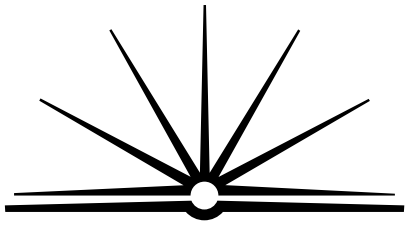

BOARD OF STUDIES
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1998 HSC

EXAMINATION REPORT

Computing Studies

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1998 Higher School Certificate Examination Report

Computing Studies

Introduction

In Stage 6 Computing Studies, students 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 students who wish to undertake additional work at a more theoretical level, and who wish to implement fully 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

- Provides correct information
- Fully describes/supports the points being made
- Provides clear, logical diagrams where required
- Generalises from specific classroom applications to applications beyond the school
- Presents arguments in a logical manner
- Indicates a complete understanding of the concept being examined.

Average

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

Below Average

- Provides generalised statements without relating to the specifics of the question
- Provides little or no justification for the points made
- Provides correct information that is, however, irrelevant to the question
- Confuses technical terms with their common English usage
- Misinterprets the question
- Indicates little or no understanding of the concept being examined.

Candidature

Once again the number of candidates opting to complete the HSC Examination in Computing Studies (all courses) increased as indicated in the table below.

	1995	**1996**	**1997**	**1998**
General	3062	3681	4620	5261
Common	7925	8064	7899	8485
2 Unit	6845	6636	6363	6783
3 Unit	1080	1428	1534	1702
Total	10987	11745	12519	13746

Students need to be reminded to read examination questions carefully and to answer the question asked, rather than recognising 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 students 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 for enhancing students’ responses and assisting in determining their 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 being 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 on the school surveys which 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. They also 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 in order to ensure that the marking scheme discriminates between students and ranks them according to their ability, and also 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 being 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 specific question and then compare the way in which the marking scheme is being applied. Senior Markers not only monitor the statistics which are processed each evening for each marker, each group and each question, but also check-mark papers. This ensures 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 Examination paper encouraged students to apply their knowledge and understanding of the five Core Topics to varied situations. This year less emphasis was placed upon mark allocation for rote learning. 5261 candidates presented for this examination paper which consisted of:

Section I – 20 multiple choice questions examining all five Core Topics. Each question was 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.

Section I

Item	Correct Response
1	A
2	B
3	B
4	C
5	C
6	C
7	D
8	B
9	A
10	D

Item	Correct Response
11	A
12	D
13	B
14	B
15	A
16	B
17	A
18	D
19	A
20	C

Section II

Question 21 – Spreadsheets

(a) Many students provided very general definitions of terms, often confusing database with spreadsheet definitions. Quite a few were unable to give meaningful descriptions of the terms, which illustrated some lack of understanding. Some candidates gave examples only and this failed to attract full marks.

(i) Candidates mostly mentioned headings and titles, rather than stating that a label was a specific data type in a cell.

A typical good response:

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.

(ii) Here many candidates described a cell rather than a cell address.

A typical good response:

A cell address indicates the location of a cell and includes its row and column position.

(iii) A function was often confused with a formula, a mathematical operation, a macro or a function key.

A typical good response:

A function is a predefined or in-built set of mathematical, statistical or logical operations which returns a value.

(iv) Many candidates confused a 'what if' prediction with the use of an IF function, some giving an example of a formula containing an IF function. Candidates should be able to describe the effects of changing input values on output values.

A typical good response:

A 'what if' prediction tests a numerical hypothesis. The effects of changing the value of (a) variable(s) are observed on outputs.

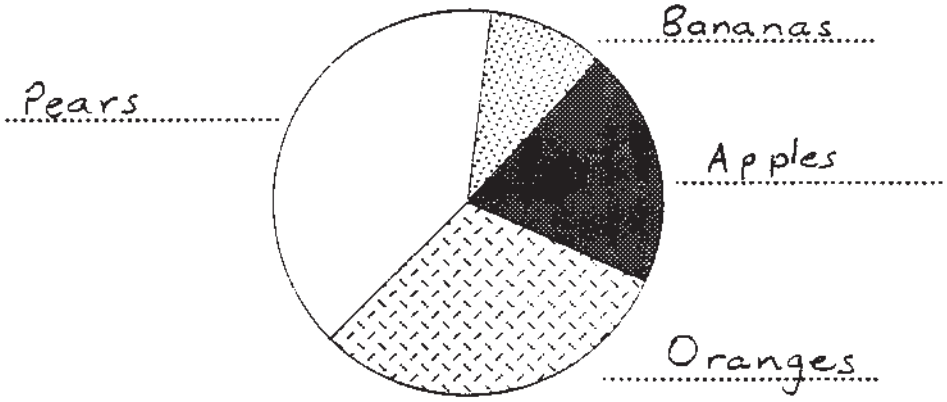
(v) Here candidates often gave examples only, being unable to describe the use of relational operators. Some confused relational operators with logical operators and computer operators.

A typical good response:

Relational operators are used to compare values. Examples of relational operators include <, >, =.

(b) (i) Most candidates were able to label the pie graph correctly.

The correct response:



(ii) A large number of candidates were unaware that only the cells in the highlighted range B2:B5 were sorted, with the data in column A remaining unchanged. The common response of 'Pears' indicated that candidates believed that all the columns in the spreadsheet were sorted.

The correct response:

Bananas.

(iii) To attract full marks candidates were required to give a syntactically correct formula including a direct or indirect reference to B8.

Good responses:

=B8-4

=B8*6

=SUM(B2:B8)

(iv) The majority of candidates were able to recognise that Spreadsheet 1 would give the correct result when an extra row was added and data entered. Even though candidates could name the correct spreadsheet, there was little understanding of the fact that the range in the AVG function would automatically change to B2:B6. Other responses incorrectly stated that the range would remain unchanged or change to B3:B6. A large number of candidates indicated that neither formula would be correct after the addition of the new row.

The correct response:

Original Spreadsheet 1

A typical good response:

With the insertion of a new row the AVG formula in B7 of the Original Spreadsheet 1 will be automatically adjusted, updating the formula to AVG(B2:B6), whereas the formula in B7 of Original Spreadsheet 2 will be =(B2+B4+B5+B6)/4 which gives an incorrect answer.

(c) (i) A number of candidates were unable to describe the purpose of two layout areas. Many were aware that the spreadsheet was poorly designed and that values and formulae needed to be grouped separately.

Typical good responses (two):

Instruction area containing information about the spreadsheet and instructions for the user.

Input area which is a clearly identified area where the user is to enter data.

Calculation area for the placement of formulae and should be protected.

Output area where the results of the calculations are placed.

(ii) Most candidates were able to substitute the values into the formula correctly.

The correct response:

(1+6)x8 = 56

(iii) Candidates often substituted values straight into the given formula without realising that the formula would change when copied. Some left their answer as a formula without substituting the required values. Answers often included $ as if it were a currency calculation.

The correct response:

(1+12)x1 =13

(iv) A common incorrect response to this question was copying the formula without change into the three cells; these candidates failed to recognise that the formula contained relative references. Some incremented only one reference.

The correct response:

=(1+B1)*B5 =(1+C1)*C5 =(1+D1)*D5

(v) Candidates often failed to understand the structure of an IF statement. Many responses correctly indicated that the false part of the IF statement would be used but failed to evaluate C3 -2.

The correct response:

7

Question 22 – Databases

(a) (i) This part was generally well answered, with the better responses explaining advantages in specific terms. For example, data given could be integrated into other applications rather than being given in terms of 'quicker' and 'easier' which clearly contradict the directions of the question.

A typical good response:

Data can be displayed in a variety of report formats when utilising an electronic database.

Data can be accessed by multiple users at the same time if an electronic database is being used.

(ii) This question was poorly answered, with many candidates misunderstanding the concept of design features to assist the data entry operator as opposed to the user. Students often described table and form views as being design features.

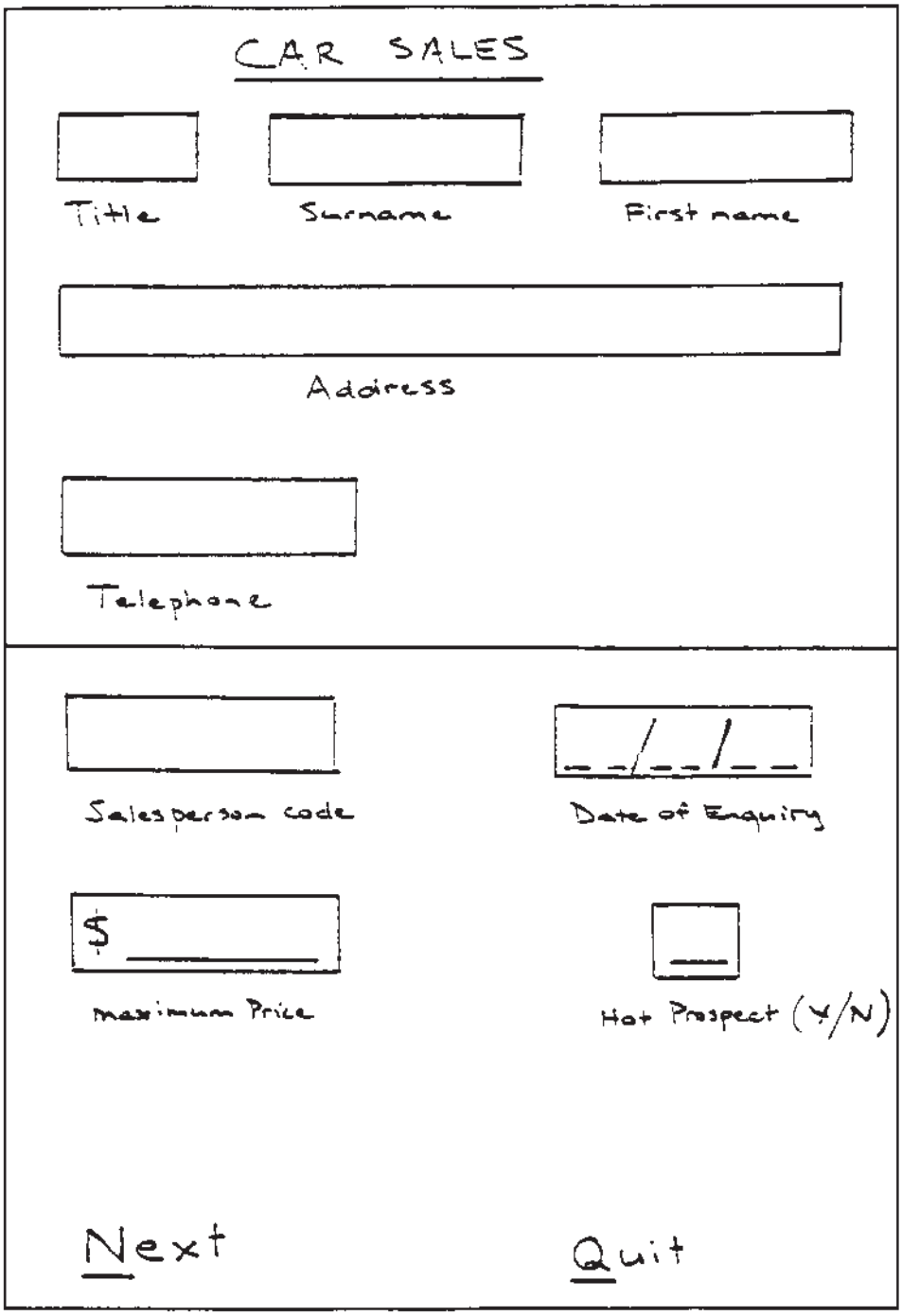
A typical good response:

The data entry screen was modelled on the record card of the manual system.

Use of prompts to assist the operator to ensure correct data entry.

(iii) This part was well answered by most candidates. Maximum marks were gained by those who could clearly illustrate design features identified in part (ii).

A typical good response:



(b) (i) This part was well answered.

The correct response:

7 records

(ii) Most candidates correctly identified the logical or Boolean field.

The correct response:

Hot prospect

(iii) The majority of candidates identified the first sort correctly; many, however, failed to understand the concept of a combination or second sort.

The correct response:

Surname – Ascending Order

Date_of_enquiry – Descending OR Address – Ascending

(iv) Whilst many candidates scored well in this part, too many failed to understand the structure of the search specification, that is field name, relational operator, data for comparison joined by logical/Boolean operators.

The correct response:

Date_of_enquiry > 1/8/98 AND Maximum_price > $30,000 AND Hot_prospect = Yes

(v) The majority of students scored full marks for this part, some overlooked the date criteria in the search, and, thus, incorrectly included Gemma Tran in their answer.

The correct response:

June Goward and Laurel Peasley

(vi) Responses to this part were often ambiguous. Most candidates recognised that a primary key was unique, but failed to state its link to a particular record in a database.

A typical good response:

A primary key is a unique identifier or field which distinguishes each record in a database.

Most students correctly stated an additional field which could include a primary key.

Good responses:

Customer_number

Driver's_licence_number

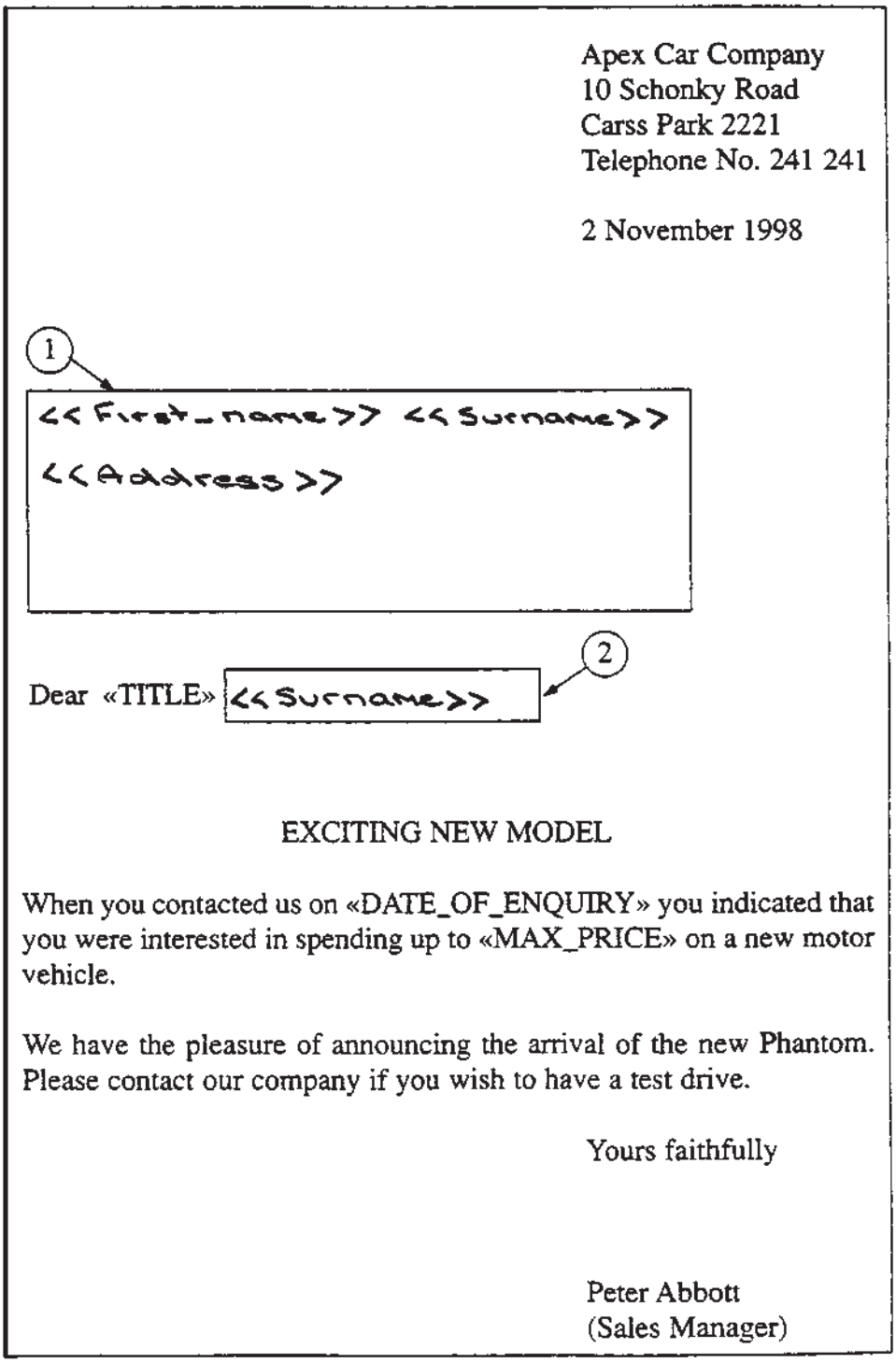
(c) (i) 1. Most candidates recognised the combination of form letter and database.

The correct response:

Mail Merge

2. This question was poorly answered, suggesting either a lack of practical experience with a mail merge or confusion in understanding the question. Poor responses included field names without place holders and simply inserting data from a particular record in the sample database onto the stimulus form letter provided.

   A typical good response:



Apex Car Company
10 Schonky Road
Carss Park 2221
Telephone No. 241 241

2 November 1998

1

<< First_name >> << Surname >>

<< Address >>

2

Dear «TITLE» << Surname >>

EXCITING NEW MODEL

When you contacted us on «DATE_OF_ENQUIRY» you indicated that you were interested in spending up to «MAX_PRICE» on a new motor vehicle.

We have the pleasure of announcing the arrival of the new Phantom. Please contact our company if you wish to have a test drive.

Yours faithfully

Peter Abbott
(Sales Manager)

3. Unfortunately, many students failed to recognise the simple solution of changing the address field into two separate fields.

A typical good response:

Change the address field into two separate fields — street (with number) and suburb (with postcode).

(ii) Most candidates correctly identified the issue of privacy. The better students were able to discuss the issue in terms of consent, confidentiality and misuse of data.

A typical good response:

Paula Hanson's personal details are confidential and should not be released without her consent. These details could be used to build a profile for telemarketing purposes.

(iii) This part was generally well answered, with most candidates recognising the need for password protection. Maximum marks were, however, gained by those students who were able to discuss levels of access and relevant physical security measures.

A typical good response:

Implement password protection so that only authorised users can access the file.

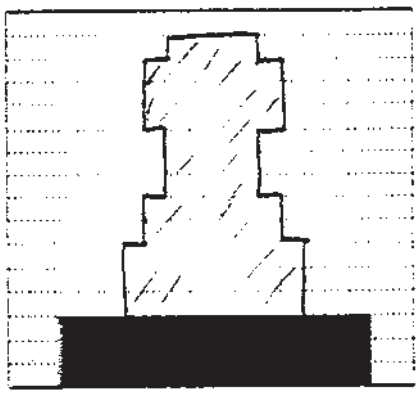
Store this file on a floppy disk which is held by the Database Administrator.

Question 23 – Graphics

This question was generally well answered, with many students showing an understanding of underlying computing processes involved in producing computer graphics. Those who scored well showed a thorough understanding of graphical processes.

(a) (i) This section was well answered, with most students drawing an image that clearly showed pixelisation or jaggies.

A good response:



(ii) Most candidates correctly answered this part.

The correct response:

Figure 2

(iii) Many students confused the terms 'pixel' and 'bit'. Their answers suggested that a vector-based image would use fewer pixels than a bit-mapped image.

A typical good response:

1. Figure 2 is the figure that uses most memory.

2. The difference is that a bit-mapped image has to store information about every pixel in the graphic even if it is just in the background, whereas a vector-based image is storing only the primitives of the objects contained in the graphic.

(iv) Some students explained how to 'move' the circle rather than 'remove' it. Others explained the differences between bit-mapped and vector-based graphics without any reference to removing the circle. Many students referred to 'deleting' or 'erasing' pixels which is not possible, rather than changing the pixel to another colour.

A typical good response:

A vector-based package would store the circle as a single object. To remove it, you simply select the object and then delete it. In a bit-mapped program the details of each pixel would be stored separately and each individual pixel would need to be changed to the background colour.

(v) Many students showed a clear understanding of the principles of cel-based and path-based animations.

A good response:

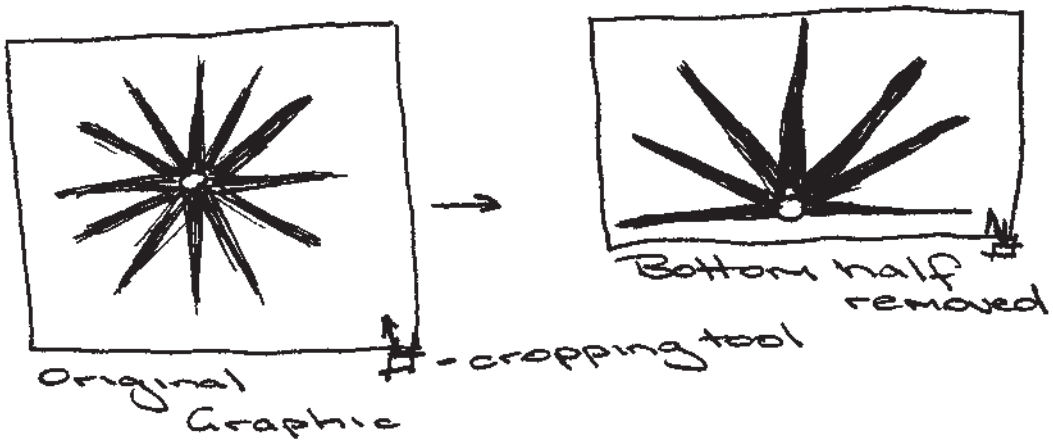
Cel-based – the animated object can change both its position on the screen and its shape through several frames, with gradual changes being made in each frame. The background doesn't need to be redrawn in each frame.

Path-based – the animated object can only change its position on the screen. This is done by drawing the object at its new position in each frame, while simultaneously erasing the drawing at the previous position. The background also needs to be redrawn for each frame.

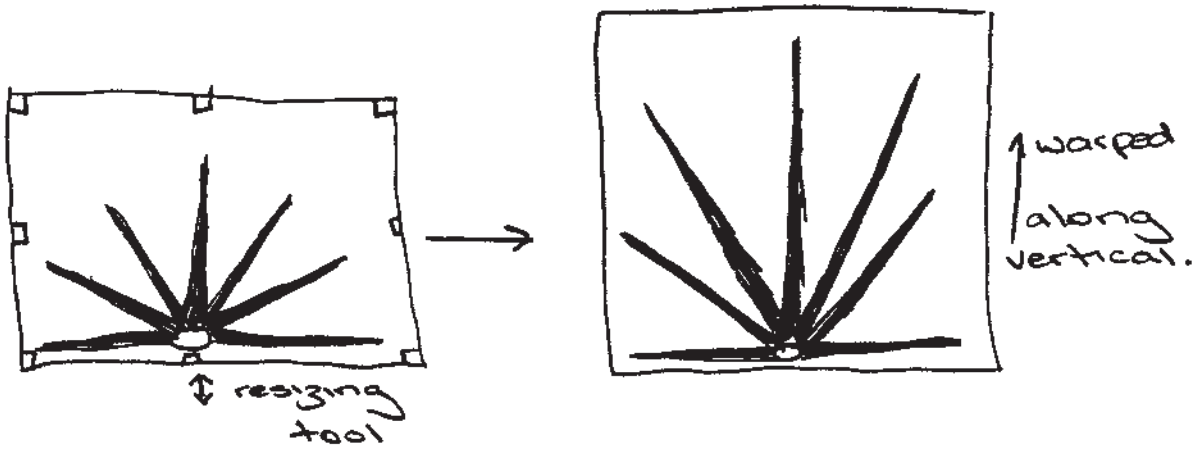
(b) (i) Many students simply quoted definitions of Cropping and Warping without explaining them in relation to the production of the final logo as directed by the question. To score maximum marks the definition of 'cropping' needed to refer to the removal of the bottom half of the logo, while 'warping' needed to refer to the direction of the warping ie along the vertical axis. While the use of a diagram was optional, the explanations provided by students using diagrams were clearer; use of diagrammatical explanations is a practice to be encouraged when appropriate.

A typical good response:

1. Cropping – the removal of unwanted space around a graphic image or parts of a graphic image. Cropping does not alter the height, width or proportions of the graphic, but may appear to hide part of the graphic from view.



2. Warping – distorting the image by adjusting the height/width proportions (or aspect ratio) of the graphic without maintaining the original ratio. In this case, the graphic has been stretched vertically so that the spokes extending from the circle appear longer and the circle at the centre of the graphic has become an oval shape.



(c) (i) Generally, the majority of candidates selected Animation for Situation 1 and Diagrams for Situation 2 which is clearly correct. Good answers justified animation in terms of needing to portray the movement of the dance, while good answers for Situation 2 referred to the static details to be provided in the mapping out of the seats, eg being able to label aisles, exits, and seat numbers. Answers that simply reworded the question did not score well.

A typical good response:

Situation 1

Animation – displaying the dance sequence will require movement in order to show the sequence in a manner that is effective and easy to understand. An animation will show the illusion of movement.

Situation 2

Diagrams – are used to convey information by using graphics so that information such as the seating plan in relation to the stage, aisles and entrance/exits can be easily understood. Diagrams use colours, labels and legend/codes to aid interpretation.

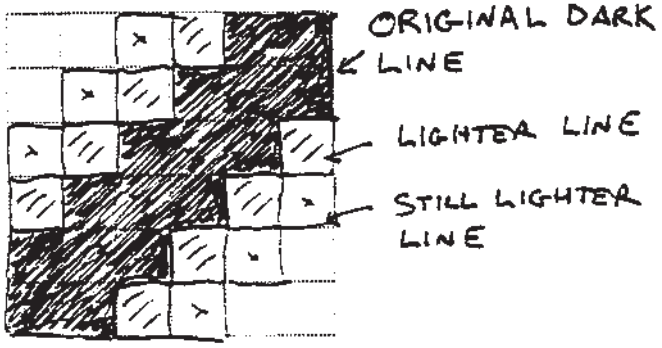
(ii) Acceptable answers in this section were based upon the need to reduce the amount of data contained in the file and not on means of increasing the amount of storage available on the floppy disk.

Typical good responses described:

- methods of compression, with some detail about how the compression is achieved
- reducing the resolution of the scan (not the screen)
- reducing the number of colours — bit planes (not simply substituting shades of grey for colours)
- cropping the image to remove unwanted detail
- vectorising the image
- selecting a more appropriate file type

(iii) Students needed to indicate that they knew the concept of averaging the intensity of the pixels in the image with the background then using that value to 'fill in' around the image.

A typical good response:



Question 24 – Desktop Publishing

A good coverage of the syllabus was provided by this question with an appropriate range in level of difficulty. Most candidates were able to attempt each part except for the more challenging questions in part (c). The style of the question required candidates to explain, compare, give purposes and describe situations that needed them to show a better understanding than that shown by just rote learning.

(a) Candidates were asked to compare two DTP terms. This enabled many to show their understanding of DTP. Diagrams were used by many candidates and this greatly assisted their explanations.

(i) A high percentage of candidates were unable to give a clear indication of word wrap, often explaining it as one word being wrapped or one word wrapped around a graphic.

A typical good response:

Word wrap occurs when a word, too long to fit on the end of a line, is placed at the beginning of the next line. Text wrap refers to the placement of text around an image or other object on the page.

(ii) This was possibly one of the best answered parts in this question as most candidates were able to show the differences clearly. Some areas which need clarification are the 'hiding' instead of 'removal' of a part of the graphic and the difference between resizing and distortion. It was necessary to emphasise the removal of part of the graphic for cropping and the change in proportions of the whole graphic when resizing.

A typical good response:

Cropped graphics have had an unwanted part of the image trimmed or removed. A resized graphic has the whole graphic reduced or enlarged.

(iii) The main emphasis in this question is clearly the different resolutions of the draft and final prints. Unfortunately this was rarely discussed and, hence, many candidates were unable to attract full marks for this part. Most candidates emphasised the idea of a 'before and after' event without ever mentioning the lower resolution of the prepress. Some mistook screen resolution as being prepress and the printed version as being final output.

A typical good response:

Prepress resolution is of lesser resolution and quality as it is used in the stages before the final output. The final output resolution is of a higher quality and may require professional hardware such as a lithographic printer.

(iv) Gutters and margins were well understood by the majority of candidates who could clearly identify the different areas of white space and the purpose of gutters to allow for stapling or binding. One main area of confusion occurred when candidates described the margin as a line, such as they would rule in their exercise books, instead of an area of space. The identification of the margin in this way indicates that there may be many candidates who could be confusing borders used to surround a text box or page, with a margin.

A typical good response:

A margin is the white space between the text and the edge of the page.

A gutter is additional white space on the inside of a page to allow for binding.

(b) The use of an example of desktop published pages provided a good stimulus for candidates to show their understanding of DTP concepts. The examples cited were generally correct; a number of candidates, however, were unable to give a meaningful purpose for the footer, bold text, template and caption. A few candidates did not take the time required to study the question fully as the last example of a caption was often left blank.

Many candidates did not give a general purpose for a footer as was expected, stating instead the specific purpose as being 'to show that the question continues on the next page'.

While there were many examples of bold face type on the page, far too many candidates cited 'bit-mapped' as their example. Far too often specific examples were not used and candidates expected the examiner to find the example from the statement 'as can be seen on p 21 and p 29' without actually stating the feature.

The purpose of a template was poorly explained and often a spreadsheet example would appear in DTP. Candidates need to be aware of the topic they are answering and to use appropriate terminology and examples relevant to that topic.

The term 'caption' was not well known and many candidates restated the question using the term 'label'.

A typical good response:

Feature	*Purpose*	*Example in sample pages*
Border around graphic	To make graphic stand out from the text.	FIG. 1 and FIG. 2 on page 21
Footer	Provides extra information that may be required on every page below the body of the text.	Question 23 continues on page 22 Question 25 continues on page 30
Bold	Used for emphasis and to make certain words seem more important and stand out.	1998 HIGHER SCHOOL CERTIFICATE
Template	An outline for repeated use to reduce time in creating layouts and to maintain consistency throughout the document.	The top of both pages 21 and 29 — boxes for candidate number, centre number, markers use etc.
Captions	Titles that accompany a graphic to explain or provide some information about the image it accompanies.	The labels FIG. 1 and FIG. 2 under the graphics on page 21

(c) (i) Most candidates were capable of defining serif fonts, but had difficulty in explaining the usage of sansserif fonts. Good responses often used diagrams and cited real examples to aid their explanations.

A typical good response:

1. Serifs are small end strokes used to improve readability. Serif fonts are a font style which contain serifs at the end of each stroke. Times is a serif font.
2. Sans serif fonts are used in headings, titles and signs where there is only a small amount of text. They are rarely used in body text.

(ii) Outlining a purpose for DTP facilities proved challenging for many candidates. A generic answer of 'drawing attention to' was used often but not related back to the specific DTP facility. Non-specific answers did not score well. The purpose of rulers was particularly confusing for many candidates. In all sections, a proportion ignored the wording of the question and simply defined the terms. The better answers clearly related the feature to its purpose in a DTP document.

A typical good response:

1. Drop Caps are large letters at the beginning of a section of text. They are used to draw the readers' attention to the interesting start of the text, encouraging them to start reading.
2. Callouts are often controversial or provocative quotations from the body text. As they are enlarged and often have borders around them, they stand out and so attract the reader's attention and entice them to read the article.
3. Rulers assist the user when positioning objects such as frames and graphics on a page. They provide 'snap to' commands for the precise alignment of objects.

(iii) The majority of candidates experienced difficulty in answering this part, indicating a lack of practical experience in importing data into a desktop publication.

A typical good response:

1. Data interchange format files are used to transfer plain text between a word processor and a DTP program. DIFF is a standard file format recognised by most applications because it stores data as ASCII code, storing only characters and requiring very little formatting.
2. File conversion filters could be used to import a graphic file into a DTP program. The file conversion filter allows the translation of one file format into another. For example, BMP to JPEG. This would be necessary if the DTP program did not support BMP files.

(iv) This part was not well answered by a large number of candidates. Some discussed the copyright symbol rather than the term Postscript, while many just ignored the question completely.

A typical good response:

Postscript has set a standard for DTP by allowing scalable fonts and thus enabling the laser printer to replace typesetting machines.

Question 25 – Computer Communications

(a) This part was well attempted by most candidates. Some, however, merely defined each one of the pairs of computer communication terms and did not actually explain the differences between them. Marks were awarded for definitions but maximum marks were gained by those who could clearly highlight the differences.

(i) The majority of students were unsure of the meaning of 'baud' other than to indicate that it had something to do with speed. Most knew 'bps' meant bits per second and that this related to the speed of data transmission.

A typical good response:

Both terms refer to units used to measure the speed of transmission in a communication medium. 'Baud', however, measures the number of times per second that the medium can change its state, while 'bits per second' measures the number of bits of data that are transmitted or received in one second.

(ii) Many students were able to describe 'password' in terms of 'secret' while 'logon' was mostly described as being what users do when they turn on the computer or get into a program. Some candidates were unclear about what the process of logging on was other than entering a machine name or their own name when they were prompted to do so by the software.

A typical good response:

'Logon' is the process of entering into a computer system or network, with a password being required to establish the level of access.

(iii) The majority of candidates made a good attempt at answering this question and provided practical knowledge of e-mail. Many, however, experienced difficulties when attempting to describe the difference between an electronic bulletin board (BBS) and e-mail. Responses such as 'e-mail to send messages and BBS to post notices' were common. BBS was often confused with web sites and chat rooms.

A typical good response:

Electronic mail comprises messages sent to specific people and is private, whereas a bulletin board is where messages are posted for many people to see and is not private.

(iv) Students found it difficult to describe differences in topologies in words. A labelled diagram worked very well for students who chose to answer in this way. Very few attempted to describe the network differences other than as physical layout. In this sense this showed their lack of knowledge or understanding of the technical aspects of the networks. A number of students described the star network as having the shape of a star and the bus network as being in a line.

A typical good response:

A star network consists of a central hub or node to which all other computers are attached by individual cables whereas a bus network consists of a single cable or spine to which each node is attached.

(v) This part was often not attempted by candidates; when attempted it was done in a superficial manner. Those who attempted it were more familiar with PKZIP than with MNP-5 and were able to state 'PKZIP is a data compression technique'. Some

students attempted to give a technical description of data compression methods. A popular answer was: 'one is for the MAC and the other is for the IBM'.

A typical good response:

PKZIP is a method of software compression and MNP-5 is hardware compression.

(b) (i) The visual stimulus proved to be both a distraction and a benefit — a distraction because candidates concentrated too much on the content and not enough on what the question actually required. Common responses were 'it enabled students and teachers to see what will be in next year's HSC' instead of explaining the advantages of having information on a remote database — a benefit because it enabled candidates to appreciate the value of wide availability of information of this sort. Most candidates just indicated an access advantage.

A typical good response:

It allows greater access to the information for many people.

By having the information in an electronic form, it saves the Board of Studies from having to print it, thus saving money and paper.

(ii) This part was generally well attempted and answers were based on knowledge of the importance of logging off in terms of cost and preventing unauthorised access. Again, candidates did not read the question well since many described hackers accessing their files as opposed to the remote database.

A typical good response:

It is important to log off from a remote database because you may be preventing other users from accessing it and you are still being charged for online time.

(iii) Student responses varied from very basic answers, for example 'without the modem you wouldn't be able to access the database', to very technical explanations of modulation/demodulation and digital to analog with diagrams. The majority of candidates gave answers that indicated that the modem was needed to enable computers to communicate across telephone lines.

A typical good response:

The purpose of a modem is to translate digital signals to analog signals to be sent down a telephone line and translate analog to digital to be read by the receiving computer.

(iv) Many candidates experienced great difficulty in describing 'downloading'. A common answer was to state that copying or saving a file was downloading, without reference to the transference of the file from a remote source.

A typical good response:

Downloading is the process of transferring a file from a remote computer to your computer.

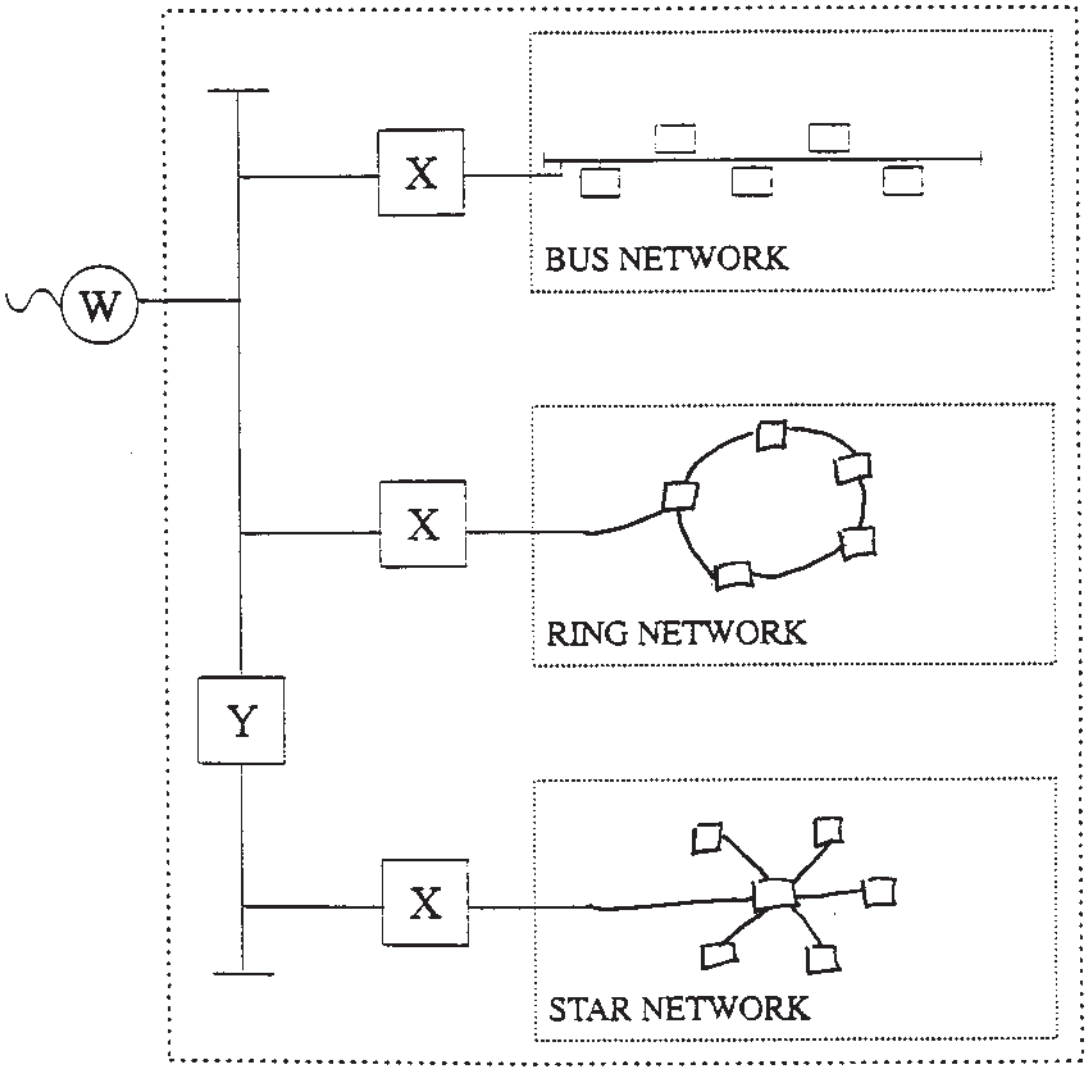
(v) This part was poorly answered, with many responses indicating no practical experience of data compression or downloading.

A typical good response:

A compressed file will take less time to download and hence cost less.

As the file is smaller in size the error factor is reduced in the transfer.

(c) (i) As required by the syllabus, students should be able to describe each of the major network topologies. The most common errors were in not connecting the drawn networks to the gateway and not including a central hub in the star network.



(ii) This part was not well answered. A common error was in identifying the gateway as a modem.

The correct response:

Gateway

(iii) This part was poorly attempted, with candidates struggling to identify even one advantage of using the named type of modem.

A typical good response:

A modem with auto-dial capability removes the need for having to type the number each time you wish to make a connection. It will also reduce the number of errors when entering the number.

(iv) Most candidates were able to state the high speed nature of the leased line as being an advantage. Candidates struggled to describe a disadvantage and the majority gave 'higher cost' as an answer. There was little evidence of understanding of a leased line other than in restating the Glossary of Terms definition.

A typical good response:

Advantage – A leased line can support a greater transmission capacity.

Disadvantage – A leased line can be more expensive and allows connection only between two distinct points.

(v) This part was not well answered. Candidates did not address the question of the function of a mail server and tended to be satisfied to state that a mail server sends and receives mail. Very few students were able to state clearly the forwarding of mail on request from an authorised user and the storing of mail in appropriate addresses as being two functions of a mail server.

A typical good response:

A mail server receives mail and stores it in appropriate addresses and, secondly, will distribute the mail to authorised users upon request.

2 Unit Common

In the 2 Unit Common HSC Examination questions were generally directed less towards the specifics than in previous years. These more open-ended questions resulted in extended answers from candidates, where often only a short paragraph was required to answer the question adequately. It was obvious that many candidates struggled to complete the entire paper within the time allocated, indicating that students need to be careful with time management in the Computing Studies HSC Examination. 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 practice that should be discouraged. The 8485 candidates who presented for this paper comprised 6783 2 Unit students and 1702 3 Unit students. The paper consisted of:

Section I – Core

Part A

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

Item	Correct Response
1	A
2	A
3	D
4	C
5	A
6	D
7	D
8	C
9	B
10	A

Item	Correct Response
11	B
12	B
13	A
14	A
15	D
16	A
17	C
18	D
19	C
20	B

Part B

Question 21 – Computer-based Systems

On the whole, this question was well attempted. The majority of candidates knew how to construct decision trees and a decision table, thus scoring well in these sections. Unfortunately, many still showed a lack of depth of knowledge about the stages of the system development cycle and of data flow diagrams.

(a) (i) Candidates had some difficulty in identifying the fact that this question related to the 'operation and evaluation stage' of the system development cycle and not the 'implementation and testing stage'. Many students referred to testing the system after it had been installed rather than accepting the fact that the system was already working. The question was answered very well by those who knew this topic.

A typical good response:

To measure the performance of the system to see if it meets the specifications of the original design and to make adjustments if any unforseen errors have emerged during full operation.

(ii) Many candidates confused the symbols and components of a data flow diagram with those of a flowchart. A considerable number incorrectly included a 'process box' as one of the components. Good answers indicated that the students knew the components and the symbols that represent them. Unfortunately, many left this section blank, indicating a lack of knowledge about the specifics of data flow diagrams.

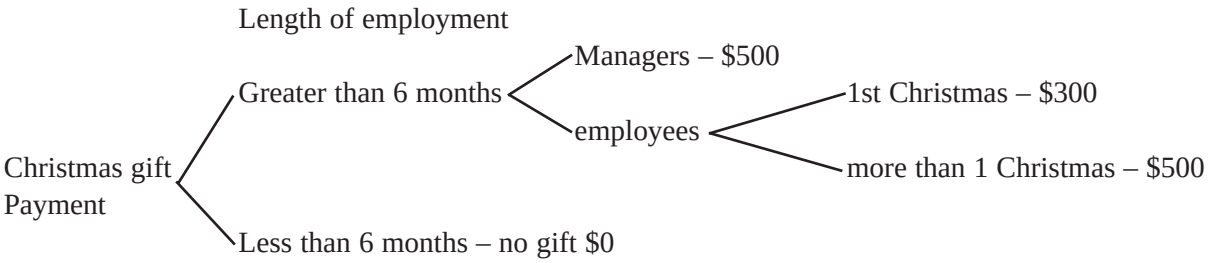
A typical good response:

1. arrow
   Shows the flow of the imputs and outputs within the system.

2. Storage 
   Stores any of the data which is required in the system.

(iii) This question was answered quite well, with more than 50% of the candidates gaining full marks. Some candidates confused it with a flowchart, while others did not have branches when decisions were being made, choosing rather, to continue along the same line. The fact that length of employment did not include exactly 6 months confused some students and many decided to add a third branch to the tree at this point. Many of the errors made were due to the fact that the students did not follow the logical presentation of the question.

A typical good response:



(b) (i) Candidates did not understand what the question was asking them to do in relation to completing the table. They answered the question by describing what they would do in the feasibility study not what they would write in that particular section of the report.

A typical good response:

For each alternative, write a one page description of the costs, benefits, constraints and time schedule. Identify the reason for rejecting/accepting each alternative.

Authorisations
Questionaires
Interviews
Documentation
Observations
Report Manuals

All are collected by the system analyst in meeting with users, managers and from their own observations.

(ii) The decision table format was well recognised by the majority of students who were able to complete the answer successfully by following the example. Poor answers indicated that students had difficulty in interpreting the codes used.

A typical good response:

	RULES					
CONDITIONS	1	2	3	4	5	6
Condition 1	Y	N	Y	Y	N	–
Condition 2	Y	Y	N	N	N	N
Condition 3	–	F	F	P	P	M
ACTIONS						
Action 1	X					
Action 2		X				X
Action 3					X	
Action 4			X	X		

Question 22 – Algorithm Design

This question required good algorithm writing skills and knowledge of arrays and searching or sorting routines. Although the majority of candidates received marks in each section, the array question in (a) part (iii) proved to be quite challenging for many. The ability of candidates to write algorithms has continued to improve; however, there are still many who do not score maximum marks due to bad algorithm structure and inability to comply with the Methods of Algorithm Description recommended for the course.

(a) (i) Most candidates successfully modified the algorithm so that it would not print the Joker but failed to gain full marks because the modified structure was incorrect. For example, in a pre-test, ‘read card’ must be before ‘test’, and must be included in the loop. A significant number of students modified the algorithm so that other parts of the game would not work normally.

A typical good response:

```
Begin Card Game
        Shuffle cards
        Points = 0
        Read card
        While card <> do
                Print face value of card
                points = points + 1
                Read card
        EndWhile
        Print points
End Card Game
```

OR

```
Begin Card Game
        Shuffle cards
        Points = 0
        Repeat
                Read card
                If card <> Joker then
                        Print face value of card
                Endif
                points = points + 1
        Until card = Joker
        Print points
End Card Game
```

(ii) The error in the scoring of the CARD GAME algorithm was found and described by most candidates. To explain how it was fixed, students were required to use terms such as 'pre-test' or 'selection' in a written explanation. Candidates who wrote another algorithm showing how to fix the problem but without explanation did not score full marks.

A typical good response:

Error –

A point is added for the joker where the description states 'one point is received for each card dealt before the Joker appears'.

Explain how to fix –

Use a selection structure which tests for the card's being a Joker; if it is a Joker then do not add point, otherwise add point.

Use a pre-test loop to test if the card is a Joker then do not enter the loop where point is added.

(iii) A large number of candidates found it difficult to set up an array with an index, and often presented an incorrect comparison process to get the High Value. The loop also posed a problem for many candidates, terminating with an incorrect count. Some used the words Output or Display instead of Print, not recognising the difference. Many students did not use a variable called 'HIGH VALUE' to store the highest score, even though the question specified this.

A typical good response:

```
Begin
        count = 1
        Read Score [count]
        Set High Value = Score [count]
        Repeat
                count = count + 1
                Read Score [count]
                If Score [count] > High Value then
                        High Value = Score [count]
                        End If
        Until x = 10
        Print High Value
End
```

(b) (i) This part was well attempted and presented few difficulties for the majority of candidates with basic algorithm design skills. Some lost marks by introducing new terms into the algorithm and not using the words in the problem. For example, 'If lift stops' instead of 'If the lift stops between floors' or 'If lift has fault'.

A typical good response:

```
Begin Lifts Warning System
                If Faults = 'Lift stopped between floors' then
                        if 'People in lift' = Yes then
                                Play message 'Help is on the way'
                                sound alarm
                        else
                                sound alarm
                        end if
                end if
End Lift Warning System
```

(ii) This part required similar structures to part (i) but also included at least one loop. Most candidates gained good marks here, losing marks mainly for not having a loop checking for times when there was no fire, and omitting one of the actions in some selections. The structure of the algorithms was awarded marks. It was noted that many candidates are still making basic errors which make their logic either hard to follow or incorrect, for example, if an End If is omitted or placing more than one statement per line in a sequence structure. Many candidates also unsuccessfully attempted a Casewhere structure when a Binary selection was more appropriate. The Casewhere structures presented were mostly incorrect and often failed to give a clear comparative condition.

Typical good responses:

```
Begin Warning System
While warning system is on
                                    Get Sensor reading ‘Fire’
                                    Get sensor reading ‘People in lift’
                                    If Fire = yes then
                                                stop lift at nearest floor
                                                Play message ‘Fire – do not use the lift’
                                                if ‘People in lift’ = No then
                                                        activate water sprinkler system
                                                end if
                                    end if
                        end while
End Warning System
```

OR

```
Begin Warning System
REPEAT
                        Check fire sensor
UNTIL there is a fire
stop lift at nearest floor
Play message ‘Fire – do noy use the lift’
WHILE there are People in lift
                        Play message ‘Fire – do not use the lift’
ENDWHILE
activate water sprinkler system
End Warning System
```

Section II – Options

Question 23 – Applied Artificial Intelligence and Expert Systems

About 9% of the total 2/3 Unit (Common) candidature attempted this question.

(a) (i) Although this part was reasonably well attempted, the majority of candidates responded with very general answers. Many merely identified problems or benefits related to the introduction of robots generally, without specifically relating their answer to intelligent robots.

A typical good response:

Two problems for society:

The introduction of intelligent robots may lead to the loss from the workforce of people who are able to make intelligent decisions, once their position is taken by intelligent robots.

Another problem is that intelligent robots are able to make decisions and act on them too quickly for humans to intervene. This could be disastrous if a serious mistake were made.

Two beneficial situations:

Intelligent robots are able to go into dangerous places where non-routine tasks need to be done, for example, finding their way through a collapsed building.

Another benefit is that intelligent robots can better control complex processes where humans can not take all the factors into account quickly enough.

(ii) 1. Most candidates had a vague idea about how neural networks are trained, but, apparently, most did not have sufficient grasp of details to give a full answer to this question.

A typical good response:

A neural network is trained by presenting an example to the network and indicating whether it is a good or a bad example. The weightings in the network adjust to reflect learning; as more examples are presented, the performance of the network improves.

2. This part was quite poorly attempted by most candidates, with many merely stating that the reason for training was to ‘make the network more like a human brain’.

A typical good response:

The weights are set at starting values, not closely related to the examples the network is meant to learn. Training allows the weights to adjust in order to be better able to respond to similar inputs later. Without such training, the performance of the network would remain poor.

(iii) Most candidates were able to state at least one characteristic of both a neural network and an expert system and to indicate how they differed. Lack of detailed knowledge about such differences was evident from the responses.

A typical good response:

An 'expert system' solves a problem using rules that have been added to the system. A neural network does not use rules but matches patterns which it has learned. A neural network can solve problems even when no rules can be formulated.

(b) (i) 1. Many candidates were able to indicate some obvious advantage of a voice recognition system, although too few were able to describe more than one advantage.

A typical good response:

Voice recognition allows the helicopter to be controlled even when the pilot is injured and unable to operate the helicopter by hand. This also means that a pilot is able to carry out other tasks while still controlling the helicopter. An added advantage is that the system can be made to respond only to a known voice, thus increasing security.

2. A large number of candidates appeared to be drawing on commonsense knowledge in answering this part and answers lacked detail about how voice recognition worked. Many appeared to regard this as a 'noise filter' for removing background noise.

A typical good response:

Under stress in combat a pilot's voice may change, so the system will have to be trained to recognise variations in the voice.

(ii) Most candidates were able to give reasonable, yet general answers, showing some understanding of the problems of artificial vision. Very few, however, were able to extend this to considering the barriers to be overcome in this particular instance.

A typical good response:

One barrier is that flaws in the glass may be very slight and difficult to detect visually.

Another barrier is that glass may reflect light strangely or allow light to pass through, making it difficult to tell whether an object behind one piece of glass is actually another piece of glass or a flaw.

(c) (i) Candidates were generally able to demonstrate an understanding of the process of backward chaining, although many appeared to think that it was a way of establishing facts by starting with a conclusion (a sort of forward chaining in reverse). Too few candidates were able to demonstrate the process by using the rules in this question.

A typical good response:

Backward chaining is goal-driven.

We start with the conclusion (THEN part) - grant loan and chain backward to see what conditions must hold if that conclusion is valid.

The antecedents to (4) or (5) (the IF part) must hold.

Select one of these, say (4) and repeat the process - what conditions must hold for this to be true.

Check its antecedents, ie wages and job history, which leads to checking rules (1) and (2).

If these hold, then conclusion is supported, otherwise check antecedents to rule (5).

This leads to checking rules (1) and (3) .

If these hold then conclusion is supported, otherwise conclusion fails.

(ii) This part was poorly attempted, with many candidates not being able to go much further than a restatement of the question, with expressions like 'the lift would be confused and wouldn't know which way to go'. Candidates who gained maximum marks suggested a strategy of going to the nearest floor, indicating that if there was no nearest floor, the lift should go up. Those who explained a strategy before writing rules were most successful. Students should be encouraged to explain their reasoning in this kind of question.

A typical good response:

The problem is how to deal with competing requests (one request to go up and one to go down).

One strategy is to keep going up until there are no more requests for floors above, then change direction and go down until there are no more requests for floors below the current floor.

Rules

IF request_1 and request_2 > current_floor THEN destination_floor = smallest of request_1 and request_2

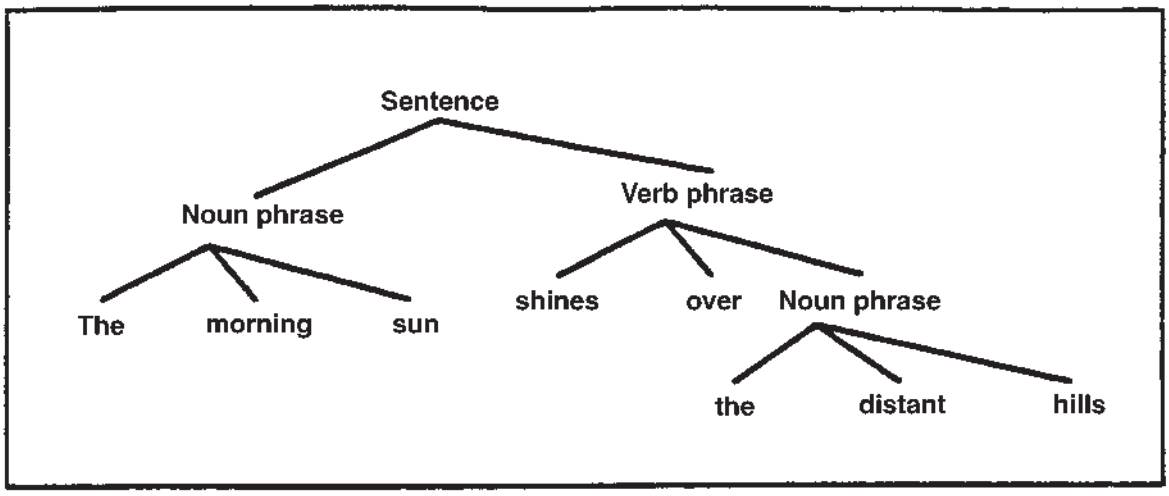
IF request_1 and request_2 < current_floor THEN destination_floor = biggest of request_1 and request_2

IF current_floor is between request_1 and request_2 THEN destination_floor is whichever of request_1 and request_2 is in the current direction.

(iii) 1. The majority of candidates found it difficult to express the reasons for their responses in this question.

A typical good response:

The parser is able to create the given structure using the given lexicon.



2. Most candidates realised that something had to be done about 'full' and 'evening'. Many, however, attempted to modify the parse tree rather than the lexicon.

A typical good response:

Add 'full' to the lexicon as an adjective.

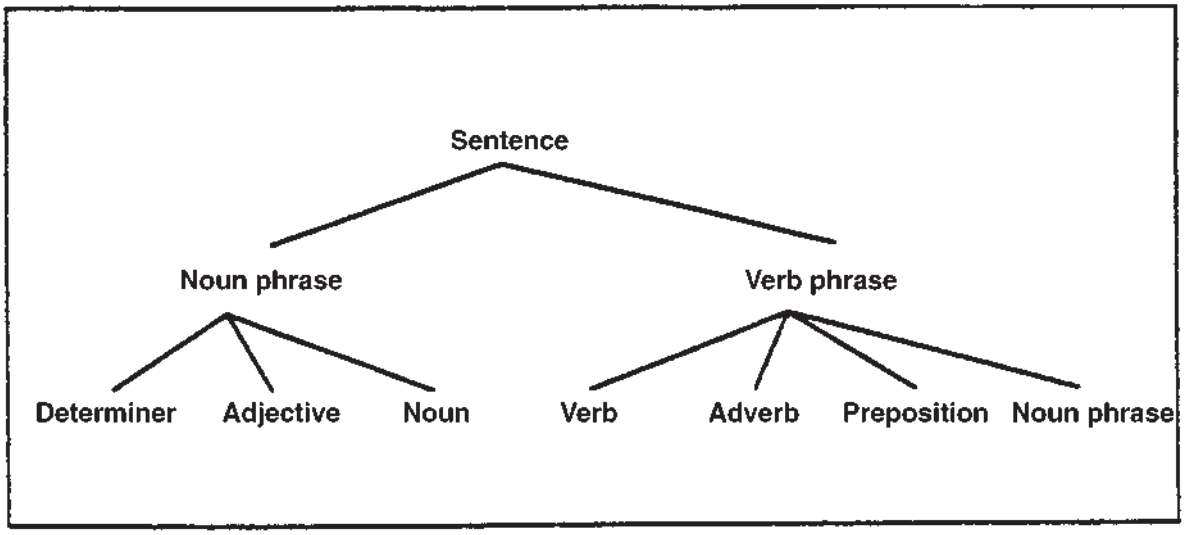
Add 'evening' to the lexicon as a noun.

3. This question was generally well answered, with the majority of candidates giving the specific change of removing the adjective and adding the adverb. Those who were able to suggest the more general strategy of indicating that both of these could be optional components, scored maximum marks.

   A typical good response:

   Make (adjective) an optional component of a noun phrase or omit it altogether.

   Add (adverb) as an optional component of a verb phrase.



Question 24 – Computer Communications

About 84% of the total 2/3 Unit (Common) candidature attempted this option.

(a) A large number of candidates experienced difficulties in identifying the differences between the pairs of Computer Communications terms. Many merely defined the two terms without necessarily highlighting their differences. Part marks were awarded for definition; however, maximum marks were gained by those who could clearly state the major difference.

   (i) This part was well attempted by most candidates

   A typical good response:

   Simplex mode is one way communication, while Half Duplex mode is two way but not at the same time.

   (ii) This part was not well answered, although some candidates were aware of the definitions as contained in the Glossary of Terms.

   A typical good response:

   Protocols are sets of rules for communications, while handshaking is the exchange of signals to establish which protocols will be used.

   (iii) This part was well answered by the majority of candidates, but many simply gave more information rather than the main difference. A number of differences were acceptable.

A typical good response:

The main difference between these two types of file transfer protocols is in the timing of transmitting an acknowledgment from the receiving computer. X-modem is a method of file transfer in which an acknowledgment is received before sending the next packet, while Z modem sends an acknowledgment only when an error has been detected.

(iv) Candidates did not differentiate well between a node and a terminal. Many recognised the hierarchical nature of the relationship but not the specific meaning of the term 'terminal'.

A typical good response:

A terminal is a device used for the input and output of data while the host computer connected to many terminals can provide processing and other facilities for the terminals.

(v) This part was well answered. Many candidates could distinguish between these two terms in some form, either by structure or by the method of transfer such as light and electrical pulses. However, a significant number of candidates confused coaxial cables with twisted pair cables.

A typical good response:

Optical fibre is made of glass strands and light is used to transmit data, whereas a coaxial cable is made up of wires and uses electrical impulses to transmit data.

(b) (i) This part was well answered, but some candidates' responses indicated that they did not understand the alternatives to a leased line.

A typical good response:

One advantage for a company using a leased line for communication with one of its branches is that high quality communication with less interference is achieved. A main disadvantage is that a leased line is expensive to hire when compared with other methods.

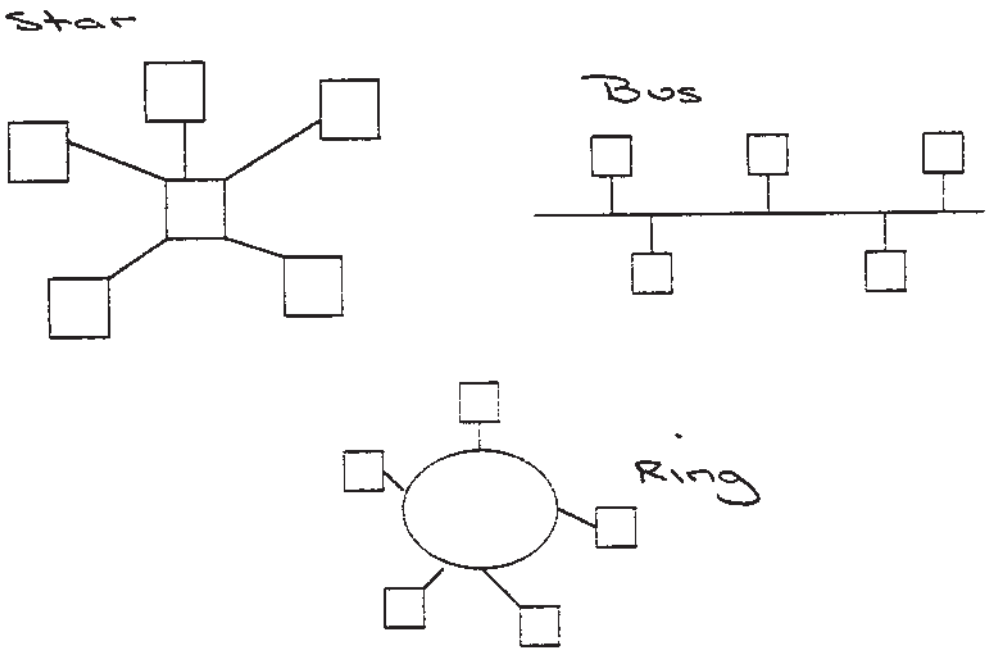
(ii) This part was not well answered. Some candidates did not seem to know the meaning of the word 'parameter'. Many correct responses were possible. Parameters are probably less evident these days, as these settings are often already defined so that the user is not aware of them in everyday use. Explanations were required to gain full marks, but part-marks were awarded for correctly listed parameters.

A typical good response:

Baud rate needs to be set so that sender and receiver are programmed for the same speed of transmission. Error detection also has to be set so that both computers know if it is set to odd parity or even parity.

(iii) 1. The majority of candidates could represent the three topologies correctly, however, some drawings were very difficult to interpret. Candidates need to ensure that any diagrams included as answers are easily recognisable and clearly labelled. While conservation of paper in writing booklets is appreciated, the ability for markers to read and identify drawings is paramount. Some detail was not always precise and candidates are advised to read the directions carefully, so as to score the maximum possible marks.

A typical good response:



2. This part was not well answered as many candidates provided very superficial explanations as to how data collision is handled by each of the three local area network topologies. If data collision does not occur in a particular topology, then this needs to be stated in the answer and explained. Some candidates just stated CSMA/CD without an explanation and, thus, maximum marks were not gained. Many students mentioned a token but did not receive full marks because they did not explain how a token helped avoid collisions on the network. Some candidates suggested that the data (message) is placed in the token as though the token were a container.

   A typical good response:

   Star networks avoid data collision by polling. The server controls and gives each node an opportunity to send. Collisions are not possible. There are now different methods in use, for example, ethernet protocol.

   Bus networks avoid data collision by using ethernet protocol and thus use a carrier sensing multiple access/ collision detection protocol. If a collision does occur, the two nodes wait a random amount of time and then retransmit.

   Ring networks use a token. A string of code (or token) travels around the ring. If it is free, a node wishing to transmit attaches the message to the token. Only a node with the token can transmit.

(c) (i) 1. This part was well attempted by the majority of candidates. Some candidates, however, merely responded by discussing the transfer of data rather than differentiating between uploading and downloading.

   A typical good response:

   Downloading: refers to receiving files from a host computer on to your personal computer.

2. There were a number of correct responses to this part. Most candidates gained maximum marks as they were required to state just two technical factors. An explanation of the technical factors was not required.

   Good responses (two of):

   bandwidth

   modem speed

   speed/processor of remote and receiving computer

   host hardware/software factors

   line speed/quality

(ii) Most candidates attempted this part well, with many different responses being acceptable. The question clearly required a discussion, so maximum marks were not achieved by those candidates who wrote just one or two words.

A typical good response:

By opting to publish the 1997 HSC Prescribed Texts, Topics, Projects and Works in a remote database the speed and ease of ensuring that the resource is up-to-date is greatly enhanced. It would also prove to be a cheaper option as the cost of CD production and distribution is removed.

(iii) 1. This part was mostly well answered. The use of the word 'explain', however, indicated to candidates that more was required than just a one word answer.

A typical good response:

Security could be a problem because hackers may gain unauthorised access to information and could change it illegally.

2. This part required candidates to state only two measures, hence maximum marks were achievable by most of the candidature. It was expected that the measures recommended would relate in some way to the problem identified in Part 1.

A typical good response:

password protection

the use of encryption

(iv) On the whole, many candidates had some idea of the ethical issues relating to the use of computer communications but did not necessarily relate it well to the question of the capability of downloading information from bulletin boards (or the web). Often security was included but not explained as an ethical issue.

A typical good response:

Downloading pornography is possible, yet may be inappropriate, especially for young children.

The validity of the information being downloaded may be questionable, as there are often no restrictions about who can publish material on electronic bulletin boards.

Question 25 – Computer-controlled Systems

This option was attempted by approximately 8% of the total 2/3 Unit (Common) candidature. In general, the question was well answered by the majority of students; as in previous years,

however, a group of candidates attempted the question who had obviously not studied this option. Those who attempt this option without having studied the topic in detail score extremely poorly as the technical issues cannot be addressed with just a good general computing knowledge.

(a) (i) This part was not well answered, with most responses being very general, discussing computers rather than computer-controlled systems.

A typical good response:

A collection of interrelated components working together to achieve a purpose, monitored and driven by a computer.

(ii) The majority of candidates correctly named the components of a computer- controlled system and, while some candidates correctly gave examples, others attempted to explain how the component worked without actually giving any examples. Candidates should be reminded to read each question carefully if they wish to gain maximum marks.

A typical good response:

Sensor such as a thermostat to measure heat.

An actuator such as a solenoid.

(iii) It was obvious from responses submitted that characteristics of computer control systems was not well understood. Many candidates answered for computers in general. A discrete control system has only a few characteristics and these appear to be poorly understood by most candidates.

A typical good response:

A discrete control system often performs multiple tasks on the item and produces only one item by the system.

(iv) Responses for identifying two noise reduction techniques were reasonable though fewer candidates were able to describe them. A number of candidates identified noise as being sound.

A typical good response:

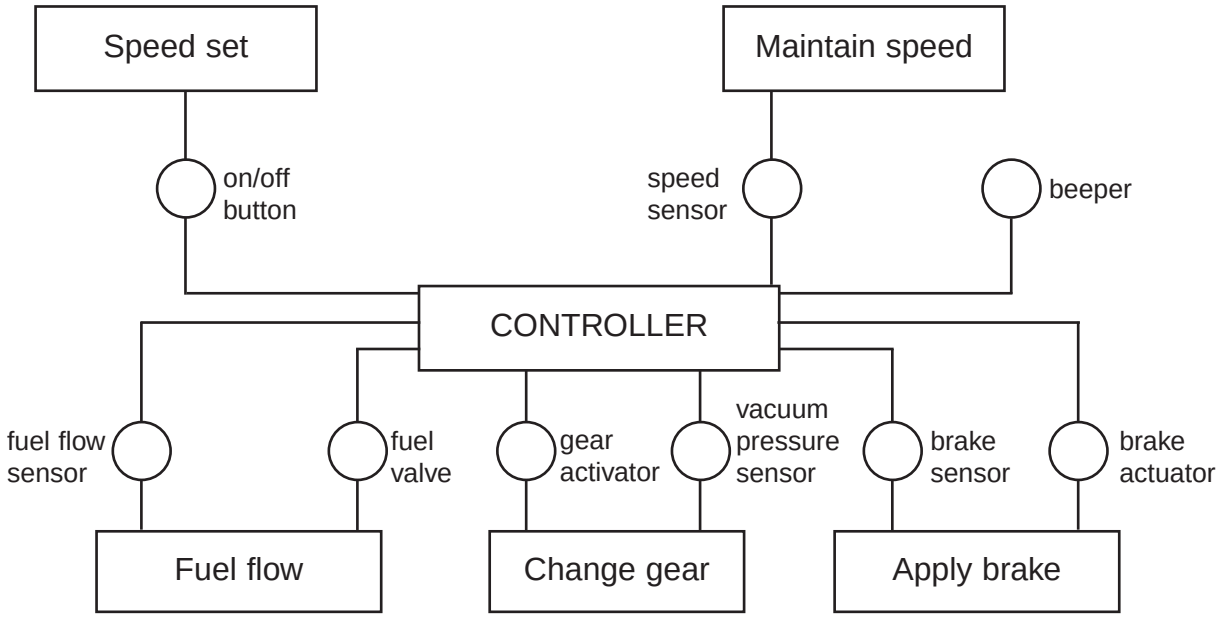
Two techniques would be: shielding a cable with a metal grid to block interference and filtering the signal through an electronic circuit to filter out the unwanted signals.

(b) (i) This part was not well attempted as many candidates experienced difficulties in identifying the type of system. Responses ranged from continuous, batch & discrete and open & closed or some other term like automated or simply computer-controlled. The complexity of the system for cruise control meant that many students attempted to explain the parts and did not give two reasons in order to justify their choice.

A typical good response:

This is a discrete control system, because the whole system is involved in a single operation and multiple tasks are performed on the product.

(ii) The complex block diagram was generally poorly done, with many candidates simply not attempting a response at all. The design of the block diagram was poor, with some responses being a cross between a flowchart and a block diagram.



(iii) The majority of candidates could generally name two inputs, but most had difficulty in describing a suitable sensor for each input. The naming of any two inputs resulted in some candidates merely describing any sensor they could think of, rather than suitable ones for this system.

A typical good response:

Speed sensed with a rotation sensor which produces a voltage change as the speed varies.

Vacuum pressure - a diaphragm can be used as a sensor to detect changes in vacuum pressure.

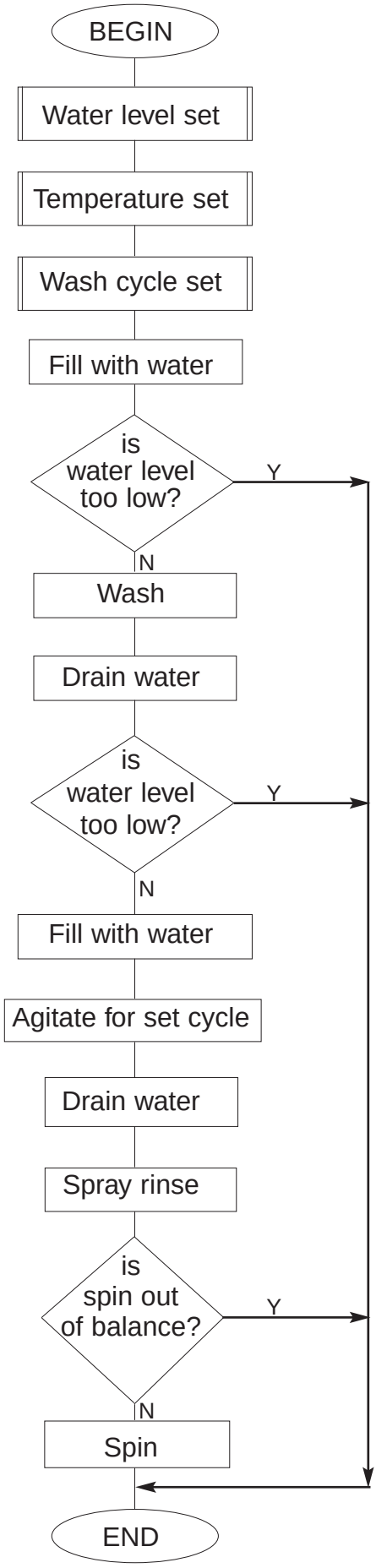
(c) (i) Two actuators (that could be used in a washing machine) could be named by most candidates. However, the operation of the chosen actuators was often not described, with many candidates writing about sensors. The descriptions were divided between what the actuator did in the washing machine and what the actuator did generally.

A typical good response:

1. Two actuators are – electric motor and solenoid.
2. The motor turns the washing machine agitator and operates the pump.

   The solenoid opens and closes the valve, allowing water into the washing machine.

(ii) The algorithm for the operation was attempted by most candidates, however the number of parts and the difficulty of completing the algorithm had many students either completing pages of work or simply stopping part way through. A number of candidates must have spent more than the allocated time in trying to complete either a flowchart (up to 5 pages) or PseudoCode (up to 4 pages). Responses written in PseudoCode tended to be more clearly expressed and often scored well. Few candidates attempted to include in their algorithm the check for water level and spin balance.


BEGIN
Water level set
Temperature set
Wash cycle set
Fill with water
is water level too low?
Y
N
Wash
Drain water
is water level too low?
Y
N
Fill with water
Agitate for set cycle
Drain water
Spray rinse
is spin out of balance?
Y
N
Spin
END

Question 26 – Computing Technologies

About 27% of the total candidature attempted this question, several sections of which they found very difficult. Most handled binary number theory quite well, except for their understanding of negative representation. The Optical Technologies section, and particularly that concerning laser printing, was very poorly handled. Theory and Construction of Integrated Circuits was answered reasonably well, but many candidates seemed unable to tailor their answers to the questions in the paper. Again, many candidates appear to have answered the Optical section simply because it came first.

(a) (i) The majority of candidates scored well; responses indicated, however, that some candidates struggled with hexadecimal transformations.

The correct response:

	Binary	Decimal	Hexicecimal
A	10101010	170	A A
B	1101	13	D
A + B	10110111		

(ii) Many candidates gave answers which did not explain ‘modulus’ and did not refer to the storage of numbers in this form. There was obvious confusion between ‘sign and modulus’ and ‘two’s complement’.

A typical good response:

In sign and modulus representation the leftmost bit gives the sign of the number (0 for positive and 1 for negative). The remaining bits give the absolute value (size) of the number. If a number is stored as an 8 bit binary, then the rightmost 7 bits give the size and the leftmost bit gives the sign.

(iii) What appeared to be an easy question generated many incorrect responses. These were usually 15 or 10012 (the twos complement of 7). These answers (together with those of the previous question) illustrate a basic misunderstanding of the representation of negative numbers.

A typical good response

The largest integer which can be represented in a 4-bit twos complement code is

01112 = 710

(iv) Most candidates were able to perform a long division algorithm to obtain a correct answer, although very few were able to describe ‘shift and subtract’ adequately.

A typical good response:

12_{10} ---> 1100_2 4_{10} ---> 100_2

```
0 0 0 1 1  Quotient
0 1 1 0 0  Dividend
1 0 0        subtract gives a negative so shift again
  1 0 0    subtract
  0 1 0 0   gives a positive so record 1 and shift divisor again
    1 0 0  subtract
    0 0 0  gives zero so record a 1
```

The divisor is repeatedly shifted to the right and subtracted from the remainder until the remainder is smaller than the divisor. If the remainder at each stage is positive or zero a 1 is recorded in the quotient in that place. If the remainder is negative a zero is recorded in that place.

(v) The majority of candidates knew how to obtain a 'one's complement' and a 'two's complement' but were unable to comprehend that 0000_2 and 1111_2 are zeroes in one's complement.

A typical good response:

Both one's complement and two's complement have a decimal zero represented by 0000_2. There is only one code for zero in two's complement as $0000_2 \rightarrow 1111_2+1 \rightarrow 0000_2$. Adding a number and its complement in two's complement form gives 0000_2. However, ones complement also classifies the code 11112 as a zero equivalent. The one's complement of 0000_2 is 1111_2. Adding a number and its complement in one's complement produces all ones.

Eg: $0001_2 + 1110_2 = 1111_2$.

(b) Optical Technologies

(i) 1. Many candidates managed to list only one or two of the properties of laser light. Many focused on the use of laser light or the properties of light generally, rather than on the properties of laser light.

A typical good response:

Coherent, monochromatic, highly collimated.

2. Many candidates confused 'optical fibre' with cables and failed to state that optical fibre is a medium for light. 'Fast' was a common incorrect answer.

A typical good response:

Allows light to pass through, high bandwidth, no electromagnetic interference.

3. If the previous parts were not answered correctly, it was difficult for candidates to gain full marks in this part. Some suddenly remembered properties which, unfortunately, they had not included in their answers to the previous parts. However, care was taken to ensure that candidates were awarded marks for indicating some level of understanding of the terms being examined.

A typical good response:

Laser light can be transmitted through optical fibres. Data can be encoded onto the laser light beam and transmitted through the optical fibre. This method of data transmission is being increasingly used because of the properties listed above for laser light and optical fibres which are very advantageous, such as high bandwidth, low interference and difficult to 'tap'.

4. The word 'technical' was again poorly understood by many candidates. A large number of candidates mentioned 'cost', while others had animals and insects eating the cable. Neither of these answers attracted marks.

A typical good response:

Technical problems with optical fibre cable include the loss of signal due to a fracture of the fibre if the cable is bent too acutely. The solution is to reinforce the cladding appropriately. It is also difficult to join and this is being overcome by improving joining technology. Some signal loss occurs over distance. This is corrected by the provision of 'repeaters' at appropriate intervals.

(ii) 1. Only a small number of candidates related their answer to the specifics of the question, that is, focusing on the 'font'. The majority of candidates seemed determined to give a description of the printing process on laser printers, many of which were only partially correct.

A typical good response:

The computer sends the information to the printer. This is stored in the printer buffer. The font for the letter 'D', from a file which contains the Times Roman Bold font set, stored in the printer, is converted to a bitmap which is printed by the standard laser technique onto paper.

2. Most candidates simply stated that this was accomplished in the same way as in part (1), without further explanation. Some mentioned that the image might have been sent to the printer in vector form and gave a good description of that process.

A typical good response:

The bit-map of the symbol is sent to the printer buffer by the computer. This can then be reproduced by the printer on paper by the standard laser printing process.

3. This part was very poorly attempted. Many candidates had no notion that the photograph would be digitised as a bit-map, with colour information being included for each pixel. Consequently, they had little chance of correctly describing the appropriate printing process.

A typical good response:

The bit-map containing the data for each pixel in the image (including colour, brightness etc) is sent to the printer buffer. The printer analyses this data and creates four separations for the picture, one each for the colours cyan, yellow, magenta, and black. The picture is then produced by a four stage process. Each colour is overlaid onto the paper, using the usual laser printer technique with a different toner each time. The mix of colours in any area of the picture creates the tone required. Because the process is repeated four times, the quality of the picture is greater than the actual resolution of the printer.

(c) Theory and Construction of Integrated Circuits

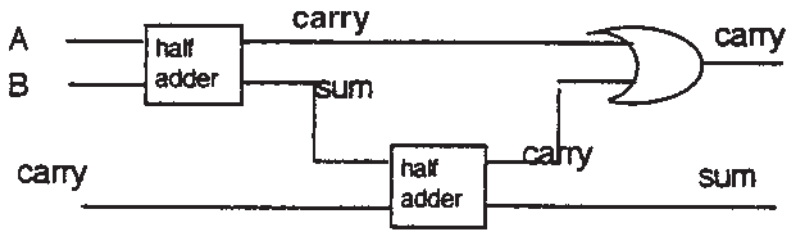
(i) Most candidates understood the function of a half adder and could describe the outputs. Many digressed and compared the half adder to a full adder and, in doing so, failed to answer the question fully.

A typical good response:

A half adder simulates the addition of two binary digits. It can take two inputs and produces two outputs (a sum and a carry).

(ii) The majority of candidates knew that a full adder contains two half adders and that the output from one is an input of the other, but few were able to draw an adequate representation of a full adder. Very few were aware that the carry from each half adder passes through an OR gate to produce the final carry.

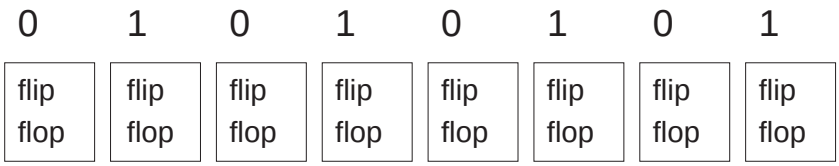
A typical good response:



(iii) This part was, on the whole, well answered, but many candidates did not show the pattern of storage in the 8 flip-flops. A large number included unnecessary details such as circuit diagrams and truth tables of flip-flops.

A typical good response:

A single byte of data may be stored by using 8 flip-flops in parallel. Each flip-flop stores one bit of the byte. For 'U' the rightmost stores 0, the next stores 1 etc.



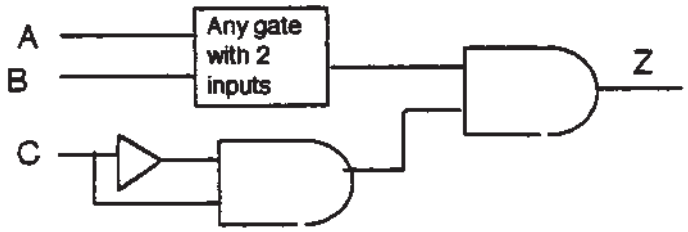
(iv) Most candidates were able to construct a truth table accurately, showing inputs and outputs. In some instances, inputs were commonly omitted altogether or candidates did not show all possible combinations.

A typical good response:

A	B	C	~C	W	X	Y	Z
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	1	0	1	1	1	0	0
0	1	1	0	1	1	0	0
1	0	0	1	1	0	0	0
1	0	1	0	1	0	0	0
1	1	0	1	1	1	0	0
1	1	1	0	1	1	0	0

(v) This part was fairly well answered, with some good variations from the obvious. The most common error was failure to keep the 3 inputs.

A typical good response:



(vi) The majority of candidates were able to show a reasonable depth of knowledge about the construction of silicon chips. Most gave a good description of the steps involved.

A typical good response:

Silicon wafer

Design the circuit

Repeat

- Photoresist
- Apply photomask
- Expose
- Etch

Until all layers are finished

Testing

Encapsulate

Question 27 – Database Design

About 60% of the total candidature for 2/3 Unit (Common) attempted this option. This year, candidates showed a good knowledge of database terminology and there was a general improvement in the standard of writing search specifications by combining logical and relational operators. Many showed a knowledge of database concepts but were unable to apply this knowledge to the specifics of the question. For example, they understood what a primary key was and how it was used but, in redesigning the database tables, they often omitted a primary key.

(a) In this part, candidates were required to explain the major difference between pairs of terms relating to database design. Many showed a sound knowledge of definitions as published in the Glossary of Terms. In order to gain maximum marks, however, candidates were expected to outline the difference clearly rather than just regurgitating definitions. Part marks were awarded for showing an understanding of each term.

A typical good response:

(i) A schema is an organised plan of the entire database, whereas the database dictionary is a comprehensive description of each field.

(ii) Data validation is a check by the computer to ensure that the data entered is the correct type and a sensible value. Data verification is a check carried out by the user of the entered data against the source data.

(iii) Sorting is the process of arranging data items in a particular way, eg alphabetically, while selecting matches a query to identify a target.

(iv) Data security is the protection of software and data against accidental or unauthorised destruction or theft, whereas data integrity is the reliability of the data, that is, the accuracy and timelessness.

(v) In a flat file database all the data is contained in one file or table, often creating redundant data, whereas a relational database comprises of many tables linked by means of a key field, thus reducing data redundancy.

(b) (i) This part was well answered by the majority of candidates. Most candidates could correctly identify data redundancy, logical fields and primary keys.

A typical good response:

1. product_description
2. order_finalised
3. customer_id

(ii) A large number of candidates experienced difficulty in creating two tables and placing related fields into correct tables, and hence did not score maximum marks.

A typical good response:

Orders	Jobs
customer_order_number	customer_order_number
customer_id	product_id
date_of_order	quantity
total_cost	order_finalised
job_order_number	

(iii) Quantity_on_hand was identified as an integral component to answer this part and candidates who could correctly use a logical operator to link this with the date_last_order field gained full marks. The term ‘excessive’ confused some candidates.

A typical good response:

From: Product File

Where: quantity_on_hand>0 AND date_last_ordered < 1 January 1998

Display: product_id

(b) (i) The majority of candidates were able to answer this part correctly.

The correct response:

donor_id

(ii) Most candidates were able to identify the redundant field but were often unable to give reasons for its being redundant. Some candidates interpreted a redundant field merely as being duplication of data rather than 'unnecessary' duplication of data, and incorrectly gave donor_id as the redundant field 'because it appears in both files'.

A typical good response:

date_last_donation would be a redundant field because you could determine the date of the last donation by sorting the donations file on donation_date to find this date.

(iii) Students were able to determine that the problem was having street name and suburb in the one file. The better students also recognised the need to include a field for the house number separately from these two.

A typical good response:

Remove donor_address and replace it with donor_number, donor_street and donor_suburb.

(iv) This part was very poorly answered. Many candidates did not recognise it as a mail merge question. Some often just wrote the letter that could be used by the charity organisation.

A typical good response:

Use a word processor to create a form letter to donors. Insert the relevant fields from the database, including donor_name, donor_address and amount_to_date. Carry out a search on the database to determine donors who have made a contribution during the year. Merge the database with the form letter to produce personalised letters. Print the letters and send them to the donors.

(v) Candidates' responses indicated that there has been a definite improvement in the writing of queries from previous years. Many were able to determine the correct query and print out the information required. Some printed out only the person's details without reference to how these donors would be selected.

A typical good response:

Carry out a search of the database to find people who have not made a donation during the year:

date_last_donation < 1/1/98.

Then print out a list of the

donor_name and donor_address.

Question 28 – Graphical Techniques

Approximately 75% of the total candidature for the 2/3 Unit (Common) paper attempted this option.

(a) Candidates generally gave an explanation of each term, but many were unable to give a graphics example as requested in this part.

(i) The majority of candidates experienced difficulties when attempting to explain 'time code' A large number did not even attempt this part, while those who did so could give an example, but not an adequate explanation. Candidates simply reused the words

'time' and 'code' and therefore did not show an understanding of the concept, thus scoring poorly in this part.

A typical good response:

Time code is a numbering system to identify each frame in a video sequence or film.

(ii) Students showed a lack of understanding of the concept of 'pixel averaging' and used the description of 'dithering' as an answer instead of dithering's being an example of where pixel averaging could be used.

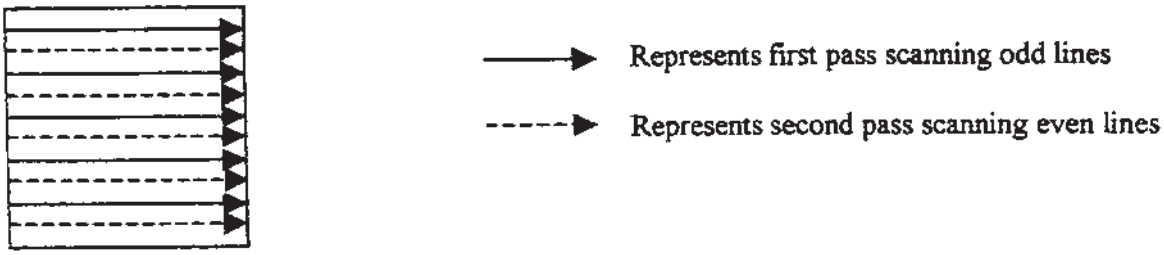
A typical good response:

Pixel averaging is where each pixel represents the average of a number of colours which should be present in the physical area covered by the pixel to achieve anti-aliasing.

(iii) This part was well attempted by most candidates, however, at times the description (or diagram if included) was inadequate.

A typical good response:

Interlacing is the method of refreshing the screen in two cycles, each cycle being alternate scan lines, odd lines then even, allowing for greater resolution of graphics on slow refresh monitors.



(iv) Candidates' responses indicated that many students did not read the question carefully, as they often launched into lengthy explanations outlining how a plotter worked, rather than why it would be chosen in preference to a laser printer.

A typical good response:

A plotter may be used in preference to a laser printer because it can print on a very large piece of paper eg house plans from a CAD package.

(v) Many candidates could outline the concept of 3D, but experienced difficulties when attempting to explain the use of a wire frame diagram.

A typical good response:

A wire frame diagram is an image of a three dimensional object formed by drawing only the edges of polygons representing the faces of solid objects. The polygons are used for creating realistic surfaces using rendering.

(b) (i) Many candidates could identify a suitable input device, but showed a poor understanding of how a graphics tablet or light pen actually works.

A typical good response:

A graphics tablet could be used where the stylus or puck draws the graphic on the surface of the tablet. The magnet in the stylus interacts with a wire grid embedded in the tablet to transmit the position of the stylus to the computer.

(ii) 1. Many candidates failed to recognise the one to one correlation but realised that a bit-mapped image was formed by pixels.

A typical good response:

The pixels forming the image on the screen are stored as bits in memory. Each pixel has a corresponding series of bits in RAM.

2. A large number of candidates were able to describe coordinates but failed to give the additional information about the attributes.

A typical good response:

Vector images are stored as primitives in memory using mathematical description together with other attributes such as line thickness, line colour and fill colour.

(iii) On the whole, this part was well answered and many candidates were able to gain full marks.

A typical good response:

A bit-mapped image, when increased in size, results in increased pixelation and the resultant jaggies or staircasing effect. When a vector image is resized there is no change in appearance and the image retains the smooth lines/edges.

(iv) 1. Many candidates failed to realise that the frame buffer stores the current image. Although a large number indicated that they knew the image was stored, they did not seem to realise that it was stored in a section of memory.

A typical good response:

Frame buffer is a section of memory that temporarily stores the current image being displayed.

2. This part was poorly answered as many candidates missed both the concept of the processing required and the fact that the image needed to be converted into a bit-map.

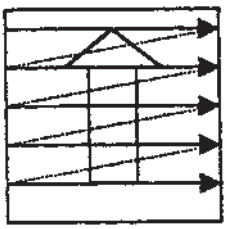
A typical good response:

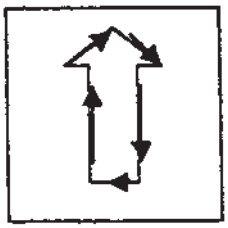
The vector image must be rasterised by the CPU in order to turn the vector data into a bit-map to be stored in the frame buffer.

(v) Some candidates did not read the question carefully and, instead of reproducing the diagrams and then indicating clearly with second arrows the possible direction of the

electronic beam, they simply used the arrow in many different directions. The vector display monitor was handled very poorly.

A typical good response:





(c) (i) The majority of candidates answered this part correctly.

The correct response:

16 colours

(ii) A large number of candidates failed to recognise that a first process had to be undertaken to reduce the number of colours in the palette from 16 bits to 4 bits in order to maintain the tonal range as closely as possible to the original.

A typical good response:

The palette could be reduced by a method whereby each block of colours is turned into a corresponding single colour in the new palette. Dithering is the process then used to reproduce the tonal range. This is achieved by representing colours not available in the existing palette by the use of a pattern of varying colours in which the eye performs the averaging to produce the required tone.

(iii) This part was well answered by the majority of candidates. Some missed the number of bits per pixel (4), and some used 1000 to calculate the number of bytes to kilobytes when no mathematical calculation was required. Candidates were asked to show how they would calculate, not actually complete the calculation (which many attempted to do). Marks were awarded for clearly indicating the steps involved in the calculation, not for the final answer. Candidates could either explain the process in words or display it as a mathematical calculation.

A typical good response:

$$\frac{300 \times 200 \times 4}{8 \times 1024}$$

(iv) The majority of candidates missed the reference made in the question to the World Wide Web, and hence the types of graphic file formats used. This detail should have featured in candidates' discussions of compression. Most could fully describe a method of data compression.

A typical good response:

Repeated patterns of pixels, shapes or colours are determined. The patterns are allocated codes and the final compressed image is stored as a series of codes, including the number of times they are repeated.

Question 29 – Multimedia

Approximately 31% of the total 2/3 Unit (Common) candidature attempted this question. Although it was generally well attempted, candidates' responses indicated that there is still a general lack of understanding of MIDI, its use, purpose and how MIDI files compare with wave table files. Answers tended to be better written than in previous years, with appropriate examples being given by candidates where possible. Some students experience great difficulty when asked to explain or discuss.

(a) Candidates need to be aware that it is important to write their answers in relation to the context of the questions; for example, in this part, the Royal Easter Show.

(i) 1. The majority of candidates were familiar with the components of multimedia as named in the Syllabus, and thus scored extremely well in this part.

Good responses (three of):

Video, sound, text, graphics or animation.

2. Most candidates were able to give examples of how each of their selected components could be used in the multimedia presentation. Only a few, however, were able to explain how the examples they quoted would enrich the presentation. Those who did so obtained maximum marks.

A typical good response:

The use of video in the multimedia presentation would enable tours of the grounds to be displayed, thus allowing users to view the new venue.

The use of graphics in the multimedia presentation would allow for photos, maps and plans to be incorporated into it. This would enhance the presentation as it would allow the history and the changes that have occurred to be conveyed visually.

The use of text in the presentation would allow more in-depth detail to be provided, thus ensuring that users gained the necessary information regarding the venue.

(ii) Most candidates could provide examples of how Hypertext might be used, but very few explained the advantages of using it in such ways.

A typical good response:

As a link to in-depth information associated with the show with which people might not be familiar, for example, brand names or ring events. These terms could be used as hypertext so that, when selected, the user could go to the meaning or explanation.

To keep the presentations neat or uncluttered – instead of large amounts of text on the screen, only a few key words or phrases.

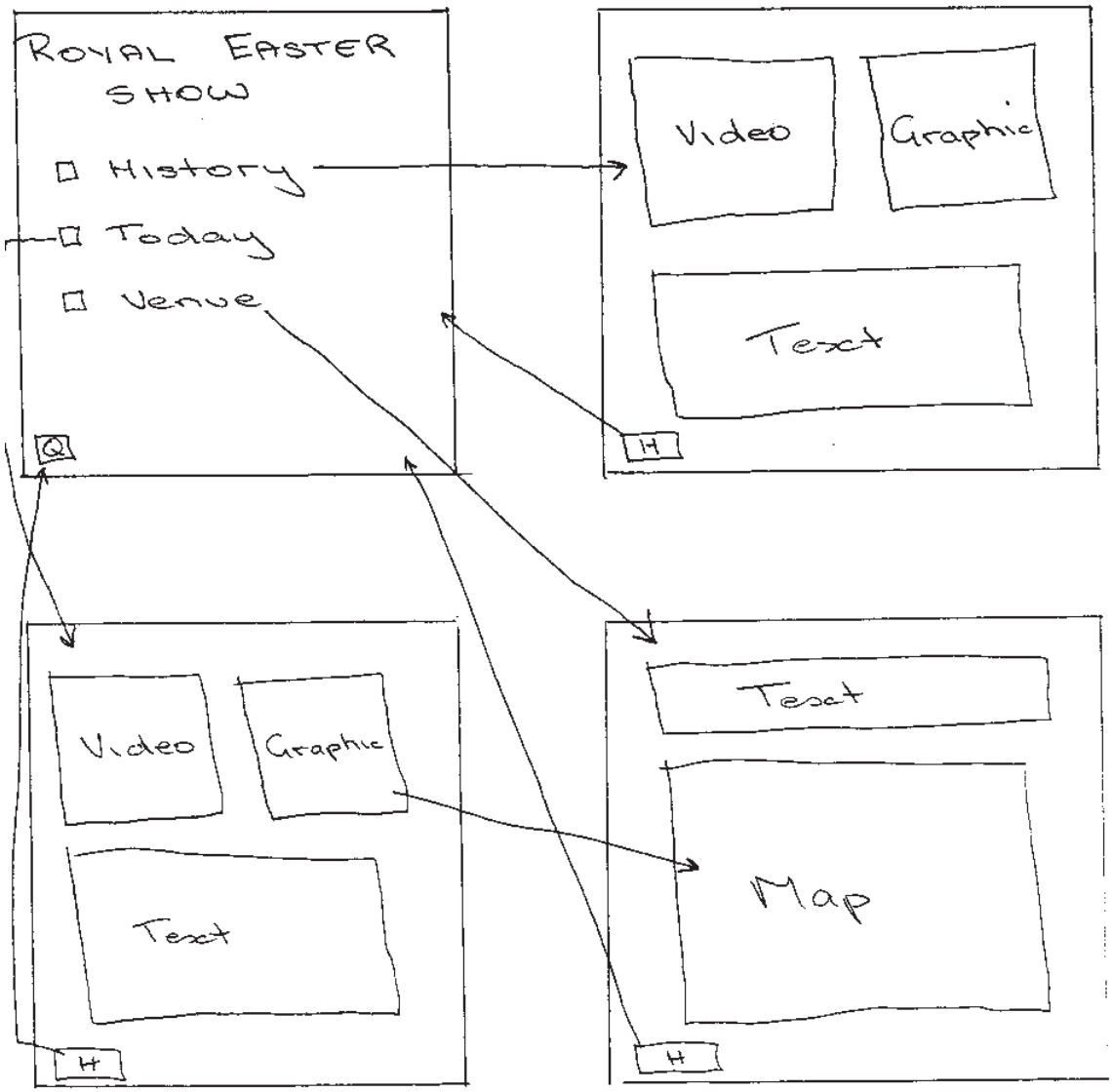
(iii) The majority of students could identify features to be included on the home screen, but many found it difficult to justify their inclusion. The screen design needed to include at a minimum, a title, placeholders or other elements. To obtain full marks, the answer needed to refer to the Royal Easter Show and justify the inclusion of 3 factors — not just name them. Each justification needed to be different and to relate to the design.

A typical good response:

- Large title to draw user's attention.
- Hypertext to allow users to follow their interests while leaving the screen uncluttered.
- Appropriate to item and audience.

(iv) 1. Many candidates did not relate their storyboard to the stimulus material provided. The storyboard needed to relate to the theme in order to obtain full marks. It needed to indicate clearly by its links that it was non-linear and to conform to good design principles by giving the user the option of returning to the home screen at any time.

A typical good response:



2. The majority of candidates made a good attempt at answering this part. The answer to this question could be given in general terms and did not need to relate to the Royal Easter Show.

A typical good response:

A storyboard is a planning tool used by the design team to plan the navigation paths which will be available to the user and to give a rough indication of what the screen will look like.

(b) (i) 1. This part was not well answered. Many students failed to discuss how the two forms affected the design of the presentation and merely wrote a list of terms.

A typical good response:

In designing a video presentation, consideration needs to be given to its use with a diverse audience who will have no more control than switching on/off and fast forwarding/rewinding. The language, therefore, needs to be pitched so that children can understand it and that adults will not be distracted. Content also needs to reflect this diverse audience.

In planning content, emphasis should be placed on video footage and animation as these forms of media lend themselves best to video presentation. Text, still graphics and voice-over would be kept to a minimum. The storyboard would be linear.

A CD-ROM design, on the other hand, would allow for a non-linear storyboard and more attention would be paid to the design of a greater range of media. Content and language could be more specific for set audiences and users would be able to follow their own interests. Programmers would need to be employed and consideration given to hardware capacity and compression of video footage and sound files.

2. In this part, discussion was the key to obtaining full marks. Candidates who merely put 'cheaper' or 'easier to produce', did not earn any marks. If reasons were given, they needed to be fully and clearly justified.

   Typical good responses:

   Video:

   - can access a large number of people at once
   - can present selected material
   - can present visual images that are understandable regardless of age, language etc.
   - if distributed, a video is more likely to be used as most people have access to a VCR.

   CD-ROM

   - can be interactive
   - the user can control paths
   - can contain information in more forms such as text, hypertext etc.
   - can contain wide content since 680Mb generally can give more information than one 3 hour video.

(ii) Many candidates made a good attempt at answering this question. A number, however, still seemed to consider the answer 'cheaper'.

Typical good responses:

Advantages

- portability
- easy individual access
- no need for special technology (VCR or CD-ROM) to access the content.

Disadvantages

- unsuitable for the illiterate
- if very widely distributed, it is a waste of paper.

(c) (i) This part was generally not well answered. Most candidates still do not understand what MIDI is and what is entailed with its production or what the end product is.

Typical good responses:

1. The purpose of MIDI is to produce files from which music can be played on musical instruments connected to the computer. Hardware needed: musical instruments, sound card/module, MIDI cables and interface.
2. MIDI is unlikely to be used: if the sound for this presentation is real-life sound (voice or noise) as MIDI cannot produce this; only wave-table files can do this. In addition, sampled sound is of higher quality than MIDI files which give information only for reproduction of musical notes and tones.

(ii) This part was well attempted by the majority of candidates, who had a good grasp of evaluation and were able to 'state', as opposed to 'discuss'.

Typical good responses:

- does the presentation satisfy the aims set in the requirements stage with regard to content, quality of production?
- ease of use
- interface
- does it give equality of access?

3 Unit Additional

There was a slight improvement in the general quality of answers this year. 1702 candidates attempted the 3 Unit HSC Computing Studies Examination which comprised:

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

Section II – two compulsory questions worth 15 marks each.

Section I

Item	Correct Response
1	D
2	C
3	D
4	C
5	C
6	B
7	B
8	A
9	D
10	A

Item	Correct Response
11	B
12	D
13	C
14	A
15	No correct answer given.
16	C
17	A
18	A
19	A
20	D

Section II

Question 21

(a) This question provided plenty of opportunity for candidates to show their understanding of programming paradigms, but it was not very well answered. Most candidates could identify an appropriate paradigm (and, in a number of cases, that is all they did), but the majority were not able to apply knowledge of the paradigms to justify their choices. It was apparent that students do not have an in-depth understanding of the paradigms, and their justifications for choices were poor. Some answers included a description of the paradigm's features, rather than a justification of their choice for each project. Very few candidates could distinguish between object-oriented and event-driven, and even fewer could managed a clear justification for the use of a declarative paradigm.

Typical good responses:

Event-driven

A touch screen information directory would lend itself to an event-driven paradigm because the user would need to select from a number of different options shown on the screen. The program would have to sit waiting for the screen to be touched before an event is triggered.

There would be no predefined sequence as in a procedural language. A timer could be used so that, if no touch is received within a certain time, the program would return to the main screen.

Declarative

The doctor's diagnosis system needs to be built around a knowledge base of illness symptoms. Declarative languages allow one to build up a knowledge base by defining rules and declaring illness symptoms. The forward and backwards chaining used in declarative languages would allow the doctor to query the knowledge base to determine the patient's illness.

Procedural

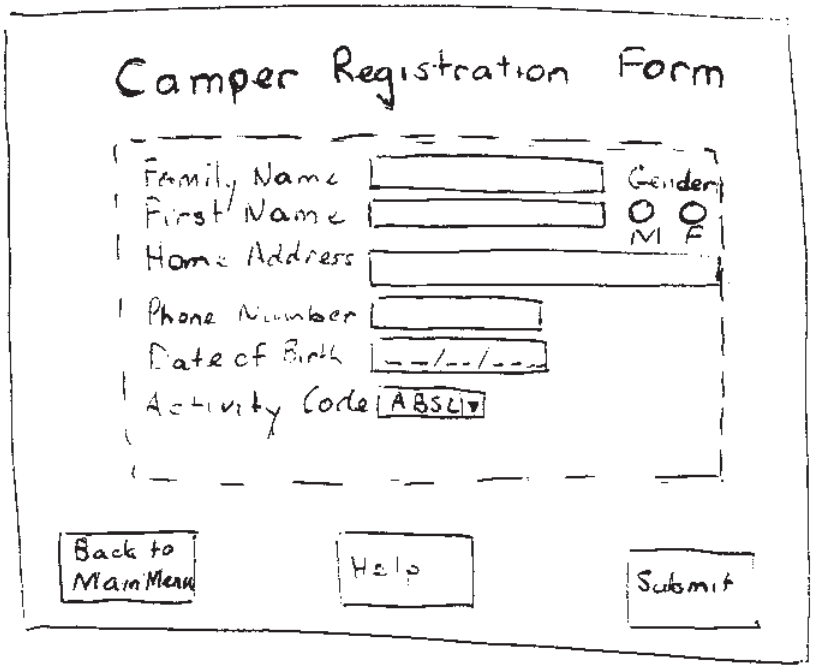
A monthly payroll system would need to store values for hours worked for each employee, rates of pay for each employee etc. This lends itself to being represented by variables and stored in record and array structures. The calculation of the pay for each employee would require repetition. The procedural paradigm best handles this type of variable assignment and control structures.

Object-orientated

The pinball game would lend itself to being created from a number of objects. Each target on the screen would be a separate instance of the same object 'Target'. The properties of each target might be slightly different. The ball and the flippers would be separate objects. The code for the way in which a target responds when the ball hits would be built into the target object. Scoring would be achieved by messages being passed from the targets to the main module.

(b) (i) Most candidates produced a screen design that identified in a diagram the essential components of a good design. Interpretations of the question as being a 'data entry screen' to the camper registration program, or an entry screen (ie title or main menu) to the camper registration program were equally acceptable.

A typical good response:



(ii) Although showing good screen design features in a diagram, the written responses to this question did not reflect thoughtful or quality elaborations of good design features utilised by students in their screen design in part (i). Answers were, in too many cases, lists of features that appeared to be 'rote' responses triggered by the words 'good design features' that did not relate back to their own design and did not reflect an understanding of the application of screen design principles, but, rather, tended to be 'wishy washy'. For example – My screen is: 'easy to understand', 'attractive', 'clear', 'concise', 'polite and respectful'. Candidates often did not elaborate the features that made their screen 'easy to understand' etc. As in other years, it is recommended that, if students nominate 'use of colour' as a good feature of their design, they use different coloured pens or pencils in the drawing they provide of their screen design. The idea of consistency of design across all screens of the system was a feature that students had trouble in showing in their part (i) answer.

Typical good responses:

(This answer relates to the hand drawn diagram in part (i))

I have used a heading to clearly identify the screen. It is centred and bold so that it stands out.

I have grouped all the inputs and placed them in a frame. The inputs are clearly labelled and left justified to improve the legibility.

I have used text boxes to collect the data input. These give an indication of the field lengths.

I have used radio buttons to collect gender information.

I have placed navigation buttons at the bottom of the screen to allow the user to move to other parts of the program.

I have aligned the buttons so that they are evenly spaced, surrounded by white space to improve the legibility.

(iii) The majority of candidates scored well in this question, which asked them to suggest how they would display general input requirements and error messages. They mostly applied the ideas to the database application that the question posed.

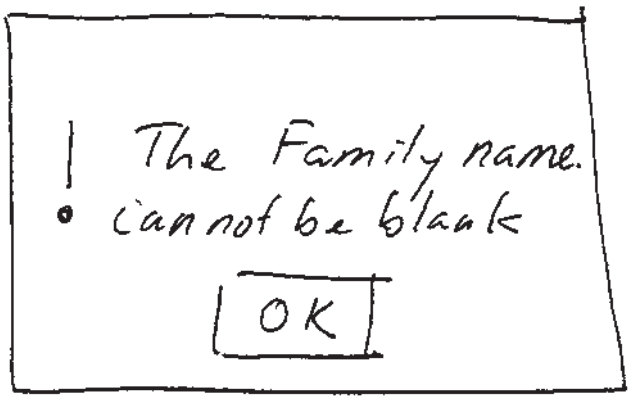
1. Some students gave specific examples of requirements for each field rather than general input requirements. They duplicated the ideas of the data validation which was later needed in part (c).
2. Some students responded to the error messages by suggesting that they should be 'polite', 'non-threatening' or 'use non-sexist language' rather than the more important aspect that error messages should be 'concise' and 'meaningful'.

Typical good responses:

1. Some of the general input requirements would be displayed by using appropriate screen elements such as:
   - text boxes indicating the field length
   - radio buttons indicating a choice of only one alternative
   - list boxes, which allow the user to select from a list of correct options.

- If the user wanted any more information than this, I would provide a link to an online help system which would give more detail.

2. When an input error occurs, I would use a popup message box which clearly identifies the error. The box would have an OK button which forces the user to respond to the error message.



(c) (i) On the whole, this question was poorly answered. Candidates tended to repeat the information given in the data dictionary provided in the question without providing additional detail that would allow data validation. For example, the field for date_of_birth had additional detail in the question regarding the age limits of participants. Some students even redefined the field specifications for a data dictionary, changing the field lengths, for example, or redefining the gender field as boolean. Few students recognised the need to check that no fields were empty. Answers reflected little analysis of the stimulus material.

Typical good responses:

family_name: Alphanumeric characters, max 20, min 1

phone_number : Numeric, >1 digit, max 10 digits, no decimals or signs

gender: Must be an M or an F

date_of_birth: Must be in the range Current_date - 25 years to Current_date - 18 years

activity_code: Must already exist in the system, 4 characters.

(ii) Candidates tended to provide rote definitions for test data as applied to programming, rather than considering the test data that would be necessary for the database application. For example, 'Test all the paths of the program'. Many students gave examples of test data rather than specifying the requirements of good test data (sometimes again specifying details for all the fields given in previous question parts). Few students recognised the need to check that no fields were empty.

Typical good responses:

Good test data for the camper registration system will:

- test the boundary conditions for each element
- test how the program responds to null entries
- test values for each field, above, below and between the boundaries.

(iii) All students appreciated the need to express the syntax of the field full_name using BNF, EBNF or railroad diagrams, but few did it well. Students did not appear to have a grasp of how decomposing the field into necessary components was carried out, lacking the ability to describe repetition of letters and optional parts. Those who did answer well often failed to provide details of how to deal with the spaces in the full_name. Students used the alternative methods with similar accuracy.

Typical good responses:

letter :: = a|b|c|d|e| ...z|A|B|C|D| .. Z

name :: = <letter> {<letter>}

Initial :: = <letter> <full stop>

full_name :: = <name><space>[<Initial><space>]<name>

Question 22

(a) (i) This part was answered well by the majority of candidates. Some, however, failed to recognise the need for an array with appropriate use of indexes. Some candidates were unclear about a "" being a character, and were confused by the use of the triangle symbol to represent the blank.

A typical good response:

```
BEGIN length
        index = 1
        Length = 0
        WHILE index < = 10
                        IF Hold (index) <> "" THEN
                                        Length = Length + 1
                        END IF
                        Let index = index + 1
        END WHILE
END
```

(ii) There were many good attempts at answering this question. Some candidates unnecessarily rewrote the LENGTH algorithm from part (i), thus wasting valuable time. Many recognised the need for an appropriate SWAP algorithm, but swapped too far, not stopping when the swap was complete and, instead, they continued swapping already previously swapped characters because their loop moved along the entire length of the array. Another common error was not to use a temporary variable, attempting to move two elements on top of each other.

A typical good response:

```
BEGIN reverse
        first = 1
last  = length
        WHILE first < last
                        Temp = Hold (first)
                        Hold (first) = Hold (last)
                        Hold (last) = Temp
                        first = first + 1
                        last = last - 1
        END WHILE
END reverse
```

(iii) Most candidates who attempted this question chose to use a bubble sort. Few of these, however, recognised the need for both loops. It appeared as if many students were trying to work out the appropriate solution from first principles, which, given the time constraints, was not easy. A surprisingly large number did not know that it was possible to compare two alpha fields. They tried to convert to ASCII first, which was simply not necessary.

A typical good response:

```
BEGIN Sort
        Sorted = FALSE
        WHILE Sorted = FALSE
                        Sorted = TRUE
                        index = 1
                        WHILE index < length
                                        IF Hold(index) > Hold(index + 1) THEN
                                                        Temp = Hold(index)
                                                        Hold(index + 1) = Hold(index)
                                                        Hold(index) = Temp
                                                        Sorted = FALSE
                                        END IF
                                        index = index + 1
                        END WHILE
        END WHILE
END
```

(b) (i) Many candidates experienced great difficulty with this part, apparently because they did not recognise that the question was merely asking them to print the entire contents of the Names array. A very large number tried to allocate patients into their appropriate positions in the array first, thus including both parts (ii) and (iii) into their answers to part (i).

A typical good response:

```
BEGIN List
        Index = 1
        WHILE Index < = Num Patients
                        Print Names (Index)
                        Index = Index + 1
        END WHILE
END List
```

(ii) Many students did not recognise that it was possible to add more than one urgent person to the list at one time. Rather, they added each new urgent patient to the top of the list. Generally, the shuffling was poorly done, even when students understood the need for such a process.

A typical good response:

```
BEGIN AddnewPatient
        totalPatient = totalPatient + 1
        Get Name, Category
        IF Category = "U" THEN
                        totalU = totalU + 1
                        index = 50
                        WHILE index > = totalU
                                        Names (index) = names (index - 1)
                                        Category (index) = category (index - 1)
                                        index = index - 1
                        END WHILE
                        Names (totalU) = name
                        Category (totalU) = category
        ELSE
                        If totalPatient < = 50 THEN
                                        Names (totalPatient) = name
                                        Category (totalPatient) = Category
                        ELSE
                                        Display "Sorry - too full!"
                        END IF
END
```

(iii) Generally, most candidates found this question difficult, or simply ran out of time. Their responses were trivial, and did not address the need either to find the required patient, or to shuffle the remaining patients up to fill the resulting slot after deletion. It was interesting to note that candidates who had successfully used PseudoCode up to this point, often reverted to a very primitive flowchart for their solution to this question.

A typical good response:

```
BEGIN DeletePatient
        Get Name
        index = 1
Found = 0
        WHILE index <= 50 AND found = 0
                IF Names (index) = Name THEN
                        Found = 1
                END IF
        END WHILE
        If Found = 0 THEN
                Print "No such patient!"
        ELSE
                TotalPatient = TotalPatient + 1
                IF Category (index) = "U" THEN
                        Total U = TotalU - 1
                END IF
                WHILE Index < = TotalPatient
                        Names (index) = Names (index + 1)
                        Category (index) = category (index + 1)
                        index = index + 1
                END WHILE
                Names (index) = ""
                Category (index) = ""
        END IF
END
```

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