2024 VCE Applied Computing: Software Development external assessment report

General comments

The 2024 VCE Applied Computing: Software Development examination comprised three sections: Section A contained 20 multiple-choice questions, Section B had six short-answer questions and Section C was a case study with 19 questions. Section A was answered quite well by most students. In Sections B and C, some students did not demonstrate their theoretical knowledge or use subject-specific terminology correctly. In these sections, the key weakness in many responses was a lack of detail and depth of understanding.

Students are encouraged to consider the question command term (for example, ‘describe’, ‘explain’, ‘outline’), the number of marks and the number of lines provided as guides to the detail and depth of the required response.

In Section C, some students were unable to apply their knowledge to the case study.

During the examination, students should have:

* used appropriate conventions when writing pseudocode
* endeavoured to use correct technical terminology from the study design
* discussed all options when asked to justify a choice or compare one option with another
* responded to key command 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

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 of more or less than 100 per cent.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. Grey shading indicates the correct response.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Question | Correct answer | % A  | % B  | % C  | % D  | Comments |
| 1 | D | 3 | 4 | 2 | **91** |  |
| 2 | C | 4 | 4 | **47** | 45 | As per the study design, testing of a solution takes place in the development stage of the problem-solving methodology. |
| 3 | C | 16 | 12 | **64** | 7 |  |
| 4 | D | 18 | 6 | 11 | **65** |  |
| 5 | A | **38** | 16 | 36 | 11 | Solution scope describes the boundaries or parameters of the solution and identifies what will be and/or what will not be addressed by the solution. Portability (the operating systems that a solution will run on) is a non-functional requirement. |
| 6 | C | 7 | 30 | **58** | 5 |  |
| 7 | A | **91** | 2 | 4 | 3 |  |
| 8 | D | 7 | 3 | 3 | **87** |  |
| 9 | B | 6 | **68** | 6 | 20 |  |
| 10 | A | **61** | 3 | 20 | 16 |  |
| 11 | B | 9 | **76** | 6 | 9 |  |
| 12 | C | 10 | 18 | **70** | 2 |  |
| 13 | B | 17 | **61** | 17 | 5 |  |
| 14 | D | 7 | 11 | 8 | **73** |  |
| 15 | D | 1 | 1 | 2 | **95** |  |
| 16 | C | 7 | 15 | **70** | 8 |  |
| 17 | D | 1 | 1 | 1 | **96** |  |
| 18 | A | **55** | 19 | 16 | 9 |  |
| 19 | B | 20 | **64** | 9 | 6 |  |
| 20 | B | 2 | **42** | 5 | 50 | Due to the nested conditional statements applying additional discount, the correct answer is B. |

Section B – Short-answer questions

Question 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 1 | 1 | 5 | 93 | 2.9 |

|  |  |  |
| --- | --- | --- |
| Variable | Data type | Description  |
| Var 1 | string | last name of student |
| Var 2 | integer | number of family members attending |
| Var 3 | Boolean | Paid – Yes or No |

Some students incorrectly chose string for Var 2 and Var 3, which was not appropriate, as Var 2 was a whole number and Var 3 was Yes/No.

Questions 2a. and 2b.

Question 2a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 33 | 67 | 0.7 |

Question 2b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 47 | 53 | 0.6 |

Most marks were awarded for the following advantages:

* updating security and fixing identified vulnerabilities
* fixing bugs in existing code
* updates to functionality.

Marks were also awarded for:

* fixing known bugs with security features
* improving the performance
* updates to third-party security frameworks/libraries/software.

Some students wrote two advantages that were synonymous and therefore were not awarded a second mark. Students were not awarded marks for generic statements such as ‘making the customer feel good’ or ‘increase customer trust’.

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

Advantage 1: Provides for security updates if the program has a vulnerability that needs to be addressed.

Advantage 2: Finds bugs and errors in the code that are later discovered.

Question 3a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 29 | 71 | 0.7 |

Students were awarded a mark for identifying a Gantt chart. Students were not awarded marks for project plan, log books, milestones, dependencies or critical path.

Question 3b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 26 | 38 | 29 | 7 | 1.2 |

Students were awarded marks for:

* stating that recording the progress of a project identifies tasks on the critical path
* stating that delays to tasks on the critical path will delay the whole project
* a question-specific statement about allocating additional resources to either the design of the user interface or to the payment function so that the project can be completed on time.

Most students wrote generic statements about recording the progress of a project on a Gantt chart. Some responded that delays could be avoided by using a Gantt chart to monitor the critical path of a project. Few responses contained statements about reallocating resources specific to the scenario outlined in the question.

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

All tasks that are on a projects critical path by definition cannot be delayed without also delaying the completion of the project. Therefore, it is important to make sure that these delays do not occur. A way that the company could have done this would have been to record and monitor the progress of every task, especially those on the critical path. This way they could have predicted the delay when developing the user interface and reacted accordingly.

Question 4

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | 4 | Average |
| % | 13 | 6 | 20 | 0.4 | 61 | 2.9 |

Some students confused goals and objectives.

|  |  |  |
| --- | --- | --- |
|  | Organisation | Information system |
| Goal | 2 | 3 |
| Objective | 4 | 1 |

Question 5a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 27 | 73 | 0.8 |

Most students were awarded marks for stating the ability to zoom in to a distance of 1 metre on any region of the world.

Some students incorrectly referenced load time or image quality.

Question 5b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 69 | 16 | 15 | 0.5 |

Students were expected to select Magnification tool 1 and state that the use of the magnifying glass icon in Magnification tool 1 had better affordance than the textbox in Magnification tool 2 because the icon is a universally accepted symbol for zooming in, which makes it easier for users to interact without needing additional instructions. Only a few students specifically referred to the magnifying glass when answering this question.

Students who selected Magnification tool 2 were not awarded marks.

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

Magnification tool: 1

Reason: Using a magnifying glass allows the user to quickly identify its purpose. It is intuitive and is something that users should be very familiar with as it is a common method of zooming, making the user experience better.

Question 6a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 60 | 40 | 0.4 |

Students were awarded marks for describing cross-site scripting as the running of malicious script or third-party code by inserting it into a web app.

Question 6b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 70 | 30 | 0.3 |

Students were awarded marks for suggesting that cross-site scripting can be protected against through the validation or sanitising of user input and the rejection of inputs containing tags, characters or symbols. Other suggestions such as the updating of code libraries relating to security were also accepted.

Question 6c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 73 | 13 | 14 | 0.4 |

Students were awarded a mark for linking their response to either of the data integrity characteristics of authenticity or correctness (responses linking to other data integrity characteristics were not awarded marks).

A mark was also awarded for the impact of cross-site scripting on the owner of the website in the context of the identified data integrity characteristic.

For example:

* Cross-site scripting diminishes the authenticity of the owner of the website, as users lack confidence in who is actually authoring the material on the website.
* Cross-site scripting diminishes the correctness of the data on the website and financial losses are incurred by the owner.

Many students wrote generally about how the data would be modified and how the business’s reputation would suffer, without mentioning data integrity in their response. Some students incorrectly identified data integrity characteristics such as accuracy. Other students incorrectly referred to reliability as a characteristic of data integrity.

The following are examples of high-scoring responses:

Example 1

XSS may compromise the correctness of user data should it be manipulated via a script, this causes confusion and diminishes trust of the website and its owner, leading to less visitors.

Example 2

Because cross-site scripting can be used to hijack another user’s account, data entered by the hijacked account loses it’s authenticity, as it is not entered by the actual user. If this is revealed, it may lead to a loss of reputation on the owner.

Section C – Case study

Question 1a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 79 | 21 | 0.2 |

A few students were awarded a mark for referring to reliability as a non-functional requirement in the context of either uptime or failure rate from the perspective of a programmer. Very few students referred to the non-functional requirement mentioned in the case study, that the app must work 99.9% of the time.

Many students incorrectly wrote general statements about whether functional requirements had been met.

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

Reliability is important because customers need to be able to access their data through the application with no restraints such as downtime.

Question 1b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 52 | 48 | 0.5 |

Some students were awarded marks for identifying that the numbers of failures are a quantifiable measure of uptime and how well the app is working. Few students referred to the measurable value of 0.1% from the case study. Some students correctly stated that the more errors the app has, the less reliable it is.

Some incorrectly made statements about error in the context of fixing bugs within the app.

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

Because analysing the number of failures could identify the frequency of reliability issues, and further calculate the uptime of the solution, hence assisting the evolution of reliability.

Question 1c.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 90 | 10 | 0.1 |

Only a few students were awarded a mark for stating that the evaluation of the app should be held between three and six months after the implementation. Some students incorrectly stated that evaluation should be conducted in the testing, development or evaluation stage of the problem-solving methodology. Some also incorrectly wrote about usability testing as a method of evaluation.

Question 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 9 | 8 | 83 | 1.8 |

Most students were awarded marks for this question. Some students incorrectly classified the constraints as functional or non-functional requirements.

|  |  |
| --- | --- |
| Classification | Constraint |
| Usability | The rewards application will need to be easy to use for staff. |
| Technical | The rewards application will need to run on existing equipment. |

Questions 3a. and 3b.

Question 3a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 14 | 26 | 16 | 45 | 1.9 |

Question 3b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 69 | 31 | 0.3 |



Most students were awarded a mark for labelling the actor as the Customer. Some students incorrectly labelled the actor as the User.

Some students were awarded a mark for identifying that Login includes Check password and that Display login error message extends Login. Some students mixed these up and were not awarded marks.

Some students correctly drew an association between the Customer actor and the Use points use case. Some incorrectly associated the use case with the Staff actor or connected it. A number of students also left the association blank and did not answer Question 3b.

Question 4a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 52 | 30 | 18 | 0.7 |

Students were awarded a mark for writing Staff or Staff member at answer line i. As per the question, it is the staff member who must make sure there are enough points available. Some students incorrectly wrote Customer. In addition, as per the question, it is the points balance that is displayed (at answer line ii). In order to do this, it must be sent from the Customer Datastore to Check points balance.



Question 4b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 55 | 24 | 20 | 0.7 |

This question was not answered well. Although some students were able to correctly state that the diagram was a level 1 data flow diagram, few were able to correctly reason why by writing that the diagram contained a data store or that the process is written as a verb.

Question 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 39 | 26 | 24 | 11 | 1.1 |

Some students were awarded marks for justifying the use of a record by stating that it allows for fields of multiple data types (as required by the data dictionary in the case study). Marks were also awarded for stating that one-dimensional arrays would be inappropriate because they store single data types and that associative arrays were inappropriate because they store key:pair values. Many students did not articulate how the different data structures handle varying data types. Some also stated that associative arrays can only store one data type, which was not enough information required for the associative array. Students are reminded that any question asking for justification not only requires them to state why an option is appropriate, but also requires a comparison of why other options are inappropriate.

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

Record can hold multiple data types which is required as shown in data dictionary with customer ID being integer and customer name being string etc. Whereas, a one dimensional array can only hold one data type, not suitable. Associative array uses key value pairs to identify data which there is no pairs or association with this, thus not appropriate.

Question 6

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 42 | 25 | 23 | 10 | 1.0 |

Students were awarded marks for choosing a linear search with the justification that customer records are sorted by Customer ID (as per the case study) and not Phone Number (as per the question). Additional marks were awarded for explaining that a linear search starts at one end of the list and checks each element in turn, and for justifying why a binary search is not going to work because it would have required customer records to be sorted by Phone Number. Students were not awarded marks for choosing a binary search. Many students incorrectly stated that it was not possible to sort records by a string such as a phone number.

The following are examples of high-scoring responses:

Example 1

A linear search. Even though the data will be sorted based on an incremental Customer ID, the phone numbers will not be in a numerically sorted manner. A binary search relies on a sorted list because if it was run on an unsorted list, the desired value could get discarded on an iteration. Linear is better as it goes through each record one-by-one to see if there is a match to the desired value, meaning in an unsorted field, all the records will still be searched.

Example 2

A linear search would be more appropriate.

This is because a binary search requires the data to be sorted. Because the customer record is sorted by the CustomerID and not the phone number, a binary search could not work, based on phone numbers.

Linear search does not need the phone numbers to be sorted.

Question 7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 22 | 45 | 33 | 1.1 |

Marks were awarded for the following reasons why Taylor’s suggestion might be better than Vanja’s:

* a statement about preserving historical sales data for the cafés
* a statement about the ability to restore a user’s account in the future
* changing the password is easier to code than deleting data
* the customer may request a copy of their information at some point in the future
* changing the password will prevent the user from creating another account with the same ID.

Some students provided a second suggestion that was the same as the first suggestion but rephrased and were therefore not awarded a second mark. Some also incorrectly wrote two disadvantages of Vanja’s suggestion or reasons why Vanja’s suggestion was better than Taylor’s and were not awarded marks.

The following are examples of high-scoring responses:

Example 1

Taylor’s solution may be better as access may need to be returned back to the customer. Another reason it may be better is that customer data may be used for analytical purposes in the business.

Example 2

Changing passwords will be a more efficient option as there are less steps required to execute this action compared to deleting all customer information. Furthermore, changing password could ensure that this customer’s data could be recovered in case the cancellation was reverted or executed by accident.

Question 8a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 54 | 46 | 0.5 |

Marks were awarded for a measurable criterion relating to accessibility, such as ‘Icons are used to effectively identify the function of a button’. Marks were also awarded for a criterion relating to different types of accessibility, for example, visual accessibility. Many students incorrectly wrote about non-functional requirements or criteria not relating to accessibility. Others wrote general and unmeasurable statements, which were not awarded marks.

Question 8b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 1 | 99 | 1.0 |

Design A. Marks were not awarded for choosing Design B.

Question 8c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 12 | 43 | 45 | 1.4 |

Marks were awarded for a statement justifying Design A in relation to two of the criteria (either the two provided or in reference to the criterion that the student wrote about in Question 8a). To obtain full marks for this question, a statement also had to be made about Design B not meeting any of the criteria and not being suitable as a result.

Many students were unable to construct a justification utilising at least two criteria or referred to a criterion that was not in the question or defined in Question 8a. There were also some students who simply stated that Design A met all criteria without referencing aspects or elements of either design. As part of their justification, many students provided reasons that did not relate to the evaluation criteria.

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

Design A uses conventional icons to display the functionality of the solution design, whilst also showing help info when the button is clicked. It also has very clean and interpretable font. Design B uses no visual display of functionality, uses barely legible text font and shows information and options when they are not needed.

Question 9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 46 | 39 | 15 | 0.7 |

Marks were awarded for the following advantages of CSV:

* Its smaller file size leads to faster transmission of data.
* CSV is easier to set up and program.
* Transaction and customer data are being used internally within a single system with one structure.

Marks were awarded for the following advantages of XML:

* It is extensible and therefore can accommodate structural changes to meet changing requirements.
* It is easier for humans and computers to read XML.
* XML can accommodate commas and line breaks.

Students were awarded marks for stating that an advantage of CSV is its file size and an advantage of XML is that it can be read more easily by humans. Few students wrote responses that referenced the retrieval or updating of a customer’s point balance. Many students incorrectly stated the same benefit for both CSV and XML.

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

CSV: CSV files are much more simplistic to create, thus could prove to have a more efficient development process when dealing with simplistic sets of data, such as only retrieving points.

XML: XML files are much more interoperatable between systems, thus when transmitting client info/records – which would include points balance – to any Café SD store XML trumps CSV

Question 10

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 26 | 26 | 35 | 13 | 1.4 |

Students were awarded marks for choosing the agile model because it is useful in projects where the requirements are not clearly defined or are subject to change. Because the question asked students to justify, marks were awarded for a comparison with the waterfall model and for stating that its use would be inappropriate, as it is suitable for projects where the requirements are clearly defined. Marks were also awarded for referencing the case study and stating that since Café SD wanted to change the functional requirements, SoDeBiz should persist with the agile model.

Many students, while giving reasons for choosing the agile model, did not justify by making a comparison with the waterfall model and were not awarded full marks. Many also did not reference the case study and as a result were not awarded full marks.

Students are reminded that any question asking for justification requires an explanation not only for why the chosen option is suitable, but also for why the alternate option is not suitable.

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

SoDeBiz should persist with the agile development model.

The waterfall development model follows a liner structure with a sequential approach to the development which has been agreed before the solution begins. There is no room for changes to the plan.

The agile development model runs in sprints, with continuous communication between developer & client; with possible changes being made throughout the project.

As Café SD continuously change what they want in their rewards application, the agile development model should be followed.

Question 11

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 74 | 7 | 19 | 0.5 |

Marks were awarded for identifying either authenticity or timeliness as characteristics of data integrity, followed by a statement linking the case study to the characteristic. Responses identifying authenticity referred to a code that is forwarded or shared with other users not being from an authentic source. Responses identifying timeliness generally referred to a code being out of date once it is used.

Responses identifying data characteristics other than authenticity or timeliness were not awarded marks. Some students made up data characteristics such as consistency.

The following are examples of high-scoring responses:

Example 1

Characteristic: Timeliness

Description: As the code is set to expire after use, if it could be used more than once, this implies the code is still being used while outdated, hence impacting timeliness.

Example 2

Characteristic: Authenticity

Description: If discounts can be reused, then a customer who hasn’t earned enough points could use the code to illegitimately receive free items, meaning it is impossible to determine if the code is being used by its authentic owner.

Question 12a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 20 | 13 | 67 | 1.5 |

As stated in the question, the value for the purchase amount is 5000. As the purchase amount is the boundary of the condition and account.Points\_balance = 4000 (below the boundary) has already been tested, students were expected to test account.Points\_balance = 5000 (the boundary) and a value for account.Points\_balance greater than 5000. Students were expected to identify that the expected and actual result of a value above 5000 would result in True and that if the value of account.Points\_balance was equal to 5000, the expected result was True, but the actual result was False.

|  |  |  |
| --- | --- | --- |
| **Test** | **Expected result** | **Actual result** |
| account.Points\_balance = 4000 | False | False |
| account.Points\_balance = 5000 | True | False |
| account.Points\_balance = 5001 | True | True |

A number of responses incorrectly retested another value below the boundary (which was unnecessary, as this was tested in the sample row).

Question 12b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 42 | 58 | 0.6 |

Students were awarded a mark for writing:

If points > amount Then

Many students incorrectly wrote ‘line 4’ and were not awarded marks. Students are reminded not to write line numbers when asked to identify the line of pseudocode that contains an error.

Question 12c.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 46 | 54 | 0.6 |

Students were awarded a mark for changing the condition from ‘greater than’ to ‘greater than or equal to’ by writing:

If points >= amount Then

Some students incorrectly wrote ‘the condition is =>’ and were not awarded marks. Some incorrectly changed the condition to ‘less than’ and were not awarded marks. Students were not awarded marks for using the mathematical symbol ≤.

Question 13

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 54 | 17 | 16 | 13 | 0.9 |

The following are two high-scoring sample responses.

|  |  |
| --- | --- |
| If payByPoints = True Then points $\leftarrow $ points – price $×$ 10Else points $\leftarrow $ points + priceEnd If | IF payByPoints THEN temp $\leftarrow $ price $×$ 10 points $\leftarrow $ points – tempELSE points $\leftarrow $ points + priceEND IF |

Marks were awarded for:

* the appropriate use of If / Else / End If
* for payByPoints being TRUE, as per the question, the points deducted should be 10 times the price (this is the equivalent of 10 coffees earning enough points for one free coffee)
* for payByPoints being FALSE, the points added should be equal to the price.

Common errors included:

* not correctly multiplying points by 10 when payByPoints was true
* using the equals sign (=) instead of the assignment operator (🡨)
* using two equals signs (==) instead of one equals sign (=) to signify equivalence
* forgetting to write an End If to accompany the If statement.

Question 14a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 32 | 43 | 25 | 1.0 |

Students were awarded marks for stating any two of the following purposes of a software audit:

* checks for vulnerabilities and security risks
* assesses whether legal requirements and obligations are met (including licensing)
* determines whether functional specifications have been met.

Most students who gained marks identified that a software audit checks for vulnerabilities and security risks. Many students were not awarded a second mark because they wrote the same purpose twice. Some students incorrectly responded that a software audit was about testing for errors in code.

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

To ensure legal requirements are met

To identify security vulnerabilities

Question 14b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 53 | 35 | 13 | 0.6 |

Students were awarded one mark for one of the following:

* statement about checking needed inputs and outputs
* statement about security requirements
* statement about legal obligations
* statement about whether specified functionality is met.

An additional mark was awarded for a relevant link to the case study (for example, relating to the secure payment system).

Most students who were awarded a mark in this question wrote a general statement about what a software audit is used for (in most cases repeating one of the points from Question 14a). Few students were awarded the second mark for relating to the case study.

The following are examples of high-scoring responses:

Example 1

A software audit would allow any security vulnerabilities in how the rewards application connects to and uses the in-built payment feature of a device to be discovered and patched. This will allow the feature to be implemented safely.

Example 2

A software audit allows the payment module to be secure and safe to use for users. This may include ensuring the payment system does not have security risks and vulnerabilities, and also ensuring relevant legal requirements and legislations surrounding data privacy could be satisfactorily met.

Question 15a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 26 | 40 | 34 | 1.1 |

Students were awarded marks for discussing that the ethical issue involves users taking advantage of location data to track the location of others, thus infringing their privacy. Marks were also awarded for a statement about the impact on the business including customer dissatisfaction and/or loss of customers.

Students were not awarded marks for stating that the app breached the *Privacy Act 1988* because the focus of this question was on ethics, not legislation, and it was unclear from the case study and question as to whether any laws had been broken by the app.

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

The ethical issue is that families might use this feature to track the locations of other family members, without the consent of the family member being tracked. As such, this might damage the professional reputation of Café SD, if it becomes known that their application can be used to track the location of other people.

Question 15b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 25 | 50 | 26 | 1.0 |

Students were awarded marks for any two of the following suggestions:

* that users could have the ability to opt in/out of family sharing
* including in the end user agreement that the sharing of location is a feature of family sharing
* only displaying the collective points balance of a family (without showing location data, time, date, etc. or family member data relating to purchases)
* de-identifying purchase data within family sharing.

Students were not awarded marks for suggesting that family sharing be removed. Some students wrote the same suggestion twice, and therefore did not receive marks for the second suggestion.

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

1. Only the number of overall points should be shown and not who added/contributed to them.
2. The customers should be given the choice in the app on whether or not they wish to include their points and details in family sharing (e.g. a toggle).

Question 16

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | 3 | Average |
| % | 14 | 30 | 46 | 10 | 1.5 |

Students were awarded marks for explaining that using the outdated code library could result in the login page being subject to security vulnerabilities, leading to problems with encryption, hacking and data theft.

Additional marks were awarded for references to the case study specifically outlining the impact on the user; for example, a data breach resulting in identity or monetary theft. Marks were also awarded for suggesting that the code library be updated and that a software audit should subsequently be organised to assess any outstanding vulnerabilities.

Students were not awarded marks for general statements such as ‘transferring code’ and are reminded to make use of subject-specific terminology when answering questions.

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

An outdated library, especially in cryptography, is likely to contain bugs and vulnerabilities which an attacker could exploit to potentially access Customer accounts and steal personal details, points, etc. SoDeBiz ought to find a new library and complete a software audit on it, ensuring it is up to date, etc.

Question 17a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 37 | 63 | 0.7 |

Students were awarded a mark for stating that all fields in the form are required fields, so an existence check is needed to ensure that no fields are left blank before continuing.

Question 17b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 39 | 61 | 0.6 |

Students were awarded a mark for stating that an existence check would ensure that some data has been entered into the name field. Some students correctly wrote that an existence check would determine that the name field is neither null nor an empty string, or that the length of the string in the name field is greater than zero.

Some students incorrectly stated that an existence check assesses whether a value exists in a database or that it is used to determine correctness of data. Some also confused existence checks with type checks and were not awarded marks.

Question 18a.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 19 | 52 | 30 | 1.1 |

Students were awarded marks for any two of the following, stating that eye-tracking technology:

* automates the process and can test more people at a time
* is more accurate when determining the focus of the user
* is less prone to bias
* produces quantitative data
* is discreet, compared to having a person observe you.

Students were not awarded marks for writing two similar statements. Some students made statements about the cost of the eye-tracking software being cheaper than an observation, but as there was no information provided about the cost of either approach, this was not awarded marks. Some students also provided disadvantages of observations outside of the context of an advantage of eye tracking and were not awarded marks because they were not answering the question.

The following are examples of high-scoring responses:

Example 1

Advantage 1: There is less pressure on the user, as an observer may make them uncomfortable, so the data produced is more accurate towards the efficiency.

Advantage 2: Having a human observer may introduce bias or mistakes (eg. over timing), but this is less likely with the eye-tracking technology.

Example 2

Provides insight into the way users interact with the screen in a way that can’t be observed by a person.

Shows what parts of the page a user is most focused on and shows the developers what the users might be missing to they can make them more obvious.

Question 18b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 30 | 58 | 12 | 0.8 |

Students were awarded marks for any two of the following, stating that observations:

* collect qualitative data that may not have been anticipated or captured by the eye-tracking system
* could note the order in which information is entered and note mistakes made by the user
* may be preferred by users who may be concerned about the privacy implications of eye-tracking technology.

Students were not awarded marks for writing two similar statements. Some incorrectly stated that the benefit of observations was that the participant could ask the observer clarifying questions Students were not awarded marks for this statement as the action stated would be inappropriate as part of a usability test. Some students made statements about the cost of observations being cheaper than eye-tracking software; however, as there was no information provided about the cost of either approach, marks were not awarded. Some students also provided disadvantages of eye-tracking software outside of the context of a benefit of observations, but this did not answer the question.

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

The eye-tracking only provides % of time the users look at each part of screen, vs. the observation being able to provide more detailed notes about how user interacts with each part of the screen.

The observation allows them to collect data about actual mistakes made by the user (which isn’t detailed by the eye-tracker).

Question 19a.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 31 | 69 | 0.7 |

Marks were awarded for identifying either the *Privacy Act 1988* or the *Copyright Act 1968*.

Question 19b.

|  |  |  |  |
| --- | --- | --- | --- |
| Marks | 0 | 1 | Average |
| % | 38 | 62 | 0.6 |

Students were awarded a mark for one of the following:

* a statement regarding APP 11 – that personal information similar to that provided by the user in the usability test must be protected from misuse, interference or loss, unauthorised access and disclosure
* a statement regarding the data from the usability testing being a work product and therefore owned by SoDeBiz, breaching copyright.

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

The data was created and owned by SoDeBiz, thus it is their intellectual property that cannot be reissued or copied without permission.

Question 19c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Marks | 0 | 1 | 2 | Average |
| % | 18 | 48 | 34 | 1.2 |

Students were awarded one mark for each valid step:

* Implement user authentication and ensure access of employees is revoked upon resignation.
* Employees must delete (or hand over) all data upon resignation.
* Have employees sign an agreement that they will not take user data or company data.
* Implement access restrictions, limiting the employees who have access to usability testing data.
* Implement encryption so that it would not be possible for someone to read the data if stolen.

This question was generally answered well. Some students wrote the same suggestion twice (rephrasing it) and were therefore not awarded marks for the second suggestion.