

BOARD OF STUDIES
NEW SOUTH WALES

1999 HSC

Computing Studies

Notes from the Examination Centre

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1999 Higher School Certificate Computing Studies Notes from the Examination Centre

Introduction

What is Computing Studies?

In Stage 6 Computing Studies, candidates learn theoretical aspects of the discipline and gain hands-on experience in computing.

The HSC course in Computing Studies 2 Unit (General) focuses on the use of a range of general applications, and the design and creation of computer-based solutions using a range of existing products. This is more than a hands-on, competency-based course and requires a balance between theory and practice.

The HSC course in Computing Studies 2/3 Unit (Common) places emphasis on how the computer works, how it can be instructed to carry out new or different tasks and how computer-based systems are designed and implemented.

The 3 Unit (Additional) course is for candidates who wish to undertake additional work at a more theoretical level, and who wish to fully implement their designs of computer-based solutions.

Marking Criteria

In general, marks for Computing Studies are awarded according to the accuracy and detail of the answer, as well as on the basis of the candidate's response relative to the quality of all other responses. Samples of student responses from the Above Average, Average and Below Average categories are often given to markers to assist in the establishment of the marking scheme. The following guidelines give some idea of how the answers are ranked.

Above average responses

- provide correct information
- fully describe/support the points being made
- provide clear, logical diagrams where required
- generalise from specific classroom applications to applications beyond the school
- present arguments in a logical manner
- indicate a complete understanding of the concept being examined.

Average responses

- provide part, but not all, of the information expected
- provide correct information with some relevance to the question
- provide an answer that is too general
- provide some justification for the points being made
- provide recognisable diagrams in a non-standard form
- indicate some understanding of the concepts being examined.

Below Average responses

- provide generalised statements without relating to the specifics of the question
- provide little or no justification for the points made
- provide correct information that is irrelevant to the question
- confuse technical terms with their common English usage
- misinterpret the question
- indicate little or no understanding of the concept being examined.

Overview of 1999 Candidature

Once again the number of candidates opting to complete the HSC Examinations in Computing Studies increased. The increase in candidature is indicated in the table below.

| | 1995 | 1996 | 1997 | 1998 | 1999 |
|--------------------------|-------|-------|-------|-------|-------|
| 2 Unit General | 3062 | 3681 | 4620 | 5151 | 5742 |
| | | | | | |
| 2 Unit | 6845 | 6636 | 6363 | 6705 | 6938 |
| 3 Unit | 1080 | 1428 | 1534 | 1692 | 1661 |
| | | | | | |
| Total 2/3 Common | 7925 | 8064 | 7899 | 8397 | 8599 |
| | | | | | |
| Total Candidature | 10987 | 11745 | 12519 | 13548 | 14341 |

Candidates need to be reminded to read examination questions carefully and answer the question asked, rather than identifying a familiar term and writing all that they know about that term. They should also be reminded to identify key words, such as describe, explain and justify. Computing Studies candidates have a tendency to write very generalised answers, where often the question requires them to relate their knowledge to a particular situation or at least to a particular topic area. Often diagrams are very useful to enhance candidates' responses and assist markers in determining the level of knowledge and understanding.

How is the paper marked?

The Supervisor of Marking (SOM), appointed by the Board of Studies, chooses a sufficient number of qualified markers from the pool of applicants to ensure that all papers can be marked within the time period allocated by the Board. Each marker is appointed to mark one question.

Markers operate in teams of five to seven, with a Senior Marker responsible for each team. The number of teams allocated to each question varies according to the estimated number of candidates attempting that question. Estimated numbers for each question are calculated using the school surveys that are completed in Term I.

Senior Markers attend briefing sessions at the marking centre prior to the commencement of the actual marking program. During this time they finalise administrative structures and prepare a draft

marking scheme for their specific question. Senior Markers read a large number of scripts in order to modify their draft marking scheme.

Once the draft marking schemes have been prepared, markers attend the marking centre to be briefed on the procedures, complete administrative details and are then introduced to the draft marking scheme. As a group, all markers and Senior Markers involved with each question may modify the marking scheme.

A large number of papers are then pilot-marked in order to determine any possible variations to proposed answers which should be accepted, to ensure that the marking scheme discriminates between candidates and ranks them according to their ability, and to verify that the scheme can be consistently applied by all markers. Papers which are used for pilot-marking are released into the actual marking process at a later date to ensure that they are consistently marked.

Once the marking scheme is finalised and meets all set criteria it is checked by the SOM to ensure that it meets the requirements set by the Examination Committee. Marking schemes are then signed off as the official marking schemes to be used in the marking operation.

To monitor consistency, Senior Markers arrange for a number of control scripts to be individually marked by all markers of a question and then compare the way in which the marking scheme is being applied. Senior Markers also monitor the statistics, which are processed each session for each marker, each group and each question, as well as check marking papers. These procedures ensure that the marking scheme is consistently applied by all markers, at all times, throughout the entire marking operation.

Understanding the Examination Report

This report is designed to assist teachers of Computing Studies and future candidates of the subject. It provides a general overview of each HSC Examination for all courses in Computing Studies. It consists of an outline of marks allocated to each section of each paper and provides a part by part analysis for each course. The part-by-part analysis includes a comment on each part, followed by an example of either a 'Good response', or where appropriate, 'The correct response'.

2 Unit (General)

Questions this year in the 2 Unit General HSC Examination encouraged candidates to apply their knowledge and understanding of the five core topics to varied situations. 5742 candidates presented for this examination paper which consisted of:

Section I - 20 multiple choice questions examining all five core topics. Each question is allocated a mark value of one.

Section II - 5 questions, each on one of the five core topics. Each question usually consists of three parts, with each part being made up of a combination of single word responses, stimulus material interpretation and short answer responses. Integration of the five core topics is also examined in this section.

Section I - Multiple Choice (20 marks)

| Question | Correct response | Percentage correct | Question | Correct response | Percentage correct |
|----------|------------------|--------------------|----------|------------------|--------------------|
| 1 | B | 92 | 11 | D | 29 |
| 2 | B | 44 | 12 | C | 71 |
| 3 | A | 44 | 13 | B | 89 |
| 4 | B | 68 | 14 | C | 71 |
| 5 | D | 86 | 15 | B | 84 |
| 6 | D | 83 | 16 | A | 58 |
| 7 | C | 76 | 17 | C | 80 |
| 8 | A | 96 | 18 | C | 85 |
| 9 | B | 57 | 19 | D | 61 |
| 10 | C | 59 | 20 | A | 74 |

Candidates performed well in the Multiple-Choice section of this examination paper. An explanation of the question, where less than 50% of the candidature selected the correct response, appears below.

Question 2

33% of the candidature incorrectly selected response A, indicating a lack of understanding of the concept of absolute referencing. While the formula shown in response A would be correct for Cell E2 it would not produce the correct result if copied down the column, which was the second requirement of this question.

Question 3

A large number of candidates incorrectly selected response C thus showing an understanding of sorting in ascending order but basing their sort procedure on the incorrect column. That is, they

sorted on Total energy rather than on Carbohydrate as specified in the question. This indicates a lack of practical experience in spreadsheet sorting.

Question 11

54% of the candidature selected response B, not realising that aliasing and anti-aliasing are two completely opposite concepts.

Section II - (80 marks)

Question 21 - Spreadsheets

Candidates answered this question well and appeared to have a good understanding of the topic. However, greater care needs to be taken when using formulae, functions and ranges.

- (a) Many candidates were able to provide the correct terms. In giving definitions for the terms many candidates gave descriptions only. Generally most candidates were able to give examples for the terms when required.
- (i) Completed on examination paper as an example.
 - (ii) This question was answered correctly by most candidates, although some gave a cell range rather than a cell address.

A typical good response:

Term: Cell

Example: B4

- (iii) Candidates mostly mentioned headings or titles rather than defining a label.

A typical good response:

Definition: A label is one of the data types used in a spreadsheet that is entered into a cell to provide some explanation of the spreadsheet.

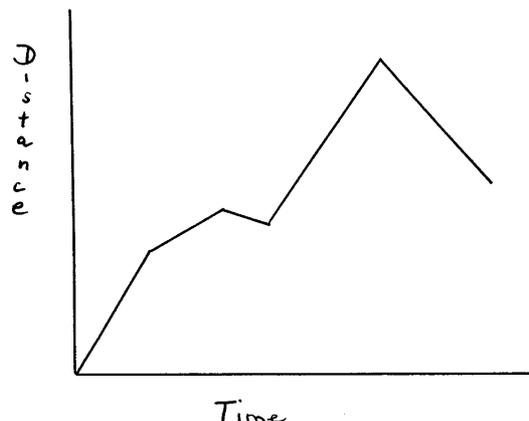
Example: Player

- (iv) Most candidates correctly described a line chart.

A typical good response:

Definition: A line chart displays changes or trends over a period of time.

Example:



- (v) Most candidates recognised that the example script represented a macro. The definition was generally poorly done giving an example rather than a definition.

A typical good response:

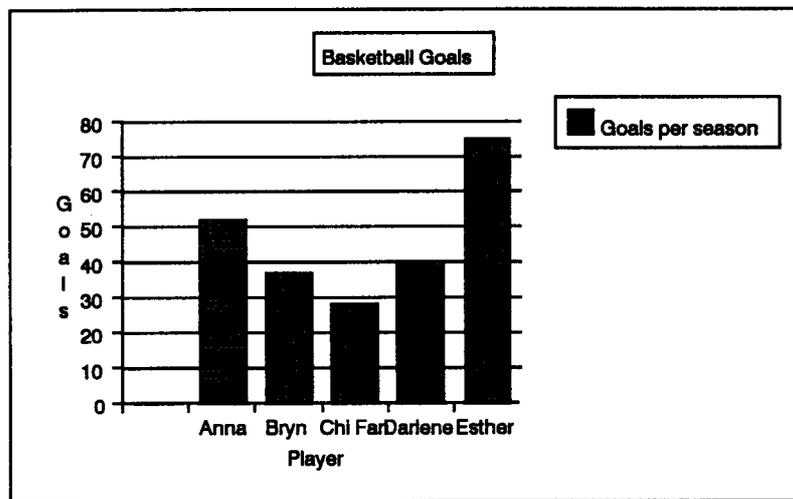
Term: Macro

Definition: A set of recorded instructions that can be executed by pressing a key or set of keys.

- (b) (i) Most candidates scored well on this section.

The majority of candidates were able to draw a bar chart with labels in the correct places. However a number of candidates did not include a title for the graph.

A typical good response:



- (ii) A large number of candidates recognised that the required format was two decimal places but were unaware that left justification should be applied to these cells.

A typical good response:

Fixed to two decimal places and left justified.

- (iii) Most candidates knew that the data should be sorted in descending order but did not specify the required range.

A typical good response:

Perform a descending sort on the range I4:I8

- (iv) This question was answered particularly well with candidates being able to state the cells affected by the changes to E6.

The correct response:

E9, I6, J6, I9

- (c) Candidates need to be aware that formulae in general need to contain an equal sign, function name and cell range enclosed in brackets.

- (i) Many candidates were unable to provide the COUNT function. A large number were unable to use the AVERAGE and SUM functions correctly. In part 3 many candidates believed that the AVERAGE function did not include the division by 7 giving their answer as =AVERAGE(D6:D12)/7. In part 4 many candidates used the formula =D6+D7+D8+D9+D10+D11+D12 instead of =SUM(D6:D12).

A typical good responses:

1 = MAX(D6:D12)

2 = COUNT(A6:A12)

3 = AVERAGE(D6:D12)

4 = SUM(D6:D12)

- (ii) Common errors in this section included the use of E6 instead of D6, and the use of the greater than sign (>) instead of the greater than or equal to sign (>=).

A typical good response:

=IF (D6>=500, '\$50 PRIZE', 'NO PRIZE')

Question 22 - Databases

The majority of candidates performed well in the Databases question, displaying a good understanding of screen design, field data types and mail merge concepts. There was a definite improvement in candidates' responses to this question compared to previous years.

- (a) (i) This part was well answered on the whole. Most candidates were able to recognise the fields which contained logical values.

Correct responses:

new_patient? or

charge_paid?

- (ii) Most candidates chose one of the correct responses.

Correct responses:

gender or

surgery_or_home_visit

- (iii) Most candidates were able to break up the obvious fields (patient_name or home_address) into smaller fields.

Typical good responses:

patient_name becomes family_name and given_name

home_address becomes street and suburb

- (iv) The correct response was stated by most candidates.

The correct response:

visit_charge

- (v) Most candidates were able to correctly recognise the link between the D.O.B. and age, whilst many of the remainder stated an appropriate link between date and time.

Correct responses:

D.O.B. and age

date and time

- (b) This question required candidates to have a good understanding of the principles of database design. It was answered well by most candidates.
- (i) Some candidates limited their response by merely drawing a List View, thus failing to show a range of good screen design features. This type of form design question has been tested in the last three years and candidates need to be able to demonstrate an understanding of screen design principles.

A typical good response:

PATIENT SCHEDULE

Patient Details:

Patient Name D.O.B. / /

Home Address Age (Yrs)

Gender (M/F)

New Patient? (Y/N)

Appointment Details:

Surgery or Home Visit? (S/H)

Date / / Reason for Visit

Time : Visit charge \$ Charge Paid? (Y/N)

QUIT ADD PREVIOUS NEXT HELP

- (ii) Candidate responses varied greatly in this part. Some candidates only described copying and pasting of data whilst others failed to mention in detail the query process.

A typical good response:

Perform a charge_paid? = N query to find the patients who have overdue amounts. Create a form letter using a word processor and from the schedule file insert appropriate fields inside placeholders in the form letter. Send the merged letter to the printer to create personalised overdue account reminders.

- (c) (i) This question was answered reasonably well. Incorrect responses included entering a data example or description of the field rather than the correct data type.

A typical good response:

| Field | Data Type |
|----------------------|-----------------|
| Account Number | numeric |
| Customer Details | alphanumeric |
| Total amount payable | currency |
| Digital? / Analogue? | logical/boolean |

- (ii) The space allocated for the response to this part indicated that more than just the term query/search/filter was required. Many candidates were able to write an appropriate query structure while others experienced difficulty with expressing the correct field with the relational operator and data.

A typical good response:

Carry out the query $\text{Balance} > 0$ to find customers who have not paid their bill.

- (iii) This part was well answered with most candidates recognising the appropriate primary key.

The correct response:

Account number

Question 23 - Graphics

This question provided an opportunity for candidates who were familiar with computing terminology to do well. While some did, it is clear that many candidates are unfamiliar with the *Glossary of Terms* document and that many rely upon one textbook as their only source of reference. It is necessary for candidates to be familiar with the terms contained in the *Glossary of Terms* and to discuss differing ideas presented in a number of texts.

- (a) Surprisingly, a large number of candidates did not complete this section correctly.

The correct responses:

- 1 pixel averaging
- 2 palette
- 3 frame buffer
- 4 frame
- 5 anti-aliasing
- 6 interlacing
- 7 bit-mapped
- 8 time code
- 9 dithering
- 10 resolution

(b) This part was generally well answered. Once again, a surprisingly large number of candidates did not attempt a response and some candidates placed two alternative responses where a one term response was all that was required.

(i) The majority of candidates answered this part well. A common incorrect response was Tweening.

The correct response:

Morphing

(ii) This part required an explanation of the term Morphing. Many candidates responded by simply describing the transition of the ball into the boat contained in the diagram.

A typical good response:

Morphing is where one image is gradually transformed into a different object in terms of its shape. Software is used to generate the changes.

(iii) A description of path-based animation was required, with an example of its use. It was clear from student responses that many candidates had not had hands-on experience of both cel-based and path-based animation packages. It is important that candidates gain the practical experiences with the techniques outlined in the Syllabus.

1 There was a wide range of responses to this part.

A typical good response:

Where the starting point, end point and path to be followed by an object are defined. The software generates the movement of the object along its path.

2 Too many candidates generalised their response, for example, cartoons. A good response contained a specific reference to an object moving against the background as a reference point. Some candidates enhanced their answers by providing a series of diagrams.

A typical good response:

The movement of a plane across the sky.

(iv) This part contained four diagrams of static graphical transformations, requiring a graphical term in response and was generally well answered.

The correct responses:

1 Rotation

2 Sizing

3 Cropping

4 Skewing

(c) (i) This section referred to the digitising of a pencil sketch of a man with a hat. A common error made by candidates was to assume that the diagram had already been digitised.

Typical good responses:

Scanning

Photograph with digital camera

- (ii) The description for this part required candidates to state how the method (identified in part (i)) worked in general terms and recognition that the final digital form was a bit map.

A typical good response:

The scanner shines light onto the sketch and the reflected light is read by sensors, which convert the details of the sketch into a bit-map.

- (iii) This part was well answered, however candidates discussed difficulties unrelated to the editing process.

Typical good responses:

As the diagram is pixel based, you would have to zoom in and edit pixel by pixel to remove the hat. You may also need to redraw the top of the head.

In a vector based package, a bit map is one object and cannot be edited at the pixel level at all. You could not remove the hat by itself.

Question 24 - Desktop Publishing

The Desktop Publishing question covered a good range of the syllabus using questions which varied in difficulty. The majority of candidates were able to attempt each part. There were a variety of styles of questions in which candidates matched terms and definitions, identified DTP elements, described differences and extrapolated information from a table.

- (a) Candidates were asked to match glossary definitions from a list of terms. The high standard of responses showed that candidates were very familiar with the use of the *Glossary of Terms*. The most common errors were the interchanging of kerning/leading and master/template.

The correct responses:

- 1 callout
- 2 leading
- 3 wordwrap
- 4 gutter
- 5 justification
- 6 template
- 7 margin
- 8 kerning
- 9 master
- 10 clipboard

- (b) (i) Candidates were asked to identify publication components from a page layout. This indicated candidates' understanding of Desktop Publishing concepts as they appear, rather than their straight glossary definition.

The correct responses:

| | | |
|---|------------------|---|
| 1 | column text | F |
| 2 | graphics | C |
| 3 | subheading | H |
| 4 | banner heading | A |
| 5 | text enhancement | E |
| 6 | footer | B |
| 7 | white space | D |
| 8 | text-wrap | G |

- (ii) The majority of candidates experienced difficulty in answering this part, indicating a lack of practical experience in importing/exporting data. This was the most challenging question in the DTP section because it required candidates to have a knowledge of file integration generally not just specific to DTP. Candidates had to apply this general knowledge to a DTP situation. It was necessary to specify a dynamic link rather than a static (cut and paste) link. Many candidates did not identify that there needed to be two separate files - a source and a target file.

Many candidates did not relate their answer to any sort of file integration and provided answers such as 'include the words 'add 10% to all prices' in the footer.'

A typical good response:

By using a dynamic link with a spreadsheet the increase of 10% can be made in the source file and this will automatically update the target DTP document.

- (iii) Candidates were asked to describe the difference in appearance of italic and bold text. Most candidates were able to successfully identify these differences.

A typical good response:

Bold text has a greater stroke weight. Italic text is a different style. Its posture slopes to the right.

- (c) Using the table as stimulus, candidates were asked to provide specific information on printers as Desktop Publishing output devices. Candidates were generally able to make use of the data given in the table to successfully answer the questions. Better responses expanded or elaborated on the details in the table. Some candidates confined their answer to a single word or a simple restatement of information given in the question and the table.
- (i) Candidates were asked to describe the advantages of a large memory capacity in a printer.

Typical good responses:

The waiting time is shorter because the computer is able to transfer large amounts of data to the printer much quicker.

It enables multiple users to send off work to the printer at the same time and their documents will be queued by the printer.

Larger documents containing elements such as tables and coloured graphics can be stored by the printer to enable faster printing.

- (ii) Candidates were asked to justify the purchase of the more expensive colour laser printer in preference to the cheaper colour inkjet printer.

Typical good responses:

The laser printer has a higher resolution of 1200 x 1200 dpi as opposed to 600 x 600 dpi in the inkjet. This would provide a better quality image.

The speed of the laser printer is greater than the other - laser 10ppm inkjet 6ppm, enabling more work to be printed in a shorter space of time.

- (iii) Candidates were asked to choose a printer from the table and then give reasons why this printer was appropriate to use in early pre-press work. There were a wide variety of responses given for the choice of printer. Many candidates did not understand the idea of pre-press. Some candidates provided answers that merely compared two printers by using data given in the table. Candidates were required to show an understanding of the concept of pre-press being a draft and not final copy in their answer.

A typical good response:

Diskjet 340 Inkjet

It does not have colour but colour is not required in a draft copy. It does not have high resolution but because this is not the final copy, it is only to provide a rough idea of the document layout so it is adequate.

Question 25 - Computer Communications

This year the Computer Communications question was answered well by a majority of the candidates. They responded well to the matching answer question with only one area of concern, that being the bit-rate/ baud rate confusion. Another question that was not well answered was the diagrammatic representation of the parallel/serial transmission.

- (a) This part was well answered with the majority of candidates correctly matching five or more terms with their definitions.

The correct responses:

- 1 LAN
- 2 protocol
- 3 simplex
- 4 WAN
- 5 full-duplex
- 6 synchronous
- 7 asynchronous
- 8 half-duplex
- 9 bit-rate
- 10 parity bit

- (b) (i) Most candidates were able to describe email as the process of transmitting a message from one computer to another. They referred to the Internet as the means of transmission. Quite a number of candidates did not indicate in their answers that it involved more than one computer.

A typical good response:

Email is the process of sending and receiving messages or files from one computer to another.

- (ii) This question was well answered by candidates. The majority of them stated that the email was much faster than traditional post. Other answers included cheaper over long distances, saves paper/trees, and the ability to make multiple copies.

A typical good response:

Email is a lot faster to send messages over long distances than traditional mail as it can arrive in seconds and not days.

- (iii) The answers to this part were varied but in the main candidates responded adequately with a range of disadvantages from 'not all people have email' to 'receiving junk mail'.

A typical good response:

A disadvantage of email is that it may not be checked regularly so you are not sure that your message will be read.

- (iv) This question required candidates to display a deeper understanding of the meaning and process of data compression. Most candidates stated that it was the act of reducing a file's size but better responses elaborated by describing one of the processes involved.

A typical good response:

Data compression is the process of reducing the size of a file by looking for repeated patterns of data and replacing it with tokens.

- (v) The majority of candidates answered this part well, being able to indicate a reason for using data compression.

A typical good response:

Data compression is used for sending large files over the Internet as a compressed file takes less time to download.

- (vi) In general, this part was poorly answered, with the majority of candidates confusing bulletin boards with email.

A typical good response:

A bulletin board is a place where you can post messages to other people and read messages from other people and where you can upload and download files.

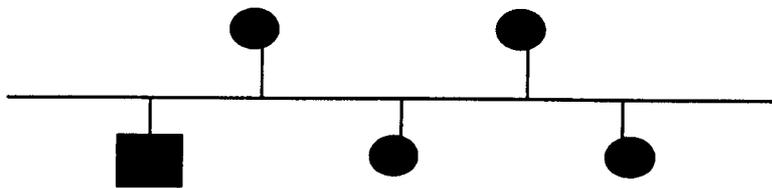
- (vii) This part was poorly attempted with many candidates opting to not answer it. Common mistakes were the mixing up of the two types of transmissions or the use of arrows rather than showing the bit stream (11010100), which was asked for in the question.

The correct response:

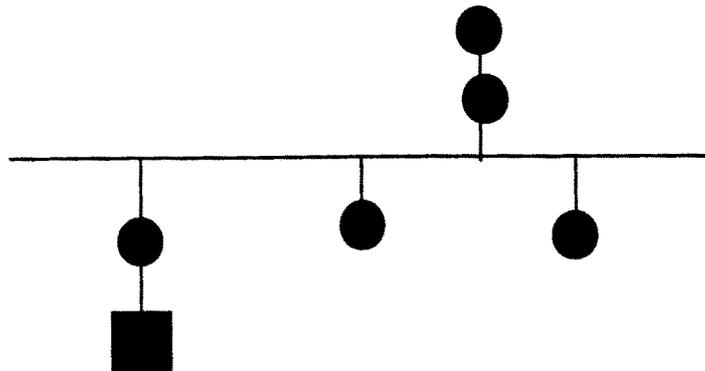
| | | | |
|---|-----------------|---------------|----------|
| 1 | | | |
| 1 | | | |
| 0 | | | |
| 1 | | | |
| 0 | parallel | serial | 11010100 |
| 1 | | | |
| 0 | | | |
| 0 | | | |

- (c) (i) Almost every student realised a bus network required a central cable or spine but it was the arranging of nodes along this spine that caused difficulty for many candidates. Nearly half of the candidates had the line going through the nodes or they drew the branching of nodes but had more than one node on the branch.

The correct response:



Common errors:



- (ii) When answering this part, candidates on the whole understood that a gateway is used to join networks together. Some candidates' responses indicated that a gateway was used within a LAN to join computers on the same network.

A typical good response:

Gateways are used to join dissimilar networks. For example a RING to a BUS.

- (iii) This part was well answered, although some candidates stated a communication activity rather than a communication channel as requested by the question.

Typical good responses:

- 1 television, radio, keyboard, mouse
- 2 CB radio, walkie-talkie, intercom, modem
- 3 telephone, Internet, modem

- (iv) This was one of the better-answered parts for communications as most candidates were able to correctly define the processes involved. Some candidates quoted the wrong process with the term, for example 'modulation is the converting of analog signals to digital signals'. Other candidates knew the process involved the changing of digital to analog and back again but did not use modulation or demodulation to distinguish the processes.

A typical good response:

Modulation is the process of converting digital signals to analog signals and demodulation is the process of converting analog signals to digital signals.

2/3 Unit (Common)

General Comments

Overall, questions in the 2 Unit Common HSC Examination were less directed towards specifics compared to previous years. These more open-ended questions resulted in extended-response type answers from candidates. Once again there were candidates who attempted more than the required three option topics and, while every precaution is taken to ensure that candidates are not penalised, it is a practise that should be discouraged. The 8599 candidates who presented for this paper comprised 6938 2 Unit candidates and 1661 3 Unit candidates. The paper consisted of:

Section I - Core

Part A

20 multiple choice questions examining the entire core, each question is allocated one mark.

Part B

Two questions - one on each of the core topics. Each question having a mark value of ten.

Section II - Options

Seven questions, one on each of the Option Topics of which each candidate was required to answer three. Each question has a maximum mark allocation of 20 marks with only three options counting towards the final mark.

Section I - Core

Part A - Multiple Choice (20 marks)

| Question | Correct response | Percentage Correct |
|----------|------------------|--------------------|
| 1 | D | 84 |
| 2 | D | 72 |
| 3 | B | 57 |
| 4 | A | 74 |
| 5 | D | 66 |
| 6 | D | 93 |
| 7 | C | 85 |
| 8 | A | 88 |
| 9 | B | 32 |
| 10 | A | 52 |

| Question | Correct response | Percentage Correct |
|----------|---------------------|--------------------|
| 11 | C | 46 |
| 12 | A | 57 |
| 13 | B | 65 |
| 14 | B | 72 |
| 15 | D | 85 |
| 16 | C | 51 |
| 17 | B | 58 |
| 18 | C | 19 |
| 19 | C | 86 |
| 20 | No correct response | |

Candidates performed well in the Multiple Choice section of this examination paper. An explanation of the question, where less than 50% of the candidature selected the correct response, appears below.

Question 9

54% of the candidature incorrectly selected response D, indicating confusion with the lack of standard symbol use, in this diagram. Unfortunately standard symbols vary greatly amongst publications and candidates need to be encouraged to analyse the data within the symbols rather than just relying on simple symbol spotting.

Question 11

33% of the candidature incorrectly selected response A, displaying a lack of understanding between pre-test and post-test loop structures. Candidates studying this course are required to be able to interpret both flowchart and pseudocode control structures.

Question 18

60% of the candidature incorrectly selected response B. While ‘boundary conditions’ should be selected as test data, the function of desk checking is to test ‘algorithm design’.

Part B - Core (20 marks)

Question 21 - Computer-based Systems

This question was attempted by the majority of candidates in a fairly successful manner. Candidates demonstrated varying degrees of knowledge in Computer-based Systems.

- (a) Candidates had problems interpreting the concepts ‘purpose of’ and ‘importance of’ and tended to concentrate on definitions rather than explanations.
- (i) Many candidates were unable to distinguish between a decision table and a decision tree while others inferred that the decision table helped the user to ‘make’ decisions.

A typical good response:

A decision table is used to list all decisions in the system and their resulting actions.

- (ii) This question was answered either very well or very poorly. A complete and accurate response was not overly forthcoming. Many answers tended to ‘generalise’ rather than ‘specify’.

The correct response:

A Gantt chart allows the systems analyst to plan or timetable the events, by showing when they take place and how long each event takes.

- (iii) This part was generally well answered. However, it was obvious that many candidates had not experienced the system development cycle in a practical sense and therefore were not able to identify the simple fact that documentation provides a record of the development process for later referral.

A typical good response:

Documentation is started at the beginning of the system development cycle so that it may be used as a record of the development of the entire system and its operation.

- (iv) This part was well attempted by the majority of candidates. Some candidates however, tended to mix up their 'Pilot' and 'Phased' strategies, while others described the 'Parallel' strategy without mentioning the end of the old system. Many candidates also gave advantages and disadvantages of each after writing the definition.

Typical good responses:

Direct: The operation of the old system is stopped and the new system begins straight away.

Phased: The new system is introduced a step at a time until the old system is replaced.

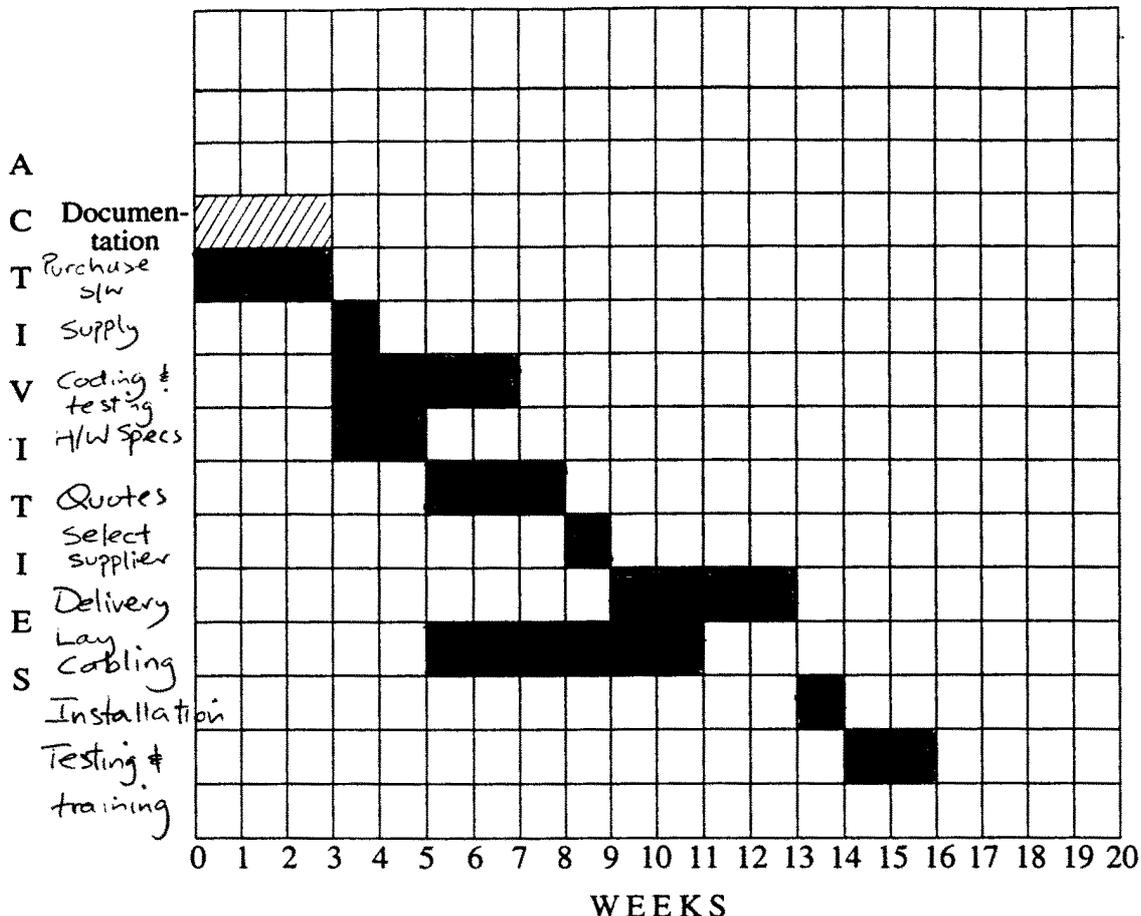
Parallel: The new system and the old system are used side by side for a period of time.

Pilot: Part of the new system is started, and, if successful, completely takes over from the old system.

- (b) (i) 1 Many candidates had difficulty completing this part as: they did not understand the concept of a Gantt chart; there was a significant amount of reading involved in the question; there was confusion with the phrase 'at the same time'; there was an inability to identify the difference between purchase and supply; there was a failure to detect that installation could only occur after delivery of equipment; and there was the inability of candidates to follow the logical sequence of events.

The correct response:

Gantt chart for purchasing system



2 **The correct response:**

16 weeks

- (ii) 1 A significant number of candidates did not seem to know the difference between a data flow diagram, a flowchart and a systems flowchart.

The correct response:

Systems flowchart.

- 2 Many candidates tried to describe the tool shown rather than explaining how the analyst can use this type of tool to help others to better understand the system. A significant number of candidates that answered the above question correctly seemed to lack understanding of the role a systems flowchart plays in the system development cycle and often went on to describe a data flow diagram.

A typical good response:

A graphical representation to show how the processes in the system will be performed.

- 3 This part was generally answered well.

The correct response:

A data dictionary

- 4 Many candidates referred to the usage of data dictionaries in databases and spreadsheets rather than referring to the actual question.

A typical good response:

Provides information on the correct name of the data item and a description of the data item.

Question 22 - Algorithm Design

This question tested the ability to design test data, recognise errors in algorithms, modify and write algorithms and implement a desk check. Compared to previous years this core question was of a moderate level of difficulty and any candidate with a basic understanding of algorithms performed reasonably well.

- (a) (i) The examiners require discrete data when designing test data and many candidates lose marks by indicating < or > ranges or by not completing the exact display expected.

A typical good response:

| <i>Time</i> | <i>Download</i> | <i>Expected display</i> |
|-------------|-----------------|-------------------------|
| 10 | 10 | access OK |
| 10 | 20 | access OK |
| 10 | 30 | access terminated |
| 120 | 10 | access OK |
| 120 | 20 | access OK |
| 120 | 30 | access terminated |

| <i>Time</i> | <i>Download</i> | <i>Expected display</i> |
|-------------|-----------------|-------------------------|
| 130 | 10 | access terminated |
| 130 | 20 | access terminated |
| 130 | 30 | access terminated |

- (ii) Two obvious errors of the three required were recognised by most candidates, however many were only able to show the correction in this part whereas the explanation of the effect of the error was required. Candidates had a lot of difficulty expressing their descriptions in writing.

The correct response:

| <i>Line number</i> | <i>Explanation of Error</i> |
|--------------------|---|
| 4 | This pre-test will allow execution of the loop when either of the termination conditions has not been met. OR should be AND as both conditions must be true for the loop to be executed. |
| 4 | By not including an equals sign in both time and download conditions this pre-test stops the loop from executing when boundaries are reached. If time is 120 the loop cannot be re-entered. |
| 7 | The incorrect messages are displayed because the access should be Terminated when either time is greater than 120 or download is greater than 20. |

- (iii) This section was well answered by most candidates who recognised the errors in (ii). The candidates who rewrote the pseudocode and changed two lines were significantly better than those who reproduced a flowchart and got into difficulties making numerous changes and leaving essential processes out.

A typical good response:

```

BEGIN INTERNET ACCESS CHECK
    set time to zero
    set download to zero
    WHILE time <=120 AND download <=20
        update time
        update download
        IF time > 120 OR download >20 THEN
            display 'ACCESS TERMINATED'
        ELSE
            display 'ACCESS OK'
        END IF
    END WHILE
END INTERNET ACCESS
    
```

(iv) Most candidates recognised and described the essential modification required. However as the question asked for a description, the examiners required more than an algorithmic routine.

A typical good response:

To change my algorithm to allow downloads of more than 20 Mb and charge 10 cents for each Mb extra I would make the selection in line 7 only be for time >120 and the loop pretest (line 4) would be changed to only have while time <120. I would include another selection to select downloads greater than 20 Mb and calculate a Charge ((download-20)*10) for the extra download. This Charge could be initialised before the loop.

(b) (i) Most candidates answered this part well. Common errors were including non-output entries in the *Output* column and putting 999 at the end of all columns.

The correct response:

| <i>L</i> | <i>X</i> | <i>Output</i> |
|----------|----------|---------------|
| 0 | 2 | 7 |
| 2 | 3 | |
| 3 | 7 | |
| 7 | 5 | |
| | 1 | |
| | 6 | |
| | 999 | |

(ii) Many candidates were unable to describe the purposes of the two input statements and often lacked the vocabulary to express their understanding in words.

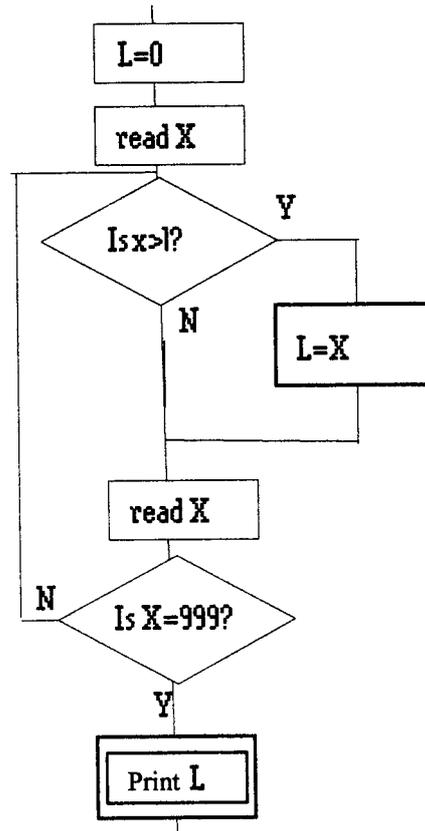
A typical good response:

The first input statement is a loop primer to provide a value before the selection in the loop to operate on.

The second input statement inside the loop allows data to be entered in the loop so the repetition will eventually terminate.

(iii) As page 31 of the *Computing Studies 2/3 Unit (Common) Syllabus* states that candidates ‘...need only be competent in describing their own algorithms in any one of the approved methods’ only the indication of an understanding of a decision mechanism and a repetition were allocated a mark. The majority of candidates attempted this question well.

A typical good response:



Section II - Options (60 marks)

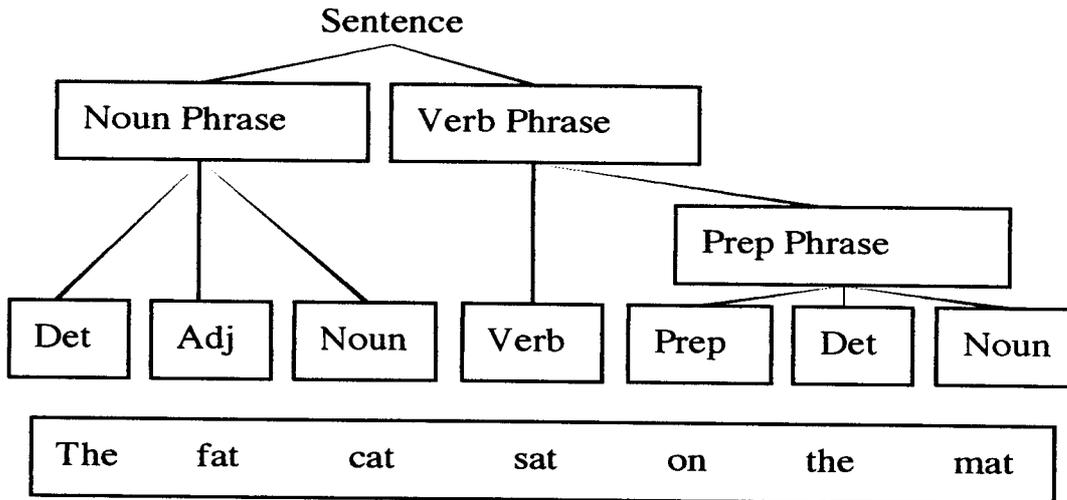
Question 23 - Applied Artificial Intelligence and Expert Systems

Approximately 9% of the total candidature attempted this option. However, it was obvious from some responses that candidates who had not studied this option topic still elected to answer it. Candidates need to be instructed to answer the three options they have studied as part of this course and not attempt an option they have not formally completed. The candidates who had studied this option generally wrote excellent responses.

The correct responses:

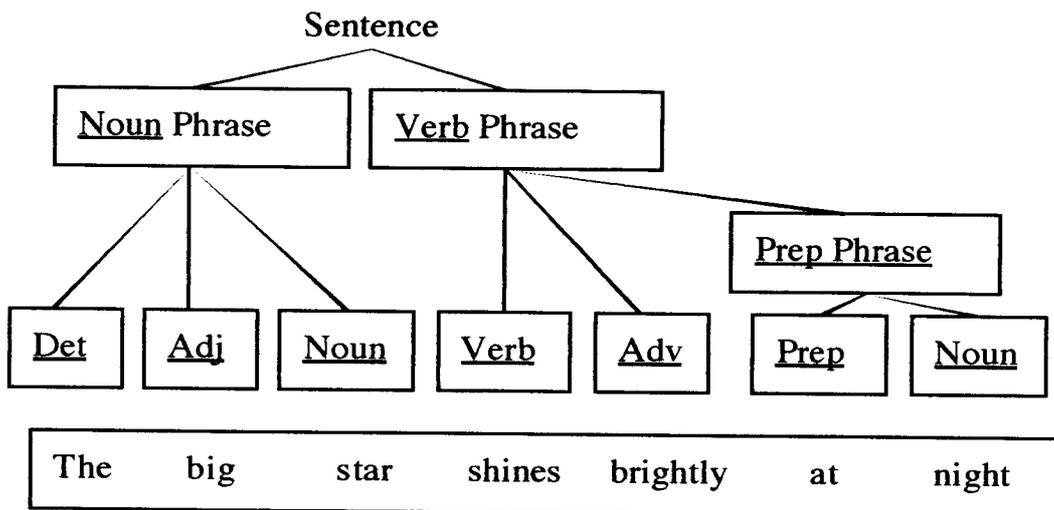
- (a) (i) A
 - (ii) B
 - (iii) B
 - (iv) B - many candidates were distracted by D, which, although listing attributes of many expert systems, are not typical.
- (b) (i) Most candidates did fairly well on this part, although many were unable to identify and name the Prepositional phrase.

A typical good response:



- (ii) Many candidates failed to recognise that, in order for this sentence to parse correctly, the adverb (brightly) had to be associated with the verb, not the noun phrase.

A typical good response:



- (iii) Most candidates were able to identify the key conditions for being qualified for the job, but many had trouble in rewriting the narrative in the form of clear rules, merely rewriting the narrative in a slightly modified form.

The greatest difficulty appeared to be in simplifying the rules by grouping them or by using the connectives suggested. There is apparent confusion among some candidates on the different meanings of AND and OR.

Most candidates were able to formulate rules in an IF - THEN format, but a disturbing number appeared to treat the resulting rules as if they formed an algorithm, using IF THEN ELSE ENDIF structures, which does not reflect the way an expert system treats its rule base.

A typical good response:

- (1) IF educated in A, M, MIS THEN Right_Education
 - (2) IF 2yrs or more in A, M, MIS THEN Required_Experience
 - (3) IF 4+ yrs general THEN Required_Experience
 - (4) IF 10+yrs experience in A, M, MIS THEN Qualified
 - (5) IF Right_Education AND Required_Experience THEN Qualified
- (c) (i) This part was generally poorly attempted, with candidates too often relying on definitions of expert systems or neural networks, without dealing with the specific characteristics asked for in the questions. Few candidates actually identified what aspect of human-like decision making they were discussing, often simply describing characteristics of experts systems or neural networks.

A typical good response:

Human-like decision making usually involves drawing logical conclusions or being able to deal with uncertainty. Expert systems are able to draw logical conclusions by making inferences from a knowledge base, using an inference engine. Neural networks are able to deal with uncertain situations by giving results when no rules are available.

- (ii) This part was quite well answered, with most candidates being able to indicate what makes an expert system unique. The major difficulty for candidates was in making a comparison to 'conventional information systems'.

A typical good response:

An expert system usually deals with knowledge in a specific area of expertise, but a traditional information system like a database contains facts only. Also, an expert system is able to draw conclusions from the knowledge it contains, while a traditional system requires a human to instruct the computer to search for specific pieces of information.

- (iii) This part was generally well answered, although a surprising number of candidates confused the role of the knowledge engineer with a computer engineer, programmer or technician.

A typical good response:

A knowledge engineer gathers knowledge from an expert in an area and encodes that expertise in a set of IF-THEN rules.

Question 24 - Computer Communications

Once again this option topic proved to be the most popular, with over 85% of the candidature opting to attempt Computer Communications. This question was well answered on the whole, with most candidates answering all parts of the question and some in a very thorough fashion.

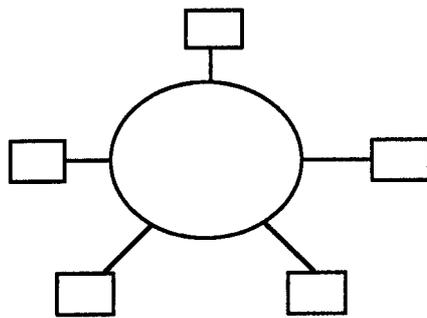
- (a) Most of the candidates completed this question with a large majority obtaining full marks. Some candidates had difficulty distinguishing between bit rate and baud, asynchronous and synchronous.

The correct responses:

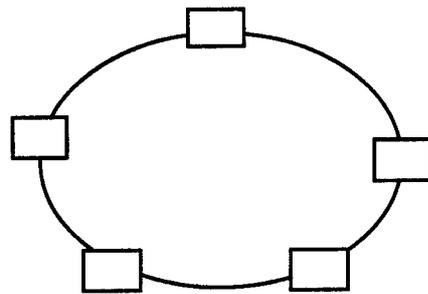
- 1 star network
- 2 stop bit
- 3 ring network
- 4 bit rate
- 5 asynchronous
- 6 bus network
- 7 parity
- 8 baud
- 9 synchronous
- 10 serial

(b) (i) Most candidates were able to draw a ring network.

Typical good responses:



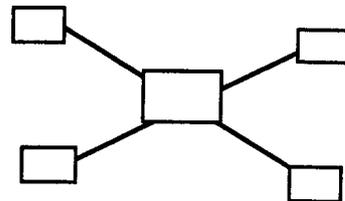
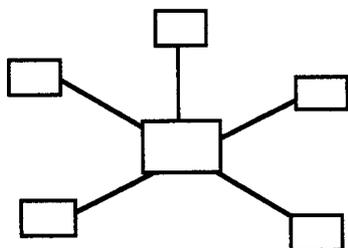
Ring network



Ring network

(ii) Most candidates were able to draw a star network.

Typical good responses:



(iii) 1 Most candidates could describe collision detection and methods of overcoming data collision. However, few candidates could discuss broadcasting aspects of Ethernet, with some candidates confusing Ethernet standard with star topology.

A typical good response:

Ethernet uses CSMA/CD in order to transmit messages. Nodes listen to the line to determine whether it is free for sending a message. If it is free, the node sends a message to all on the network. If two nodes send messages at the same time a collision occurs. One of these nodes then sends a jamming signal to the network indicating there has been a collision to prevent other nodes transmitting. The two original transmitting nodes both wait a random amount of time before retransmitting their messages.

- 2 This part was well answered with most candidates describing the token and its role in the transmission of a message. Most candidates were able to answer this question, especially what a token was and its role in a token ring network.

A typical good response:

A token ring network needs a token in order to transmit its messages. A token is a series of binary digits that continually circulates around the network from node to node. Each node accepts the token and either accepts the message addressed to it or passes it to the next node. The addressed node will accept the message. A node can only send a message on the token ring network if the node has the token and the token is free to transmit. Once a message has been delivered it is freed up by the message sending node. This means that collisions can not occur as only one message is transmitted at any one time.

- (iv) Many candidates gave an advantage without an explanation as required by the question.

Typical good responses:

Advantage 1: Security

No one from outside the organisation has access to the line, unlike a normal telephone line. This makes it a lot harder to tap into and makes the information being transmitted more secure as the line is dedicated to the business.

Advantage 2: Reliability

A leased line saves time and allows a constant flow of data. The line is always available to the user.

Advantage 3: Quality

Less noise on the line as it is only used for data transmission thus there are fewer errors in transmission. This also enables a higher rate of data transfer.

- (c) (i) 1 Very few candidates were able to clearly describe the structure of a packet as used in Z-modem file transfer protocol.

A typical good response:

The packet in Z-modem contains a start of transmission character, 1024 bytes of data and a CRC for error detection.

- 2 This part was poorly answered by the majority of candidates, as they were unable to describe an advantage or gave a poor and unrelated description of the advantage.

A typical good response:

Advantage 1: Message sent more quickly

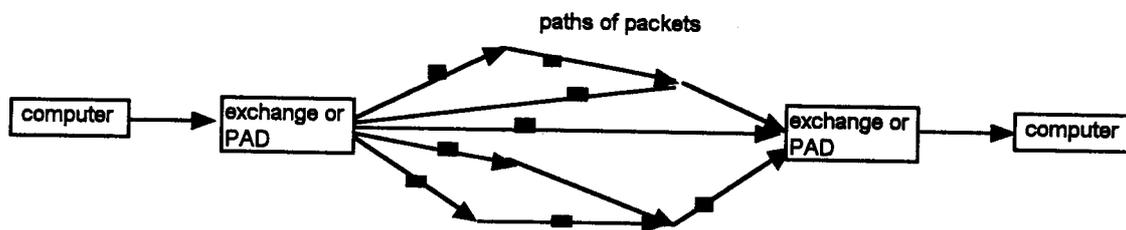
No need to retransmit the whole document if an error occurs in one packet. Only need to retransmit this packet.

Advantage 2: Security

Data is transmitted in smaller sections (packets), therefore, if packets are tapped into it is less likely that the information will be understood and therefore, the information is more secure.

- 3 Many candidates did not attempt this part but those that did score well were able to indicate different paths for where the packets travelled.

A typical good response:



- (ii) This part was well answered by the majority of candidates.

A typical good response:

optic fibre;

microwave;

coaxial cable.

- (iii) While many candidates were able to write a definition for communication protocols, few candidates were able to describe their function.

A typical good response:

Communication protocols are the rules by which two terminals must abide in order to communicate. They make sure that the least number of errors occur during transmission and exist to ensure successful transmission.

- (iv) While some understanding of the function of the repeater was evident in many responses, some candidates were unable to describe the dual function of amplifying and retransmitting.

A typical good response:

A repeater accepts an incoming signal, amplifies it and retransmits it on to the next node or repeater. Repeaters help strengthen the signal in a WAN which tends to weaken over long distances.

- (v) Most candidates were able to provide a well-written explanation to this part. However some candidates could not explain the role the modem played, only what it did in modulation/demodulation.

A typical good response:

Computers are digitally based but most transmission media such as telephone lines are analogue based. The role of the modem is to modulate digital signals from the computer into analogue signals to be transmitted and to demodulate the incoming analogue signals back into digital so that the computer can recognise the message.

Question 25 - Computer-controlled Systems

Only 5% of the total candidature attempted this option, which was generally well answered. However, a number of candidates attempted this question with little evidence of having studied the topic in detail, and as a result, were unable to score marks, as the technical issues in this topic can not be addressed from a general knowledge of computer systems.

- (a) (i) This part was generally answered well, with most candidates being able to give some distinguishing characteristics of a batch control system.

A typical good response:

A batch control system has a clear beginning and end. It queues jobs until there are enough to process. This system can be changed to perform similar but different tasks.

- (ii) Most candidates were able to describe what is meant by signal conditioning. Better responses mentioned both conversion of signals and removal of noise or filtering.

A typical good response:

Signal conditioning is where there is modification of a signal into a form which the controller or actuator can use. It may involve amplification or filtering of a signal.

- (iii) This part was well answered by the majority of candidates. Some candidates' responses were too general and did not specifically examine the impact of computer technology on our society.

A typical good response:

A traffic control system will improve the flow of traffic especially on congested roads. Improved traffic flow will increase road safety by reducing the number of accidents, particularly those related to road rage.

- (b) Many candidates answered this question in general terms, describing the 'photocopier system' rather than specifically describing the control system of the photocopier. Candidates appeared more concerned with factors in the environment rather than with the control system in question.

- (i) Some candidates were confused about what constitutes an input and an output for a control system, and identified factors outside the influence of the controller such as putting paper in the tray of the copier as an input, and the copied paper in the tray as an output.

A typical good response:

- Inputs: Dimensions of the original
 Number of pages to be copied
- Outputs: Adjustment of copy density
 Magnification of original

- (ii) Responses to this part indicated that most candidates understood what constitutes a sensor. Some candidates, however, chose inappropriate sensors in the context of this question, for example, a manometer to measure pressure as a way of detecting the number of copies passed through the copier.

A typical good response:

Phototransistor: used to detect the edges of the paper.

Light dependent resistor: where light reflected off original will determine copy density.

- (iii) This section was not answered by a large number of candidates. Many candidates found it difficult to describe the sorts of tests that could be used to evaluate the performance of the system. The better responses showed depth of thought about what the question required. Some candidates attempted to answer this question from an algorithmic point of view, getting distracted into descriptions of desk checking and systems analysis.

A typical good response:

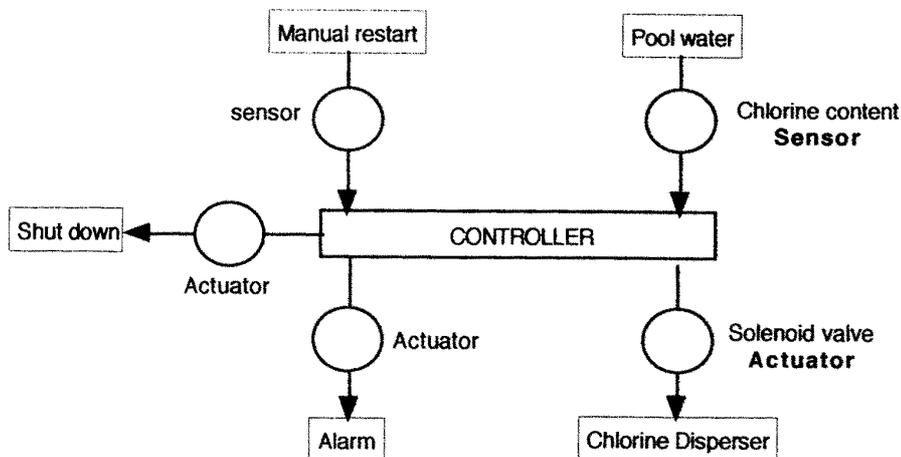
Test 1: Use a large and a small sheet of paper to be copied (less than A4, greater than A4). Evaluate paper size system.

Test 2: Use paper to be copied in varying shades of grey and black to test accuracy of copy density system.

Test 3: Photocopying double-sided pages to see whether counting mechanism works.

- (c) (i) This part was poorly attempted by the majority of candidates. Many candidates resorted to drawing flow charts or data flow diagrams and did not produce a block diagram, which showed a clear relationship between controller, sensors, actuators and end effectors. Many candidates omitted the controller.

A typical good response:



- (ii) Most candidates were able to give examples of appropriate sensors for measuring temperature, justify why it would be used, and describe how this sensor worked. Very few candidates could give examples of sensors which could be used to detect levels of chlorine. Some answers describing thermostats and thermistors were excellent, with candidates being able to describe in detail how these devices worked. Some candidates successfully supported their answers with appropriate diagrams.

A typical good response:

A thermostat could be used as a sensor to measure the temperature. It closes a switch once the temperature reaches a certain value.

A thermostat consists of a bi-metal strip which bends as it gets hotter. This bending can activate a switch to turn off the heater.

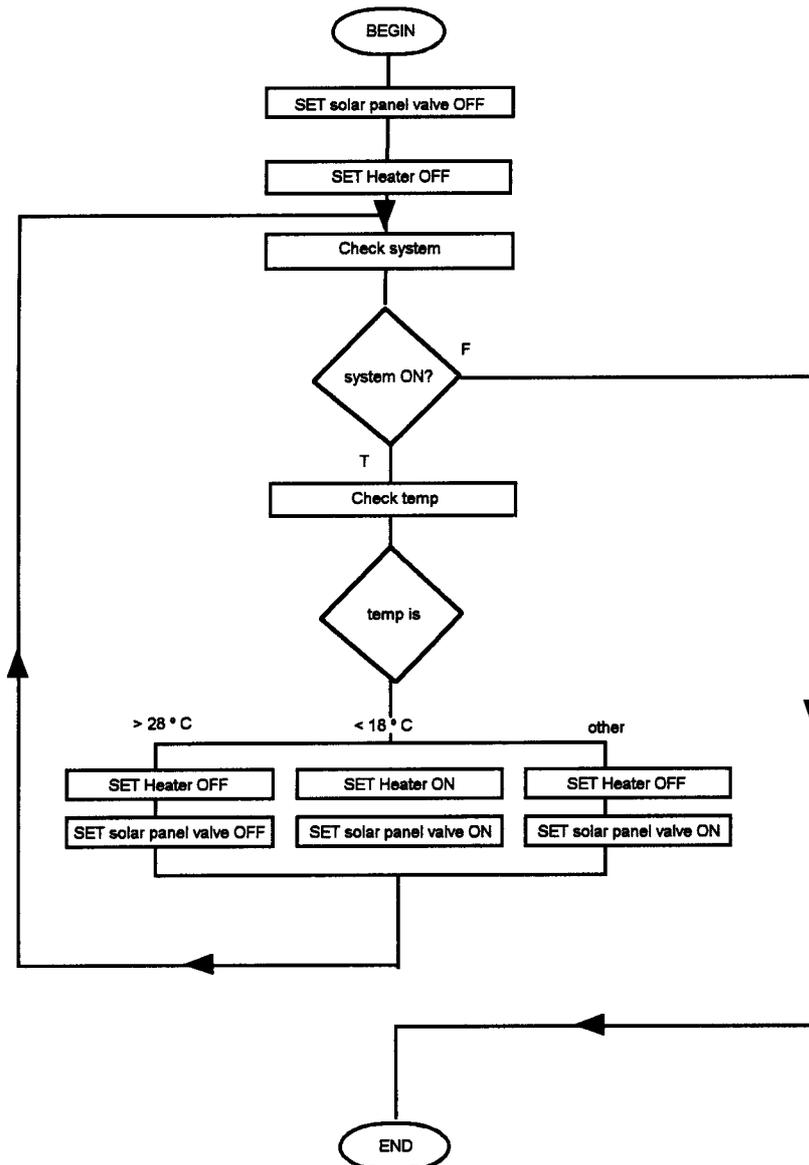
- (iii) Most candidates were able to give examples of actuators.

A typical good response:

A relay could be used to open and close the switch on the heater. A relay is a solenoid and a switch. When a current is applied, the solenoid closes or opens the switch.

- (iv) Most candidates were able to score marks where the algorithm showed good structure as set out in the *Methods of Algorithm Description* document. Many failed to do well for such things as not initialising, having a begin but no end statement, having the temperature check outside the loop or omitted altogether, not showing the loop correctly, and no option to return to do a temperature check.

Typical good responses:



```

BEGIN
  SET solar panel to OFF
  SET heater to OFF
  WHILE system is ON
    GET temperature of water
    IF temp is <18° C THEN
      SET heater to ON and Solar panel to ON
    ELSE
      IF temp is >28° C THEN
        SET heater to OFF and solar panel OFF
      ELSE
        SET Heater to OFF & Solar panel to ON
      END IF
    END IF
  END IF
END WHILE
END
  
```

Question 26 - Computing Technologies

Approximately 27% of the total candidature attempted this option topic, with the split between Theory and Construction of Integrated Circuits and Optical Technologies being about even. Most candidates handled binary number theory quite well, except for their understanding of negative representation and the process of binary division. Candidates again had difficulty when asked to discuss flip-flops in the Theory and Construction of Integrated Circuits, but otherwise showed a reasonable understanding in this section. The second part of Optical Technologies was fairly well answered. Again, candidates had difficulty in both parts (b) and (c) in tailoring their answers to the specific questions in the paper.

- (a) (i) The majority of candidates answered this part well, although some appeared to struggle when converting binary into the hexadecimal characters A-F. Candidates who had learnt to split the 8 bits into two groups of 4 bits and then represented the solution 4D as 413 did not do well.

The correct response:

| <i>Decimal</i> | <i>Binary</i> | <i>Hex</i> |
|----------------|---------------|------------|
| 77 | 0100 1101 | 4D |
| 78 | 0100 1110 | 4E |
| 79 | 0100 1111 | 4F |
| 80 | 0101 0000 | 50 |

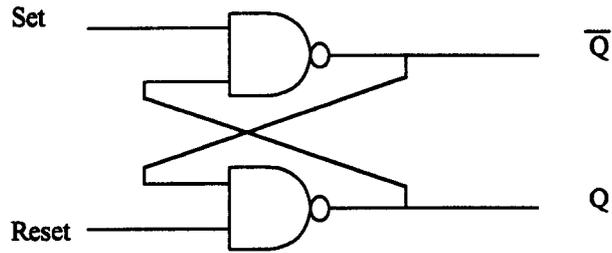
- (ii) This question generated a number of potentially correct solutions. It was clear from the responses given that most candidates have learnt the types of negative representations as processes and have little understanding of the implications of a negative number system. Most failed to recognise that for the binary number 10110101 to be positive as stated, it must have had at least one extra 0 bit preceding it.

A typical good response:

| <i>Positive binary number</i> | <i>One's complement</i> | <i>Two's complement</i> | <i>Sign and modulus</i> |
|-------------------------------|-------------------------|-------------------------|-------------------------|
| 10110101 | 101001010 | 101001011 | 110110101 |
| 00110101 | 11001010 | 11001011 | 100110101 |

- (iii) 1 No marks were allocated to this part due to the typographical error in the examination paper.
- 2 The majority of candidates answered this part well, but some responses indicated a general lack of awareness of overflow. Candidates performed much better than in similar questions in previous years as most now seem to understand that you only need to take the 2's complement of B, not of both numbers, before adding it to C.

A typical good response:



- (iii) This question was very well answered by a majority of candidates.

The correct response:

| <i>A</i> | <i>B</i> | <i>C</i> | <i>X</i> | <i>Y</i> | <i>Z</i> |
|----------|----------|----------|----------|----------|----------|
| 0 | 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 1 | 1 | 0 | 1 |
| 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 1 | 0 | 1 |
| 1 | 0 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 0 | 1 | 1 |

- (iv) 1 Most candidates could arrange the 5 steps into the correct sequence, although a number swapped photomasking and etching.

The correct response:

CAD
 photomasking
 etching
 testing
 packaging

- 2 This question was reasonably well answered by most candidates. There is still some confusion between the photo-resist and the photomask.

A typical good response:

Photo-resist is a light-sensitive chemical that is applied on top of the semiconductor layered on the silicon wafer. When exposed (through a photomask) the soft photo-resist hardens where the light hits it and stays soft where it is covered (or vice versa). The hard photo-resist then protects the wanted parts of the circuit while acid removes the soft parts, allowing the underlying semiconductor to be similarly etched.

- 3 Most candidates did not tailor their answer to the question, rather they wrote down every fact they knew about the manufacturing environment. Unfortunately,

this meant that they tended to focus on the wrong aspects of manufacturing silicon chips and disregarded the facts the examiners were seeking, hence few candidates gave responses that were as thorough as required.

A typical good response:

Hospital operating theatres mainly have to worry about germs. Very small dust particles and flakes of skin etc do not interfere with patient recovery. However, the inner components of chips are microscopically small and even such small things do interfere with their function. A tiny bit of dust is big enough compared to a chip's internal circuitry to ruin it.

(c) Optical Technologies

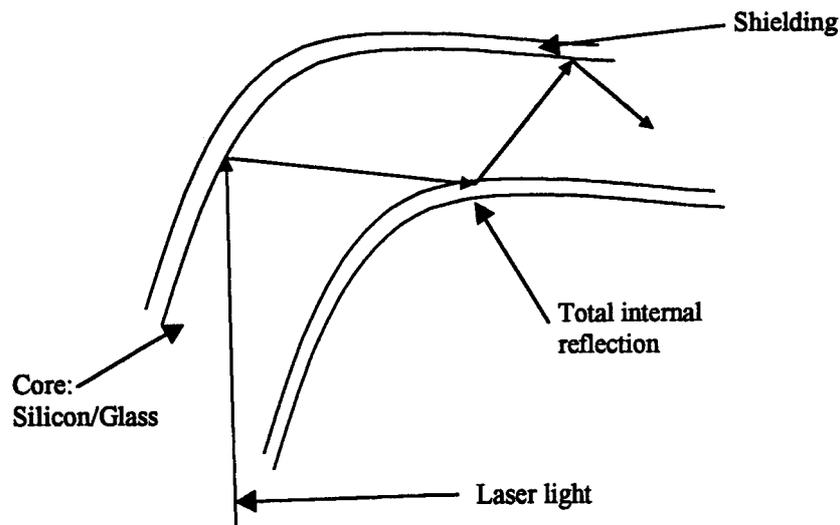
- (i) The vast majority of candidates had great difficulty in answering this question. Many attempted to write responses without identifying which of the FOUR topics they were addressing. Candidates who constructed a table generally performed better. Candidates frequently could not distinguish between environmental aspects and social costs.

A typical good response:

| | <i>Fibre optics</i> | <i>Metal conductors</i> |
|------------------------------|---|--|
| <i>Data capacity</i> | Very high due to large bandwidth | Lower bandwidth than fibre |
| <i>Transmission velocity</i> | Speed of light | Speed of light |
| <i>Data storage life</i> | No signal loss over medium to long distance | Repeaters are needed over long distances |
| <i>Environmental aspects</i> | Made from abundant silica | Uses copper wire which is expensive to mine. |

- (ii) 1 It was clear from a proportion of scripts that a research project had not been undertaken.
- 2 Candidates who chose Laser printing as the technology performed better overall than those who chose CD-ROM or Fibre optics. Magneto-optical technology was chosen least and answered most poorly.
- 3 Candidates appeared to have a good understanding of how laser printing technology works.

A typical good response:



Laser light is pulsed along the fibre optic cable. The cable has an outer cladding and a core with a higher refractive index providing total internal reflection.

- 4 The majority of candidates answered this correctly according to their responses in parts 1 and 2.

A typical good response:

UTP or coaxial cable.

- 5 Many candidates wrote about the benefits of using the new technology and failed to address the limitations of the old technology.

A typical good response:

Coaxial cable has a lower bandwidth than fibre optic and is more prone to interference.

- 6 Candidates had difficulty identifying technical problems/limitations of the new technology.

A typical good response:

Specialist equipment is needed to join fibre optic cables. They are not as flexible as UTP or coaxial cables and can break if bent beyond the critical angle.

Question 27 - Database Design

About 61% of the total candidature attempted this option. The question illustrated the candidates' ability to display their knowledge of theory but exposed their inability to apply their theoretical knowledge to 'real world situations'.

- (a) Most candidates were able to do well in this part of the question. Common errors were that candidates tended to confuse binary and linear searches, as well as the different types of databases.

The correct responses:

- 1 logical operand
- 2 data integrity
- 3 data hierarchy
- 4 binary search
- 5 data dictionary
- 6 data redundancy
- 7 linear search
- 8 relational database
- 9 network database
- 10 hierarchical database

- (b) The first parts of this question were answered quite well.

- (i) This part provided many satisfactory responses but very few exceptional ones.

The correct response:

The primary key is a combination of seat number and event number.

- (ii) This part was very well answered.

The correct response:

It is possible for many people to have the same surname, therefore Family_name is not a unique identifier hence it is not suitable as a primary key.

- (iii) The better responses demonstrated a good knowledge and understanding of relational databases, while poorer responses tended to be too generalised and not database related.

Typical good responses:

- 1 Valid_Credit_Card?
- 2 Age
- 3 Age is a variable quantity, which changes and hence requires constant updating to ensure data integrity. Age would be better represented by a Date_Of_Birth field.
- 4 Address is better split into different fields as it enables the sorting or searching of different categories based on for example, suburb or postcode. The address field would be divided into street and number, suburb, postcode.

5 A more appropriate database solution would be to create an Events_required file, which is linked to the Person file through a field, like Person_ID which would be the unique identifier in the Person file.

- (iv) This question was very poorly answered and was often not attempted. Many candidates neglected to outline the method in which the data would be placed in the person file and only a small number of candidates identified the 'electronic' nature of the file required. Most candidates were able to identify the need for a separate file relating to Sponsor_Details.

A typical good response:

An interactive, online database file would be required in order to store the entered data. A sponsor could access a data entry form on a web page and details would be transmitted using a secure transfer method. This online file would be linked to the person file via a key field, which would enable the details to be transferred to the Person File.

- (c) (i) The most common responses to this question were passwords and encryption. Most candidates were able to identify two methods to secure data but often failed to elaborate further on their response.

A typical good response:

Encryption is where data is scrambled into an unreadable form which requires an 'electronic key' to decipher it. A password is a string of characters used in conjunction with a user name, which is required in order to access the credit card details. The password should not be obvious and should be changed regularly.

- (ii) Many candidates gave answers that did not reflect a computing statement, with some candidates giving their answer in the form of a letter from Bob's Book Company to interested customers.

The correct response:

Books_category_preference = 'Asian politics'

- (iii) Many candidates simply stated the privacy act or other laws they thought were relevant. Most candidates were able to identify that there was an issue of privacy but needed to give more detailed discussion of the consequences or situations which arose.

A typical good response:

Customers assume that when they give their details to a business that it will not be given or sold to anyone else. The passing on of data is an invasion of privacy. This would be more acceptable if the customers were asked to give their consent before passing on information to other companies. One consequence of the unauthorised passing of information is receiving junk mail from the video and music companies.

Question 28 - Graphical Techniques

Once again Graphical Techniques proved to be the second most popular option topic with 75% of all candidature attempting this question. On the whole, candidates do not have a great depth of understanding of the graphics concepts. In particular, knowledge of the operation of hardware devices is very poor. Overall those candidates who employed good diagrams in their answers found it easier to express their answer more clearly.

(a) Definitions are still poorly understood and often the student who did know the definition could not apply this understanding to the effect on the image.

- (i) A significant number of candidates described the term *aspect ratio* without explaining the effect on an image of changing the ratio. Candidates generally lacked the understanding, or failed to demonstrate that changing the aspect ratio changed the proportion of the graphic.

A typical good response:

If the aspect ratio of an image is changed then the image will be out of proportion. For example changing the ratio from 4:3 to 8:3 will mean the image will be stretched vertically.

- (ii) Candidates needed to realise that the colours and textures are added to the surface of the object not just to the wire frame.

A typical good response:

Rendering involves adding colour and texture to the surface of a wire frame object. This will make the object look solid. In addition ray tracing may be used to light the surface of the object.

- (iii) Candidates needed to refer to the graphical capabilities of the two types of printers not just the cost and speed. There appears to be a widespread lack of knowledge of the role of the laser in a laser printer.

A typical good response:

The laser printer has a higher resolution and produces high quality output in areas such as magazine production.

- (iv) Candidates typically missed the point of this part, which was referring to vector and raster monitors. Many answered in terms of vector and raster graphic images only. Candidates generally tried to use last year's answer for this year's question.

A typical good response:

Vector monitors are best used when there is only a need to display vector images. They are especially useful in the areas of CAD and architecture.

- (v) Candidates had a better understanding of the concept of dithering but could not relate it to the decrease in colours.

A typical good response:

Dithering is the representation of a colour not in the existing palette by the use of a pattern of varying colours where the eye performs the averaging to produce the desired colour. Dithering allows colours to be created thus reducing the number of colours required in the palette and therefore the number of bit planes needed to represent them.

- (vi) Candidates generally explained the effects of compression on storage or transmission of the file. They were required to relate their answer to the effect on the image itself.

A typical good response:

There are two types of compression: lossy and lossless. If using a lossy compression method such as JPEG then the quality of the image is degraded. However, lossless compression such as GIF does not degrade the original image.

- (vii) Candidates generally understood the concept of anti-aliasing, but many failed to link it with pixel averaging.

A typical good response:

Anti-aliasing is used to remove the visual effect of the 'jaggies' by the use of pixel averaging.

- (b) Candidates did not read the question carefully. Some candidates used systems in sport that were not graphical, for example, timing mechanisms. Answers in art and sport showed trivial uses of computer graphics and a lack of knowledge of typical input devices.

- (i) Candidates struggled to give changes in sport or art that had resulted from the use of computer graphics.

A typical good response:

In art the use of computers and graphics have created a new art medium whereby the artist is able to move away from the traditional canvas and paintbrush to the usage of a graphical software program enabling them to create, manipulate and edit their work in a digital form, for example, the creation of 3-D images.

- 1 Candidates obviously did not read the question carefully. The listed (and prescribed) devices were used along with output devices.

A typical good response:

Graphics tablet

- 2 The responses to this part were poor with many trivial answers being provided.

A typical good response:

The graphics tablet can be used to input freehand drawings or to trace over existing drawings. This allows the artist to quickly input an image that can then be manipulated using suitable software.

- 3 There appears to be a very poor understanding of the operation of most input devices, especially a light pen, where many candidates believe that the light pen emits light that is detected by the monitor.

A typical good response:

A graphics tablet consists of a stylus or puck, and a tablet. The surface of the tablet is made up of a grid or matrix of sensors that can be activated by the stylus/puck. When the sensor is activated its co-ordinates are sent to the computer so that it can calculate where the stylus/puck is touching the tablet.

- (iii) Responses to this part were again fairly trivial in nature, with many candidates simply identifying larger hard disks and faster processors as the advances. Many answers from candidates were not restricted to processing and storage as requested in the question, but included areas such as the Internet and input/output devices.

A typical good response:

Advances in CPU's both in clock speed and data width (16 - 32 - 64 bit) have allowed much larger graphics to be manipulated in real time and greatly improved realism in animations. This has led to the development of a whole new artistic area: computer generated graphic art.

Advances in HDD technology storage capacity mean that much larger graphics and animations can be stored, coupled with faster data speeds, this has allowed artists to create very intricate graphics and animations.

- (c) Candidates must read the question carefully including all relevant information, such as the text above the graphics of the rabbits.
- (i) Candidates showed a generally poor understanding of the technical operation of devices such as scanners throughout this part. In this section many chose to describe what the user would do rather than the operation of the scanner.

A typical good response:

A scanner passes a strong light over the image to be scanned. The light is reflected back to a series of LDD's or CCD's. The reflected light generates an electrical current in these devices, the level of the current is used to determine the colour or shade of grey contained in that part of the image. Finally the data stored in the sensors is converted to a digital format and sent to the computer for processing.

- (ii) Many candidates seemed to think that a monochrome graphic and a bit-mapped graphic were two different things and would be stored in different ways. Candidates needed to identify the one to one correspondence between pixels on the screen and memory locations and the fact that this graphic would have a bit depth of 1.

A typical good response:

As this is a bit-mapped graphic every pixel in the graphic will be represented by a different memory location in the RAM, as the graphic is also monochrome only one bit will be required in every memory location.

- (iii) This part was generally well answered.

The correct response:

Eight bit-planes will allow 256 (2^8) colours to be used.

- (iv) Candidates need to be made aware that 'show how' does not mean you have to calculate the answer, simply show the formula. Rounding 1Kb to 1000 is not acceptable.

The correct response:

$((20 \times 40 \times 8)/8)/1024$

- (v) Candidates should be reminded that the *Glossary of Terms* document supplies the official definitions and terms. Candidates need to be able to distinguish between tweening and morphing.

The correct response:

This process is called tweening.

- (vi) The question required candidates to write about animation, rather than graphics or computing in general. Candidates should again be reminded to read the question carefully. The question also referred to the resolution of the system rather than that of the graphics/animation.

A typical good response:

Memory size and processing speed both have similar effects on the animation. If there is insufficient memory or the processor speed is too low then the animation will appear to be jerky as it constantly stops and waits for the next frame to be loaded, alternatively it may appear jerky because frames are being discarded to keep up the speed. Additionally if memory is very limited the animation may not run at all.

If the resolution of the system is different to the one where the animation was created it may appear larger (if the resolution is lower) or smaller (if the resolution is higher) than the animator intended.

Question 29 - Multimedia

About 32% of the total candidature attempted this option. Candidates' responses often involved attempts to match conditioned responses learned in class to the special situations described in the question. Candidates who performed best had read the entire question first and thus avoided the trap of duplication. For example, many candidates unwisely answered (a) (i) in terms of MIDI and then found little new they could add in latter parts.

- (a) (i) Most candidates recognised that *digital* was the format which should have been chosen over *analog* for the band to represent their performances on CD-ROM. Many of the candidates had difficulty in understanding the question and they suggested alternative techniques to those identified in the question, such as describing the advantages of in-house burning of the CD over mass production techniques. Many candidates interpreted the introductory statement as restricting their responses to *audio* media and were then confused by the reference here to the 'band's performances'.

A typical good response:

Digital.

The band's performances would be recorded using digital video equipment and then stored on the hard drive. The recording process may involve using an analog video recorder and then digitising the recording via a video capture card or alternatively by recording the performances using a digital video camera and then transferring the recordings to a computer. After editing, the recordings could either be 'burnt' onto a CD-ROM or they could be sent to a recording company where they would be professionally produced on CD-ROMs for mass distribution.

- (ii) Most candidates were able to provide two advantages and two disadvantages. It is important that candidates provide disadvantages that are clearly different to the advantages, and not just an opposite statement. Candidates are advised to name the 'alternative technique' when it is the basis of their comparison.

A typical good response:

Two advantages:

The equipment necessary for the technique above is readily available.

Recorded sequences can be easily edited and special effects may be added.

Two disadvantages:

A large amount of storage space is needed to store digital sounds and video.

A large variety of formats exist for digital sounds and the chosen format may be incompatible with other applications.

- (iii) The reference here to *songs* caused some candidates difficulty, carrying as it does the implication of voice content. Better responses required the range of hardware to included specific MIDI related equipment.

Typical good responses:

Synthesiser

Sound card

Sound module

MIDI controller

- (iv) This part required candidates to explain how a MIDI file is created. Most candidates were able to give a basic explanation although few were able to provide an in-depth answer.

A typical good response:

A MIDI input device, for example a keyboard, is played and the note information such as pitch, tone and note length is stored by a sequencer program as MIDI events. The actual MIDI data describes how a piece of sound should be played. The note information is then interpreted by the sound chips in a sound module and sent to an output device.

- (v) Candidates were required to describe two major differences between MIDI and digital waveform sound files. Many candidates merely stated a difference without describing it in some detail.

A typical good response:

1 MIDI files only store note information and are therefore considerably smaller than waveform files which store the actual sampled sounds.

2 Voice and other live sounds cannot be stored as MIDI files whereas waveform files are able to store all sounds including background sounds.

- (b) In parts (i) and (ii) candidates were asked to 'name' techniques to reduce video and audio data without reducing the content of the material.

(i) ***Typical good responses:***

Reduce frame rate

Reduce frame size

Reduce number of frames

Reduce resolution
Reduce number of colours

(ii) **Typical good responses:**

Compression
Reduce sampling rate
Change from stereo to mono
Reduce bit resolution

- (iii) Candidates who argued that it is not possible to increase the storage of a CD-ROM, but merely to create more storage space by compression of existing files were given credit. Those who argued that the answer would be dependent upon the degree of compression undergone by either the audio or video files or the relative proportions present of these two types were also given credit.

A typical good response:

Reducing video data will maximise the storage capacity because video data typically takes up much more storage space than audio data.

- (c) Generally, this question was answered well by the majority of candidates. However, candidates who did not attempt this question were greatly disadvantaged because of the significant allocation of marks.

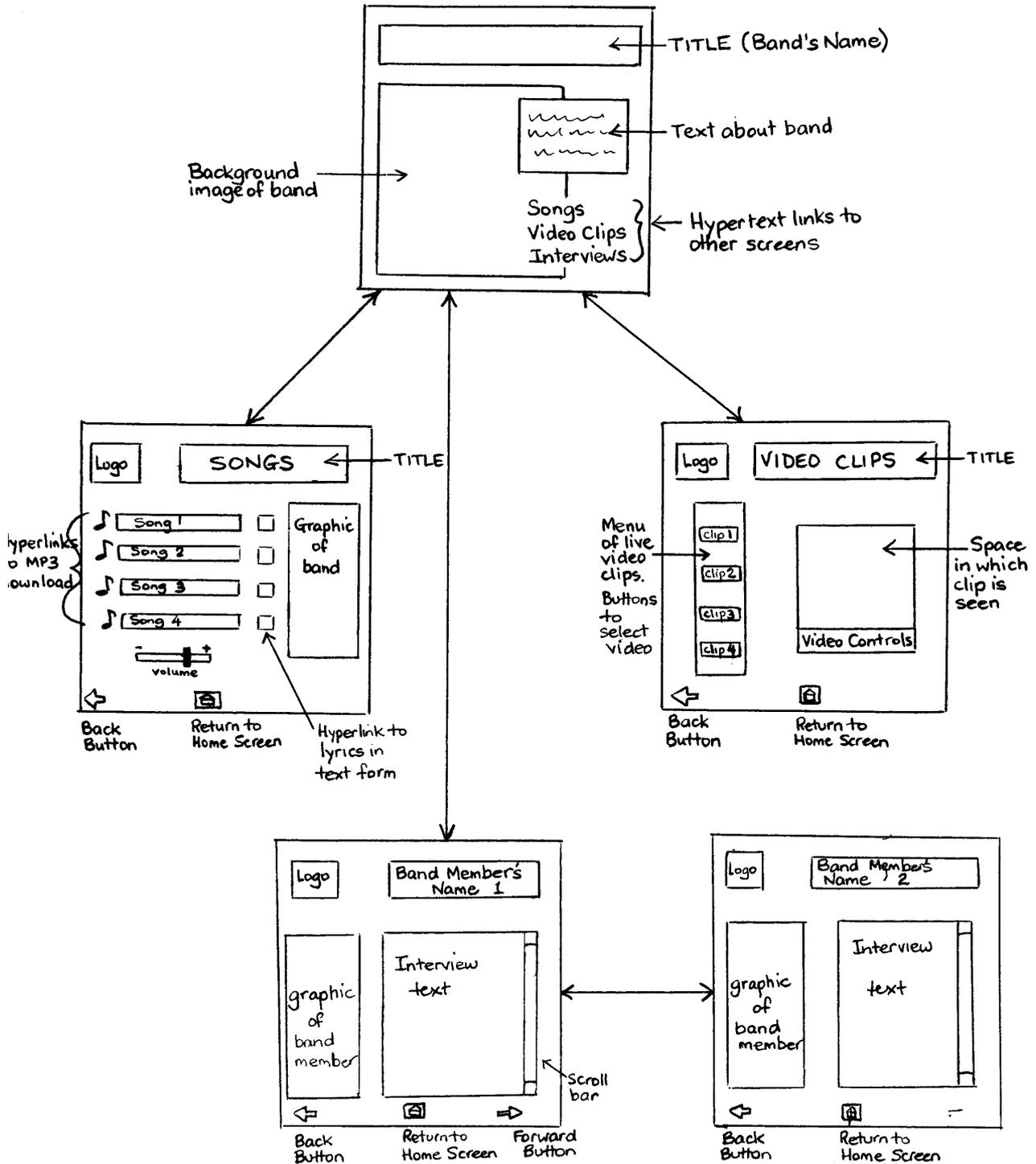
(i) **Typical good responses:**

Linear or sequential
Hierarchical or branching
Non-linear or network
Composite or hybrid

- (v) It was evident that this question was rushed by a number of candidates, however it was generally well answered. Candidates would do well to note the mark allocations for parts of questions before commencing work.

A common error was to ignore the importance in a multimedia storyboard of designing logical navigation. Many candidates created diagrams with single arrows that lead to dead-ends or without return/back buttons to the main screen.

A typical good response:



3 Unit (Additional)

General Comments

This year 1691 candidates attempted the 3 Unit Additional HSC Computing Studies Examination Paper. The majority of candidates did not complete all parts of this paper, especially Question 22, where it was evident that many responses were rushed. Candidates need to be reminded to monitor their time carefully throughout the examination, so as to ensure they allow enough time to attempt all parts of the paper.

The 3 Unit Additional Examination consisted of:

Section I - 20 Multiple Choice questions worth one mark each.

Section II - two compulsory questions worth 15 marks each.

Section I - Multiple Choice (20 marks)

| Question | Correct response | Percentage correct | Question | Correct response | Percentage correct |
|----------|------------------|--------------------|----------|------------------|--------------------|
| 1 | D | 68 | 11 | C | 92 |
| 2 | C | 66 | 12 | A | 50 |
| 3 | A | 91 | 13 | A | 54 |
| 4 | C | 36 | 14 | C | 73 |
| 5 | A | 58 | 15 | D | 23 |
| 6 | D | 79 | 16 | B | 79 |
| 7 | B | 85 | 17 | B | 53 |
| 8 | C | 39 | 18 | C | 65 |
| 9 | A | 81 | 19 | C | 85 |
| 10 | D | 89 | 20 | B | 73 |

Candidates performed well in the Multiple-Choice section of this examination paper. An explanation of the question, where less than 50% of the candidature selected the correct response, appears below.

Question 4

The majority of candidates selected response A, believing that the illustration shown was a storyboard.

Question 8

Candidates' selections were fairly evenly distributed between response A, response B and response C, with about 4% not even attempting this question. It is advisable for candidates to complete a deskcheck table for this type of question. A deskcheck would have brought about the following results:

| Sum | A | Count |
|-----|----|-------|
| 0 | 61 | 1 |
| 61 | 61 | 2 |
| 122 | 62 | 3 |
| 184 | 63 | 4 |
| 247 | 64 | 5 |
| 311 | 46 | 6 |

Question 15

59% of candidates incorrectly chose response C, believing that prototypes are used to ensure proper program structure, rather than to aid in evaluating proposed screen designs.

Section II (30 marks)

Question 21

The second part of this question was well answered by the majority of candidates. Many candidates however, struggled with the first part of this question, finding it difficult to clearly express the underlying concepts associated with the terminology quoted in their responses.

- (a) Candidates needed to understand that the program being written is actually a new programming language, and also that the translating method, which this new language would utilise, was the point of the question.
- (i) It was important that candidates mentioned distinct differences, rather than just describe source and object code. Differences involve some sort of comparison.

A typical good response:

Source code is English-like as it is the code the programmer writes, whereas object code is binary code that is understood by the computer. Source code is written in a high level language like Pascal, but object code is translated into a low level language by a translator. Object code is machine code and therefore cannot easily be changed whereas source code can be edited easily and then re-compiled into object code.

- (ii) This part was not generally answered well. It was important that responses justify why their chosen paradigm was appropriate for the translation process by giving some sort of example to assist in justifying their response.

A typical good response:

Procedural: The translation process is a step by step process. Each line of code is examined in turn. For each line lexical analysis occurs followed by parsing followed by conversion to machine code. This step by step process makes a procedural paradigm the most appropriate choice.

- (iii) 1 Most candidates correctly named and described advantages for two translation methods. It was not important which method was chosen for Fig 1 or which for Fig 2. The significance of their decision had consequences for the next part.

A typical good response:

Figure 1 is an interpreter. Interpreters translate each line individually, this means that errors in a single line are highlighted more effectively.

Figure 2 is a compiler. Compilers convert the whole program into machine code, which means that execution of the program will be faster.

- 2 Candidates needed to describe two processes that take place for the translation method chosen in part 1.

A typical good response for a compiler:

Process B: Lexical analysis occurs for the entire source code, looking for key words. Comments and other non-essential characters are removed at this stage. Parsing then occurs to make sure that the code is syntactically correct.

Process C: Assuming process B has been completed without error then the code is converted into machine code ready for later execution.

- (iv) Different platforms imply differing CPU architecture and differing operating systems. Therefore responses needed to detail problems that may occur due to these differences.

A typical good response:

The instruction set in the processor could be different. Hence, the object code would produce unpredictable results. Also different operating systems use different methods of naming files, so it is possible that the file may not be able to be recognised in the first place by the operating system.

- (b) (i) This part was generally well answered. It seemed that some candidates were not totally conversant with the meaning of some of the symbols used in EBNF.

A correct response:

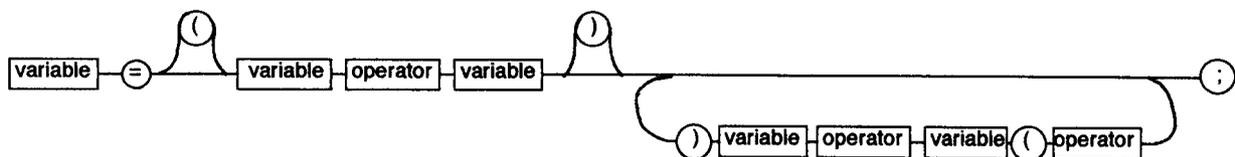
Alphabetic = abc..zABC...Z

Digit = 012...9

Variable = <alphabetic>{<alphabetic><digit>_}[&]

- (ii) This part was well answered, although some candidates had difficulty converting the loop to a railroad diagram because it is only optionally entered.

A correct response:



- (iii) The three techniques chosen needed to be uniquely different. For example describing test data within the description of a deskcheck did not attract marks if the use of test data was presented as a technique in its own right.

A typical good response:

Deskchecking: Deskchecking the program is manually working through using data where the expected outputs are known. The outputs obtained are compared with the expected outputs.

Stubs: A piece of code used in place of a subprogram. This allows for testing of the main program before the sub-program is actually written.

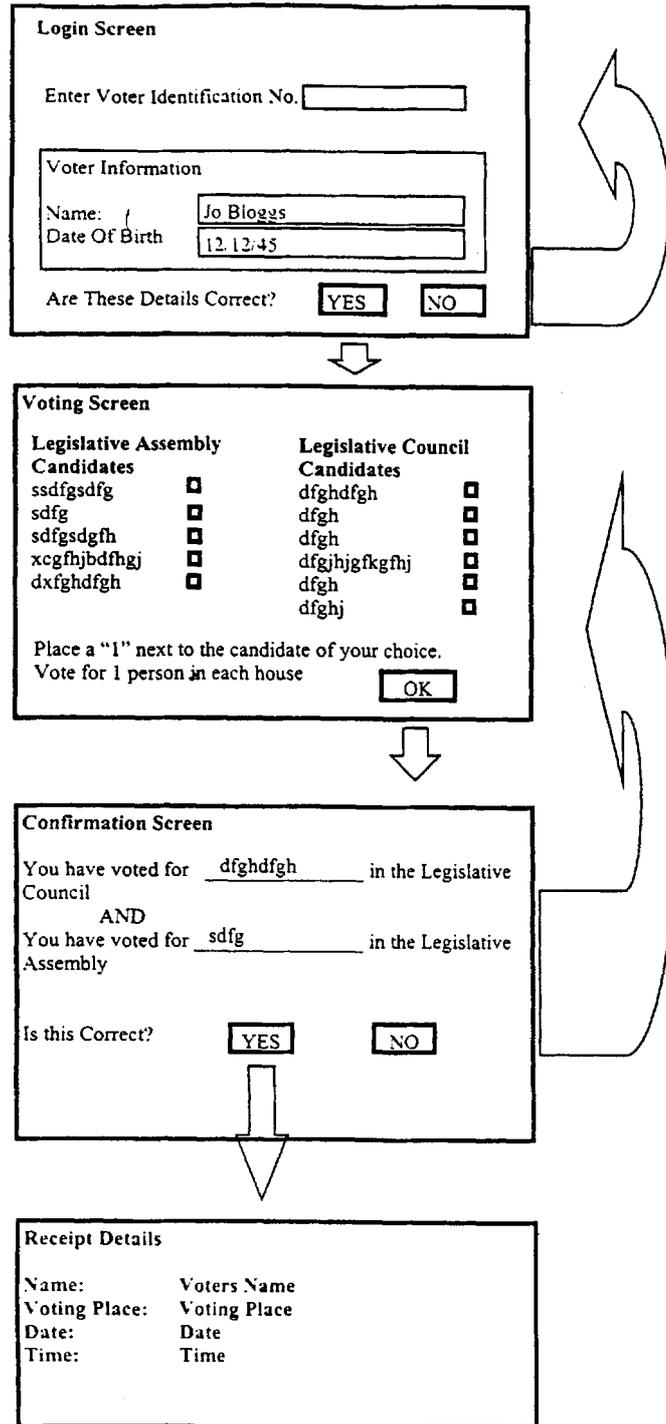
Flag: A boolean variable that is set when a specific event or piece of code is executed. This shows the programmer that control has passed through that point in the code.

Question 22

The question required a large amount of reading and subsequent analysis. Many candidates spent a lot of time on the first part of the question and did not allocate enough time to complete all parts of this question. Overall the question was well attempted by the majority of candidates.

- (a) (i) This part was generally well answered. It was pleasing to see that most candidates understood the basic principles behind good screen design, particularly the need for clear prompts and a space to enter the data. A surprising number of candidates did not attempt to show sequence despite the clear instructions in the question. A large number of candidates obviously spent a large amount of time on this part, which unfortunately caused difficulties later in this question.

A typical good response:



- (ii) A surprising number of candidates did not understand the concept of a prototype, as a model that can be used to evaluate proposed screen designs and gauge user reaction. Candidates who did understand the concept found it difficult to justify the use of a prototype.

A typical good response:

The Electoral Commission would use a prototype because it allows them to get fast feedback on screen designs. Prototypes are also easily modified to accommodate changes that the Electoral Commission may want.

- (iii) Pre-processing is a concept that many candidates found difficult to explain. Some chanced upon a correct definition, but few provided the definition in the detail required.

A typical good response:

Pre-processing is any processing of data that is done to prepare a piece of data for another process. For example Voter ID Validation filter ensures that a valid voter is using the system before accepting their vote. These systems would also validate that a '1' has been entered against a candidate before processing the vote.

- (iv) Many candidates seemed to think that an array of 3 000 000 records kept in memory was an appropriate data structure. It is unfortunate that candidates are not exposed in the classroom to more real life examples, which would help them to understand that such huge amounts of data would have to be stored on disk.

A typical good response:

The data would be stored as a file or record. There would be 3 000 000 records made up of; VoterID, Voter_Name, Date_of_Birth, & Address. These would be stored in a random Access file.

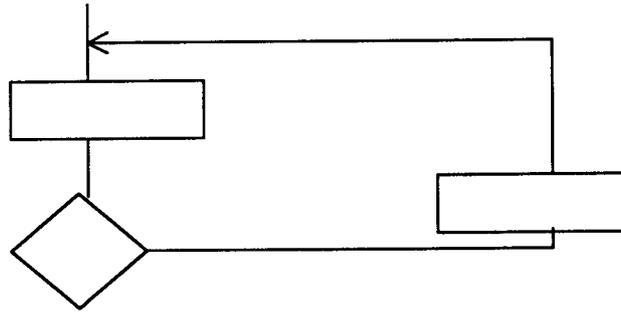
- (b) (i) Most candidates were capable of correctly desk checking the provided algorithm. Some candidates were confused by the nested IF structure. Candidates should be careful to correctly distinguish output statements from processing statements and to reproduce output messages exactly.

A typical good response:

| <i>Last message displayed</i> | |
|-------------------------------|-------------------|
| 1 | |
| 2 | INCORRECT PIN |
| 3 | INCORRECT PIN |
| 4 | MAXIMUM PIN tries |

- (ii) Although many candidates understood the requirements for the algorithm, many experienced difficulty with utilising correct structures. In particular, conditions in selection statements were poorly done, and many pseudocode attempts did not include the appropriate use of ELSE and END IF.

Candidates using flowcharts commonly used a structure as shown below.



This structure is neither a pre-test nor a post test loop and should not be in use at 3 Unit level.

Even where the structures were correct, some candidates had difficulty correctly using '>=', to cope with the boundary conditions. A number of candidates also neglected to decrement the account balance or increment the daily total, which was an obvious requirement for the algorithm to work properly.

A typical good response:

```

BEGIN SUBPROGRAM Withdrawal
  read CurrentBalance
  read AmountWithdrawnToday
  REPEAT
    IF CurrentBalance <= 500 THEN
      MaxAllowedWithdrawal = CurrentBalance -
      AmountWithdrawnToday
    ELSE
      MaxAllowedWithdrawal = 500 -
      AmountWithdrawnToday
    ENDIF
    Input WithdrawalAmount
    IF WithdrawalAmount <= MaxAllowedWithdrawal
      AND WithdrawalAmount >= 20 THEN
      OutputReceiptInformation
      AmountWithdrawnToday =
      AmountWithdrawnToday + WithdrawalAmount
      CurrentBalance = CurrentBalance -
      WithdrawalAmount
    ELSE
      Output "Amount Not Valid"
    ENDIF
  UNTIL CurrentBalance < 20 OR AmountWithdrawnToday >=
  500
END SUBPROGRAM Withdrawal
  
```

- (iii) Many candidates correctly recognised the need to test both above and below the boundary conditions as well as the boundary values of \$20 and \$500 for a daily total. Fewer candidates included multiple transactions on a day to correctly test the accumulated day total. Although the question asked for a desk check most candidates chose to display expected output.

A typical good response:

| <i>Test data set for withdrawal</i> | <i>Amount withdrawn today</i> | <i>Account balance</i> | <i>Expected output</i> |
|-------------------------------------|-------------------------------|------------------------|------------------------|
| 100 | 500 | 700 | Amount Not Valid |
| 0 | 0 | 700 | Amount Not Valid |
| 20 | 0 | 700 | Withdrawal = 20 |
| 100 | 100 | 700 | Withdrawal = 100 |
| 450 | 100 | 700 | Amount Not Valid |
| 500 | 0 | 700 | Withdrawal = 500 |
| 700 | 0 | 700 | Amount Not Valid |

- (iv) Many candidates did not attempt this part and those that did generally answered poorly. Candidates struggled vainly to validate accounts, and neglected to adequately process the transfer by incrementing one account and decrementing the other. Candidates needed to realise that mere checking of conditions was not sufficient - some processing also needed to be done. Candidates had little difficulty 'printing the receipt', if they reached this part.

A typical good response:

```
BEGIN SUBPROGRAM Transfer.  
  Read CurrentAccountBalance  
  Select TransferAccount  
  WHILE TransferAccount is valid  
    Checkcorrect = NO  
    REPEAT  
      Input TransferAmount  
      Input Checkcorrect  
    UNTIL TransferAmount >=50 AND TransferAmount  
    <=1000 AND  
    TransferAmount <= CurrentBalance AND Checkcorrect  
    = YES  
    CurrentAccountBalance = CurrentAccountBalance-  
    TransferAmount  
    TransferAccountBalance = TransferAccountBalance +  
    TransferAmount  
  END WHILE  
  Input ReceiptRequired  
  IF ReceiptRequired = True THEN  
    PrintReceiptDetails  
  ENDIF  
END SUBPROGRAM Transfer.
```