names. Additionally, associative arrays allow for many reports to be assigned to a single name, which is required for the solution.

Question 4

Marks	0	1	2	3	Average
%	20	23	37	20	1.6

A more efficient searching technique would be a binary search on sorted data. The study design only specifies linear and binary searching. Students needed to identify binary search (using sorted data), describe how the search technique works (list is repetitively halved) and why this was more efficient than a linear search (fewer comparisons). Higher-scoring responses were able to provide this information in well-structured, detailed sentences where information was linked. Students should avoid responding in dot points for questions that ask for 'outline', 'explain', 'describe', etc,; full sentences addressing the command word and that uses computing terminology are required.

The following are two examples of high-scoring responses.

Example 1

Binary search is more efficient than linear search however requires the records to be sorted. Binary search involves reducing the list by half in every step while linear search involves searching every individual record to see if it matches the desired record. With 5000 records, the average time taken to search is significantly less in binary search then linear search making it more efficient.

Example 2

A binary search is a more efficient searching technique compared to a linear search. A binary search requires a sorted data set. While a linear search checks through each record, a binary search compares your wanted value with the midpoint, and discards half of the data set which is not required. This makes a binary search exponentially more efficient than a linear search.

Question 5

Marks	0	1	2	3	Average
%	62	15	14	8	0.7

There were a number of possible responses to this question; however, a number of students used 'i' for the counter when the variable 'counter' was already provided.

The following is a possible response.

```
While counter < array_length
      If inputArray[counter] = inputArray[counter+1] then
            duplicate_count ← duplicate_count+1
      endIf
      counter ← counter+1
endwhile
```

Section C – Case study

Question 1a.

Marks	0	1	2	3	4	Average
%	8	13	59	7	13	2.1

Question 1 required students to apply their knowledge of project management and utilise key terms such as dependency, predecessor, critical path and milestones. In general, students were able to read and interpret the tasks list and the Gantt chart. However, a number of students missed the second part of the question, which required use of evidence from the Gantt chart. Students should remember that answers must apply to the case study (as stated in the instructions), so responses not related to the case study may not be awarded marks.

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

Many tasks, including the trialling of one system, and the design of the EasyDel App are not dependent on one another, meaning they may be completed simultaneously.

The critical path is shown to only take 27 days, every task can feasibly go twice as long without the project taking 55 days.

Question 1b.

Marks	0	1	2	Average
%	12	54	34	1.2

Most students were able to describe that if the 'Design the EasyDel app' went longer than planned it would impact on the project by pushing out the end date, as the task is on the critical path, thus any delay would delay the entire project. Extending the 'Stores to begin to add items for sale' task

has limited to no impact on the project. A number of students also noted that if it did take longer than an extra 11 days it may have an impact on the project completion date.

Question 1c.

Marks	0	1	2	Average
%	13	14	73	**1.6**

A majority of students were able to indicate milestones on the Gantt chart. There were a number of possible milestones including 'Design EasyDel app' and 'Develop local control system for robots'.

Question 2

Marks	0	1	2	Average
%	6	20	75	**1.7**

Acceptable answers were constraint or scope for Statement 1 and non-functional requirement for Statement 2.

Question 3a.

Marks	0	1	Average
%	38	62	**0.6**

The stick figures in the use case diagram are referred to as an actor. Many students were not able to answer this question correctly and used incorrect terms such as 'user', 'entities' or 'customer'.

Question 3b.

Marks	0	1	2	3	4	5	Average
%	4	14	15	15	23	28	**3.3**

The use case diagram required students to have a clear understanding of where 'includes' and 'extends' would be used, with a number of students confusing these two key terms.

	Label
A	Customer
B	<<includes>>
C	<<includes>>
D	<<extends>>
E	Bank

Question 3c.

Marks	0	1	2	3	4	Average
%	35	6	13	10	36	**2.1**

Students were asked to explain the difference between 'includes' and 'extends'. An 'explain' question is often supported by examples; in this case it was explicitly requested in the question. Students needed to refer to the use case diagram in their response. There was an example of both 'includes' and 'extends' in the use case diagram. In their response students should have shown their understanding of each term and used an appropriate example to gain full marks.

The following are two examples of high-scoring responses.

Example 1

"includes" indicates that the included use case is required to complete the including use case. "make purchase" includes "customer login/registration" because the customer must be logged in to make a purchase. "extends" indicates an optional, but not required, use case that may or may not be completed while the user is performing the extended use case. "good delivery" extends "checkout" because the customer may optionally choose to have the goods delivered while they are checking out their purchase.

Example 2

The term 'extends' refers to an option or path that can be chosen whereas, the term 'includes' means that in order for a particular process to take place something else must also occur. For example, the 'includes' between "make purchase" and "customer login/registration" indicates that a customer must either login or register to make a purchase. In contrast, the 'extends' between "checkout" and "good delivery" indicates that a customer has an option when checking out for a purchase to have their good delivered to their house.

Question 4a.

Marks	0	1	Average
%	21	79	**0.8**

Most students were able to indicate that Bluetooth's limited range would be the reason for rejecting it as a means of communication with the robots.

Question 4b.

Marks	0	1	2	Average
%	59	7	34	**0.8**

Many students were not able to provide a technical feature. A number of responses could have been provided, including wireless NIC or IP address. Students often used vague terms such as 'wireless receiver/transmitter', which was not correct technical terminology.

Question 5a.

Marks	0	1	2	3	Average
%	31	20	14	34	**1.5**

Students who utilised the question stem and the tests already performed provided the three key tests required.

Test no.	delivery_distance (km)	fragile	Expected result	Actual result
1	3	True	order invalid	order valid
2	2.5	True	order invalid	order valid
3	1	False	order valid	order invalid
4	*3*	*False*	*Order invalid*	*Order invalid*
5	*2.5*	*False*	*Order valid*	*Order invalid*
6	*1*	*True*	*Order invalid*	*Order invalid*

Question 5b.

Marks	0	1	Average
%	44	56	**0.6**

The error was in the 'If' statement: the >= symbol should be <= and the fragile should be '= True' not '= False'.

Question 5c.

Marks	0	1	Average
%	40	60	**0.6**

There were a number of ways to correct the pseudocode; the most appropriate is below.

```
if delivery_distance <= 2.5 AND fragile = false
  print ("Order valid")
else
  print ("Order invalid")
EndIf
```

Question 6a.

Marks	0	1	2	Average
%	11	37	51	**1.4**

Variable name	Data type or structure	Description
validcard	*Boolean*	a value that represents the validity of the credit card

creditnum	*String/Array*	the credit card number of the customer, 0000-0000

Question 6b.

Marks	0	1	Average
%	59	41	**0.4**

The type of validation was a range check as values can only be 5, 6 or 7.

Question 6c.

Marks	0	1	2	Average
%	27	35	38	**1.1**

creditnumtotal = 34 or 18

validcard = true

Both 34 and 18 were accepted as possible answers for creditnumtotal as the answer could be derived using either the algorithm or its description.

Question 7a.

Marks	0	1	Average
%	92	8	**0.1**

Most students were not able to identify that the first line (XML declaration or prolog) of an XML file defines its file type. The most common incorrect responses referred to the file extension.

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

> *Many XML files have a header stating the version of XML. XML files also have opening and closing tags which can be used to differentiate from other files.*

Question 7b.

Marks	0	1	2	Average
%	69	28	4	**0.4**

This question required students to apply their knowledge of XML, as XML does not deal with formatting as such but with data and its structure. XML provides an independent way of storing and sharing data, which means new browsers and applications can read it without losing data.

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

> *XML files use self descriptive tags to describe data and give it structure. The EasyDel app can read these tags and use them to place data in the correct places.*

Question 8

Marks	0	1	2	3	4	5	6	Average
%	8	5	13	25	30	14	5	**3.3**

Students needed to consider the words in the question ‘compare the purpose’, which required students to discuss similarities and differences between two elements, in this case ‘backup strategy’ and ‘data encryption’. Students then needed to recommend which should be

implemented; this recommendation could have included utilising both. Students were expected to clearly show their knowledge of the purposes, describe the strategies and justify a recommendation. There were a number of possible responses.

The following are two examples of high-scoring responses.

Example 1

The purpose of a back up strategy and encryption is both to increase data security. However they achieve this differently with a back up provide redundancy, allowing data to be restored if it ever gets deleted. Encryption provides security in a more traditional sense in encoding the data so that it is unreadable. To achieve best practice Lilianna should implement both of these strategies. Given that information such as credit card details is stored in the database, encryption should be considered as this information may be of high target for hackers. Furthermore, a backup should be used for redundancy to ensure that if any data is ever lost it can be restored. An incremental backup in which only data that has been changed since the last back up is backed should provide a good balance of speed and redundancy for the system.

Example 2

Data encryption is a security measure that is designed to protect data from being accessed by unauthorized users. Backup strategies such as incremental backup, where changes between any previous incremental or full backup are backed up each day, protect the company if they lose access to the data. As data encryption and backups serve different functions, one protecting security of data from attackers and another preventing data loss, it would be in Lilianna's interests to implement both. For Lillian's needs a daily incremental backup of the encrypted data on external hard drives, and a weekly full backup on magnetic tape (for it's storage capacity) would be advisable.

Question 9

Marks	0	1	2	3	4	Average
%	9	15	35	23	18	**2.3**

Students are encouraged to read and reread the question before responding. In this question, a number of students missed the need to explain 'how' the measure will help keep data secure, with many simply describing the measure.

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

The firewall will monitor incoming network traffic to check for unauthorised access attempts and stop them from accessing data on the server.

By encryption the signal, even if the signal is intercepted, it will be unreadable, and no useful information is gained by the intercepter, thus keeping the data secure.

Question 10a.

Marks	0	1	2	Average
%	33	45	22	**0.9**

The EasyDel app should include a privacy policy and the ability for the customer to agree to the policy. Many students only included one element.

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

The customer should be made aware of the sharing of their details when signing up for the app. This should be contained within the terms and conditions and users should be made to sign this or give consent if they sign up.

Question 10b.

Marks	0	1	2	Average
%	22	58	20	1

Christos must include consent to receive the emails and customers must have the ability to unsubscribe. Many students only included one element.

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

Customers must have given consent to be sent emails and must be able to unsubscribe from emails easily. Once a customer has unsubscribed they should no longer be sent emails.

Question 11

Marks	0	1	2	3	4	Average
%	36	27	22	10	4	1.2

A detailed description of a VPN and a considered justification for its use with the software solution's data was required. Many students found it difficult to include the required detail; increased practice of detailed written responses may assist students.

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

A VPN establishes a secured private communication channel between the storage and the RedGumGrove's Central server. This is appropriate because outsourcing the storage necessarily requires the connection of two local area networks via the internet (that of the RedGumGroves' and that of the storage companies). A VPN prevents unauthorised attackers from intercepting communication between the two networks.

Question 12

Marks	0	1	2	3	4	5	6	Average
%	24	9	18	11	26	7	5	2.5

Criterion	Strategy	Explanation
98% of customers received the items they ordered.	Classify the number of customer complaints according to the type of problem and count them. Record the number of orders processed. The ratio will give the percentage of customers who receive their orders.	The ratio will be used to judge if the 98 per cent criterion has been met. If over 98 per cent, then criteria successful, however if under 98 per cent criterion was not met.

Delivery of 80% of purchased items occurred within two hours of the order being completed.	When the customer uses his/her assigned number to open the robot, send a message to system stating the delivery time. Run a program to count/calculate whether the items have been delivered within the allocated time.	Use the data over a set period of time (e.g. three months) to calculate if 80 per cent of orders were delivered within the two-hour time frame.

Students are encouraged to read the information provided carefully. This question required students to describe with some detail a strategy (a number of actions or steps to collect the data required) to evaluate the software solution in order to check that the two listed criteria had been met. Students should then have explained how this data would be used to evaluate the criteria. Many students mistakenly used the 'explanation' column to explain why they considered that strategy.