Information Systems GA 3: Written examination

GENERAL COMMENTS

Areas of strength and weakness

While the style of the examination paper was similar to previous years, the structure of the questions, and the marking scheme differed significantly. The paper consisted of only seven questions. However, each question was subdivided into two, three and four parts – with each part being worth between 2 and 12 marks. The maximum possible score was 125.

Partly as a result of these changes the raw score mean percentage decreased from approximately 64% in 1999 to 51.5% in 2000. However, the percentage of students awarded each grade was very similar to the 1999 results.

The standard of the student responses to most questions was quite pleasing. It was gratifying to note that almost all students related their answers to the case study. Rarely was an answer marked down because it failed to include reference to the case study. However, the poor quality of students' handwriting was of concern. Teachers should strongly discourage students from using pencil.

On a positive note the number of students who sat the Information Systems examination again increased dramatically, compared to 1999. The approximate numbers were 2250 in 1999 and 2675 in 2000.

Not surprisingly Question 4, relating to algorithm testing, was found to be the most difficult question on the paper. In particular parts b. and c. had by far the lowest mean scores, though part a. was answered much better. At the other end of the scale, Question 3 was the easiest question, while responses to Questions 5a and 7a were awarded the highest marks.

The biggest disappointments were the answers provided for Question 5b, which required an improved backup procedure, and the whole of Question 6.

In a few cases students did run out of time to complete the paper. However, students found Question 7 to be the second easiest on the paper. The fact that students achieved a much lower score on part d. of Question 7 than on the other parts was due to their inability to understand the concept of a 'disaster recovery plan' rather than to shortage of time.

As usual, a number of students did not read the questions properly – and thus failed to distinguish between instructions such as **list**, **discuss**, **describe** and **explain**. As a result students lost marks because their answers were too brief when they were asked to discuss or explain, or they wasted time with detailed answers when they were asked to list. Teachers are urged to impress on their students how important it is to read the question carefully after completing their answer, to make sure the answer covers all aspects of the question.

In some questions students will be given clear directions about the number of points to be raised in the answer. The 2001 exam paper will include an answer booklet that will give students more guidance in the structure of their answers. Refer to 'Study Advice', February 2001 *VCE Bulletin* No. 161, for further information.

SPECIFIC INFORMATION

Question 1

The first step in developing a new system is the process of systems analysis. As part of this process, Fred, the systems analyst, needs to determine facts about the:

- operations of the factory
- current information system
- requirements of the proposed system.

These facts include details of:

- the existing file structures of the accounting system
- the current procedures for ordering and billing.

a.

*Give details of **two other** facts the systems analyst needs to find out about in order to design the new system.*

Acceptable responses were:

- hardware specifications of the existing computer equipment, such as CPU, RAM, disk capacity, peripherals
- software used, such as operating system, name/type of application software, hardware specs required, GUI
- the objectives of the proposed information system, for example a summary of the requirements outlined in the preceding paragraphs of the case study

- workflow – in other words a description of the physical processes that occur.

The above list is not exhaustive; for example, the systems analyst would need to find out how much ABC is prepared to spend on implementing the new system.

In the past, Question 1 has been a straightforward 'pipe-opener' but this question proved to be one of the more difficult questions – especially parts a. and c.

Too often students gave examples that were very specific (the procedure for producing an invoice), or irrelevant (the quantity of each bike part currently in stock). Even when students gave appropriate examples they tended to simply state the information required, for example ABC's budget for the new system, without giving the requested details.

b.

*Describe **two** methods Fred could use to obtain details about each of the following:*

- *the existing file structures of the accounting system*
- *the current procedures for ordering and billing.*

This means a total of four different methods (two for each bullet point). Acceptable responses were:

- file structures: (i) consult manual for details of filenames, field names, (ii) contact helpdesk/support, (iii) run program and examine files
- current procedures: (i) interview specified people (need to specify, for example orders clerk, accounts manager) (ii) observe how staff create orders and accounts, (iii) place a test order and observe its progress through the system, (iv) consult procedural manuals.

Many students gave more or less generic answers to this part of the question (sometimes even listing identical methods for both bullet points) rather than suggesting methods that were appropriate for the information to be gathered. Some students did not even appear to know any of the methods used to gather information in systems analysis.

c.

Fred needs to document the information obtained about current procedures for ordering and billing. List two tools he could use. Describe the purpose of each tool.

An acceptable response was:

Discussion about data flow diagrams, flow chart/NS diagram, pseudocode, IPO charts, decision table/tree, data dictionary. The discussion should indicate the purpose, for example a data flow diagram (DFD) is used to document the flow of data throughout the factory, including data stores and processes.

Very few students associated 'tools' for documenting the information gathered with the (mainly diagrammatic) answers suggested above. Too many students listed a computer, pencil and paper, tape recorders or Word as their chosen tools. Even students who coped well with the DFD in Question 2 did not mention this as a documentation tool in this question. The small number of students who mentioned a data dictionary had very strange notions about its purpose.

Question 2

The data flow diagram provided gives a rough outline of the design of the new system. The 'allocate bike order to bike builder and create parts list' process can be broken down into the sub-processes listed in the table below.

Sub-processes

A. find next bike order for bike to be built
B. determine availability of bike parts for this bike order and update parts file
C. allocate this bike order to bike builder, update bike orders file and generate bike parts list

a.

List the data flow number/s associated with each sub-process A, B and C.

Acceptable responses were:

A – 6
B – 7 and 8
C – 5, 9 and 11

Students experienced some difficulty with both parts of this question. Although the data flows listed in the examination paper were deemed to be correct by the Exam Setting Panel, it could be argued that other data flows may be required, particularly for sub-process C. These extra data flows were accepted without penalty. However, since the question is restricted to the 'allocate bike order to bike builder and create parts list' process, only those data flows going into or out of this process could be considered.

b.

What steps will be required in the 'Create Invoice' process to produce this invoice? The steps in the 'Create Invoice' process should include the source of any other necessary data. You are encouraged to present your answer in an appropriately structured format.

An acceptable response was:

- generate next invoice number
- read system date
- calculate due date for payment
- retrieve customer details from customer file
- retrieve bike parts list from bike orders file
- use bike parts list to calculate total cost of parts
- calculate total cost of bike from total cost of parts plus cost of labour plus profit margin
- print all details on invoice.

This was intended to be a 'broad brush' question. Students were not expected to give a detailed algorithm – just the outline steps. However, students were not penalised for writing a detailed algorithm – provided it contained most of the steps listed above. Pseudocode was the most appropriate format for answers.

A significant number of students described the process in essay format. These students were much more likely to miss vital steps. Students should be strongly urged to present a series of steps (when describing a process or procedure) as pseudocode or other suitable format.

It was difficult, but not impossible, for students who used a DFD to obtain full marks.

Question 3

There is an existing computer in the accounts area. Fred has determined that his design will require another three workstations:

a.

For each new workstation specify:

- *who will use each workstation*
- *where the workstation should be located*
- *for what the workstation will be used.*

The table below shows one possible way to set out an answer.

WS	Who will use it	Location	What it will be used for
1	Catherine Wheel	Reception	Taking bike orders
2	Bike builders	Bike building area	Enter builder ID, print parts list, assign bike to builder
3	Michelle Irons	Stores/Goods In/Out	Sending orders for parts, entering new stock data

This part of the question was well answered, especially by those students who took the advice given in the paper to set out their answer in the form of a table. Providing an answer booklet for the 2001 paper will give students better guidance in the structure and expected length of their answers, and encourage them to write more legibly.

A large number of students listed the Manager (and/or the Accounts manager) as needing a computer. While this was considered to be a reasonable suggestion it was not awarded full marks because the case study indicates that each of the functions in the table above is essential. If students chose the Manager they could still achieve full marks if they combined two of the other functions into the one computer; for example, by combining the stores and bike building functions into the one machine.

Very few students listed a games computer in the tea room as essential.

b.

Data files, such as the bike parts file, will need to be accessed from more than one of these workstations. Fred is unsure whether these data files should be:

- *stored on a separate file-server computer which can be accessed from all the other computers, or*
- *stored on the workstation where the data is first entered. Each workstation would be configured to allow the other workstations to access its data files (peer-to-peer).*

Compare these two options by discussing the advantages and disadvantages.

An acceptable response was:

	Advantages	Disadvantages
File-server	• Centralised data – simplified management of data (including backup) • Accessible by all workstations • Better security	• Server failure means no access to any data • Need fileserver (network) manager
Peer-to-peer	• Cheaper – don't need separate file-server computer • Less cost in initial set up • Accessible by all workstations • Failure of one workstation means only that the workstation's data is unavailable	• More difficult backup • Security not as good • All workstations need to be switched on to access all data

While students scored reasonably well on this part, their answers revealed serious misconceptions about the difference between a centralised (server-based) network and a peer-to-peer network. Many answers were very superficial.

It was particularly disappointing that many students seemed to ignore, or were unaware of, their own school experience of a server-based network. For example, some answers listed as a disadvantage of using a file-server that employees would have to go to the file-server to enter data.

This question was about logical configuration of the network, not physical configuration – discussions of, for example, bus and star networks were irrelevant.

Common misconceptions included:

- peer-to-peer is intrinsically more secure;
- if a file-server is used, employees would have go to the fileserver to enter the data, or enter it locally and then deliberately copy it to the fileserver;
- a file-server model does not need a network;
- the different models need different physical LAN topology – typically star for file-server and bus for peer-to-peer.

Question 4

a.

ABC needs to determine values for the minimum stock level and maximum stock level fields. List four factors that need to be taken into account when determining these values.

An acceptable response was:

Any four of the following: average number used per day, reliability of supplier, delivery time, cost, number per carton, storage space available at ABC.

This part was generally well answered, with the above list by no means exhaustive.

b.

The following algorithm is proposed to carry out the reordering process described above.

```
Open Parts File for Input
Open Order_Item File for Output
While NOT End of Parts File
  Read Part_Number, Quantity_in_Stock, Minimum_Stock_Level,
    Maximum_Stock_Level from Parts File
  If Quantity_in_Stock = Minimum_Stock_Level Then
    Date_Ordered ← System Date
    Quantity_Ordered ← Quantity_in_Stock – Maximum_Stock_Level
    Write Date_Ordered, Part_Number, Quantity_Ordered to
      Order_Item File
  End If
End While
Close Parts File
Close Order_Item File
```

To test this algorithm:

- *design test records that could be inserted into the parts file*
- *explain your choice of values for each of these test records*
- *indicate the expected output to the order file (if any) for each test record.*

Note that values have not been entered for fields that are not read in, since they are not relevant. An acceptable response and sample values are shown below.

Part Number	***Quantity in stock***	***Minimum stock level***	***Maximum stock level***
ABC12	*3*	*20*	*50*
ABC34	*50*	*50*	*100*
ABC56	*100*	*50*	*200*

Part Number	***Reason for choosing values***
ABC12	*Stock below Minimum_Stock_Level*
ABC34	*Stock equals Minimum_Stock_Level*
ABC56	*Stock above Minimum_Stock_Level*

Part Number	***Date ordered***	***Part number***	***Number ordered***
ABC12	*(Today's date)*	*ABC1*	*47*
ABC34	*(Today's date)*	*ABC34*	*50*
ABC56	~	**No output**	~

Answers to this part of the question were the least successful on the paper, with nearly half the students scoring zero. Choice of test data is a very important skill when developing an algorithm.

Since this algorithm is concerned only with the reorder process, and the only test carried out is a comparison of 'Quantity_in_Stock' with 'Minimum_Stock_Level' students were expected to choose values for three test records, where the Quantity_in_Stock is less than, equal to, and greater than the Minimum_Stock_Level.

Many of the students who had some idea about test data spent a considerable amount of time generating records to test data validation instructions, ignoring the fact that the algorithm does not attempt any data validation.

c.

Find the errors in this algorithm and explain how to correct them by using a bench test or any other suitable method.

Answer: Bench test (Desk check)

Step	***Variables***							***Output***
	Part Number	*Number in stock*	*Reorder amount*	*Maximum stock level*	*Date ordered*	*Number ordered*	*Test*	
Open Parts File for Input								
Open Order File for Output								
While NOT End of Parts File							*FALSE*	
Read Part Number, Number in stock, Min stock level and Max stock level	*ABC12*	*3*	*20*	*50*				
If Number in Stock = Min stock level Then – FALSE	*ABC12*	*3*	*20*	*50*			*FALSE*	*If FALSE – no output *PROBLEM*
While NOT End of Parts File	*ABC12*	*3*	*20*	*50*			*FALSE*	
Read Part Number, Number in Stock, Min stock level and Max stock level	*ABC34*	*50*	*50*	*100*				
If Number in Stock = Min stock level Then TRUE	*ABC34*	*50*	*50*	*100*			*TRUE*	
Date ordered < system date ( )	*ABC34*	*50*	*50*	*100*	*10/3/00*			
Number ordered < Number in stock – Maximum stock level	*ABC34*	*50*	*50*	*100*	*10/3/00*	*–50*		*Negative number *PROBLEM*
Write Date ordered, Part Number, Number Ordered to Order File	*ABC34*	*50*	*50*	*100*	*10/3/00*	*–50*		*10/3/00, ABC34, –50*
While NOT End of Parts File	*ABC34*	*50*	*50*	*100*	*10/3/00*	*–50*	*FALSE*	
Read Part Number, Number in stock, Min stock level and Max stock level	*ABC56*	*100*	*50*	*200*	*10/3/00*	*–50*		
If Number in Stock = Min stock level Then – FALSE	*ABC56*	*100*	*50*	*200*	*10/3/00*	*–50*	*FALSE*	*No output – correct*
While NOT End of Parts File	*ABC56*	*100*	*50*	*200*	*10/3/00*	*–50*	*TRUE*	
Close Parts File	*ABC56*	*100*	*50*	*200*	*10/3/00*	*–50*		
Close Order File	*ABC56*	*100*	*50*	*200*	*10/3/00*	*–50*		

Errors in algorithm:

- Relational operator in 'If' statement should be < = (not =)
- Number Ordered ‹ Number in Stock – Maximum stock level is back to front – it should be:
  Number Ordered ‹ Maximum stock level – Number in Stock.

Students did receive credit for spotting the (unintentional) error in the last line of the algorithm, which should have read:

Close Order_Item File

Although more than half the students scored zero on this part overall, a slightly better outcome was achieved than on the previous part.

It was surprising that a number of students who had little idea about test records could spot and correct the errors.

The number of students who made 'corrections' to perfectly valid instructions was of concern. For example:

- the 'While' statement should be 'Do till eof'
- the 'If' statement has no 'Else'
- there is no command telling it to go on to the next stock item
- there is no 'UNTIL End of Parts File' statement.

There were also students who wanted to include data validation instructions.

Students should be encouraged to look at the essential elements of any similar future question, and not worry about features that are not there.

Question 5

Fred (the systems analyst) is not happy with the manager's suggested procedure.

a.

*List **four** important concerns that Fred might have about this procedure.*

An acceptable response was:

Inefficiency (waste of Lucy's time), backup relies too much on Lucy, for example, it may not be carried out if she is away, storage space on a floppy disk is likely to be too small, data will not be backed up if it is being used at the time of backup (clash with re-ordering process), timing of backup (not after end of working day), location of backup disks, no rotation of backup media, accumulation of large numbers of backup disks.

This was the second most successfully answered part, with most students obtaining either 3 or 4 marks out of 4. However, many students focused almost exclusively on the limitations of the floppy disks themselves.

b.

Suggest a better backup procedure, include any new hardware/ software that may be needed by your procedure.

An acceptable response was:

Purchase a tape drive and at least seven suitable tapes. Install the tape drive in one of the computers on the network – preferably the fileserver. Install backup software that allows a timed automatic data backup to be set up. The tapes should be labelled one for each day of the week Monday to Friday leaving two spare to do a backup once a month to be kept in a different place to all the daily backups (but off-site).

The process Lucy could then use would be:

- Every morning check that the previous night's tape has worked successfully.
- Remove that tape and store either in a fireproof safe or leave ready to be stored off-site.
- Place correct day's tape into the drive ready for automatic backup at the end of the day.
- At the end of each month create a complete backup on one of the monthly tapes, and store this tape off-site.

Of concern was the standard of student answers to this part. An all-too-frequent answer went along the lines of: 'A better backup procedure would be a tape drive.' Many students appeared to have little idea what the word 'procedure' means.

Perhaps there is confusion between 'people procedures' – the set of steps taken to carry out a task (who, what, where, when, and how) and 'subprogram procedures' – the set of instructions (written in a computer language) needed to make a computer perform a task.

The question invited students to mention any new hardware or software required and then give details of a better backup procedure. A procedure is a set of steps. It would be best written as a set of steps – not in 'essay style'.

To obtain full marks students needed to:

- suggest an improved backup medium (many students were keen on Zip disks – which were quite acceptable – but students need to be reminded that Zip disks are not very robust)
- suggest an improved timing regime for backups
- suggest improved storage locations for the backups
- suggest rotation of the backup media
- outline a backup procedure.

If students choose to use mirroring (of hard disks – for example RAID arrays, or of file servers) to achieve backup they need to explain this concept. Such students should also be made aware that, even with mirroring, some form of backup is still usually required (in case of a total 'melt-down').

Another concern was the imprecise terminology used by a few students. There were suggestions that 'Zip tapes' and 'tape disks' might be used for backup.

c.

*Discuss **two** reasons why your procedure is better than the one suggested by the manager.*

An acceptable response was:

This procedure would be much more efficient as Lucy would only need to spend about 5 minutes a day to do the backup instead of perhaps an hour.

Setting the backup to start at the end of the day will mean that all computers will be able to be used right up to closing time and that all files will be backed up. (If the procedure suggested by the manager is used it will mean that each person will not be able to use their computer while Lucy is backing it up and everything that is done on that computer will not be backed up that day.)

Students achieved a better standard on this part than on part b. Many students who gave very limited answers to part b. could still give a good discussion of two reasons why their procedure was better than the manager's.

Question 6

Fred has contracted the Big Yellow Cabling Company (BYCC) to install the electric power and data cabling in the bike factory.

BYCC have estimated that it will take:

- 2 days to lay the required network data cables
- 3 days to wire up the required power points

- 1½ to 2 days to set up the computers which includes:
  - connecting the new computers to the network
  - connecting the existing computer to the network
  - installing and configuring the required software on all computers.

The factory cannot afford to have its existing computer system out of action during the working week. The manager suggests that the cable laying and wiring could be done during this time since it will not interfere with the operation of the factory. After the cable and wiring are complete the computers could be set up during a weekend. The system could be completed by Sunday afternoon, including connecting the existing computer. It would then be ready for Monday morning.

a.

Name the changeover strategy that the manager is suggesting.

The expected answer is direct changeover – or any name that suggests that the changeover is being done immediately.

Overall, Question 6 was the second-most-difficult question on the paper. Part a was surprisingly poorly answered – with well over half the students scoring zero. Many students suggested phased, pilot or parallel changeover as the method.

b.

Discuss any problems that might arise if this strategy is adopted.

An acceptable response was:

The main potential problems include the following:

- doesn't allow much time, if any, for testing
- no fall-back strategy – if the new system isn't fully operational by Monday morning ABC has no computer system
- no time allocated for staff training.

Students were expected to use a couple of sentences to elaborate on two of these problems.

Many students could only suggest one problem – the question did require the discussion of problems.

c.

Suggest another strategy and explain why you think it is better.

An acceptable strategy was:

- set up all other computers, and test
- backup all existing files
- on weekend hook in existing computer and test
- fall-back – disconnect new computers and restore system to existing configuration
- run paper system in parallel until happy.

An explanation of why the above strategy is better than the manager's suggestion could include that there is a contingency plan that will allow ABC to keep operating if the new system doesn't work and a different strategy would give more time for testing and staff training.

The best student answers named and described a parallel changeover strategy, then went on to explain that this would overcome the problems with lack of testing and staff training. Unfortunately many students either did not describe their chosen strategy properly and/or did not explain why it was an improvement.

Some students described strange and inappropriate variations on the suggested strategy.

Question 7

Once the changeover is complete, the continued successful operation of ABC will depend on the reliability of this computerised system. Three possible events that may affect this reliability are:

- staff may take files home on floppy disks and bring them back infected with a virus
- one or more computers may break down or be stolen
- there may be an electric power failure or a fire at ABC.

a.

List three problems that these kinds of events might cause for ABC.

Acceptable responses included: loss of data, malfunction of programs, staff unable to use computers, if file server out of action factory ceases production, if fire then factory ceases production.

Overall this was the second-best answered question on the paper, and part a was the easiest part question on the paper – two-thirds of the students scored 3 marks out of 3.

b.

Describe three ways that these kinds of events affect the people working for ABC.

Acceptable responses included: temporary lay-offs, loss of income, lots of overtime when system resumes operation, victimisation/lionisation of staff perceived to cause problems, forbidden to take disks home.

This part was generally well-answered. Some answers were too brief to qualify as descriptions (the sample answers above need some enlargement). The question asked for the effect on people but, some students ignored this.

c.

List four measures that ABC could take to minimise the chances of the system becoming unreliable?

Acceptable responses included: install virus-checking software, fire extinguishers, fire alarms, UPSs, regular maintenance.

This part was handled well, mainly because students were only required to list four single phrase answers to achieve full marks.

d.

ABC needs to develop a disaster recovery plan. Describe three strategies that should be included in this plan.

Acceptable strategies that required a description included:

- back up of all data on a regular basis
- make sure backups are available
- have technical assistance on stand-by to assist in recovery
- install a stand-by fileserver in a remote location which contains a mirror of the live data so that it can be brought online in case of disaster
- workstations should be able to switch to other functions if necessary
- manual fall-back system
- train staff so that they know what to do when a disaster occurs.

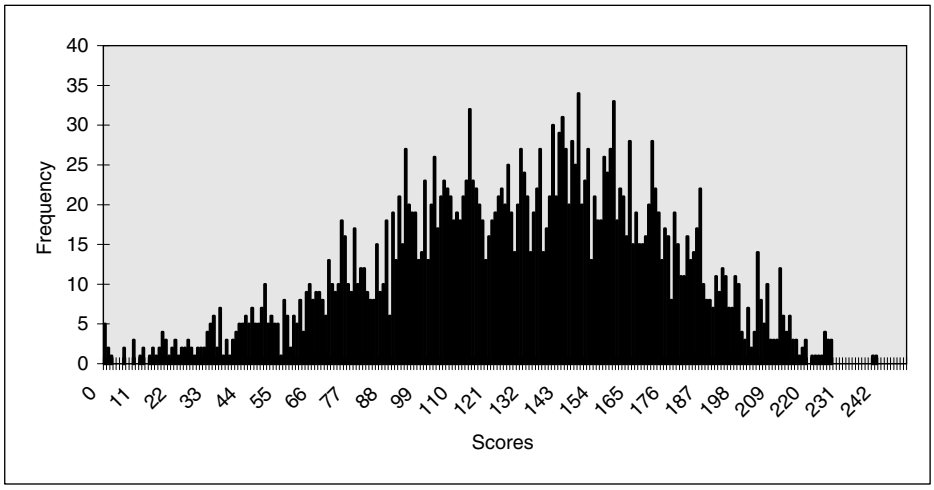
This part of the question required a description – most of the points raised above do not qualify as a 'description' – and was poorly answered.

Beyond emphasising the need for backups to be available, few students were able to describe strategies that would be part of a disaster recovery plan. The point about recovering from a disaster is that the disaster has already happened, so whatever measures are suggested must keep this fact in mind.

GA IT033 INFORMATION SYSTEMS WRITTEN EXAMINATION

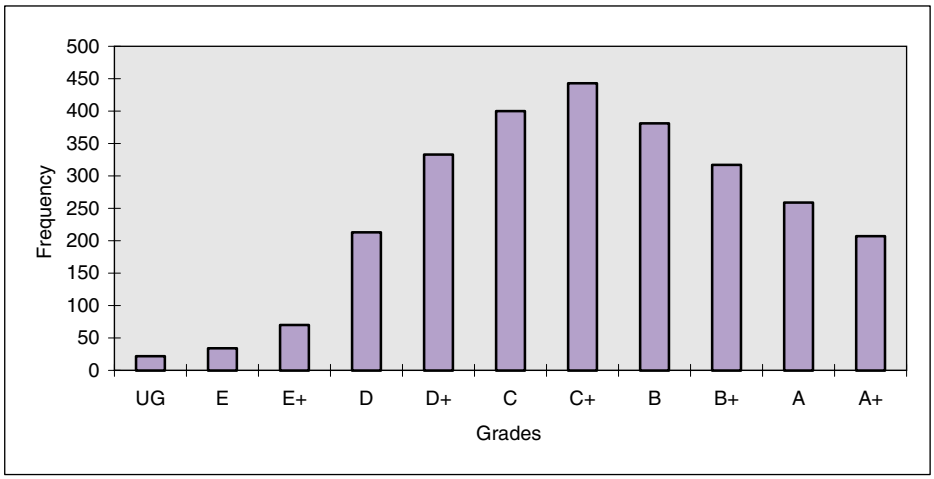
HISTOGRAM OF TOTAL SCORES 2000

Count 2679 Mean 128.94 Standard Deviation 44.33 NA Result 220



HISTOGRAM OF TOTAL GRADES 2000

Count 2679 Mean 6.12 Standard Deviation 2.26 NA Result 220



ENROLMENTS		%
Female	339	11.7
Male	2560	88.3
Total	2899	

GLOSSARY OF TERMS

Count Number of students undertaking the assessment. This excludes those for whom NA was the result.

Mean This is the 'average' score; that is all scores totalled then divided by the 'Count'.

Standard Deviation This is a measure of how widely values are dispersed from the average value (the mean).