CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES' WORK IN THE CARIBBEAN ADVANCED PROFICIENCY EXAMINATION MAY/JUNE 2009

INFORMATION TECHNOLOGY

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GENERAL COMMENTS

This was the first sitting of the examination under the revised syllabus, which included the introduction of Unit 2. The Information Technology syllabus comprises two Units, each consisting of three Modules:

Unit 1 – Information Technology Theory

- Module 1 - Fundamentals of Information Technology
- Module 2 - Information Technology Systems
- Module 3 - Information and Problem Solving

Unit 2 - Application and Implication

- Module 1 - Information Management
- Module 2 - Use of Information Technology Tools
- Module 3 - Social, Organizational and Personal Issues

This year, there was a candidate entry of 940 candidates for Unit 1, a 55 per cent increase over the 2008 entry. There were 150 candidates registered for the Unit 2 examination.

The overall performance of candidates in both Units was fair only, although there was an improved performance in Paper 03/2 of Unit 1.

DETAILED COMMENTS

UNIT 1

PAPER 01

Paper 01 comprised 45 multiple-choice items, with 15 items based on each Module. The candidates performed satisfactorily with a mean score of 24 out of a possible 45.

PAPER 02

SECTION I

Paper 02 comprised nine compulsory questions, three testing each Module. The mean mark on this paper was 44.7 out of a possible 150.

MODULE 1

Fundamentals of Information Technology

Question 1

The question was designed to test the candidates' understanding of the concepts of "Information Technology" and "data". The mean mark was 4.1 out of 15.

A number of candidates gave inappropriate responses to Part (a) and were not able to correctly give an example to demonstrate their understanding of the discipline "Information Technology". However, some candidates responded appropriately by stating that Information Technology is an integration of computer technology and information processing. An example would be a Human Resource Management System that captures, stores and manipulates employee data.

In Part (b), many of the candidates were not able to properly identify or discuss ways in which Information Technology can provide timely delivery of services. The phrase "delivery of services" was interpreted to mean the physical delivery of goods. Some examples of "timely delivery of services" are the use of:

- Search engines to gather data/information on a particular topic for a class assignment
- The Internet by the school administration to make utility bill payments or place an order with a supplier
- Online banking application by the school administration to query accounts' balances or transfer funds from one account to another
- Web-based teaching resources and multimedia tools for presentations
- Electronic collaborative tools by students located in different Caribbean territories to work on projects

The majority of candidates gave appropriate responses to explain the two types of data. However, a few candidates gave explanation in terms of the characteristics of the data. For example, some candidates explained qualitative data as being "complete", "accurate" and so on, and quantitative as being "one of high value". Candidates, who gave correct responses stated the following:

- Qualitative data are descriptive and are usually subjective or opinion based.
- Quantitative data are measurement based and are usually objective.

The performance on Part (c) (ii) was satisfactory and the candidates were able to identify appropriate pieces of data that could be found on the website.

Recommendations to the teachers:

It must be emphasized that students pay close attention to the fundamental concepts of Information Technology. Specifically, students should understand the terms and be able to give examples, when necessary.

Question 2

This question assessed candidates' knowledge and understanding of the information processing and in particular, the input-processing-output relationship. The mean mark was 7.0 out of 15.

For Part (a), the scenarios developed by candidates to show the input-processing-output relationship were inadequate, for example, "the keying/typing a report". In addition, most examples were not relevant to the information-processing model (data → processing → information). In their responses, the candidates were required to give an illustration which involved the "transformation" of data into information. For example, "the subject teacher added the scores that a student obtained for class work, weekly and in end-of-term tests to find the final average." The "input" is the individual student's scores, the "processing" is the addition (calculation), and the "output" is the student's final average. Another example of the relationship is illustrated by "a movie (output), which is generated from thousands of frames of images, sound and texts (input) played at a particular speed (processing)".
For Part (b), those candidates who gave correct responses in Part (a) were able to state the importance of the information (output). Using the example above, the teacher is able to identify those students would need extra lessons on the material covered in the school term, that is, it would assist in **informing the teacher of an action to be taken or a decision to be made**.

For Part (c), most candidates performed satisfactorily as they were able to identify appropriate productivity tools and associated features/functions that could be used to perform the various steps of the manual system. For example, some candidates stated that the clinic could use a row in a worksheet (spreadsheet) or create a table (word processor) to capture the data about each animal.

Recommendations to the teachers

1. Use scenarios to illustrate the input-process-output relationship.
2. Encourage candidates to identify areas in their community or society that are involved in information processing.
3. Present a list of different scenarios and ask candidates to select the most appropriate or relevant scenarios, giving reasons why the scenarios are relevant/not relevant to information processing.
4. Review the use and function of the various productivity tools.

Question 3

This question was designed to test candidates' knowledge and understanding of tools used in the entry, processing, storage and retrieval of information and their ability to justify the choice of these tools. The mean mark was 5.9 out of 20.

In Part (a), most candidates simply stated that wikis and online libraries were "web-based resources", which was given as a part of the question.

In Part (b), while most candidates were aware that anyone, from a subject expert to a layman, could make an entry on a wiki, they were unable to explain that this would be a disadvantage of using wikis as references and thereby justify the position taken by universities.

In Part (c), most candidates were able to list three information technology tools and provide an appropriate example of each tool. However, a few candidates misunderstood the question and therefore gave responses such as "interview", "observation and questionnaire". For Part (c) (iii), a number of candidates identified uses of the tools that were not applicable to the tasks performed in the Accounts Department.

Recommendations to the teachers

1. Teachers should encourage students to use technical key phrases or words when explaining or defining a term and desist from writing in layman terms.
2. Compile a glossary on information technology terminologies, in particular, those found in the syllabus.
3. Facilitate regular class discussions, presentations and debates.
4. Encourage students to do extensive reading to widen their vocabulary.

SECTION II

MODULE 2

Information Technology Systems

Question 4

This question assessed the candidates' knowledge and understanding of the major components of an information technology system. The mean mark was 6.0 out of 15.

For Parts (a) and (b), most candidates gave the correct responses: Software, Network and Users (People) as the other three major components of IT systems. These candidates were also able to explain the purpose of the components and give an appropriate example of each component. However, a few candidates incorrectly listed devices and IT terminologies as the other components of IT Systems, for example, monitor, keyboard, hard drive, CPU, authentication, primary and secondary storage, communicative device, processing, storage, input, output, information, and memory.

For Part (c), most candidates explained the purpose of input and output devices in general, rather than explaining the two types of hardware in relation to a Point of Sale (POS) system. The candidates, who scored well explained that "in the POS system, input is provided through the cashier's keyboard, touch screen or barcode reader (**how**), which allows the item and/or its price to be entered (**reason**). Output in the POS system will include the monitor or printer (**how**) on which information related to the items being checked is displayed or printed (**reason**). It is of interest to note that even though "Point of Sale" was mentioned in the question, a number of candidates wrote "Point of Scale".

For Part (d), most candidates performed poorly. Their responses did not describe a situation but was simply a statement of a general nature, such as "the laser prints faster", "prints pictures", "prints large quantity" and "does high quality printing". For the dot matrix, inappropriate examples were "to print graphs and charts that require dots" and "cheaper". More suitable responses were:

- Dot matrix is more appropriate: Print in duplicate or triplicate on multi-part paper for customers' receipts where impact is needed.
- Laser printer is more appropriate: Printing the minutes of the meetings of the Board of Directors on cut-sheet paper.

Recommendations to the teachers

1. Stress the importance of reading the questions carefully before attempting to respond.
2. Compare and contrast the uses of various types of printers, describing scenarios in which one type of printer is more appropriate than another.

Question 5

This question examined the candidates' knowledge and understanding of software, the various types of automated information systems, and the software engineering process. The mean mark was 3.1 out of 15.

Part (a) was done satisfactorily, with most candidates achieving at least one mark. Some candidates gave appropriate examples of the application software, but could not properly state the function. For example, application software helps the user to carry out specific tasks using the computer.

Part (b) was very poorly done. Only a few candidates scored any of the available marks. Candidates misinterpreted the terminology "open source" to mean "allowing access to a company's data/information". As such, they discussed challenges that were not applicable to using open source software, for example, "users outside the organisation could tamper or hack into their system and change the data." Some challenges in relation to the use of open source software are:

- Deciding on which version to work with
- Deciding on how to obtain reliable updates, as no one is obligated to provide such updates
- Incompatibility with more popular proprietary software.

Responses to Part (c) were generally acceptable. Most candidates were able to give the name of two types of Information Systems (IS). However, some candidates could not explain the function or features of the IS so as to distinguish between the two types.

Based on their responses for Part (d), it would appear that most candidates were unaware of the activities done in the analysis stage of the software engineering process and, hence, the significance of this stage to the overall process.

Recommendations to the teachers

1. Discuss similarities and differences between major groups of software: Application and System (Operating Systems & Utilities).

2. Ask students to do research on the various stages of the software engineering process, paying particular attention to the major tasks (activities) to be done in each stage and the major outputs from each stage.

Question 6

The question was designed to assess candidates' knowledge and understanding of computer networks and the considerations that must be taken into account when developing human computer interfaces (HCIs). The mean mark was 5.7 out of 15.

In Part (a), most candidates did sketches of the network topologies and lost marks as there was no labelling and/or arrows to indicate the direction of the signals. Regarding the advantages and disadvantages of one topology when compared to another, most candidates were confused citing, for example, the advantage and disadvantage of the star to the bus, or vice versa.

In Part (b), most candidates seemed unaware of the existence of virtual private networks(VPNs) and spoke to the issue of local/wide area networks, in general. Hence they were unable to explain that the benefit of this particular type of network is the affordability of setting up a private network by tunnelling through the Internet practically free, hence being most cost-effective but secure.

In Part (c), most candidates were able to distinguish between different types of HCIs: menu-driven, command line, natural language, and so on. However, candidates could not identify particular user

characteristics: age, educational level, abilities, skills' level and culture. Also, they were unable to fully capitalize on the marks allocated, as their explanations were inadequate.

Recommendations to the teachers

1. Assign the students to research and make class presentations on the various networks and HCIs.
2. Discuss similarities and differences between the various types of network topologies.
3. Discuss similarities and differences between the various types of HCIs.

SECTION III

MODULE 3

Information and Problem Solving

Question 7

This question was designed to test the candidates' knowledge of the problem-solving process and ability to differentiate between programming languages. The mean mark was 3.8 out of 15.

In Part (a), a number of candidates confused the problem-solving process with the system engineering process. Further, too many candidates used single words, for example, "define/definition" and "analyse" rather than "define the problem" and "analyse the problem" in stating the stages of the problem-solving process.

In Part (b), most candidates gave the definition for an algorithm rather than focusing on the importance of the algorithm in the problem-solving process such as 'writing steps to solve the problem without worrying about the syntax rules (coding into a desired language)'.

The responses of most candidates in Part (c) were limited, suggesting that they were not aware of the properties of a well-designed algorithm.

In addition, several candidates gave unacceptable answers in Part (d). Furthermore, many candidates did not know that assembly language must also refer to the memory and register storage locations, using symbolic codes. Several candidates confused assembly language with machine language. Others gave an English language definition of 'assemble" and "procedure" instead of the technical meaning of these two terminologies.

Recommendation to the teachers

1. Discuss the strengths and weaknesses of the various generations of programming languages.

Question 8

This question assessed candidates' ability to develop and interpret algorithms. The mean mark was 3.3 out of 15.

In Part (a), many of the candidates gave a detailed explanation of the flowchart line by line, without identifying the problem that was solved. Further, a number of candidates did not recognize that $\frac{Num}{2}$ *has a remainder of 0* represented an *'even number'*. Additionally, they did not recognize that the flowchart added all even numbers between 0 and 100 inclusive and printed the total at the end of the iteration.

In Part (b), the assignment statements and print statement were included in the responses of most candidates. It was evident that most candidates did not understand the flowchart and correct conversion to pseudo code. Other challenges identified were:

- The statements were not logically sequenced
- Several candidates did not include a loop statement or attempted to use an IF statement for the looping structure
- A few candidates used English-like statements or narrative instead of pseudo code

Most of the candidates performed very poorly in Part (c). The most popular response was that an 'Endwhile' was needed so that the structure would not loop infinitely. Some candidates stated that the less than sign (<) needed to be changed to a greater than sign (>), not realizing that if this was the loop would not be performed at all and hence, the problem would not be solved. A limited number of candidates indicated that a 'for loop' was necessary without clearly stating how it could be used.

Recommendations to the teachers

1. Provide students with opportunities to analyse and dissect the problems that various algorithms are solving, to facilitate a better understanding and appreciation for developing algorithms to represent problem solutions.

2. Explain and illustrate how to convert a flowchart to pseudo code and vice versa.

3. Emphasize the diagrammatical differences between looping structures and selection structures.

4. Suggest the use of the 'arrow' as the assignment operator with emphasis on the direction in which it flows (that is, to the left (←)).

5. Trace algorithms with students and help them to identify the important components that allow the structure to loop.

6. Place more emphasis on the operation of the loops as it relates to the component that allows the loop to continue or discontinue (in this case the increment or counter).

7. Give students faulty algorithms involving loops for them to debug.

Question 9

This question was designed to test candidates' knowledge and understanding of the role of information in solving real-life problems, as well as using a specific tool for documenting the flow of information in an organization. The mean mark was 7.2 out of 20.

For Part (a), the majority of the candidates could not differentiate between each of the categories of information, namely, essential, desirable or cosmetic. Even when they categorized the given items correctly, many candidates were unable to justify the selection of their choices. Others were vague in their justification, providing cursory details to why they chose that category of information.

Several candidates seemed unaware that the selection of one of the types was based on the scenario, where the mortgage department wished to calculate the monthly payments based on life expectancy and the amount of money to be borrowed. Therefore, these candidates categorized the information given based on a general perception. For example, many candidates stated that the name of the applicant was essential, however, since the mortgage was based on life expectancy and amount to be borrowed, then name cannot be essential to the scenario; the name of applicant is desirable.

For Part (b), the responses were very limited, suggesting that these candidates did not have an in-depth understanding and familiarity with the symbols used in a data flow diagram (DFD). Many candidates drew sketches of symbols used in a flowchart and entity-relationship diagram (ERD). For example, the process symbol was  , which is the flowcharting symbol used for a decision. Even where the correct symbols were drawn, the majority of candidates were unable to state the purpose of that particular symbol.

It should be noted that the majority of candidates in stating the purpose of a data store simply stated that it was used to store data, without adding that it stores the data/information for future use.

For Part (c), the responses by most candidates were generally satisfactory. Most candidates did not draw a context level diagram but did provide some level of DFD and were given credit.

Recommendations to the teachers

1. Use a variety of case studies from various organizations to enhance students' knowledge of real-life situations.

2. Make clear distinctions between the categories of information which will clarify all details before Case studies can be given.

3. Emphasis should be placed on the drawing of the DFD symbols correctly and clearly. Further, teachers should ensure that students understand the purpose of each of these symbols and be able to differentiate between DFD symbols and other tools used in IT.

4. Teachers should ensure that the students are able to differentiate between a context level DFD and a level 1 DFD.

5. Teachers should use a variety of exercises to ensure that students become familiar with constructing DFDs. This will enhance their logical and critical thinking skills.

PAPER 03/1

Internal Assessment

This project required candidates to demonstrate knowledge and understanding of the problem-solving process and display competence in examining potential solutions with the view of determining the most feasible solution. The projects were generally well done by most candidates. The mean mark was 37 out of a possible 60. The candidates who scored highly demonstrated the ability to:

- Select a topic based on the guidelines provided in the syllabus
- Collect and analyse data that identified the cause(s) of the problem being solved
- Thoroughly analyse the possible solutions
- Make recommendations that were supported by data
- Present a paper that was organized, well structured, and contained a cover, content page, abstract and layout of references using an acceptable style.

In addition, these candidates demonstrated mastery of the tools used to process and present their findings, draw Gantt charts, and prepare their final reports.

Problem Identification

Full marks were awarded for a complete and accurate description of the problem identified. Candidates who gained full marks in this section provided a background that established the context within which the problem occurred. From this background, the moderator was able to determine who the problem affected, the nature of the problem (performance, information, efficiency, control or security), its undesirable effects and who was seeking the solution. However, a few candidates were ambiguous in their problem description, which could have led to several interpretations.

A wide range of problems was identified, most of which were in the following categories:

- Communications (cross-border data sharing, and so on)
- Service delivery (sale of lunch tickets)
- Information storage and delivery (School registration, medical records, club membership)

A few projects identified problems well outside of the scope of the syllabus. One such project dealt with nanotechnology.

Gantt chart

Some candidates produced Gantt charts which did not include all stages of the problem solving process. In addition, in a number of diagrams, the labelling of axis and bars was omitted and the time frames indicated for some activities (tasks) were unrealistic.

Analysis of the Problem

Candidates were expected to use at least one fact-finding technique to collect data, conduct a thorough analysis of the data collected and establish one or more major cause of the problem.

Candidates who scored full marks:

- Applied at least three appropriate fact-finding techniques in the data collection process
- Processed quantitative data using a range of features provided by an electronic spreadsheet
- Analysed data in summary form to establish the cause(s) of the problem being studied.

Whilst interviews, questionnaires and observations were popular fact-finding techniques, not all of these were utilized appropriately.

Identification of Possible Solutions

This component required that candidates identify at least two **information technology** solutions. Candidates who scored highly provided details of how a particular tool or set of tools could be used to solve the problem identified. For example, instead of simply stating Microsoft Access, the student stated that "*a relational database management tool such as Microsoft Access be used to create an application that will be used by existing staff, after retraining, to record transactions, perform computations, and print on-demand reports*".

Evaluation of Possible Solutions

This component required that candidates objectively evaluate two or more of the solutions identified. A few candidates scored full marks. These candidates undertook an evaluation of all or most of the following aspects of the possible solutions:

- Hardware tools (technological)
- Software tools (technological)

- Network and data communication services (technological)
- Costs such as acquisition/implementation and recurrent (financial)
- User issues such as recruitment, training needs, user interface (operational)
- Other issues such as legal, environment, and so on (operational)

Selection and Justification of Most Feasible Solution

This component required that candidates do a thorough analysis of the issues (technological, operational and financial) by comparing all possible solutions and make a selection of one of the solutions. The selection of the most feasible solution should take into consideration the resources required for implementation and those currently available. Generally, the analysis was limited and did not consider all the strategies recommended. Only a few candidates scored full marks.

Presentation and Communication of Information

Overall, the projects were well organized and structured. However, some candidates did not adhere to the rules stipulated by MLA or APA standards in their references. Candidates did not include an abstract in their report. Candidates need to pay attention to the table of contents by assigning correct page numbers to respective pages and including same in the table of contents or use the TOC feature of the word processor to generate one.

The following are recommended:

1. Ensure that the project report contains clearly defined, logically sequenced sections as suggested by the sub-headings in the mark scheme for internal assessment **(**syllabus document page 29).

2. The following items should be placed in the appendix:

    - Gantt chart
    - Data collection instruments (observation checklists, questionnaires, interview questions)
    - Data/information collected
    - Charts, graphs and summaries

3. Use appropriate features provided by the word-processor to prepare the project report. Some of these features that may be used are:

Editing tools	Tables, footnotes, APA/MLA references, table of contents
Proofing tools	Spell checker, grammar checker, word count

4. Concerning Gantt Charts: use the recommended textbook *Discovering Computers* by Shelly Cashman and Vermaat (or any other appropriate text) as a guide.

PAPER 03/2

ALTERNATIVE TO THE INTERNAL ASSESSMENT

This paper tested candidates' knowledge and understanding of a problem that they have examined and for which they were required to identify at least two possible solutions and then determine the most feasible solution. Most of the candidates performed at a satisfactory level.

Question 1

Most candidates were unable to develop good problem statements; the statements were either very vague or terse, for example, "poor bus system", "new system not working", "poor communication" and "long delay times when purchasing cellular phones". Also, some candidates developed problem statements (such as "Alcoholism" and "Drug Abuse among Teenagers") for which they were unable to identify IT-related solutions. An example of an appropriate problem statement would be "long queues of customers purchasing cellular phones".

In Part (b), several candidates gave responses that were deemed to be outcomes rather than causes, suggesting some level of confusion in differentiating between the two. A cause is defined as "that which produces an effect", whereas an outcome is defined as "a consequence".

Using the problem statement cited above, possible causes of the problem are:

- Sales clerks complete application forms by hand.
- The application form consists of several pages.
- Inadequate number of sales clerks during peak times.
- Customers do not possess valid identification, which is required to finalize the sales agreement.

Possible outcomes of the problem are:

- Customers become frustrated or boisterous at the lengthy delay.
- Lost sales as customers leave without purchasing cellular phones.

In Part (c), a number of the candidates identified steps of the problem-solving process rather than those of the SDLC.

In Parts (d) and (e), based on their responses, most candidates did not appear to know what are the advantages and disadvantages of the various data gathering instruments such as questionnaire, interview and observation.

Question 2

Most candidates identified either only one possible solution to the problem or solutions that were deemed impractical. In evaluating the options, the candidates were expected to discuss the technological, financial and operational feasibility of each option, that is, what would be required in terms of resources in order to implement the option.

Question 3

Most candidates performed unsatisfactorily on this question. In Part (b), the candidates did not provide any comparison of the options in relation to the current environment in terms of constraints. For example: Are financing and other relevant resources available? Which option is feasible when all constraints are considered?
In Part (c), the majority of candidates produced cover pages that

- Had no title
- Were very cluttered, with poor use of white space
- Were not balanced and the organization of the content haphazard
- Had no graphics
- Had no variation in font size.

UNIT 2

PAPER 01

Paper 01 comprised 45 multiple-choice items, with 15 items based on each Module. The candidates performed satisfactorily with a mean score of 26 out of a possible 45.

PAPER 02

SECTION I

Paper 02 comprised nine compulsory questions, three testing each Module. The mean mark on this paper was 52.4 out of a possible 150.

MODULE 1

Information Management

Question 1

This question examined candidates' knowledge and understanding of the various formats of data and how data storage has changed over time. The mean mark was 6.3 out of 15.

In Part (a), most candidates were able to identify three formats in which data may be stored. A few candidates gave examples such as graphs, charts or Microsoft Word and Excel, which showed that they misunderstood the question.

In Part (b), most candidates were able to identify relevant criteria for choosing a storage media, for example:

- Storage capacity
- Cost
- Portability
- Access method (sequential, random or dynamic)
- Non-volatility
- Compatibility with existing device
- Durability

Some candidates gave incorrect responses such as accuracy, reliability and flexibility.

In Part (c), most candidates identified situations where the use of CD-RW or DVD-RW was preferred over hard disk storage, but they were not able to give a suitable. Some candidates were unsure about the situations where the use of CD-RW or DVD-RW would be preferred over a disk for storage and wrote incorrect statements such as:

1. CD-RW and DVD-RW hold more information than a hard drive.
2. Information on a hard disk cannot be changed.

In Part (d), most candidates were aware that a compression utility should be executed before the file could be copied to the diskette. However, most of the candidates could not provide any justification, that is, the compression utility "transforms data from one representation to another smaller representation, thereby reducing the size of the original file".

Recommendations to the teachers

1. Review different file formats, other than text-based format.
2. Teachers should ensure that students can identify and justify situations where one storage medium is preferred over another.
3. Discuss various data compression utilities.

Question 2

The question was designed to assess candidates' knowledge and understanding of the differences between flat files and databases, of file organisation methods, and the risks that companies might face in managing their own data. The mean mark was 2.6 out of 15.

The responses for Part (a) were extremely limited, which suggested that most of the candidates were not fully aware of the advantages of using relational databases instead of flat files for storage and retrieval of data.

In Part (b), the majority of the candidates were not able to discuss the two file organization methods that are possible with disk storage, but not with tape storage. Most candidates merely stated the two methods – direct or random and indexed sequential, but did not give any description of the file organization nor did they differentiate between the two methods.

In Part (c), candidates were able to list two concerns (other than data security) that a company may have regarding its data. However, very few candidates highlighted the possible implications for the company and most of the candidates provided only partial strategies that the company could implement in order to minimize risks associated with the concerns identified. For example, to minimise data loss, a company should not only back up its data to an external storage device, but should also secure/safeguard the storage medium from any possible damage either off-site or in a vault.

Recommendations to the teachers

1. Teachers should encourage students to make extensive use of the Internet and invite resource persons to present on specific areas of specialty.
2. Teachers should incorporate guided discussions on relevant topics in the instructional process.
3. Students should be required to create different types of databases and make comparisons between them.

Question 3

The question assessed the candidates' ability to explain data validation strategies in relation to database, explain the concept of normalization and apply normalization rules to remove normal form violations. The mean mark was 6.4 out of 20.

The majority of the candidates were not able to identify the types of validation checks required in Part (a). Suitable responses include: range check, presence check, format check; look-up list check. Most of the candidates did not identify the data field on which the validation check was being done and, therefore, the responses were general rather than specific. Examples of good responses were:

- Date Hired and Date Returned: A format check can be made to ensure that there is consistency and that the data in each field is entered as DD/MM/YY
- Client Number: A presence check may be used to ensure that this field does not have a NULL value or is left empty.

- M/V Registration: A length check (format) can be used to ensure that any information entered does not exceed the required number of characters.

The responses to Parts (b) and (c) suggested that a limited number of candidates was familiar with the terms un-normalised and normalisation. Although some candidates were able to identify normalisation as a process or set of rules that remove or minimize redundancies and anomalies, only a few candidates alluded to the fact that normalisation ensures that the database is structured in the most efficient manner.

In Part (d), the majority of the candidates included partial dependent and non-key dependent attributes in their responses of 3NF relations, suggesting that they did not know the rules applicable to the normalisation process.

Recommendations to the teachers

1. Teachers should discuss the various types of validation checks. It is important that appropriate examples from various scenarios are used to identify which fields and possible validation checks can be used.
2. Both the table structure and standard notation should be used to illustrate database relations in the un-normalised and normalised forms.
3. Teachers should provide opportunities for students to normalise relations, ensuring that the students can identify the particular anomalies and violations when moving from the un-normalised relations to the 3NF.

SECTION II

MODULE 2

Use of Information Technology Tools

Question 4

This question was designed to test candidates' ability to use their knowledge and understanding of popular productivity tools and apply their use in various situations. The mean mark was 6.9 out of 15.

In Part (a), most candidates correctly identified three generic software tools that should be installed on the laptops.

In Part (b), the majority of candidates were able to explain how the tools identified in Part (a) could be used to assist the staff in its effort to provide humanitarian aid. However, some candidates explained how the tool is used in a general way, but did not link it to activities done by the charity organization. A more appropriate response, for example, was "use the database management system to track the inventory of emergency supplies at their various locations worldwide" or "use the word processor to produce reports regarding the organisation's effort in the most recent disaster".

In Part (c), there were some candidates who were unable to integrate the software tool. Most candidates spoke generally about integration and failed to identify the two software tools and show the steps to transfer data from one to the other.

Recommendations to the teachers

1. Teachers should describe situations from the school or community experience and demonstrate how popular productivity tools can be used by persons to perform specific tasks. For example, use the tools to create posters, store the results of events, and so on, for the School's Sports Day.
2. Teachers should demonstrate how data from one software tool can be integrated with data in another by using the export and import or copy and paste features. The advantages and disadvantages of the methods should also be reviewed.

Question 5

This question examined candidates' knowledge of information sources and their ability to critically evaluate pieces of information based on the sources of the information come. The mean mark was 6.3 out of 15.

Part (a) was well done by the majority of the candidates. However, a few candidates confused information sources with tools used for data gathering such as interviews, questionnaires and observations.

While Part (b) was done satisfactorily by most candidates, several candidates simply stated the situation, for example, "A student uses the Internet to do his research", but offered no explanation why the Internet would be considered an appropriate source.

Part (c) was poorly done by most candidates. Some candidates confused the characteristics of information with the criteria for accepting/rejecting pieces of information based on the evaluation of the information source. Regarding Part (c)(iii), a number of candidates viewed the Internet (website) as being reliable as an information source, indicating that they are unfamiliar with the pitfalls associated with the Internet (website) in relation to information sources.

Recommendations to the teachers

1. Students must become more aware of the jargon that must be used through familiarity with syllabus.
2. Students must be given information from various sources and allowed to evaluate the sources using the criteria listed in the syllabus. This should include evaluation of information on select websites.

Question 6

This question examined candidates' knowledge and understanding of the features and functions of spreadsheet applications, as well as their ability to use the application to provide the solution to a problem. The mean mark was 4.8 out of 20.

For Part (a), most candidates were not able to identify features, other than general formatting features such as bold and font size, of the spreadsheet application that the teacher used in developing the given worksheet. Some features include:

- Cell formatting (decimal places)
- Merge and Centre
- Functions/formulae (to perform calculations)
- Cell referencing
- Copy and paste/Drag and drop
- Word wrap
- Conditional formatting

Parts (b) and (c) presented a challenge to candidates as they did not identify the correct built-in function, COUNTIF, and were not able to describe the steps that the teacher would perform to generate the results of the COUNTIF function.

While the majority of the candidates performed satisfactorily in Part (d), some candidates incorrectly placed the image and the headings. In addition, a few candidates used a **numbered** list for the training courses.

Recommendations to the teachers

1. In addition to the basic spreadsheet features and functions, students should be exposed to the advanced features and functions available within the application to assist in providing solutions to problems.

SECTION III

MODULE 3

Social, Organizational and Personal Issues

Question 7

This question was designed to examine candidates' knowledge and understanding of the ways Information Technology impacts on the society, with particular consideration to the introduction of a new information system in an organization. The question also sought to test the candidates' ability to examine potential threats or vulnerabilities faced by an organization when employees are allowed access to the Internet and to develop appropriate mitigation strategies for countering these threats. The mean mark was 8.1 out of 15.

In Part (a), several candidates experienced difficulty in stating the changes, from an employee's perspective, that may arise from the introduction of an information system. Although some candidates understood what the question required, they were unable to clearly state their response. For example, several candidates answered using one-word responses such as "accuracy", "efficiency", "reliability", or "speed".

In Part (b), the majority of candidates gave partial explanations of the possible effects that can be experienced from the changes identified in Part (a). Candidates seemed unable to develop strong explanations of their effects on an employee of the company.

In Part (c), most candidates provided a simple statement, typically defining the threat (terminology) without supporting the answer with a reason or explanation as to why the matter is considered a threat to the company. Threats or vulnerabilities pose a serious challenge to the security and integrity of company's data and consequentially their information. Therefore, any discussion must include the possible impact of risks associated with the threats.

In Part (d), good and valid suggestions were made, as most candidates were able to correctly identify a strategy for countering the threat or vulnerability identified in Part (c). For example, if the threat was "employees would be using the computer for their personal gain", then candidates stated that the strategy to be implemented would be to monitor the websites that the employees access and block any website deemed inappropriate.

Recommendations to the teachers

1. Teachers should use case studies to assist students in understanding the various risks to entities and individuals.
2. Teachers should practise responses to questions with the students to ensure that students understand the type of response required when the terms such as "state", "discuss" and "explain" are used.
3. Students should be encouraged to work in cooperative groups when conducting research on particular topics in the syllabus.
4. Teachers should provide students with exercises on the topics of impact of IT on society and threats/vulnerabilities.

Question 8

This question examined candidates' knowledge and understanding of the danger and risks posed by natural and other disasters to ICT systems in Caribbean countries, as well as a mitigation strategy – disaster recovery plan. The mean mark was 7.4 out of 15.

The first part of the question was generally well done by most candidates as they were able to identify three hazards that may occur in the Caribbean and which may pose a danger to ICT systems.

In Part (b), most candidates provided limited responses such as "damage to computer systems from flooding" and "corrupt data due to power spike", with no further explanation as why these are considered serious risks. Such risks could result in loss of revenue for a company due to either lengthy downtime of the ICT system or customers taking their business to competitors arising if inaccurate or delayed billing is produced. Several candidates interpreted the question by looking at risks caused by ICT systems instead of risks that create problems for ICT systems. However, most candidates performed fairly well.

Generally most candidates performed satisfactorily in part (c), identifying appropriate strategies to counter the risks given in Part (b). Responses included: installation of an uninterruptible power supply (UPS), unplugging or turning off computers at the end of the day and limiting use of computers during natural disasters.

The responses to Part (d) suggested that most candidates did not know what a disaster recovery plan was. Several stated that a disaster recovery plan should be implemented after the occurrence of a disaster. A more appropriate answer should have stated that this is a written plan describing the steps or actions a company would take to restore its computer operations in the event of a disaster. A proper plan should contain four major components: emergency plan, back up plan, recovery plan and test plan.

Recommendations to the teachers

1. Teachers should incorporate appropriate case studies in the instructional process to assist students in answering questions of this type.
2. Teachers should write persons from the business community to discuss their disaster recovery plans with the students.

Question 9

This question was designed to test the candidates' knowledge and understanding of legal and ethical dilemmas that organizations and individuals may face arising from the use of IT systems. The mean mark was 5.4 out of 20.

In Part (a), a limited number of candidates responded correctly when asked to explain the term "copyright". They stated that it is the right to control or produce and also made reference to the legal aspect of it. However, some of the candidates were unable to correctly explain the terminology and

mainly referred to copyright as an illegal act. In relation to "information privacy", most of the candidates indicated a basic knowledge of the right to deny or restrict access to information. However, the important component that speaks to the unauthorized collection and use of that information was omitted.

In Part (b), many of the candidates were able to describe a situation where it would be legally permissible to reproduce copyrighted material without the expressed approval of the holder. The most popular answers included:

- Time limit
- One back-up copy
- Limited number of pages
- Acknowledging the source

The phrase "without the expressed approval of the holder" was ignored by most of the candidates.

In Part (c), the majority of the candidates were able to adequately state how the malware could have been avoided, but were unable to correctly identify the type of malware. The majority of the candidates stated that the malware was a virus.

Only a few candidates were able to gain maximum marks in Part (d). A number of candidates were able to correctly identify that the breach of the copyright law given in the scenario as "plagiarism". However, the possible actions to be taken by the tutor were not properly addressed. The candidates mainly stated negative consequences of Alicia's act.

Recommendations to the teachers

1. Invite guest speakers who deal with these legal concepts on a regular basis. In addition, allow students to copyright original work done and initiate a discussion on the importance of copyright to their work and ideas. Additionally, an in depth research on "copyright law" will facilitate a better understanding of the situations in which it is legally permissible to reproduce copyrighted material without the expressed approval of the holder.
2. Teachers should ensure that the students identify important keywords given in questions, as this will guide them into answering questions correctly.
3. Concerning malware, use scenarios and case studies to help students in identifying which types of malware have been activated and justifying the answers given, so that valid solutions or avoidance strategies can be recommended.

PAPER 03/1

Internal Assessment

This project enabled candidates to demonstrate their skills and competence in using IT tools to assist them in developing a solution to a problem. The performance of the candidates was moderate. The mean mark was 28 out of a possible 60.

Problem identification

Full marks were awarded for a complete and accurate description of the problem identified. Candidates who scored well provided a background that established the context within which the problem occurred. From this background, the moderator was able to determine who the problem affected, the nature of the problem, its undesirable effects and who was seeking the solution. However, most candidates merely wrote a single sentence for the problem, providing no background

in which the problem occurred. In addition, a few candidates were ambiguous in their problem description, which could have resulted in several interpretations.

A range of problems was identified such as:

- Inventory (receiving and distributing items such as schools' supplies, music CDs, movie DVDs)
- Registration (school, health centre)

Analysis of the Problem

Most candidates did not describe their findings from the various data-gathering activities done. In the analysis phase, candidates were expected to conduct a study of the problem, using two or more tools (questionnaires, interviews, observation and review of documentation) to determine what the facts/issues were concerning the problem. This would assist the candidates to identify the actual causes of the problem, rather than persons' perceptions. This phase also affords candidates the opportunity to refine the problem statement.

A few candidates included a justification of the data-gathering tools used. However, this is not required.

Identification and Justification of IT Tools

Candidates were required to use productivity tools and/or web pages to implement their solutions. Although most candidates were able to identify productivity tools that could be used to assist them to solve the problem, many were unable to adequately justify the use of these IT tools. A few candidates identified tools that are not in keeping with the requirements of the syllabus such as global positioning systems (GPS), networking and voice recognition systems.

Assessment of the Implications of the Solution

This section proved challenging to most candidates. A number of candidates provided statements on the issues, rather than a discussion of the issues. Only a few candidates mentioned strategies that could be employed to address the issues raised.

Implementation of the Solution

Appropriate Use of IT tools and their features

Most candidates' use of the IT tools in implementing their solutions was appropriate. For example, the word processor was used to generate form letters and the spreadsheet application to "crunch" numbers. However, most candidates did not exploit the most appropriate features of the tool in implementing their solutions, especially, when using the database management system. No security features were in evidence, the "form" feature was not used for data entry and queries were not used to build reports.

Human Computer Interface

For the database or web page component, the solutions revealed limited use of navigational features and labelling. Some solutions did not employ navigational features or buttons, for example, tab keys, arrow keys, BACK, NEXT, PRINT, CLOSE.

Working Solution

Although the majority of the solutions were satisfactory, some of the solutions did not meet the minimum criteria as stipulated in the syllabus.

Recommendations to the teachers

1. Students should be encouraged to identify a problem that exists in their environment (school or community) and for which an IT-based solution is a feasible one.
2. Students should be encouraged to use features such as form, report and query when building databases.
3. To assist in the construction of web pages, students should refer to the recommended text, *Computer Concepts*, or any other suitable source for guidance.

PAPER 03/2

ALTERNATE TO THE INTERNAL ASSESSMENT

This paper tested candidates' ability to apply appropriate features of software tools in developing the solution to a problem encountered in their environment (school or community).

Question 1

The candidates were unable to develop good problem statements. Their statements were either very vague or terse. Although the candidates could state two of the tools that could be used to assist them in thoroughly analysing the problem, they were unable to justify the use of the tools. In addition, they did not provide suitable responses regarding the limitations of the tools.

Question 2

Candidates performed at an acceptable level on Parts (a), (b) and (d), identifying two software applications, the features of the tools that could be used to assist them in developing their solution, as well as a limitation of one of the tools. However, in Part (c), the candidates were not able to justify their choices of features given in Part (c).

Question 3

Candidates were required to discuss issues and user requirements for human computer interfaces (HCIs) that ought to be addressed in order to ensure the successful implementation of their solution. Candidates performed unsatisfactorily as responses were generally statements rather than discussions or sound arguments.