2013 Examination Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2013 Software Development GA 3: Examination

GENERAL COMMENTS

The 2013 Information Technology: Software Development examination comprised three sections: Section A contained 20 multiple-choice questions (worth a total of 20 marks), Section B had six short-answer questions (worth a total of 20 marks) and Section C was a case study (worth a total of 60 marks). Teachers and students should refer to the *VCE Information Technology Study Design 2011–2015* and the examination while reading this report.

Students generally performed well on the multiple-choice section. In Section B, students needed to provide detailed and accurate responses. In Section C, it is important that responses are specifically applied to the case study.

During the examination, students should

- use correct IT terminology
- discuss all options when asked to justify a choice or compare one option to another
- respond to key instructional terms in questions, such as 'state', 'explain', 'justify' and 'describe'
- re-read each question and their response to ensure that the question has been answered
- remove the case study insert and refer to it when completing Section C
- read the case study and questions carefully, and underline or highlight keywords
- endeavour to write clearly and write in pen, rather than pencil
- demonstrate their knowledge of the subject and apply that knowledge to the case study, as general responses often result in low or no marks; knowledgeable, clear and appropriate responses receive full 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 the 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 errors resulting in a total 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
1	12	1	5	82
2	32	50	8	11
3	5	86	8	1
4	24	22	50	4
5	82	12	1	4
6	76	1	22	1
7	6	13	8	74
8	20	41	8	31
9	11	22	42	25
10	5	75	15	5
11	4	9	85	2
12	8	55	17	20
13	7	6	7	80
14	67	10	16	7
15	78	6	12	4
16	10	85	3	2
17	7	2	89	1

Question	% A	% B	% C	% D
18	1	5	81	12
19	17	79	1	2
20	6	23	0	71

Section B – Short-answer questions

Question 1

Marks	0	1	2	3	Average
%	64	16	11	8	**0.7**

Many students had difficulty expressing the descriptions required for this question. Very few students were able to provide accurate definitions and many were superficial. Students are encouraged to keep a glossary of key terms throughout the year (in additional to the glossary in the study design), including key programming concepts.

The following is an example of a response that provided an appropriate brief description of each structure.

Selection control structure
This chooses which section of code to execute or to skip the code contained depending on whether the condition specified has been met or not.

Procedure
A procedure is a section of code which can be called repeatedly from any line of a program in order to complete certain actions.

Function
This is similar to a procedure, in that it can be called upon when required but will accept parameters when called upon and return a value when it is done.

Question 2

Marks	0	1	2	3	Average
%	70	11	7	12	**0.6**

```
Begin
        largestAge ← 0
        For i ← 1 to 1000
                If ages[ i ] > largestAge Then
                        largestAge ← ages[ i ]
                EndIf
        EndFor
End
```

A lack of exposure to algorithm development was clear from student responses to this question. Students were either able to write a complete, accurate algorithm or struggled to identify the correct logic and the selection statement required. Students are expected to use the variables identified and include appropriate indentation.

Question 3a.

Marks	0	1	2	Average
%	29	45	26	**1.0**

Acceptance testing is conducted during development to determine if the solution requirements (functional and non-functional) as specified in the software requirements specification (SRS) have been met. It is usually conducted by members of the organisation who commissioned the solution.

In a question of this type it is important that students identify the two parts of the question, first the 'what' and then the 'who'; both needed to be addressed to gain the two marks for the question. Many students did not answer both parts of this question. Students are encouraged to clearly show their knowledge, which can be done by answering each part as a separate statement; for example, by defining acceptance testing in detail then describing who in this scenario would be involved in testing the solution.

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

Acceptance testing is where you get the client/users of the software solution to use the software developed and make sure it fulfils all their needs and the requirements specified in the SRS. In this case the students and teachers from the plumbing faculty college would be involved in the testing.

Question 3b.

Marks	0	1	2	Average
%	28	29	43	**1.2**

Measures of an effective solution include completeness, readability, attractiveness, clarity, accuracy, accessibility, timeliness, communication of message, relevance and usability.

Evaluation criteria are developed during design and reflect the solution requirements. This question required students to suggest appropriate **effectiveness** criteria; however, many students missed this keyword. Effectiveness and efficiency are keywords defined in the study design glossary and students should be able to apply them as appropriate throughout their responses.

Some student examples of possible evaluation criteria are listed below, in a number of formats; questions, statements and identification of measure. All of these were acceptable.

Does the software solution provide 100% accurate test results to the students and teachers?

Does the software solution provide test results in a form that is relevant and complete?

Is the user interface easy to understand?

Is the solution clear and well explained?

Does it use the correct plumbing language?

Results of the test are given accurately after the completion of the test.

Accuracy – the solution's results must be correct i.e. returning the correct number of marks that each student received.

Completeness – the information that is returned to the students and teachers should be able to return all information i.e. their mark, which ones were incorrect etc.

Question 4

Marks	0	1	2	3	4	Average
%	3	6	8	34	49	**3.2**

Data	Use	Data type
GivenName	**to store the given name**	string
Status	**F for full-time employee or P for part-time employee or V for volunteer**	character
FirstAid	**Do they have first-aid qualifications? True or false?**	boolean
HomePhoneNumber	**stored in the form (09) 9999 9999**	string

All possible data types were listed in the question. The most common error was *HomePhoneNumber*, with many students indicating that it should be integer or floating point. It is important that all information provided is considered when making a decision on data type; for example, the table indicated how *HomePhoneNumber* would be stored, with spaces and brackets, which could only occur if a string data type is used.

Question 5

As with Question 1, students often struggled to provide a clear and technically accurate definition of a record and a file. Students should have used these during their programming area of study; however, they also need to be able to show their understanding in written form.

Question 5a.

Marks	0	1	Average
%	76	24	**0.3**

The following are examples of appropriate student responses.

A record is a control structure and method of storing and grouping related data together: eg ID 001, Name Fred, LastName Jones. This data is a record as it is relevant to each other and stored together.

A record is a data structure which stores related information such as name, score, year in one data store. Individual data stored in a record can be accessed through an index to find the related information within that record.

Question 5b.

Marks	0	1	Average
%	71	29	**0.3**

The following are examples of appropriate student responses.

A file is a type of data structure which stores data or information on a storage medium. A file may contain a set of records and a file may be accessed through random or serial access.

A file is an external storage of data for a solution which can be created by the solution and read back into at a later date.

Question 6

It was pleasing to see that students, in general, were able to read and interpret the elements of a use case diagram. Most understood the difference between 'includes' (must) and 'extends' (optional), but a number of students had some difficulty expressing that clearly in part c.

Question 6a.

Marks	0	1	Average
%	10	90	**0.9**

Any visitor can join the organisation.

Question 6b.

Marks	0	1	Average
%	2	98	**1.0**

The manager must login first.

Question 6c.

Marks	0	1	2	Average
%	21	20	59	**1.4**

The following are examples of high-scoring student responses.

When a visitor to the website wants to browse the catalog, they are always required to 'login' beforehand, whereas they can choose to purchase a journal at any point they wish, though this will always be after they have completed their 'login' procedure.

In order for a visitor to browse the catalog, he/she MUST login. The «includes» means that it is a must be done in order to browse the catalog. If a visitor is browsing the calalog, then they have the option to purchase a journal, however it is only conditional as depicted by «extends». This means he/she does not have to purchase a journal when browsing, but has the option to do so.

Section C – Case study

Question 1a.

Marks	0	1	2	Average
%	26	27	46	**1.2**

Tasks that related to understanding/identifying the solution requirements, solution constraints and solution scope where appropriate.

It was encouraging to see that students were able to identify that this question asked for tasks that occurred during the analysis stage of the problem-solving methodology. It was important to note that the question required a task. This meant that an action word (for example, create, interview, determine, write, etc.) needed to be provided within the response.

The following are examples of appropriate student responses.

Prepare a Software Requirements Specification (SRS) which will be used in the later stages of the project.

Collect data that would assist in the creation of the AADS, which could range from interviewing rangers to researching similar systems.

Determine the solution requirements. This includes the functional requirements of the AADS (what it must do to meet the goals of the solution) and the non-functional requirements (the qualities of the AADS).

Determine the scope of the solution. This sets the boundaries as to exactly what AADS will do and equally as important, what it won't do.

Question 1b.

Marks	0	1	Average
%	41	59	**0.6**

The chart could also monitor resources, people or time.

Most students were able to identify one of these elements of project planning.

Question 2a.

Marks	0	1	2	3	Average
%	12	12	6	69	**2.3**

	Data flow	Composition
1	**visualised_telemetry_data**	**GPS_data + image_data (formatted for display)**
2	**GPS_data**	**reading_time + latitude + longitude**
3	image_data	**reading_time + optical_image_data + infrared_image_data**
4	flight_command	**['take-off'/ 'land' / 'fly to' / 'circle'] + latitude + longitude**
5	**flight_log**	**time + latitude + longitude + altitude + *optional* [hot_spot_images + animal_spotter_id + animal_spotter_response]**
6	patrol_path	***sequence* of [latitude + longitude]**

The majority of students were able to interpret the elements of the context diagram; however, students should ensure that they use the examples in the table and text provided in the diagram to assist in formulating accurate responses; for example, image_data is a more accurate response than image or picture data, etc.

Question 2b.

Marks	0	1	2	Average
%	12	16	72	**1.6**

floating point

Most students were able to identify 'floating point' as the most appropriate data type for storing longitudinal values, as they required the use of decimal values.

Question 3

Marks	0	1	2	3	Average
%	9	13	4	75	**2.5**

- the PNPW computer: 1 – plan flight
- the drone: 3 – control flight and detect hotspots
- the tablet computers: 2 – visualise telemetry data

Most students were able to interpret the data flow diagram (DFD), and many took advantage of simply listing the number of the process involved.

Question 4

Marks	0	1	2	3	Average
%	64	8	10	19	**0.9**

The data flows should have been labelled

- A: visualised_telemetry_data
- B: flight_command
- C: patrol_path

Again, students should have taken advantage of the text provided in the diagram to assist in formulating an accurate response; for example, 'telemetry data' is not as accurate as 'visualised_telemetry_data'.

Question 5

Marks	0	1	2	3	4	Average
%	12	12	13	28	35	**2.6**

Queue data structure

Students should have noted the requirement to justify their response, and that four marks had been allocated. In general, a response that provided the correct choice, provided a justification for a queue data structure or stack structure and correctly applied the response to the case study obtained full marks.

The following are examples of high-scoring student responses.

Choice: queue
Justification: As the first coordinates entered will the first points the drone flies to, queue would be the most appropriate data structure, as it goes by the rules 'first in first out' as compared to a stack which goes by the rule 'last in first out' which would not be appropriate as this would cause the last coordinate being entered to be the first point the drone flies to.

Choice: queue
Justification: Since the queues have a 'first in first out' nature, this would satisfy the 'first coordinates entered being the first point the drone flies to' statement. Melanie's choice would be incorrect as a stack follows the 'first in, last out' principle, which would not satisfy the required method stated.

Question 6a.

Marks	0	1	2	3	Average
%	26	28	34	12	**1.3**

In general, students were able to give some information about the purpose of a code of ethics; however, many found it difficult to expand their response to provide adequate detail and depth for full marks.

The following is a possible response.

A code of ethics outlines values and principles that should be upheld by stakeholders. A code states what is acceptable behaviour and can provide guidelines for resolving ethical dilemmas. They are not laws but rather values that help professionals make decisions about going about their work.

Question 6b.

Marks	0	1	2	Average
%	65	21	14	**0.5**

Students needed to discuss using the code of ethics and/or decision support frameworks to help resolve the ethical dilemma.

Many students found it difficult to identify the ethical dilemma of whether George should use the code; instead they concentrated on the illegal downloading of the code. Many responses incorrectly stated 'just stop using the code' as the way he could resolve the dilemma. Students are reminded that answers should apply to the case study.

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

> *His ethical dilemma is that if he uses the software off the internet without permission, he could be in breach of the Copyright Act 1968, but by using the software it will make the development process of the software be much quicker (more efficiency). To resolve the ethical dilemma, George must consult the company's code of ethics and decision support framework to see what the best method to go about creating the software is, and to see what company policy says about using other people intellectual property.*

Question 7a.

Marks	0	1	2	3	Average
%	15	33	26	26	**1.6**

	CurrentTime	AlertReply	Action Observed
test 1	**10:58**	**NULL**	**drone continues to monitor hot spot**
test 2	**10:58**	**Monitor**	drone continues to monitor hot spot
test 3	**10:58**	**Patrol**	drone continues to monitor hot spot
test 4	**11:04**	**NULL**	drone continues to monitor hot spot

Similar types of questions have appeared in past examinations. In this question, students were required to provide the action observed in each test; many missed this and wrote about the change to variables or that the drone continues on its path.

Question 7b.

Marks	0	1	Average
%	56	44	**0.5**

Many students identified that the algorithm required both conditions (time expired and resume patrol) to be true, but only one needed to be true to resume the patrol.

The question asked students to identify the problem. It was not sufficient to only write the line of code containing the error without some explanation.

Question 7c.

Marks	0	1	Average
%	52	48	**0.5**

Many students were able to identify that the AND needed to change to an OR in the UNTIL statement.

The following is an example of a correct response.

UNTIL (CurrentTime > FinalTime) OR (AlertReply = Patrol)

Question 8

Marks	0	1	2	3	Average
%	63	23	9	6	**0.6**

The majority of students were not able to outline a concern such as 'George is not taking the skills or knowledge of the animal spotters into consideration' and instead wrote lengthy responses about elements of the user interface. Ideally, responses should have identified a concern (not seeking input from spotters), and discussed two methods for gaining input (before design) or feedback about the design from the spotters.

Question 9

Marks	0	1	2	3	4	5	Average
%	15	10	12	16	21	25	**2.9**

A complete algorithm is shown below. Other answers were also possible.

```
Get (or Read) UserName and Password
IF UserName =CorrectUserName AND Password = CorrectPassword then
        Load Monitoring Program
Else
        Display incorrect username/password message
ENDIF
```

Students were expected to use the information provided in the text of the question to develop an algorithm. Key elements of the algorithm included getting the inputs, correct logic within a selection control structure, control structure options (load and display) and appropriate indentation.

Question 10

Marks	0	1	2	3	Average
%	4	10	13	73	**2.6**

Test no.	Password	What is being tested?
1	<= 4 characters or digits. Eg: abcd,1234, ab12	message 'Password too short' displayed
2	>4 only alphanumeric Eg: Adgjl, 13579, ad123	a valid password is accepted
3	At least 5; with 4 or less valid and at least one invalid character Eg: asdf!	message 'Password contains invalid characters' displayed

A number of students missed the requirement for >4 (greater than four characters) and only provided four, while others missed the requirement that to test the last condition the test data had to be greater than four plus an invalid character.

Question 11a.

Marks	0	1	Average
%	86	14	**0.2**

The data in an array needs to be sorted on the username field.

Students are encouraged to make use of past examination reports as there has been a question on binary searching on the past two examinations. This may have assisted students in avoiding the common mistake of not identifying the data

field that needed to be sorted. Many students were aware that for a binary search to occur the data in an array needed to be sorted; however, very few indicated that it needed to be sorted on the username field.

Question 11b.

Marks	0	1	2	Average
%	62	9	29	**0.7**

The starting point of the search is the midpoint of the file. Half will be disregarded based on the midpoint being higher or lower than the search value. This is then repeated until the value was located.

Describing a binary search process was quite difficult for most students.

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

> *The binary search will compare the username in the middle of the file to username entered. If the entered username is greater then it compares it with the value in the middle of the usernames between the middle of the list and the end of the list. If the entered username is smaller than it will compare it with the username in the middle of the usernames from the start to the middle of the list. This is repeated until the middle value equals the entered username.*

Question 11c.

Marks	0	1	2	3	Average
%	37	14	26	23	**1.4**

To gain full marks students were required to describe how records are accessed when using a random access and a serial access file, and why random access files are more appropriate when doing a binary search.

Many students answered the first two parts of the question but many did not answer the 'why' part. Students are reminded that using the words 'more efficient' is not considered a justification. Students often find it difficult to clearly express the difference between random access and serial access.

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

> *Random access file allows access to any point in the file, meaning that it does not have to be read in the order it was written (usually indexed). Serial files only allow reading of the contents in the order it was written. Melanie wants to access the file of usernames/passwords for any random person, checking the input of a username and password hence a random access file will be more beneficial as it doesn't have to read in order every time (like a serial file).*

Question 12

Marks	0	1	2	Average
%	16	39	45	**1.3**

The use of a tablet was a better choice as the data being displayed was images with small detail; this was not appropriate on the small screen of a mobile phone.

Question 13a.

Marks	0	1	2	Average
%	9	17	74	**1.7**

This is an example of archiving, and many students were able to identify that this was characterised by removing the file from the original device.

Question 13b.

Marks	0	1	2	Average
%	22	22	55	**1.3**

Students were able to describe a backup method that used an additional storage medium, with many suggesting 'cloud' options.

Question 14

Marks	0	1	2	3	4	5	6	Average
%	29	13	27	19	6	3	3	**1.8**

This question was poorly answered by most students. Many gave generic security measures, and/or failed to explain the measure or provide details as to how the measure would prevent unauthorised access. Students needed to ensure that the measures they were explaining were appropriate to the device identified in the question (the drone).

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

Install a firewall between the tablet and router
- *A firewall controls which user can and cannot have access to certain ports.*
- *The firewall would only allow the park rangers access to the drones and would prevent unauthorised outside users.*

Ensure all path instructions are encrypted
- *Encryption changes the 'plain text' of the flight instructions into unreadable 'ciphertext'.*
- *This will ensure that the drones can only accept instructions from the official tablet devices and nothing else.*

Question 15

Marks	0	1	2	3	Average
%	8	27	56	9	**1.7**

As this question asked students to 'resolve this conflict' it was expected that they would write about decision support frameworks; however, most responses included details of training and/or documentation and were awarded some marks. As some resolution was required, it was important to include some evaluation/feedback mechanism from the park rangers, before, during and/or after training.