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Information Technology

2015 Chief Assessor’s Report

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## Overview

Chief Assessors’ reports give an overview of how students performed in their school and external assessments in relation to the learning requirements, assessment design criteria, and performance standards set out in the relevant subject outline. They provide information and advice regarding the assessment types, the application of the performance standards in school and external assessments, the quality of student performance, and any relevant statistical information.

## School Assessment

Assessment Type 1: Folio

Typically, this assessment type consists of four assessment tasks, with each task designed to allow the students to demonstrate their abilities against the performance standards. Teachers who clearly mapped questions against the performance standards in Knowledge and Understanding, and Analysis and Evaluation, developed sound assessment tasks. Students who undertook scenario-based questions were able to demonstrate their abilities clearly and use technical language appropriate for this subject area.

Students were hindered through the overuse of test structures as the only method of gathering student evidence. It is recommended that teachers use a range of assessment tools to enable students to show their knowledge against the performance standards. When assessing option topics, it is recommended that teachers use the previous year’s examination paper as a guide for depth and length for a 25-minute assessment tool. However, teachers must be sure to design questions that allow students to access specific features of the performance standards.

The use of folio tasks, essays, and recorded presentation questions must allow students to do more than recount knowledge, as this does not allow achievement above a C grade. Essay questions should involve analysis, evaluation, and recommendations by the students based upon their learning, to allow students to achieve at the upper end of the performance standards. Students are encouraged to give their opinion based upon referenced research when undertaking the information systems folio task.

Case studies must provide analysis of an information system including a comprehensive insight into the flow of data. It is recommended that case study tasks are scaffolded to encourage students to explore how data is gathered, inputted, validated, processed, stored, retrieved, outputted, communicated, and disposed of. Students performed better when they studied a visitable information system and were able to interact with this system’s technology team, rather than study an information system online and draw hypothetical conclusions.

Teachers are encouraged to include how grades have been established relative to the performance standards, by providing comments and indicators of where the performance standard has been met and to what level. Teachers who designed questions using terminology from the performance standards established clear direction for students. This process also provides moderators with a greater insight into how a teacher has determined a grade.

Assessment Type 2: Skills and Applications Tasks

Students are required to complete three skills and applications tasks (SATs) — one in the option topic for which the Assessment Type 3: Project is done and two in the option topic for which no project is completed. Each SAT should clearly identify opportunities to achieve at the upper level of the performance standards in Analysis and Evaluation, and Development and Validation. Task design should avoid ‘mini’ projects and focus instead on either modifying an existing solution or developing a solution by building on a framework. The task must allow the students to demonstrate Analysis and Evaluation as well as Development and Validation. Teachers should use the skills checklist as a guide to develop competent tasks, remembering to include optional items to enable students to access the higher levels of performance standards.

The task may be split into Part A and Part B to allow Analysis and then Development; however, too much scaffolding will limit the opportunity of the students to achieve at the higher levels of the performance standards. Students performed at a higher standard when tasks are not linked and discrete. Teachers should review and re-evaluate their SATs each year to ensure that they design appropriate tasks for their cohort and make adjustments to enable students to demonstrate their abilities against the performance standards. Modifications can be made to the SAT without having to change the learning and assessment plans; however, the use of the learning and assessment plan (LAP) addendum can help teachers ensure that courses are appropriate for their current cohort.

Teachers are encouraged to access and use the skills checklist available on the SACE website, within the Information Technology minisite. Teachers are encouraged to add skills to the ‘optional’ column of the checklist, to fit with teaching programs. Moderators noted the limited validation of SATs, and encourage the use of screen capture as a method of white box and black box validation and to allow students to demonstrate their understanding across multiple performance standards.

Assessment Type 3: Project

The project must be an open-ended task that requires students to develop a solution by using the stages of the systems development life cycle, as outlined in the subject outline. The project is to assess Knowledge and Understanding, Analysis and Evaluation, and Development and Validation.

Solutions developed in the project must be able to be validated on other computers/devices, and must be accompanied by documentation of the systems development life cycle. The solution should incorporate the elements outlined on the skills checklist (available on the SACE website, within the Information Technology minisite), where a C grade indicates demonstration of most of the skills in the ‘required’ column and higher achievement incorporates demonstration of skills in the ‘optional’ column.

Moderators noted the limited validation in the project. Each outcome must be validated through screen capture video (or otherwise) that shows students’ understanding through both black box and white box validation. It is not enough for students to simply describe the front end of the solution (black box). Moderators also noted the lack of analysis available through the systems development life cycle documentation, with limited achievement in showing the flow of data.

Students who clearly identified their outputs in the problem definition maintained consistency throughout the documentation process. Analysis provided moderators with the clear outline of the data to be processed and ensured that the documentation of the design phase was consistent and discrete.

Teachers are encouraged to use the resources on the SACE website and attend clarifying forums to gain insight into the requirements and standards of performance for their students.

External Assessment

Assessment Type 4: External Examination

Question 1

The majority of responses to this question indicated that students understood the ‘Diggiticket’ scenario and were able to successfully relate the concepts and processes inherent in the Information Systems topic to the scenario.

1. Questions i) and ii) were answered very well. Students stated a range of benefits that this information system provided to the cinema chain and to customers.   
     
   Question iii) was not answered as well, with responses often confusing the outcome(s) of the information system with the aim. Students need to focus upon the transaction of the information system in order to identify the system’s aim.
2. Most students were able to correctly state one example of the required elements of the information system. The weaker responses were generic and did not relate the element to the scenario, such as ‘computer’ for hardware.
3. A common response to this question outlined a benefit of the information system for the customer, rather than an actual output from the information system. Good responses referred to a reminder email or text message sent to the customer that would state which cinema the film would be shown in and provide seating directions.
4. i) Students were able to successfully outline items of data needed to create a user account, with many responses including an email address and a mobile phone number as the two main items.  
     
   ii) Responses that referred to the use of a primary key field on the account’s username or mobile phone number showed limited understanding of uniqueness in relation to the account. The better responses recognised the need for the information system to compare multiple fields within an account to ensure that it could not be duplicated.
5. i) Although many of the responses were general in nature, the use of words such as ‘popular’ and ‘number of’ were sufficient for the response to qualify as a statistical output. The better responses clearly indicated the field used to group the output and included statistics such as total or average.   
     
   ii) Most students were able to suggest ways in which the output could be used to assist the cinema management in their planning, such as being able to allocate larger capacity cinemas to the more popular movies.  
     
   iii) Many students struggled to correctly identify a valid constraint. The better responses identified a factor that prevents the output of the information system from being achieved, rather than a limitation of its data.
6. i) The responses to this question were often general in nature and did not refer to the legal requirement of businesses to protect customer data under the *Privacy Act 1988*. Students did, however, generally understand the need to protect personal data.  
     
   ii) Common responses to this question referred to the use of encryption and passwords to protect customer data on a server. Students who mentioned the use of a firewall often did not describe how it could secure data. Weaker responses mentioned the use of backups, which does not secure data but allows data to be recovered if something goes wrong with the server.

Question 2

Students should practise answering an embedded system question like this from previous examinations. They must realise the need to relate their response to the context of the question, rather than copying generic descriptions of the functions of the parts of a central processing unit from their examination notes.

1. The better responses referred to a simple mathematical function such as adding two numbers then described the role of the registers, main memory, and arithmetic and logic unit (ALU) as the two numbers are added.
2. The majority of students correctly identified a keypad as an input device for a graphics calculator.
3. Not many responses demonstrated a full understanding of the most appropriate secondary storage device in this context. The better responses were based upon the need for the device to be non-volatile, as its contents must be preserved after the calculator is switched off. Hence, these responses correctly identified electrically erasable programmable read-only memory (EEPROM) and provided a valid reason. The weaker responses gave reasons of storage capacity and/or cost of the device.
4. Many students tried to explain how the memory was cleared rather than how the control unit coordinates this process. The best responses were based upon the stages of the machine cycle and referred to the fetch, decode, execute, and store stages in the context of clearing memory locations.
5. This question was well answered, with most responses relating the network connectivity of a graphics calculator to a student’s potential to cheat in an examination setting. The better responses discussed this in terms of being able to access information via the Internet, or communicating with other students in the examination room.

Question 3

1. i) The most common incorrect response to this question was either ‘local area network’ or a network topology such as ‘star’. Students should have been able to name this as a peer-to-peer network.

ii) Students recognised that the printer was not directly connected to the teacher laptop, but their analysis of the consequences of this connection varied. The weaker responses said that the printing could not occur and often either did not offer an explanation, or mentioned that a wireless connection to the printer was not available. The better responses recognised that printer sharing is a feature of a peer-to-peer network, but that the desktop computer connected to the printer had to be on and a user had to be logged into the network on the desktop computer before printing could occur from the teacher laptop.

iii) Responses to this question varied. The better responses referred to an internet protocol (IP) address as the method for identifying a computer on this network, although an example was often not given. Other responses mentioned a media access control (MAC) address, which was accepted for this question but not if given again in question c) iii).

1. i) Common responses to this question were optic fibre, wireless, and copper cable; however, the first option was the most suitable type of connection. Many students did not provide a suggested connection speed for this connection. It is important that students read the entire question before writing their answer.

ii) Regardless of their response to question b) i), students were able to correctly identify a limitation of their suggested connection type.

iii) Students were expected to discuss the role of a router in this question. Many responses were superficial and mentioned that it enabled computers to connect to the Internet. The better responses referred to the router either calculating the best path for data packets to travel based upon routing tables and its inbuilt algorithms, or changing the IP address of the packets as they leave or enter the local area network.

1. i) Some students did not show an understanding of the type of services offered by network servers, and wrote general tasks such as improving communication between students. The best responses named the type of server to be installed such as ‘mail server’, then described the service it performs using specific and correct terminology in the context of a school.

ii) Most students recognised the need for a wireless access point (WAP). The better responses were able to clearly articulate that this would enable students who use laptops, phones, or tablets to be able to connect to the school’s network in a variety of locations.

iii) This question was answered very well, with many students correctly identifying a MAC address as the means of identifying an individual device on a network.

iv) The responses to this question varied. The weaker responses referred to the use of a username and password by the network operating system (NOS) but often did not refer to limitations set that would prevent more than two logins at the same time. The better responses noted that the MAC address of a device can be associated with user accounts on a network and that the NOS could check the number of devices currently in use by a given account to determine whether or not to allow a third device to connect to the network.

1. The majority of students demonstrated a very good understanding of how to create a secure password, with many responses giving an example as requested. The better responses indicated that passwords can have a strength factor, based upon the number and combination of required characters.
2. Many students wrote superficial responses to this question. In general, students demonstrated limited understanding of a virtual private network (VPN) and how it works, with some students misinterpreting that a VPN disguises the location of the user. The better responses correctly identified that a VPN uses a public network to provide secure access to a private network by an authentication process based upon protocols that provide an extra layer of encryption. Not many responses indicated that once connected to the VPN, teachers would be able to work as though they were connected directly to the internal network.

Question 4

Students were able to write responses to this question that demonstrated an understanding of malware and how to prevent its intrusion into a personal computer. However, quite a few students then responded with how to improve the integrity of a computer by writing about techniques such as backing up and defragmenting hard drives, which, in the context of malware, were not relevant by themselves.

The better responses were able to clearly state the methods to be used and explain how the methods work in the context of prevent malware intrusions, whereas the weaker responses often left out details, and as a result, their discussion lacked depth or the response was written in dot-point form which reduced the strength of the discussion. For example, a response may have stated ‘install a firewall’, but did not go on to explain how a firewall inspects packets coming into a network and can prevent packets that contain malicious code from entering the network and reducing the integrity of a computer.

Many responses identified viruses as a form of malware and described the impact that these can have upon the operation of a computer and the damage they can cause to data files stored on the computer. This discussion often referred to the use of antivirus software and the need to perform a scan of the computer on a regular basis, but fewer responses referred to the need to continually update the antivirus software so that it could protect the computer against new virus strains.

Other methods that students wrote about included: care when accessing sites on the Internet and downloading files from websites, care when opening email from unknown sources, keeping the computer’s operating system up-to-date, and downloading security patches. Not many students discussed spyware or Trojan infections.

Question 5

1. Not many students answered this question correctly, as their answer did not acknowledge the importing of the data from the spreadsheet, but instead referred to normalisation. The best responses stated that data entities should be discrete and stored in separate fields.
2. Most students correctly identified the data types as ‘text’ and ‘Boolean’.
3. Students demonstrated a good understanding of normalisation principles and correctly explained that data should not be stored in a single table due to the issue of duplication and the resultant redundancy.
4. i) This question was generally well answered, with most students recognising the need to add a S\_ID field into Table A to form the primary key. Not as many students added both of the additional data fields into Table B, which were ‘Grade’ and ‘Year’. The relationships between the tables were generally well done, with the better responses linking the primary key field with its foreign key field. The weaker responses indicated the links between the tables, rather than identified the correct fields.

ii) There were fewer responses that stated ‘many students can do many subjects’ and more that stated ‘each student can do many subjects and each subject can be done by many students’. A few students explained only one side of the relationship, such as ‘a student can do many subjects’ and went on to incorrectly deduce that the relationship is one-to-many.

iii) Most students were able to correctly identify Table B as a transaction table that enables the many-to-many relationship between Students and Subjects to be implemented in a relational database.

iv) Most students did not appear to understand the role that a composite key plays in a transaction table, as they incorrectly stated that a composite key was not needed because the table already has a foreign or primary key. The best responses acknowledged that the use of the suggested composite key would mean that each student would only be able to study a subject once, and would not be able to repeat a subject; however, including the year as part of the composite key would allow a student to study a subject once per year.

1. The majority of students used structured query language (SQL)-type syntax to answer this question and were able to form a query that sorted the listed subjects in alphabetical order through the use of the ORDER BY clause.
2. Students understood that this query required the number of students to be counted, but very few realised that this involved grouping the data by year, and omitted the GROUP BY clause in their SQL response.
3. Students were able to discuss the use of database access controls in a variety of ways, stating that different groups of users could be allocated different privileges that controlled their access to and use of the database. The better responses included examples relating to the context of this question, and stated that students could only look up their results, teachers could allocate grades to students, and the university administration staff could enrol students into courses.

Question 6

1. The desk-check was completed by most students, with many of them correctly processing the supplied data to count the number of each type of entrance ticket. Common errors included totals appearing in the wrong column and the totals in a column not being correctly incremented.
2. Students were able to correctly identify a variable that was an array structure, with most responses referring to cost, child, or adult. A common mistake was to name EntryType as an array, due to the pair of rounded brackets that followed it in the algorithm. However, in this case students should have recognised that this formed part of the input statement and that an array has a single value inside the rounded brackets to indicate the position or index being referenced in the array, rather than multiple values.
3. A common response to this question was that arrays, when used within a loop, enable code to be written in an efficient manner rather than referencing separate variables. Not many students wrote about the extensible nature of arrays that in this context could enable more than three different categories of entrance to be included in the future.
4. Most students correctly identified Boolean as the most appropriate data type for the variable ‘Under 16’.
5. Students who read the question carefully were able to correctly identify the condition from the selection construct as ‘Under 16 = true’. A common incorrect response was ‘EntryType <> 0’, which was the condition for the WHILE loop — an iteration construct, not a selection construct.
6. i) Few students named the type of error that would occur, but they were able to suggest that the number ‘4’ would cause a problem for the algorithm as it pointed to an index position that was outside the range of the array.

ii) Many student responses used the IF statement to prevent the error from occurring, although this would check just one incorrect value. The better responses made use of a WHILE loop to ensure that multiple incorrect values would be rejected, and used the ‘and’ operator to make sure that the number was greater than zero AND less than four. Weaker responses used the ‘or’ operator, which still allowed numbers out of the index range to be used.

1. i) Students recognised that the total number of people in the swimming centre had to be divided by fifteen, but not many responses used code to indicate that the result needed to be rounded up. Likewise, only the better responses included a loop to traverse the child and adult arrays to add up the total number of people from each part of the array before performing the division.

ii) Most students were able to correctly indicate the placement of the code in g) i) in the algorithm.

1. Many responses used a single line of code to calculate the daily total entrance fees by multiplying the array elements by their respective cost. The best responses used a FOR loop and variables to calculate the cost for each type of admission.
2. The majority of student responses lacked depth, making one or two points about options that developers had, but often ignored the phrase ‘end-user’ and focused on desk-checking the algorithm rather than the design of the application. Better responses referred to techniques for preventing users from entering invalid data, such as the inclusion of a touch screen to add and remove the number of people in each category.

Question 7

1. Responses indicated that students were aware that modifications to the audio output for mobile devices were necessary, although often the details mentioned were superficial. The better responses referred to reducing the audio sampling rate for the lower-quality speakers of mobile devices and changing the stereo channel to a mono channel.
2. Most students were able to correctly outline two methods such as using the gyro-sensors to tilt the screen, tapping the screen, or audio input that moves the submarine by voice commands.
3. Few students were able to define what a vector graphic is, let alone how it helps to reduce the file size of an animation. The better responses noted that vector animation is scalable due to its ability to re-draw larger images without the need for the larger file that a raster graphic image requires.
4. Students were aware of the term codec and could use the terms compression and decompression without really explaining how this technology provides compression and security. Only a few responses noted that compression removes repeated patterns of code, and that without the applied codec algorithm the media could not be accessed.
5. i) Students responded to this question in a variety of ways, with the majority opting for pseudocode and a minority writing actual programming code. Most responses acknowledged the need to detect a collision between the submarine claw and the rubbish object, and attempted to increment the total score through the use of a variable. Many students used the IF statement to detect which object had been collected, although the weaker responses often did not use an ELSE or ELSE IF pathway.

ii) The response to this question was not well done by the majority of students. The concept of generating a random number within a given range was not evident in many answers. Student are advised to read questions like this carefully and to plan a solution that performs the required task in a logical manner using control structures that are a feature of the multimedia programming environment they have used.

iii) Many students were able to suggest how the developers could improve the media richness of the total score. Common responses were to include an animation of the score, change colours, or include a sound effect to indicate that the score had changed.

1. Most students made a reasonable attempt to suggest how the game could encourage its players to make better real world choices by providing extra information, video clips, or links to sites that the players could engage with after certain parts of the game have been completed.

Question 8

1. Students were able to correctly identify two forms of navigation on the supplied home screen. Common responses were the menu bar at the top of the screen, and the icon of a game.
2. The majority of students were able to discuss how cascading style sheets (CSS) can be used to create a consistent website style by ensuring that the font colour, size, and style used on each page were based upon the same settings, together with a common background colour. Fewer students were able to articulate that each webpage can be linked to the one CSS file, which enables global changes to the website style to be made once in the linked CSS file.
3. i) Students made reasonable attempts to write code to perform the required tasks. The better responses used a FOR loop and an array variable to store three random numbers, and included a mathematical function of some kind to ensure that the generated random numbers were whole numbers.

ii) The output of the total score was well answered, with most students demonstrating an understanding of how to add the dice number to a total variable.

iii) Students were able to apply the selection construct to display a message based upon the total score. The weaker responses did not show output for all three pathways, as they either forgot to include an ELSE pathway, or did not include the second conditional test. The best responses used neatly indented code that clearly indicated where the conditional tests started and finished via the use of END IF.

1. i) Most students were able to correctly identify two form elements used on the given page and named a button, a text box, or a drop-down list.

ii) Students who answered this question wrote a technically correct CSS rule to format one of the form elements on the page. Popular choices included the button object or the paragraph element.

iii) The responses for this question highlighted the fact that most students understood the role that cookies play in a website (storing and recalling data from a previous session). The better responses related this to the *Under Ten* game and suggested that the page would be able to recall a player’s colour preference during future sessions of the game.

1. Students were expected to discuss recommended practices that should be implemented to manage the website. As a result, the weaker responses discussed other aspects of website programming and did not include enough specific detail. The best responses said that the development team should store files in appropriate folder structures, use CSS libraries developed for the site, and ensure that all files are labelled to the protocols devised by the team.
2. Most students were able to explain the importance of testing the website on a variety of browsers and platforms, as each type can display aspects of the game in different ways. The better responses named some of the browsers and discussed how these behave differently in terms of resolution and colour palettes.

Question 9

1. Students demonstrated a good understanding of the advantage of a dynamic website compared to a static website. Common responses included the ability to have product availability automatically updated from a stock database, showing current pricing, and showing the number of items in stock.
2. The responses to this question indicated that the students did not read this question carefully. They were asked to explain one disadvantage to the *company* that uses the dynamic website, yet quite a few students wrote about a disadvantage to the *customers*. The better responses were able to articulate the company’s need to secure and protect customer’s financial data used to conduct transactions.
3. Most students were familiar with the layout of a shopping cart function on a dynamic website and drew good designs for an appropriate layout. Fewer students also annotated the layout, as instructed by the question. The better responses were neatly formatted and contained all of the required elements of a shopping cart, including the ability to select options such as postage.
4. i) The students who answered this question made a reasonable attempt to design a stock query using SQL-type syntax. The SELECT, FROM, and ORDER BY clauses were used accurately, but the WHERE clause included a variety of responses. The best responses included criteria to locate ‘storage’ devices of the brand ‘Arial’ and included the Boolean ‘and’ operator between the criteria.

ii) Many students did not know how to write a script that counted the number of results from the query they wrote in d) i)

1. The majority of students answered this question by discussing how PHP or ASP can check a customer’s credentials when they log into the dynamic website. Very few students were able to analyse and identify the key components of an email address that a PHP or ASP script must look for in order to check that the username is a valid email address. Such responses indicated the need to check for an @ symbol, followed by text before the symbol and text after the symbol which must contain text before and after a period symbol.
2. In many cases, the responses to this question were superficial and demonstrated a lack of understanding of the ‘request response cycle’. Student responses often referred to ‘code injections’ and hinted at what malicious scripts could be made to do, but they rarely discussed them to the required depth.

## Operational Advice

School assessment tasks are set and marked by teachers. Teachers’ assessment decisions are reviewed by moderators. Teacher grades/marks should be evident on all student school assessment work.

Teachers are encouraged to revisit their LAP and use the addendum to ensure that all assessment tasks enable the student cohort to achieve against the performance standards.

Preparation and packaging of materials requires all evidence of assessment against the performance standards to be clearly identifiable for students and moderators. Teachers are encouraged to ensure that each student has a DVD with digital copies of their assessed work and that the ‘teacher DVD’ contains the work and assessment tasks of all students. Commonly in 2015, teachers also supplied a copy of the teacher DVD content on a USB drive. Ensuring that all multimedia, video, and audio is assessable by the moderation team is crucial to validating student performance standards. Students are encouraged to use media formats compatible with VLC player for validation of videos and presentations.

## General Comments

Teachers are encouraged to use indicators such as ‘AE1’ for Analysis and Evaluation specific feature 1 rather than use ticks. Placing next to the AE1 the performance level in the student work, such as ‘AE1 A’, allows students to understand their ability against the performance standards for reflection and improvement and allows moderators to clearly verify performance standards.

Students performed at a higher standard when the performance standard terminology was used in the construction of questions. Scenario-based questions that allow for evaluation and recommendation, rather than seek recall, provide students with opportunities to access the higher grade bands.

Teachers are encouraged to share assessments tasks for peer review and feedback. Using the SACE Board materials as a guide, teachers will be able to make quality assessment tasks for their cohort to access the higher performance standards. Annual adjustment of the skills and applications tasks and the folio is recommended to reflect the changes from clarifying forums, the Chief Assessor’s report, and the evolution of software and application wizards.

Information Technology

Chief Assessor