2012 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2012 Software Development GA 3: Written examination

GENERAL COMMENTS

The 2012 Information Technology: Software Development paper comprised three sections: Section A contained 20 multiple-choice questions (worth a total of 20 marks), Section B comprised five 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* while reading this report and while preparing for the 2013 examination.

The multiple-choice questions were well done by many students. Areas of weakness tended to be the theoretical components of the study, such as control structures, design characteristics and the purpose of a software requirements specification (SRS). Throughout the year, it may be useful for students to practise answering questions based on these areas.

In general, Section B required students to demonstrate sound theoretical knowledge and to provide detailed and accurate responses. In 2012, this section contained two questions that asked students to apply their knowledge of pseudocode algorithms. The study design specifies pseudocode as the only algorithmic representation to be used as a method of expressing software designs. Many students appeared to welcome the challenge to demonstrate their skills in this area.

The format of Section C was consistent with that of previous years and student responses were expected to refer to the case study. The key weakness of many responses in this section was the lack of depth and detail provided by students.

During the examination, students should

- endeavour to 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’ or ‘describe’
- reread 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 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

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.

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	34	58	4	4	It is very important that students thoroughly understand the problem-solving methodology (PSM). Use case diagrams are part of Area of Study 1, Unit 3, which focuses exclusively on the analysis stage of the PSM.
2	83	3	8	6	
3	78	1	11	10	
4	4	3	33	60	
5	4	81	2	13	
6	14	58	7	21	
7	5	3	3	89	
8	16	6	75	3	
9	5	70	15	9	
10	2	9	3	86	

Question	% A	% B	% C	% D	Comments
11	8	39	9	44	A sequence structure (alternative B) was incorrect because a sequence structure is a series of unconnected steps. This was clearly a set of steps to select a value (i.e. alternative D).
12	61	7	29	2	
13	49	4	10	37	
14	3	12	80	6	
15	3	2	61	34	Alternatives A and B were not viable options because the weight of a mobile phone would not affect the programmer's coding. Memory size and screen resolution are both important considerations when designing games (images and clarity), but it is the operating system (option D) rather than the processor speed (option C) that will most affect the functioning of a games program on a mobile phone. Incompatible operating systems would render a program inoperable, whereas processor speed is likely to allow the program to run but at a lower speed.
16	58	11	10	22	
17	66	27	3	4	
18	2	73	2	23	
19	61	4	23	12	
20	6	2	87	5	

Section B – Short-answer questions

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.

Question 1

Students are expected to know the functions, technical underpinnings and sources of worms, trojans and spyware. This question provided students with an opportunity to display their knowledge. Even though parts a. and b. were worth only one mark each, many students were unable to show sufficient detail or depth of knowledge to gain full marks. Students needed to ensure that they responded to the keyword in the question, which was to state the 'feature' of the malware listed.

Question 1a.

Marks	0	1	Average
%	45	55	**0.6**

Acceptable responses included a reference to a worm being self-replicating (i.e. creating a copy without the need for human intervention).

For example:

It must replicate itself and spread over a network without user intervention.

Question 1b.

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

Students should have commented on data being 'unknowingly' collected.

For example:

To be spyware, the malware must take data from a computer/device/network without knowledge of the owner and transmit it back to its creator.

Question 1c.

Marks	0	1	2	Average
%	34	30	36	**1**

Some students struggled to provide a clear, detailed response to this question. Malware can be considered both a worm and spyware if it moves around a network with the self-replicating features of a worm and performs the actions of spyware, collecting user data unknowingly.

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

> *To be both a worm and spyware, a malware program must have the ability to access and record personal information, but also hold the ability to self-replicate in order to spread.*

Question 2a.

Marks	0	1	Average
%	14	86	**0.9**

The majority of students were able to identify that the development stage was the appropriate stage of the problem-solving methodology at which to undertake program coding.

Question 2bi–ii.

Marks	0	1	2	3	4	Average
%	24	10	23	24	19	**2.1**

Question 2bi.

Students were asked to identify two features of a naming convention. Many confused this with stating a naming convention, such as Hungarian notation or camel case. There was a range of acceptable features that students could have identified, including capitalisation, underscores and abbreviated start of the variable for object type.

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

> *The first three letters of an element name should denote what type of element it is. For example for a button the name would begin with 'btn'. The remainder of the name should describe the elements function, with each word beginning with a capital. For example, 'btnPrintReceipt'.*

Question 2bii.

Students needed to explain how a naming convention could help both development and maintenance of a solution to gain full marks. They could have mentioned the following features: consistency, simplicity, sets standards for all variables, easy to read, easier to understand code, etc. Students are advised to avoid using the words 'efficiency' and 'effectiveness' without any qualifying statements (for example, 'it makes it more efficient'), as responses such as this often result in low or no marks.

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

> *During development, the meaningful variable names easily identify what the variable is and makes it easier to understand the code of the program. During maintenance, meaningful variable names with capitalised letters make the program much more clear and readable and makes the process of finding errors and modifying code easier.*

Question 3

Marks	0	1	2	Average
%	52	23	25	**0.8**

Appropriate responses included 'when creating a prototype' or 'when creating a program that is used infrequently'. A number of students thought the correct response was to say this should never happen. However, the question specifically asked when this could occur.

The following are examples of a high-scoring response.

> *This may be the case when the needed program is simple and won't have any long term application. If the program is simple in design then its developers should not have to spend large amount of time creating the solution which reduces the cost of the programmers wages. As long as the program doesn't have a long useful life and the scope of the program isn't very large.*

This may be the case if it is only going to be used once, and does not require future maintenance or alterations and if only the sole programmer is making it, so no others need to read the code.

This may be the case when making an example program to show functionality, that is not part of the solution code. As the code will be written quickly and discarded afterwards, it does not need to be written well as it will not be used in the real solution, only as an example or demonstration.

Question 4

Marks	0	1	2	3	Average
%	60	2	3	35	**1.2**

In the 2012 examination, students were expected to write pseudocode for the first time. While it is pleasing to note that 35 per cent of students scored full marks, it is disappointing to note that 60 per cent scored zero.

The following are the expected three lines of the algorithm. 'Temp' could have been replaced with any variable name other than width or length.

Temp ← Length Length ← Width Width ← Temp	Temp ← Width Width ← Length Length ← Temp

Question 5

Marks	0	1	2	3	4	5	6	Average
%	9	10	12	12	15	18	24	**3.7**

Students were given a procedure as a set of written statements with the expectation that they develop the algorithm using pseudocode. Most students attempted this question. Students often confused a selection control structure (IF) with an iteration control structure (WHILE/REPEAT). Also, many did not know the difference between assigning a value to a variable (←) and setting a variable to equal a value (=).

The following are two possible algorithms.

Begin
A←1
B←2
Repeat
A ← A * 2
B←B + 1
Until A>=B
End
	Begin
	A←1
	B←2
	While A<B
	A ← A * 2
	B←B + 1
	EndWhile
	End

Section C – Case study

Question 1

This question asked students to analyse the case study and identify solution requirements – both functional (what it is required) and non-functional (the solution attributes, such as user-friendliness, response rates, robustness, portability, reliability and maintainability). Many students were unable to write solution requirements, and confused functional and non-functional requirements.

Throughout the year, clear and concise solution requirements should be modelled (using dot points, numbered lists, tables, etc.), where appropriate, in design briefs and SRS. In addition, students should practise identifying and writing appropriate solution requirements from provided stimulus material.

Question 1a.

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

Even though a range of responses was accepted, one of the most important non-functional requirements is 'ease of use'.

Question 1b.

Marks	0	1	2	Average
%	36	19	45	**0.5**

This question asked students to identify what AQADAS is required to do and should be able to do. There was a range of functional requirements that students could have identified, including 'facilitate entry of symptoms', 'obtain air quality measurements', 'obtain location and time' and 'keep data for up to 24 hours'.

Question 1c.

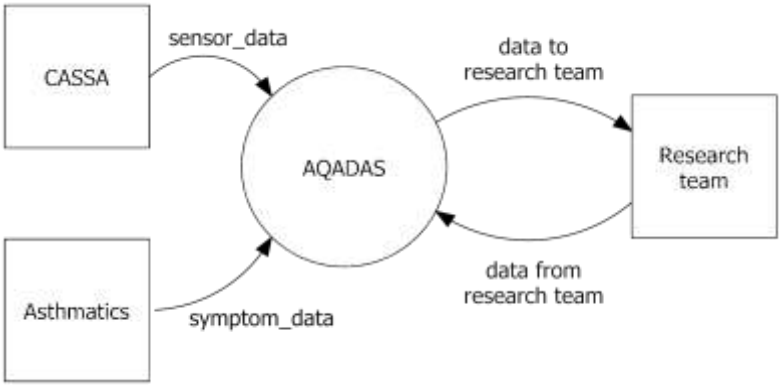
Marks	0	1	Average
%	49	51	**0.5**

Even though obtaining air quality measurements may be a functional requirement, it is not something that a mobile phone can do without additional hardware/software.

Question 2

Marks	0	1	2	3	Average
%	56	5	19	20	**1.1**

Many students were not able to complete the context diagram provided. Students should have carefully read the case study stimulus material that was provided in the insert since it contained a data flow diagram (DFD) that would have assisted them with completing the diagram. A significant number of students identified the 'mobile phone' as an external entity, when in fact it should have been 'asthmatics'; they provide the data. The mobile phone is the collection device and thus not included on a DFD.

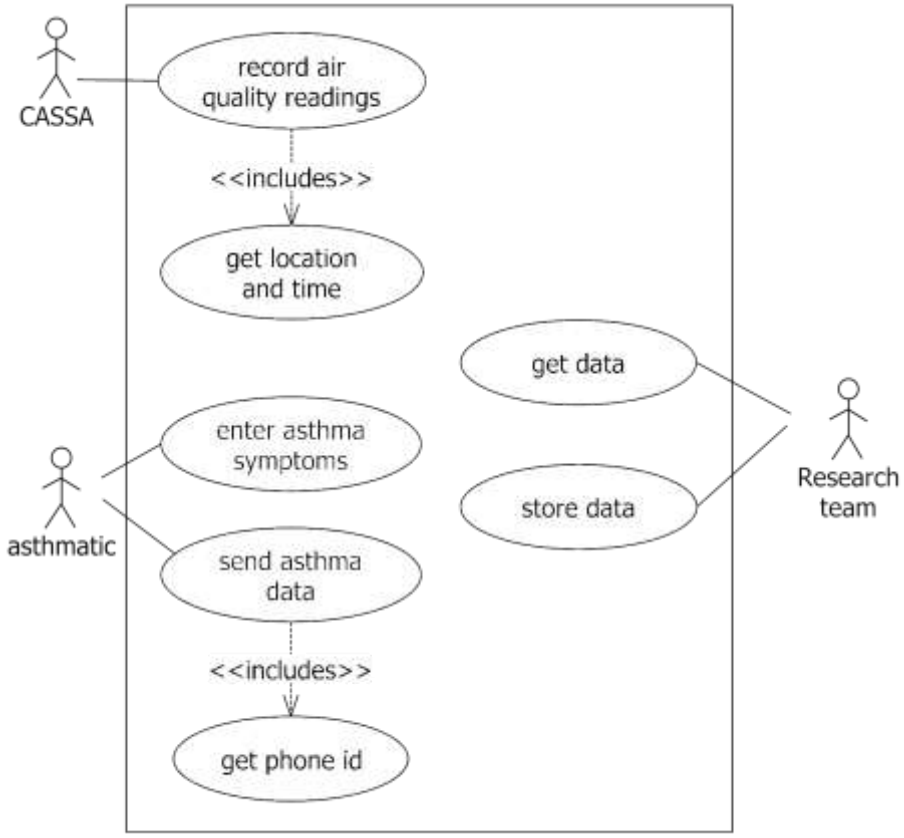


Question 3a.–b.

Marks	0	1	2	3	Average
%	40	21	18	21	**1.2**

Students had difficulty identifying the correct use cases (set of tasks that the system must carry out), with many identifying the mobile phone as the actor (role) rather than the asthmatics.

The use of exemplar DFDs and use case diagrams throughout the year is encouraged. In addition, students may find value in practising the construction of DFDs and use case diagrams from the stimulus material.



Question 4

Marks	0	1	Average
%	94	6	**0.1**

Few students were able to identify the correct processes from the DFD. These were

- 1. standardise measurements
- 2. append location and time
- 3. collate asthma episode data
- 4. validate symptom data.

This information was taken directly from the DFD in the case study insert. Students could have written the numbers 1, 2, 3 and 4 or written out each process in full as above. The order was not important.

If students listed all five processes, they received no marks as they did not understand that the question related only to the processes involved in the software solution used on the mobile phone.

Question 5a.

Marks	0	1	2	Average
%	29	35	36	**1.1**

This question, needing a technical description, was well answered by many students. However, it is disappointing that many students do not score any marks for this type of question. It is important that students are able to provide technically accurate descriptions. The development of a glossary of technical terms throughout the year may assist students with these terms. Answers should have referred to a VPN being a private network that uses public infrastructure and that access was gained through authentication security protocols.

Question 5b.

Marks	0	1	2	Average
%	34	30	36	1

Students were required to agree or disagree with the recommendation to set up a VPN. They also needed to ensure that reasons were provided, applicable to the case study, to justify their contention.

An example of an acceptable answer for supporting a VPN is the increased security will better protect the privacy of asthmatics. An acceptable answer for opposing a VPN is the additional cost to the research project of setting up authorisations.

Question 6

Marks	0	1	2	3	4	Average
%	13	18	36	15	17	2.1

This question contained two parts: discussing the concerns and then describing what could be done to deal with the concerns. Many students overlooked the second part of the question.

Responses could have included the *Privacy Act* or the *Health Records Act* and anything within these to do with privacy, security, access, collection or dissemination. Copyright of coding was also appropriate.

The following are extracts from high-scoring responses.

> *Ilma needs to make sure that the data she collects through the use of her design is only collected once the users are made aware of what their data will be used for and what they will be collecting and then agree to these terms and conditions. She can assure this by asking permission of the user before collecting the data.*

> *To obey the Privacy Acts, the medical data sent by the asthmatics must be protected and secure. This can be achieved by encrypting the data when transferring it, and making sure the file storage is protected, both physically and logically, e.g. locks and guards at the university, and a firewall along with antivirus, anti spyware and passwords on accounts that can access the data.*

Question 7

Marks	0	1	2	3	Average
%	64	2	16	18	0.9

Even though there is considerable information provided in the case study insert, students need to ensure that they carefully read any of the additional information provided within each question. This additional information is often used to prepare or guide the student when analysing the situation and may help them narrow their possible responses.

Students should have knowledge of the following data structures: one- and two-dimensional arrays, records and files, stacks and queues. In this question, information was provided about what data would be stored, when it would be stored, for how long it would be stored and in what order it would be deleted (oldest deleted first). This information was to be used to select a suitable data structure (from the above list). Many students had difficulty identifying a data structure and used programming terms that were not data structures. Students should have identified a queue as the appropriate data structure, described it as 'first in first out' and explained that a stack, being 'last in first out', was not appropriate in this situation (as the first data in was what should be removed).

Question 8a.

Marks	0	1	Average
%	50	50	0.5

The screen size and input/output methods were the most common and appropriate technical considerations that affected the design of the user interface.

Question 8b.

Marks	0	1	2	Average
%	7	20	73	**1.7**

Some accepted advantages of the designs include the speed of Design 1, as the user just touches options that are already displayed on the screen, and the compactness of Design 2 means it is less likely that the user would have to scroll or swipe through the screen to get to all data entry points.

Most students were able to provide an advantage of each design. Responses such as 'Design 1 is more efficient' or 'Design 2 is quicker and easier' received no marks. Details were required as to why one was more efficient, why one was more effective, etc.

Question 8c.

Marks	0	1	2	Average
%	11	28	61	**1.5**

Students should have provided a response that examined the two options and included a reasoned explanation of their choice. Either design could have been selected.

Question 9

Marks	0	1	2	3	4	Average
%	6	7	18	38	30	**2.8**

Data	Use	Data type	Reason
surname	*to store the surname of the asthmatic*	*string*	*a simple list of characters is required*
postcode	to store the postcode of the asthmatic	integer or string	postcodes are whole numbers or postcodes do not need to be used in calculations
gender	the gender of the asthmatic stored as M or F	character	only a single letter is required
adult	Is the asthmatic over 18? True or false?	Boolean	requires only a yes or no value (string or character not the most appropriate)
mobile	to store the mobile number of the asthmatic in the form +61(0)499999999	string	contains characters other than numbers

The majority of students handled this question well. Students had to correctly state the data type and the reason for each listed data to score one mark.

Question 10a.–b.

Marks	0	1	2	3	4	5	Average
%	12	10	24	24	22	8	**2.6**

Question 10a.

This is another example where the stem of the question contained valuable information that assisted with answering the question. The function 'check postcode' validation had already occurred to ensure that a four-digit number was entered. The function performed a range check and required the boundary conditions to be tested.

Postcode value	Reason
2999	a number below the lowest limit is needed to test the lower limit from below
3000	tests the exact cut-off
3999	tests an exact cut-off and also tests above the minimum
4000	a number above the highest limit is needed to test that the cut-off number works

Question 10b.

An additional validation is recommended, which checks if the postcode is a valid Victorian postcode. Students were asked to state how this would best be described. The question did not ask for the name of the validation technique that

was suggested. One way of describing this test would be, 'it checks if the postcode is contained in the list of valid Victorian postcodes'. A range of other responses was accepted.

Question 11a.

Marks	0	1	Average
%	62	38	**0.4**

Students were required to consider a presented algorithm, check its logic and identify the error. To support students, working space was provided so that they could draw up a draft table to desk-check the algorithm if required. It was encouraging to see that many students utilised this space.

	NumAsthmatics	NumMales	NumFemales
Values displayed at the end of the procedure	3	1	1

Question 11b.

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

To get the one mark for this question, students needed to provide a response similar to: 'The value displayed for the number of females is wrong. The number of females is one fewer than it should be. The expected values should be Asthmatics = 3, Males = 1 and Females = 2.

Question 11c.

Marks	0	1	2	Average
%	54	10	36	**0.8**

The line of pseudocode statement(s) that needed correction/editing was

NumAsthmatics←NumAsthmatics + 1
or
NumFemales←NumAsthmatics – NumMales

An appropriate explanation related to the line of code could have been as follows.

Move NumAsthmatics←NumAsthmatics + 1 to immediately after the **end if** or after the **Read**.
or
Move the line NumFemales←NumAsthmatics – NumMales to immediately before or after the **Until**.

E.g.

NumFemales←NumAsthmatics – NumMales
Until End of File
or
Until End of File
NumFemales←NumAsthmatics – NumMales

Students needed to suggest one of the ways that worked. There were other appropriate suggestions. However, the key to correcting the algorithm was to ensure that the number of females is calculated after the total number of asthmatics is increased.

Question 12

Marks	0	1	2	3	4	Average
%	33	20	27	13	6	**1.4**

Random access versus serial access has appeared in a number of examinations over the last few years. However, students still found it difficult to express their response in a detailed and clear manner. An appropriate response would have included comments about ease of reading and/or writing random access files, would have compared these to serial access and would have indicated why random access was appropriate in this scenario.

For example: A sequential file would require the whole file to be read each time and then, after making the alterations, the whole file would have to be rewritten. With a random access file, you can read just the record that you require and rewrite just this record. In this case, you have the asthmatics code, which could be used to identify the record in a random file, so access is no problem. You are doing this only infrequently, so you do not want to have to read the whole file, just the record that you are interested in. Hence, random access would be much faster.

Question 13

Marks	0	1	2	Average
%	85	5	10	**0.3**

In this question, students needed to indicate that a linear search (Anton's suggestion) was more appropriate and justify it by explaining why a binary search would not work in this situation. The question required students to have in-depth knowledge of the binary search technique. In the AsthmaticsFile, the records are not ordered according to the asthmatic's name, so a binary search will not work as it requires the records to be ordered in the field you are searching and the researchers plan to find records by using the asthmatic's name.

Question 14a.–b.

Marks	0	1	2	3	4	Average
%	51	30	13	5	1	**0.8**

Question 14a.

Many students read this question as an evaluation question when, in fact, it covered acceptance testing, which occurs in the last part of any development prior to implementation. Typically, the key personnel in acceptance testing is the client – meaning Dr Fischer or the research team.

Question 14b.

When describing a technique, students should indicate who the stakeholders are, what data will be collected, the method of collection (survey, observation, etc.) and how this will be used to check against criteria/requirements. There were many possible responses. The table below shows some examples.

Criteria	Technique
Are the requirements in the SRS for the mobile being met?	Research team enter test data into the solution and check output/requirements against SRS
Is the output from the mobile phone in the correct format?	Research team crosscheck output against manual calculations to ensure format is correct
Is the mobile phone software solution easy to use?	Research team run a number of simulations of data entry in a range of circumstances (darkness, in the car, etc.) and complete a checklist about ease of use under each circumstance

Generally, students performed poorly on this question as it required them to apply their knowledge of acceptance testing and techniques to the case study.

Question 15a.

Marks	0	1	2	Average
%	11	32	57	**1.5**

Question 15b.

Marks	0	1	2	Average
%	8	24	67	**1.6**

Question 15c.

Marks	0	1	2	Average
%	31	22	47	**1.2**

Most students were able to provide appropriate examples of the advantages of a printed manual, including that it is simple and easy to use, can be used without knowledge of the phone and can be used when there is no power for the

phone, and the advantages of an electronic guide, including that it is always available, easily updated and it is easier to search for information that you need, plus cheaper.

Students were also able to provide a range of alternatives, including a website, context-sensitive help and quick start guide.

Question 16

Marks	0	1	2	3	4	Average
%	18	15	36	23	8	**1.9**

Many students found it difficult to develop a training strategy. A strategy is a method by which an activity is carried out. This would include a set of steps/procedures covering what will be done, when it will happen, who does it, etc.

In their training strategy, students should have included the following

- a timeline of activities (when training will occur)
- the method of training e.g. online, trainer, website, class, etc.
- the method of evaluating the training e.g. short test, quiz, demonstration, etc.
- justification (of appropriate method) e.g. access across Victoria, cannot have 1500 in one place at one time, etc.