2016 VCE Computing: Software Development examination report

General comments

The 2016 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 four short-answer questions (worth a total of 20 marks); and Section C, which was a case study with 13 questions (worth a total of 60 marks). Teachers and students should refer to the *VCE Computing Study Design 2016–2019* and the 2016 written examination while reading this report.

Section A was answered well by many students. Section B required students to demonstrate sound theoretical knowledge and to provide detailed and accurate responses. The format of Section C was consistent with that of previous years and students' 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.

During the examination, students should have:

- endeavoured to use correct technical terminology
- discussed all options when asked to justify a choice or compare one option with another
- responded to key instructional terms, such as 'state', 'explain' and 'describe'
- re-read each question and their response to ensure that the question had been answered
- removed the case study insert from the question and answer book, and referred to it when completing Section C
- read the case study and questions carefully, and underlined or highlighted key words
- demonstrated their knowledge of the subject and applied 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	88	7	5	0	
2	19	57	16	7	
3	35	41	3	21	When testing an algorithm students must consider the boundary conditions when checking for logic errors.
4	28	16	25	31	Student should be able to identify instructions, procedures, methods, functions and control structures.
5	9	8	77	6	
6	47	49	3	1	Many students confused archiving and backing up. Backup is always a copy where archiving is the original often removed from active use.
7	23	13	9	56	
8	8	82	2	7	
9	3	9	8	79	
10	5	6	88	2	
11	20	12	25	43	
12	91	3	2	4	
13	34	45	10	10	Many students selected rich client architecture, but this requires using at least some resources from either a server or the internet. Mobile architecture is the best to use in the given scenario as the handheld device application stores all its data on the device and does not need an internet connection.
14	10	43	18	30	
15	81	10	5	4	
16	57	1	41	2	The *Privacy and Data Protection Act 2014* deals with Victorian government agencies, of which VicRoads is one.
17	6	11	6	77	
18	2	8	21	68	
19	5	3	88	4	
20	10	77	8	6	

Section B – Short-answer questions

Question 1

Marks	0	1	2	3	Average
%	10	18	35	37	**2**

The three fields in the file are staffid, staffname and salary.

Most students were able to identify one or two of the required fields; however, many students incorrectly included name as one of the fields. If information is provided in the stimulus material – for example, field names – the most appropriate response would be to write the information as it is listed; for example, staffid is more appropriate than Staff ID.

Question 2

Marks	0	1	2	3	4	5	6	Average
%	44	19	12	7	9	6	3	**1.5**

There were a number of appropriate responses. Below is one possible response.

```
Begin
     LowestEmployeeName ←""
     LowestEmployeeNumber ← 100000
     While Not EndOfFile
          Read EmployeeName, EmployeeNumber
          If EmployeeNumber < LowestEmployeeNumber
               LowestEmployeeName ← EmployeeName
               LowestEmployeeNumber ← EmployeeNumber
          EndIF
     EndWhile
     Print LowestEmployeeName, LowestEmployeeNumber
End
```

A significant number of students were unable to complete the missing lines from the algorithm using pseudocode. Throughout the year exposure to a range of sample algorithms should be considered; in addition, a range of formative assessments on developing appropriate pseudocode may assist in further developing knowledge and skills.

Question 3a.

Marks	0	1	2	3	4	Average
%	38	10	15	20	17	**1.7**

Most students were able to provide some information about a binary search; however, many were not able to provide a detailed and knowledgeable response to gain full marks. Students are reminded to read the question carefully and consider the mark allocation and amount of answer space when responding, as this will give an indication of the detail and depth required.

Students were required to show knowledge of the process of a binary search, including an understanding that a binary search identifies the midpoint, discards half of the list that is higher/lower than the search value, and repeats this process until the value is found. If the list were not sorted it would not be able to follow this process.

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

An array must be sorted for a binary search as it uses recursive division. It picks a midpoint and compares the wanted value to it. If the wanted value if higher than the midpoint it discards all below it and vice versa. It then does the same thing to whichever half is left, repeatedly till the midpoint = the wanted value. If the list was unsorted, the wanted value could end up in the half that gets discarded as it's not in the correct order, and thus, doesn't get found.

Question 3b.

Marks	0	1	2	Average
%	32	28	40	1.1

Students were able to generally provide some point of comparison between a binary and linear search method with many being able to identify that a linear search compares all elements of the array to the search item until found, which does not occur in a binary search. Some students went on to discuss the lack of efficiency of this method, but this was not required.

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

A linear search makes comparisons with every value in the array until the target value is found. As every value is checked it does not matter if the array is sorted or not.

Question 4a.

Marks	0	1	2	3	4	Average
%	22	5	12	2	59	2.7

As part of Unit 4, Area of Study 1, students are required to have an understanding of a range of data structures to organise and manipulate data, and the common processing features of programming languages. This question required an understanding of arrays and the purpose of a function. A significant number of students were able to utilise the details in the stimulus material and performed basic arithmetic to calculate the hash function value and thus allocate the numbers to be stored to the correct array location.
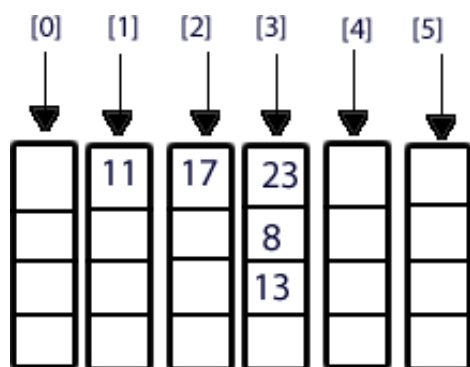
Question 4b.

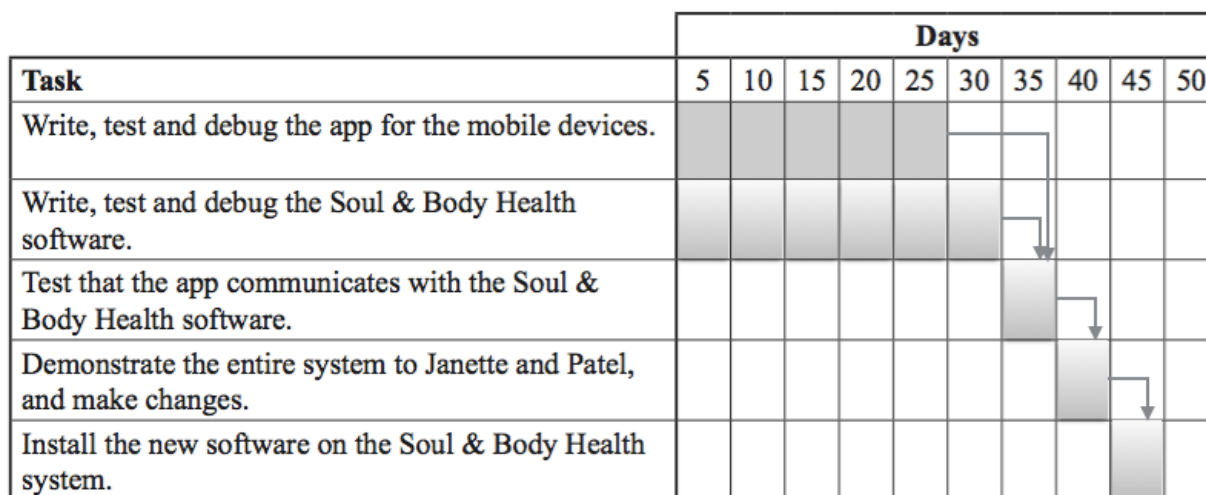| Marks	0	1	Average
%	87	13	0.2

Although students were able to work through the function's arithmetic and logic in Question 4a., most students were not able to articulate how you would then use this function to retrieve a desired

value. An appropriate response included searching for the number that matched the hash key, and once found doing a linear search of elements at that array location to find the number.

Section C – Case study

Question 1a.

Marks	0	1	2	3	4	Average
%	7	9	2	8	74	3.4

Task	Days									
	5	10	15	20	25	30	35	40	45	50
Write, test and debug the app for the mobile devices.										
Write, test and debug the Soul & Body Health software.										
Test that the app communicates with the Soul & Body Health software.										
Demonstrate the entire system to Janette and Patel, and make changes.										
Install the new software on the Soul & Body Health system.										

Most students were able to complete the Gantt chart quite well; with many indicating dependences, to show a more complete understanding of the project.

Question 1b.

Marks	0	1	Average
%	68	32	0.3

Most students were unable to name a milestone. The stimulus material did not indicate a zero duration task, but many students restricted themselves to the five listed tasks in the partial Gantt chart when responding, instead of considering the project and a likely milestone. Examples of possible milestones include:

- finish writing
- testing and debug app and software
- testing complete.

Question 2

Marks	0	1	2	Average
%	56	36	8	0.5

An example of an appropriate response is:

- Organisational goal: Improve the health of clients through a holistic approach, provide clients with 'best practice' physiotherapeutic care
- System objective: streamline the payment process, connection with national healthcare system.

The knowledge and understanding of organisational goals and objectives is a new area in the study design. Unit 4 includes goals and objectives of organisations and information systems. Most

students were not able to clearly state an organisational goal nor a system objective. Many listed the new solution requirements (Keep Fit app) for system objectives; however, both the goal and objective were of the current organisation and system at Soul & Body Health.

Question 3

Marks	0	1	2	3	Average
%	41	26	19	14	**1.1**

Students needed to carefully and logically consider the system. Students often confused solid lines and dotted lines, and misused extends and includes. Students are encouraged to attempt all questions and to use reading time to re-read questions that require careful thought, such as this one.

There were a number of appropriate responses. Below is one possible response.
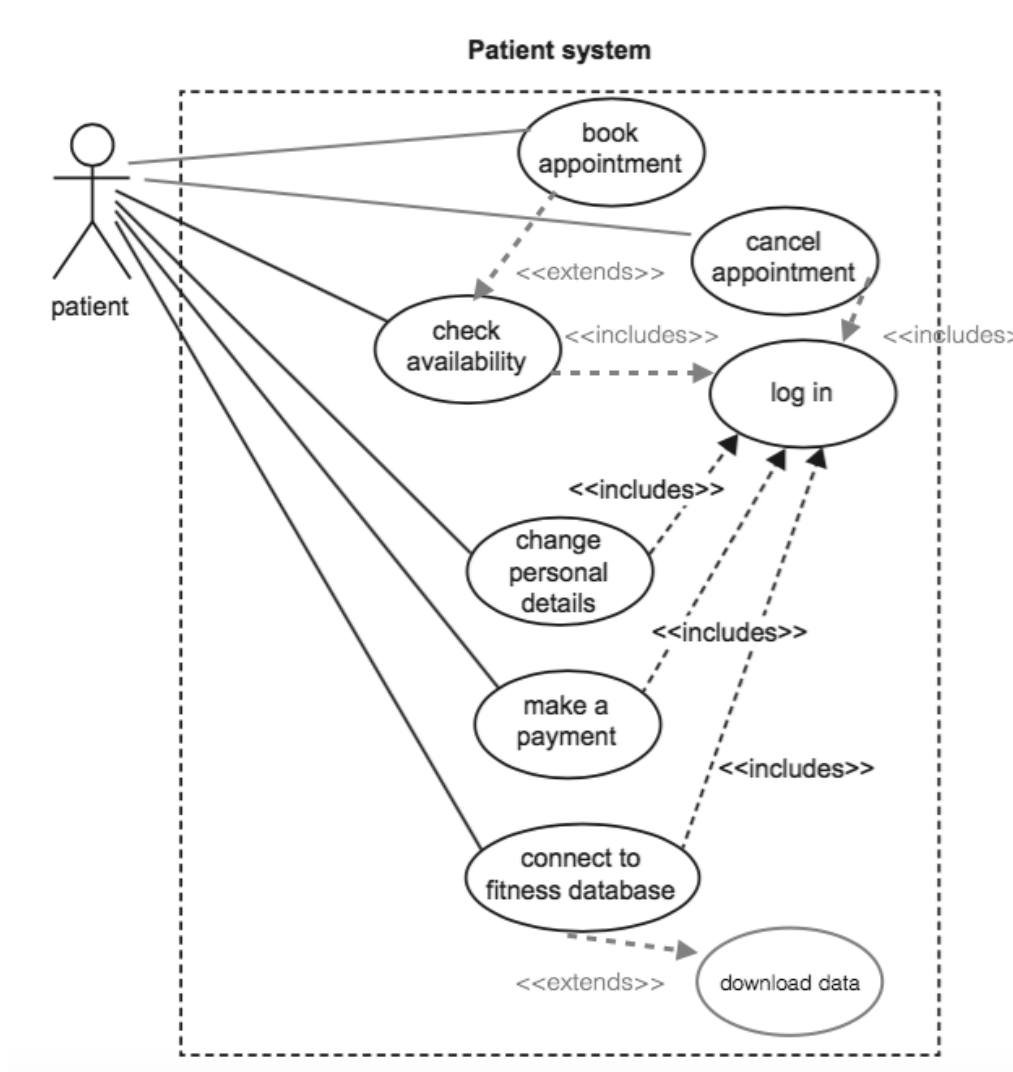
Question 4a.

Marks	0	1	2	Average
%	32	35	33	**1**

Most students were able to identify a feature of the design, but many students struggled to articulate how it contributes to effectiveness. Ideally students should have linked the feature to one of the following effectiveness measures: completeness, readability, attractiveness, clarity,

accuracy, accessibility, timeliness, communication of message, relevance, usability (as listed on page 12 of the study design).

The following are four examples of high-scoring responses.

Feature of Design idea A:

Design A improves accuracy as drop-down boxes, which are easy to use on a touch screen, are used instead of text field, which could contain errors like misspelled words.

Accessibility – the use of icons rather than words make the design more accessible/effective for visually impaired.

Feature of Design idea B:

Clarity – Everything in this is labeled with what it is, it makes this design clearer and thus contributing to it's effectiveness.

Readability/Clarity The program is clear and easy to read and understand what to do and where. It is also clear and uncluttered. This will allow most clients of Body and Soul to easily use this design.

Question 4b.

Marks	0	1	2	Average
%	19	51	29	**1.1**

It is important that students consider the key command terms given in questions. In this question students were asked to select which design idea would meet the solution requirements (stated in the information prior to the question) and justify their selection. When justifying, students should ensure they give a clear reason why the selected design is the better design, and it is appropriate to indicate why the alternative design was not appropriate. Either option was accepted if there were reasoned justification.

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

Design B – the distance 'slider' is contradictory to the need for 'error-handling features', as more errors would be made with this. Similarly, the design of B is more clean/clear in the each button/label is clearly defined rather than made vague through pictures.

Question 5

Marks	0	1	2	3	Average
%	63	22	13	3	**0.6**

A majority of students were unable to identify appropriate entities, thus showed incorrect data flows. The case study did not provide a data flow diagram to model responses, so students needed to read carefully and think about the entity names. A range of names for entities and data flows was acceptable.

A suitable response would show the following on the diagram provided:

- Entity 1 – Patients/clients with an appropriate patient data flow
- Entity 2 – Clinic staff/physiotherapist with an appropriate patient medical/treatment data flow.
- Entity 3 – National healthcare system with rebate data flow.

Question 6

Most students were able to successfully provide advantages of the two data storage methods described: data stored and accessed locally (Ethan's method) or data stored centrally and accessed via the internet (Sue-Lee's method).

Question 6a.

Marks	0	1	2	Average
%	12	43	45	**1.4**

The following are examples of high-scoring responses.

Storing the information locally allows the app to function without an internet connection and hence provide a more usable app.

The data can be access quicker by the patients, as it is already stored on their phone.

Data does not have to be sent over the internet reducing data usage.

Question 6b.

Marks	0	1	2	Average
%	20	36	44	**1.3**

The following are examples of high-scoring responses.

By having the data stored centrally updates could be made to the database without having to push an update to the entire application.

Storing this information on the internet means less of the valuable (and small) storage capacity on a mobile device is taken up.

Internet access also allows for the data to be more easily and regularly updates, as users will simply retrieve this new data next connection.

Question 7a.

Marks	0	1	2	3	Average
%	16	35	39	9	**1.4**

Most students were able to consider an appropriate security measure; however, they often provided limited detail of the measure and how it secures data. Ideally students should have stated (identified) a measure, and then provided a detailed explanation of how it works and its role in protecting data. The mark allocation provided details of the depth required. A range of responses was accepted, including user authentication hierarchy, a firewall, encryption of stored data, and physical security measures.

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

A firewall should be installed onto the Soul & Body Health network. Firewalls control and regulate the flow of packets through a network's ports and blocks packets with malicious or unauthorized information. A firewall would severely restrict the ability of hackers to enter the network and steal the head office's sensitive information.

Question 7b.

Marks	0	1	2	3	Average
%	17	29	43	10	**1.5**

This question required students to show more than superficial knowledge of backup procedures. The mark allocation of three marks provided an indication that a detailed response was required. Appropriate responses could have included details of how the procedure worked, the type of media used, and/or the location of that media and the timeframe. Students should show their knowledge with detail, depth and accurate technical information.

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

Perform an incremental backup on Monday through to Saturday (of only data that has been changed/added) to an external hard-drive. On Sunday, perform a full-backup of every file used in the health system to magnetic tape (for its large storing capacity)

Question 7c.

Marks	0	1	2	3	Average
%	16	21	33	30	**1.8**

This set of questions required detailed and technically accurate information. Many students provided very generic responses. Students are urged to use the number of lines and the mark allocation to guide the length and depth of their responses. These more technical questions can be practised throughout the year in all knowledge areas.

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

Archiving is when inactive customer details are removed from the head office Soul and Body server and transferred to a secondary storage medium, the transferred data is then deleted from the head office server. The archiving of customer records is beneficial as space on the main system is freed up for newer customer data, it also decreases the size of backups as well as decreasing how long it takes to perform a backup.

Question 8a.

Marks	0	1	2	Average
%	5	11	84	**1.8**

Most students were able to consider what data would be considered sensitive, with many giving variations of payment details or medical records.

Question 8b.

Marks	0	1	2	3	Average
%	77	5	10	7	**0.5**

This question required students to show their understanding of key knowledge and not just provide generalised information. Students were required to identify a protocol that would help to secure the system's sensitive information. Options could have included HTTPS, Secure Socket Layer (SSL) or Transport Layer Security (TSL).

Many students were able to name a protocol but were unable to explain how the protocol worked or how it aided in securing data.

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

Secure Socket Layer (SSL) is an asymmetrical encryption protocol which would be suitable for the Soul & Body Health system. First, a transfer request and a public key relating to how to turn plaintext into ciphertext are exchanged. A private key is then encrypted with the public key and then sent, which explains how to decrypt ciphertext. A secure connection is then established and information can then be exchanged quickly and securely.

Question 9a.

Marks	0	1	Average
%	64	36	0.4

The only answer for the process described was data mining.

Question 9b.

Marks	0	1	2	3	4	Average
%	40	26	24	5	5	1.1

Students found it difficult to clearly and accurately write about any technical issues that should be considered before implementing additional commercial software. Many students discussed compatibility when in fact they meant interoperability, i.e. the ability for a number of systems and software applications to communicate, exchange and use exchanged data.

The following are examples of three high-scoring responses.

The amount of space the new software will take up on the existing soul and body system may be a factor as the system already holds thousands of records and the new software may take up space on the storage that the system does not have.

Patel should verify that the software does not contain any vulnerabilities and can be trusted to operate in the secure manner when handling information.

The security of the software. This may compromise the security of the overall system as although Patel has ensured that Soul & Body Health's system will adequately deal with sensitive data, this software may not.

Question 10

Marks	0	1	2	3	Average
%	28	25	29	18	1.4

Most students were able to list at least one action that should be taken to ensure Soul & Body met their legal obligations; however, students should re-read their responses to ensure they are not repeating similar actions.

There were a number of possible appropriate answers. The following are examples of possible responses.

Patel must make sure he has the consent of patients to allow the software to handle their information.

Create an open and easily accessible Privacy Policy in accordance with APP1 of the Australian Privacy Policy.

Receive consent of the users' whose data will mined.

All information provided to the data mining company should be void of any identifying patient information.

Patients should be given the opportunity to opt out of the program at any point of time.

Question 11

Marks	0	1	2	3	4	Average
%	42	12	23	15	7	**1.3**

The characteristics of data that has integrity include accuracy, timeliness, reasonableness, authenticity and correctness, as listed in Unit 4 of the study design. Familiarity with these key knowledge terms allowed students to provide detailed and accurate responses; however, while many students knew these terms, many were unable to explain a method to check this data integrity.

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

When a healthcare number is entered into the software, a validation check should be performed to ensure that the input is indeed a possible healthcare number and hence reasonable. The check would confirm that the input was a 10 digit number.

Question 12a.

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

The most appropriate answer was range checking.

Question 12b.

Marks	0	1	2	3	4	Average
%	21	14	28	13	24	**2.1**

Students are encouraged to use their skills with desk checking and trace tables to work through the algorithm and avoid assuming results. The most appropriate set of test data would be one that checks all boundary conditions.

Test no.	Test data	Expected results	Actual results
1	20	ValidSpeed = True	ValidSpeed = True
2	1	ValidSpeed = False	ValidSpeed = True
3	0	ValidSpeed = False	ValidSpeed = False
4	30	ValidSpeed = False	ValidSpeed = True
5	31	ValidSpeed = False	ValidSpeed = False

Question 12c.

Marks	0	1	Average
%	57	43	**0.5**

The pseudocode range checking is incorrect. At 1 and 30, actual results are true instead of false.

Question 12d.

Marks	0	1	2	Average
%	49	4	47	1

The most appropriate answer is below.

```
Begin

ValidSpeed ← False

        If Speed > 1 And Speed < 30 Then
                ValidSpeed ←True
        EndIf

End
```

Question 13a.

Marks	0	1	2	Average
%	66	26	8	0.4

Students are required to have knowledge of the formatting and structural characteristics of input and output, including XML file formats. This area is new to the course and many students struggled with describing this with any level of technical detail. Students need to ensure they are able to define all key terms. Using a glossary of terms throughout the course may assist.

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

XML files are structured using tags to give data meaning in any program. They allow for structure and meaning to be conserved when transporting data, whereas simple files are seen to lack structure/meaning due to them only storing raw data as opposed to structured data.

Question 13b.

Marks	0	1	2	3	Average
%	51	32	14	3	0.7

As in other areas requiring technically accurate information, in general, students struggled to provide a clear explanation of a virtual private network and its advantage over another form of transmission. It is important for students to fully read the question and their response to ensure all parts of the question are covered. In this question students failed to address the part that required a comparison to another form of transmission.

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

A VPN creates an encrypted connection through which to send data. This is good as encrypted information is practically unreadable by anyone without a decryption key. In contrast, plan text message are easily intercepted and read by unauthorised personnel.