

AN INVESTIGATION INTO THE COMPARABILITY OF SENIOR CERTIFICATE
EXAMINATION RESULTS IN DIFFERENT SUBJECTS AND AT DIFFERENT
GRADES.

by

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I, ANNE KATHLEEN OBERHOLZER, declare that

**An investigation into the comparability of Senior
Certificate examination results in different subjects
and at different grades**

is my own work and that all sources I have used or quoted have
been indicated and acknowledged by means of complete references.

A handwritten signature in cursive script that reads "Anne Oberholzer." The signature is written in black ink and is underlined with a single horizontal stroke.

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November 1995

Abstract

In this study current practices in the certification process at Standard 10 level are questioned with particular reference to the assumption that results in different subjects, and results at different grades within a subject, are comparable. The central problem associated with subject comparability is that although discipline specialists maintain that subjects are inherently different and therefore it is inappropriate to compare performance in different subjects, the certification requirements at Standard 10 level assume that comparability does exist.

A description of methodological studies in the area of comparability of standards in different subjects is provided together with a critical discussion of the underlying assumptions of each. Two main approaches in the study of subject comparability are identified. One is the use of an external reference test as a point of comparison and the other is the use of internal evidence, namely examination performance in other subjects. Methods from both approaches are applied in this study to a single set of data.

The data used in the study were collected from a sample of the 1992 Natal Senior Certificate candidates. The data consisted of their results in a Core Skills Test of general developed scholastic ability and their results in the final Natal Senior Certificate examination of that year.

All methods of addressing subject comparability used in the study yielded similar results, the general conclusion being that certain subjects appear to be severe in mark awarding in comparison with other subjects while certain other subjects appear lenient.

It is acknowledged that the question of subject comparability is affected by a number of issues which influence performance in different subjects. These include the motivation and preparation of learners and the resources of the school as well as the difficulties raised by the so-called talent subjects. In particular, the question of gender and cultural differences in examination entry and performance is investigated. Furthermore, it is acknowledged that the complex structure of South African society intensifies the potential impact of these issues.

Recommendations arising from the study include a revision of the current process of standardisation of results at Standard 10 level, as well as a re-structuring of the current system of differentiation.

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Chapter 1

Introduction and rationale for the study

1.1 Introduction

The question of comparability in respect of public examinations has wide ramifications. As the late Professor Desmond Nuttall and his co-authors said in what can be considered a seminal work on subject comparability:

... comparability between examining bodies is only one of the facets of comparability...The following five aspects of comparability may be identified:

- a. between examining boards in the same subject and year;
- b. between years in the same subject within an examination board;
- c. between modes of examining in the same subject and year within an examination board;
- d. between alternative syllabuses in the same subject and year;
- e. between subjects in the same year within an examination board.

(Nuttall et al., 1974: 11)

There has been great concern in South Africa about differing standards between different examining authorities (Barnard and Vorster, 1992; Kallaway and Siebörger, 1990; King and van den Berg, 1992; Vorster, 1988). The question of comparing results from different examining bodies is not an easy one as British studies have shown (Skurnik and Hall, 1969; Nuttall, 1971; Bardell et al. 1978; Orr, 1979; Christie and Forrest, 1981; Orr and Nuttall, 1983) and the social and political complexities in South Africa only serve to complicate an already difficult academic question. There has been some work in South Africa in which attempts have been made to address the issue of comparability between boards by making use of item bank tests within a subject

subject (Vorster and Oosthuizen, 1986; Vorster, 1988; Hartman, 1993). The South African Certification Council (SAFCERT) has also conducted some experiments using item banks but the reports of these experiments have not been made public. Item bank tests are conducted across boards and within specific subjects. Therefore they are not able to address the question of comparability between subjects directly. It is for this reason that it is this facet of comparability that will be focussed on in these discussions.

1.2 The notion of and rationale for subject comparability

The question of comparing results in different subjects is a contentious one. Goldstein (1986) argues that the point of having different syllabuses is to promote diversity in respect of ability and attainment. Clearly the incorporation of a variety of subjects within the curriculum serves this function as well and for this reason it is understandable that discipline specialists maintain that subjects are inherently different and 'since the aims, content and teaching of subjects differ, it is inappropriate to compare performance in different subjects.' (Nuttall et al., 1974: 68) It is difficult to contest such a claim especially in the case of so-called 'talent' subjects of art, music and drama. In reality however whether subject specialists believe comparison of results in different subjects is appropriate or not, as Forrest and Vickerman (1982) point out, users of examination results assume that some form of general comparability exists between subjects.

In South Africa this is illustrated quite clearly in the criteria for certification at Senior Certificate level. The Senior Certificate examinations which have been offered by different examining authorities in South Africa are group examinations. This means that in order to be awarded a pass in the examination as a whole, candidates are required to offer a minimum of six subjects. At present¹ the two official languages of English and Afrikaans have to be studied, one at first language level and the other at second language level. The option also exists to replace one of these with an African language at the first language level. To gain a certificate candidates must pass one of the official languages at first language level and the other official language at second language level. If a candidate is required to pass one language at first language level, then there is an assumption being made that results in English First Language and Afrikaans First Language, for example, are comparable. The inclusion of African languages at first language level in the certification process increases the complexity of this problem. Similarly it is assumed that results in English Second Language are comparable with results in Afrikaans Second Language.² Furthermore, the requirement that candidates must pass at least three other subjects of their own choice implies comparability between subjects. The awarding of a Senior Certifi-

1. Certainly until the end of 1995 and this will continue until the regulations for the Senior Certificate are changed.

2. There are no second language syllabi available as yet for the nine official African languages and so the complication posed by these languages at first language level is not yet apparent at second language level. However this limitation will be removed as soon as syllabi and teachers are available to enable candidates to offer these languages at second language level.

cate has also depended on the attainment of a minimum aggregate.¹

In the calculation of an aggregate, because the marks are simply added together, a mark of 200 in one subject carries the same weight as a mark of 200 in another subject. Clearly in this practice there is an assumption that a particular mark in one subject represents a level of achievement that is comparable with that same mark in another subject, regardless of the subjects involved or the level at which the subjects are written. In other words, because of the aggregate requirement in certification, it is reasonable to expect that 250 marks in Mathematics Higher Grade represents a similar level of achievement to 250 marks in History Higher Grade. The current system of differentiation in examining coupled with the aggregate requirement raises some interesting issues. Currently in the calculation of the aggregate, 200 marks in Mathematics Higher Grade - a D symbol - carries the same weight as 200 marks in Mathematics Standard Grade - a C symbol - and each of these in turn has the same value as 200 marks in Mathematics Lower Grade. In an effort to make some allowance for comparability between subjects studied at higher grade and at standard grade in the calculation of the aggregate, there is an attempt to quantify the difference by allowing a maximum of 400 marks for higher grade and only 300

1. Recent documents reviewing the secondary phase curriculum suggest that the requirement of attaining a minimum aggregate mark should be dropped and indications are that this will become policy for certification at the Standard 10 level in the near future. There are also recommendations concerning the language policy but the absence of second language syllabi at present for African languages makes definite rulings difficult since they may be impossible to implement.

marks maximum for standard grade.¹ In spite of this there is understandably some debate about whether the demands made on a candidate who achieves a mark of 200 at the standard or lower grade compares with the demands made on a candidate who produces a mark of 200 on the higher grade.

The assumption of comparability between results in different subjects logically indicates as a starting premise the assumption that similar achievement in different subjects reflects a common entity between the subjects being compared. In other words, as Mathews (1985: 146) puts it, subject performance 'depends primarily on one characteristic of the candidates which may be called "general ability".' A logical deduction from this assumption is that since performance in each subject is based on this 'general ability' hence making these performances comparable, it should be possible to construct an instrument whereby it is possible to measure this 'general ability'. In this way comparisons may be made between performances in different subjects. This will be discussed in more detail in Chapter 2.

Forrest and Vickerman (1982) cite the weaknesses and strengths of the particular individuals, their different degrees of motivation in respect of different subjects and the possible lack of uniformity of preparation for all the subjects they offer as factors affecting performance. Hence it may happen that an individual

1. In second language, the maximum for higher, standard and lower grade is 300. Hence there is no allowance in mark allocation for differentiation between the grades. A candidate scoring 200 marks for second language at lower grade is not differentiated from a candidate scoring 200 marks at higher grade in the calculation of the aggregate.

will not necessarily find it as easy to score a particular mark in one subject as in another subject. However, as Nuttall et al. (1974) argue, for a large group of candidates representative of the population, taking two subjects, there is no reason to suppose that their mean scores in both subjects should not be the same. Clearly there is an assumption that compensation is made for a candidate who is able and interested in one, but not the other subject, by another candidate whose abilities and interests are the other way round. Clearly if the group is sufficiently large, a balance is created.

An inspection of the Natal Senior Certificate 1992 examination results reveals that for the 346 candidates taking Afrikaans First Language at the higher grade (AFRM9)¹ and Mathematics at the higher grade (MATH9), the mean score of these candidates in AFRM9 was 66.00% while their mean score in MATH9 was 55.89%, a difference of 10.11%. If one follows the argument given above, the differences can be attributed to a basic lack of comparability between the scoring standards used in the two subjects.

In answer to the claim that such a difference simply reflects the relative demands of the two subjects on the intellectual capability of the candidates - in the current example the claim would be that AFRM9 is inherently easier than MATH9 - Nuttall et al. (1974) argue that this is missing the point of marking or examining in a system where standards ought to be related, subject by subject as the process of certification in South Africa demands.

1. Appendix A contains a full list of the subjects and the subject codes that are used in this thesis.

Nuttall et al. go on to say that these standards in marking and examining ought to be 'related, subject by subject, to the notional attainment of the average 16-year old'. (1974: 12)¹ In other words, what an average 17-year old in South Africa should 'know' or be able to do to achieve a particular score in AFRM9 should be comparable with what an average 17-year old should 'know' or be able to do in order to achieve that same score in MATH9.

Following this argument, the interpretation of a difference in scores as representing the fact that one subject is inherently more difficult than another should rather be that the demands made by the 'difficult' subject exceed what is reasonable for the average 17-year old. One could rephrase the original assumption with regard to subject comparability within the context of the Senior Certificate examinations in South Africa as follows: performance in different subjects depends primarily on a characteristic called 'general ability', defined in terms of the average 17-year old in South Africa. Since the Senior Certificate examination is a group examination and hence comparability between subjects is implied, if raw scores in subjects are not comparable they ought to be adjusted so that they are comparable. In terms of this discussion the criterion for adjustment is 'general ability', defined in terms of the average 17-year old in South Africa.

1. In South Africa, one would be tempted to replace '16-year old' with '17-year old'.

Quite obviously it would not be acceptable to adjust subject results so that all subjects have the same mean score since different subjects attract students of different levels of ability. This is especially true in a group examination where particular combinations of subjects allow candidates to qualify for possible matriculation exemption while other subject combinations do not. In such a system a logical expectation would be that the mean score in each subject reflects the relative level of 'general ability' of candidates taking that subject and that the mean score in the subject itself would be comparable with the mean score of those same candidates in each of the other subjects they offer.

Nuttall et al. (1974) take up one of the points that is raised in opposition to studies that attempt to make comparisons between subjects. Those who oppose comparability studies claim that since the aims, content and teaching of subjects differ, it is inappropriate to compare performance in different subjects and that any apparent differences in standards between subjects that emerge in subject comparability analyses have in fact nothing to say about standards but only something to say about subjects. The authors respond to this with the observation that these arguments would be valid in an examination system which was entirely criterion-referenced. In such a system, a candidate's performance is measured against the absolute standards for a pass in a subject and there is no strict ranking of candidates according to their performance in relation to each other. However, this proviso of criterion-referenced examinations is irrelevant within the South African context where norm-referencing is a

dominant feature of the examination and certification system.

Forrest and Vickerman (1982: 125) quoting Petch (1953: 150) make the observation that '...in any examination which offers the candidates a choice of subjects, indeed in any examination which is not a test in one subject only, the problem of equating demand as between subject and subject must arise.' Furthermore they argue that any change from a group examination, as occurred in Britain with the introduction of the GCE examinations, does not remove the necessity for aiming at subject comparability. Petch (1953: 151) makes the point that 'Even though the GCE examination is a test in separate subjects, an attempt will have to be made to ensure that some subjects do not make considerably more, or less, demand than others.' In view of this one could argue that even in a purely criterion-referenced system in which candidates are measured against criteria within a subject, it would be necessary to ensure that the criteria in one subject are not unduly severe in their demands on candidates in comparison with the criteria of another subject. In essence the norm and criterion-referencing debate is not a debate about standards but about the reference point against which candidates are assessed. Since this does directly affect the nature of the demands that may be made in each subject, comparability of standards between subjects is an issue to which examining authorities should give attention, whether they are operating in a norm or criterion-referenced system.

Anthony (1994) reported that in Britain courses in Physics,

Chemistry, Biology and Mathematics are experiencing a decline in numbers even before A level. One of the reasons suggested in the report was that these subjects are viewed among learners as being 'harder' than other subjects. The report has the following to say about the implications of this:

If pupils believe it is harder to obtain good grades at GCSE or A level in science or mathematics they are likely, with competition for university places in mind, to choose 'easier' subjects, and the decline will go on. (1994: 86)

There is little reason to believe that this perception is different among learners in South Africa. Research conducted by the pre-election¹ Natal Education Department into the position of French and German in the Republic of South Africa indicates that there is a perception that it is more difficult to score high marks in these two subjects than in other subjects (Struckmann et al., 1992: 69). The practice within some schools of selecting candidates at the end of the Std 7 year who may continue with Physical Science and/or Mathematics suggests that intellectual demands in these subjects may be greater than in other subjects. In view of the inadequate attention given to subject comparability in this country it has been very difficult to say whether these perceptions have any foundation or not. What is evident in the pre-election Natal Education Department is a steady decline in the number of candidates offering these subjects at the Standard 10 level.

1. The elections referred to by the term 'pre-election' throughout this study are the 1994 elections in South Africa.

The decline in the number of candidates choosing to do a so-called 'tough' subject is not the only danger. Blackburne (1994) reports that teachers claim that some students, in spite of being good science students, achieve poor grades relative to the other two national core curriculum subjects of English and Mathematics and as a result of the better grades in English they turn from Science thinking themselves 'better' at the arts. It would seem then that the decline in numbers taking a subject is accelerated by information that may be giving a learner an incorrect message about his/her abilities. If this deduction is true then the examining authorities have failed in one of their most fundamental duties, namely to give accurate feedback to candidates about their achievement.

It should be noted that it is not only certification authorities but also other users of the examination results that assume that standards in different subjects are comparable. The 'points system' for university entrance that is used at many universities at present, awards a specific number of points for a particular symbol in a subject, without distinguishing between them. In addition different grades within a subject i.e. higher and standard grade, have point allocations thereby implying that not only is there comparability between higher and standard grade within a subject but also that the difference between the two grades can be quantified¹.

1. Bulletin For Academic Staff, 12(2), University of Durban-Westville, 1991, Pages 27, 46 and 69. It must be acknowledged that in some institutions the points system is not always the only criterion that is used in the selection of students as the limitations of this system have been recognised. The Teach-Test-Teach programme of the University of Natal provides such an alternative.

Forrest and Vickerman (1982: 18) suggest that 'until such time as it is found desirable and possible to report performance in public examinations solely in terms of grade criteria specific to each subject and also that it is established and accepted that there should not necessarily be any stable relationship between subjects', finding effective methods of comparing subjects and attempting to establish what the nature of the relationships between subjects are, will continue to be of interest and significance. One could debate at length whether it is educationally sound to accept that there should not be any stable relationship between subjects. Long (1994) of the Scottish Examination Board states that although they do not expect all subjects to be equally difficult there is an expectation that subjects within the same curricular mode, such as social subjects or the sciences should be closely aligned. They make use of a particular process to address the issue of subject comparability directly. Within the South African system such a relationship is assumed and since assumptions are made about subject comparability, in the interests of equity it is the duty of examining authorities to address the issue of subject comparability whether subject discipline experts deem it appropriate or not.

1.3 The empirical focus of the study and outline of the report

The purpose of this study is to investigate available methods of addressing the issue of subject comparability. A sample of 2295 of the 1992 Natal Senior Certificate entrants was used in the

research. The following data was gathered for each candidate who participated in the exercise:

- o his/her score in a reference test, designed to test scholastic core skills that one would expect of a school-leaver;
- o his/her results in the 1992 Natal Senior Certificate examination.

The possible methods of exploring the problem of subject comparability discussed in this thesis are, firstly, the use of an external reference test as a point of comparison and, secondly, methods that rely on the comparison of the performance of the same candidates in different subjects within the examination as a whole.

In Chapter 1 the problem is identified, contextualised and a rationale for the study is provided. Chapter 2 of the thesis reviews the literature. In Chapter 3 the methodology of the study is described. This incorporates a critical discussion of how the reference test was constructed and administered, taking into consideration possible bias in the test, its validity and its reliability. In Chapter 4 the methods of comparison are explained and the results are reported. Furthermore the results as they relate to the profile of subject groups are discussed. Chapter 5 incorporates discussion on a number of pertinent issues including the relevance of the results within the sample for the full 1992 Natal Senior Certificate population, the relationship between the difficulty ratings of subjects and the academic quality of the candidates taking the subjects and differences in

performance within different gender groups and culture groups. The 1992 Natal Senior Certificate population was primarily white and hence the discussions surrounding cultural differences are restricted essentially to differences between the white English-speaking candidates and white Afrikaans-speaking candidates. Difficulties posed by talent subjects and language policy are raised. In Chapter 6 conclusions are drawn and recommendations are proposed.

Chapter 2

Review of previous research

2.1 Introduction

The question of subject comparability has not been an issue that has enjoyed much attention in South African publications¹. The pre-election Natal Education Department used a system of subject-pairs analyses from the early 1980's as a means of monitoring standards between subjects within the department. However it is a recent development that the potential of this process of comparison is being investigated more widely. SAFCERT has understandably concerned itself with experiments addressing comparability of achievement between examining authorities². Others interested in the question of comparability between examining authorities have argued the value of subject-based multiple-choice item bank tests (Barnard and Vorster, 1992). However these discussions and experiments have been limited to comparability of results in one subject across different boards and from year to year. They do not address the issue of comparability of achievement between subjects directly. SAFCERT however is investigating the issue of subject comparability through subject-pairs analyses and the assumption of symmetry theory (Calitz, 1993).

The issue of comparability between subjects is a matter that has

-
1. Two publications and an internal report for the Natal Education Department by C J Talbot make reference to the issue of subject comparability and more recently Dr F Calitz of SAFCERT has referred to it.
 2. In 1988, 1990 and 1992 subject-based item bank test experiments were carried out across a number of examining boards. The reports of these experiments are not yet publicly available.

been addressed in other countries and a number of studies have been carried out in Britain. In the words of Forrest and Vickerman: 'By far the most comprehensive report on subject comparability is that by Nuttall et al. published in 1974'. (1982: 6) The study of Forrest and Vickerman (1982) also addresses the issue of subject comparability. Kelly (1976) has investigated the issue in Scotland. Furthermore, McGaw and Hannon (1985) make the point that all Australian systems adjust subject marks to reflect the ability of students studying a particular subject in comparison with students in other subjects since selection procedures for tertiary entrance are based on a single measure of achievement across subjects studied in the final years of secondary schooling. As Viviani so clearly states: 'If we need to add results to get an overall measure of student achievement, then we need first to find a way of comparing achievement in different subjects.' (1990 :38) This issue then is one which enjoys a fair amount of attention in Australia. On the whole, statistical procedures are used in an effort to ensure comparability and a number of studies on the process and effectiveness of these procedures have been done (McGaw et al., 1986; MacCann, 1989; McGaw et al., 1990; Viviani, 1990).

2.2 Factors that affect subject comparability

In Chapter 1 it was pointed out that the question of comparing results in different subjects is a contentious one, with some fundamental problem areas. Forrest and Vickerman make the following point:

It is not expected that an individual candidate will be awarded the same grade in every subject he or she takes

since it is recognised that individual candidates have their own strengths and weaknesses, have different degrees of motivation in respect of different subjects and may not have had uniformity of preparation for all the subjects they offer. (1982: 7)

The following table lists a number of subjects offered in the Natal Senior Certificate (NSC) and the number of candidates offering each of the subjects at the higher grade (HG), standard grade (SG), lower grade (LG) and functional grade where relevant, for the years 1992 and 1993.

Table 1: Subject entries (1992 and 1993) for the Natal Senior Certificate (NSC) according to grade

Subject	Year	Grade:				Subject Total	NSC Total	Subj. Total as % of NSC
		HG	SG	LG	Func-tional			
Mathematics	1993	1918	3618	65	726	6327	8003	79
	1992	1999	3702	79	649	6429	8264	78
Physical Science	1993	1840	1900	81	208	4029	8003	50
	1992	1936	1790	85	172	3983	8264	48
Biology	1993	2239	2028	207		4474	8003	56
	1992	2382	2183	201		4766	8264	58
Accounting	1993	1270	1016	52		2338	8003	29
	1992	1275	1020	39		2334	8264	28
History	1993	1363	602	83		2048	8003	26
	1992	1455	582	60		2097	8264	25
Geography	1993	2298	1376	64		3738	8003	47
	1992	2460	1537	67		4064	8264	49
Art	1993	711	330	16		1057	8003	13
	1992	735	360	7		1102	8264	13
Music	1993	39	12			51	8003	0,6
	1992	47	14			61	8264	0,7

Source: Natal Senior Certificate Examination Results: 1992 and 1993

From this table it is apparent that subjects have varying degrees of popularity as indicated by the percentage of the Natal Senior Certificate candidates who offer each of the subjects. Mathematics is substantially more in demand than the other subjects cited. Music is taken by a very small number of candidates and this leads to the speculation that it is offered only by those candidates who are especially interested and talented in the subject. The absence of any lower grade or functional grade in Music would support this.

It is reasonable to assume that a student who chooses Music for example, because she is talented and interested is likely to be highly motivated to do well in Music. However, there is no guarantee that that same student who may have chosen Mathematics because it is a necessary pre-requisite for a particular post-secondary course of study is as highly motivated in Mathematics. Therefore the comparison of the performances in Music and Mathematics of candidates doing both Music and Mathematics cannot discount the effect of the motivation of students in the two subjects. Motivation and hence performance is affected by issues such as the status of the subject within the curriculum, the availability and competence of teachers, the talent or aptitude that a learner displays within the subject and finally the utilitarian value of the subject. A serious problem then in subject comparability studies is the effect of motivation and related issues on the performance of children. This, it would appear, is difficult to measure.

A further complicating factor is a possible lack of uniformity in preparation for all subjects offered. It is likely that the experience and ability of teachers and the resources available at schools may differ from subject to subject. The response from Nuttall et al. (1974) to the problems posed by lack of uniformity in motivation and preparation of candidates within different subjects is that for a sufficiently large number of candidates representative of the population, there is no reason why their mean grades should not be the same. When comparing the performance of a group of candidates who offer two subjects, the assumption is made that the candidates who are ill-prepared or not motivated in the one subject will be balanced by candidates who are ill-prepared or not motivated in the other subject. In subjects which enjoy a similar status within the curriculum e.g. Accounting (28-29% of the NSC population) and History (25-26% of the NSC population), this is possibly quite likely. However in the so-called 'talent' subjects such as Music and Art the argument is less convincing.

The following table lists four subjects offered in the Natal Senior Certificate in 1993 and the number of candidates according to gender, offering each subject at the respective grades. These four subjects were selected on the grounds that they traditionally most clearly reflect particular gender biases.

Table 2: Subject entries (1993) for the Natal Senior Certificate (NSC) according to grade and gender

Subject	Gender	Grades:			Func- tional	Total	As % of subj. total
		HG	SG	LG			
Mathematics	Girls	817	1523	6	131	2477	39
	Boys	1101	2095	59	595	3850	61
Physical Science	Girls	587	408	4	9	1008	25
	Boys	1253	1492	77	199	3021	75
Biology	Girls	1518	1381	135		3034	68
	Boys	721	647	72		1440	32
Accounting	Girls	660	637	35		1332	57
	Boys	610	379	17		1006	43

Source: Natal Senior Certificate Examination Results: 1993

From this table it is apparent that boys are more inclined to offer certain subjects while girls tend to offer other subjects. Historically Woodwork and other workshop subjects have been offered almost exclusively by boys and Typing and Home Economics have been offered almost exclusively by girls. The reasons for this can be found in the traditional roles that men and women have played in society.

The following table lists the number of candidates in five randomly selected single-sex girls' schools who offered Biology and Physical Science and the number of candidates in five randomly selected single-sex boys' schools who offered Biology and Physical Science in the 1993 Natal Senior Certificate.

Table 3: Subject entries in five single-sex boys schools and five single-sex girls schools in Biology and Physical Science in the 1993 Natal Senior Certificate (NSC)

School	Total number of candidates	Total Biology	Biology as % of total	Total Science	Science as % of total	
Girls	A	155	155	100	27	17,4
	B	125	118	94,4	20	16
	C	95	77	81	20	21
	D	179	161	89,9	49	27,4
	E	170	151	88,8	40	23,5
Boys	A	202	47	23,2	202	100
	B	202	77	38,1	153	75,7
	C	163	27	16,6	162	99,4
	D	214	103	48,1	144	67,3
	E	181	66	36,5	138	76,2

Source: Natal Senior Certificate Examination Results: 1993

Physical Science is often seen as a subject that boys should take while Biology is seen as the subject for girls. From informal discussion with the subject advisor for Physical Science at the pre-election Natal Education Department, Mr R R Commaille, it emerged that there is a general perception at school level that Physical Science is too difficult for girls and that they should rather be encouraged to do the 'easier option' of Biology. Furthermore the perception exists that girls do not need Physical Science as it is a pre-requisite for apprenticeships and careers such as engineering which are not career paths that girls are likely to pursue. A similar perception exists about Mathematics.

What is apparent from Table 3 is that the trend at single-sex girls' schools is for the enrolment for Biology to be substantially higher than Physical Science and vice versa at boys' schools. The issue of subject comparability then is further complicated if the higher enrolment of girls in certain subjects e.g. Biology, is seen to be as a result of those subjects being perceived as 'easier options' than subjects favoured by boys.

The following table lists the number of candidates according to gender in five randomly selected co-educational schools who offered Biology and Physical Science in the 1993 Natal Senior Certificate.

Table 4: Subject entries according to gender in five co-educational schools in Biology and Physical Science in the 1993 Natal Senior Certificate (NSC)

School	Total number of candidates	Total Biology	Biology as % of total	Total Science	Science as % of total
Coed. A	88	37	42	29	33
Girls	36	22	61,1	5	13,9
Boys	52	15	28,8	24	46,1
Coed. B	185	121	65,4	88	47,6
Girls	107	87	81,3	33	30,8
Boys	78	34	43,6	55	70,5
Coed. C	148	85	57,4	89	60,1
Girls	77	65	84,4	24	31,1
Boys	71	20	28,2	65	91,5
Coed. D	162	85	52,5	85	52,5
Girls	83	58	69,9	34	41
Boys	79	27	34,2	51	64,6
Coed. E	121	75	62	61	50,4
Girls	62	51	82,2	19	30,6
Boys	59	24	40,7	42	71,2

Source: Natal Senior Certificate Examination Results: 1993

The same distinction between girls and boys offering Physical Science and Biology that is evident in single-sex schools is also evident in co-educational schools. What is interesting to note is that although Biology is still a preference for girls, the percentages of girls in co-educational schools who offer Biology tends to be lower than the percentages of girls in single-sex schools who offer Biology, while the percentages of girls in co-educational schools who offer Physical Science tends to be higher than the percentages of girls in single-sex schools who offer Physical Science. A similar trend is apparent among the boys. Although Physical Science is still a preference for boys, the percentages of boys in co-educational schools who offer Physical Science tends to be lower than the percentages of boys in single-sex schools who offer Physical Science, while the percentages of boys in co-educational schools who offer Biology tends to be higher than the percentages of boys in single-sex schools who offer Biology. It would seem that the type of school i.e. single-sex or co-educational, has some impact on subject choices.

The conclusion that can be drawn from the discussion so far is that the issue of subject comparability is affected quite seriously by factors which determine the nature of the population offering certain subjects, factors affecting the motivation of individuals as well as groups.

2.3 Approaches to subject comparability

In the literature it would seem that there are essentially two approaches which have been followed in the comparison of results in different subjects.

The one approach is based on the assumption that similar achievement in different subjects reflects something that is comparable between the subjects namely 'general ability' and that this 'general ability' can be measured (Nuttall et al., 1974; Nuttall, 1971). This is the basis for the use of an external reference test of general scholastic ability as a point of comparison for achievement in different subjects. In this approach it is assumed that if the 'general ability' measurement of a group of candidates offering one subject is comparable with the 'general ability' measurement of a group of candidates offering another subject, the mean scores in each subject should be the same. The definition and nature of intelligence have direct relevance for this approach and in themselves are not unproblematic.

Some theorists (e.g. Spearman and Vernon) proposed a general theory of intelligence, while others (e.g. Thorndike and Thurstone) viewed intelligence as being composed of many independent faculties. Many now accept the theory that general intelligence co-exists with separate independent abilities (Sattler, 1982: 46).

In Chapter 1 it was noted that Goldstein (1986) argues that the point of having different syllabuses is to promote diversity in respect of ability and attainment. If the main purpose of introducing a wider variety of subject choice into the curriculum is to accommodate different aptitudes and abilities that children

have, then it seems inappropriate to compare performance in these different subjects on the basis of a single dimension, namely 'general ability'.

Porter (1990), talking about tertiary entrance schemes in Australia, argues that these schemes are discretionary and that tertiary entrance scores are based on discretionary professional judgements of teachers and examiners. What is necessary then when adopting a particular scheme, is for those who administer it to confess to being discretionary and then make their criteria for judgement explicit. Pursuing this line of thinking, one could claim that a discretionary judgement of the professionals who oversee an external examining system is that gaining some idea of a candidate's 'general ability' is an important feature which the examination aims to address. If this is the case, then this approach to subject comparability is justified. One is comparing performance in different subjects on the basis of what they reveal about the development of 'general ability' as defined by the reference test.

The second approach to comparability between subjects advocates comparison between subjects based on the overall results of the candidates within the examination (Nuttall et al., 1974; Forrest and Vickerman, 1982). This approach has as its underlying assumption the notion that performance in a subject, in addition to giving an indication of competence within a subject, also reflects 'general ability'. This approach then also bases comparison between subjects on the concept of 'general ability' but does not advocate measuring it directly. Instead it advocates

the use of internal evidence within the examination system as a basis for comparison. In this approach it is assumed that if a large group of candidates representative of the population take two subjects, their mean scores in both subjects should be the same. Forrest and Vickerman (1982) point to this as the basic argument for the use of subject-pairs analyses and other variations of the same principle.

In studies in which comparisons are made across examining boards, cross-moderation is a technique that has been used (Johnson and Cohen, 1983; Bloomfield, Dobby and Duckworth, 1977). However, as Mathews (1985) points out, although cross-moderation may be an acceptable method for comparing subject achievement between different examining boards, across different syllabuses and from year to year within a board, it is a technique that is logically limited to use within a subject. Unless a moderator is a subject expert in two subjects, effective cross moderation between subjects is impossible. Even if a moderator is an expert in both subjects, there are those who will argue that effective cross moderation is still not possible because of the inevitable differences in the nature of the subjects.

2.4 Detailed descriptions of approaches to subject comparability

Studies that have used both approaches include Nuttall et al. (1974), and Forrest and Smith (1972). Studies that have used only the external reference test approach include Forrest (1971) and Viviani (1990), in which the system in Queensland, Australia

is described, while the work of Forrest and Vickerman (1982), Kelly (1976) and Calitz (1993) has taken the second approach.

2.4.1 Using an external reference test

One of the problems of using an external reference test in studying subject comparability is identified by Forrest (1971). He acknowledges that the content and construction of the test might be such that candidates taking Mathematics, for example, may do better simply because of their studies than candidates who do not study Mathematics. Bias in the test may be a possible cause of differences between subjects, rather than as a result of differences between standards in different subjects.

The external reference test used in the study done by Nuttall et al. (1974) was the Test 100. It consisted of 80 multiple-choice questions, mostly of the five-choice type. Half the items were designed to measure verbal ability and the other half quantitative ability. As a result of an investigation into possible bias in Test 100, Nuttall et al. came to the following conclusion:

... the estimates based on the use of each test agree so well that test bias can be ruled out as a factor complicating the interpretation of results of investigations into subject comparability (Forrest and Smith (1972) reached the same conclusion). However, the slight differences that exist in the estimates of severity are generally in the direction expected on the hypothesis that Test 100 favours those studying mathematics or science subjects. (1974: 24)

The Australian Scholastic Aptitude Test, which is compiled by the Australian Council for Educational Research, is used by a number of states in Australia, e.g. Western Australia, Australian Capi-

tal Territories and until recently Queensland; in scaling subject results in order to calculate the single Tertiary Entrance (TE) score. It is the basis of comparisons between results in different subjects. It is a non-syllabus-based test which

draws on material from the humanities, social sciences, sciences and mathematics. It aims at the fundamental skills of these broad curriculum areas but does not examine the particular content of a curriculum or subject area. ASAT is carefully constructed so as neither to advantage nor to disadvantage particular groups of students and is intended to compare groups of students in terms of their abilities to reason, comprehend, interpret and make judgements from the variety of material used. ASAT, despite its name, is not an aptitude test, nor is it an intelligence test. (Tanner, 1990: 90)

It consists of a number of multiple-choice items, grouped in units, based on stimulus material presented in any of a variety of forms. Any specific information required to answer the questions is contained in this stimulus material.

The Queensland Core Skills Test was introduced into Queensland as a result of the Viviani Report in 1990. It is based on the ASAT premise of a non-syllabus-based test but has been expanded to include modes of assessment other than multiple-choice. Hence there has been the introduction of a writing task and a short-response item test. In this test candidates may be requested to give a very short one-word answer or to write a short paragraph. The rest of the test consists of multiple-choice questions as in the ASAT. The Board of Senior Secondary School Studies prepares the test and they make every effort to ensure the test 'is as fair as possible to everyone who sits for it.' (Board of Senior Secondary School Studies Student Information Bulletin, 1994: 2)

2.4.2 Using internal evidence

Subject-pairs analysis is a method for comparison between subjects that is widely used in Britain and in a number of subject comparability studies among which are Nuttall et al. (1974) and Forrest and Vickerman (1982). It rests on the premise that if a large group of candidates representative of the population take two subjects, their mean scores in both subjects should be the same. In other words, if the mean score of candidates taking the subject chosen for analysis is calculated together with the mean score of these same candidates in each of the other subjects that they have taken, these pairs of mean scores should be more or less the same. If not, then one of the subjects in the pair is said to be easier (or more difficult) than the other. The use of the terms 'easier' and 'more difficult' have a specific meaning in this context. By 'easier' the suggestion is that it is easier to score marks. By 'more difficult' the suggestion is that it is more difficult to score marks. Nuttall et al. (1974) use the terms 'lenient' and 'severe' rather than 'easier' and 'more difficult'. They make the point that differences may be due to factors other than differences in standards applied by the examiners in different subjects. Because the reasons for the differences are not immediately obvious, the terms are a 'convenient shorthand' used to indicate the direction of the differences from the consensus standard.

An example will serve to illustrate the point. If Biology Higher Grade (BIOL9) is the subject being analysed, the mean scores in

Biology Higher Grade and Physical Science Higher Grade (PHSC9) of those candidates taking both Biology and Physical Science Higher Grade are calculated and compared. If, for example, BIOL9 has a mean score of 65% while these same candidates scored a mean of 59% in PHSC9, in comparison with PHSC9, it could be said that mark awarding in BIOL9 is lenient. Alternatively, in comparison with BIOL9, mark awarding in PHSC9 is severe. This process is done for all subjects that Biology Higher Grade candidates take. A comparison of the differences in mean scores between Biology and the other subjects may reveal a trend. If the mean score in Biology is consistently lower than the mean score of the Biology candidates in their other subjects then one may conclude that mark awarding in Biology is more severe than mark awarding in other subjects.

Another method of comparing standards between different subjects used by Nuttall et al. is the Unbiased Mean Total (UBMT). The UBMT is defined as follows: 'the mean grade in all **other** subjects attempted' (Nuttall et al. 1974: 32). Since the Senior Certificate examination is a group examination, candidates are obliged to offer a minimum of six subjects. If for example MATH9 is the subject under consideration, the UBMT for MATH9 is simply the sum of the scores in all the other subjects the MATH9 candidates have offered in the examination, divided by the total number of other subjects offered by the candidates. Subject comparisons are made by comparing the subject mean score and the mean UBMT score of the subject under consideration.

Nuttall et al. (1974) also made use of the analysis of variance (ANOVA) statistical technique to address the issue of subject comparability. Subject comparability involves dealing with a number of variables at one time i.e. possible variations of severity in the grading of different subjects, difference in ability between candidates, the variation in calibre of candidates from subject to subject. The objective of ANOVA is to locate important independent variables and to determine how they interact. Nuttall et al. came to the following conclusion in respect of the ANOVA method:

It is undoubtedly the ANOVA method which is the most versatile and the most likely to yield sensible results with small samples and low numbers of subjects attempted. The ANOVA method, however, needs relatively sophisticated computing techniques in order to work at all. (Nuttall et al., 1974: 50)

They compared the results obtained using a subject-pairs analysis, the UBMT and ANOVA and their conclusion was as follows:

.. the three methods employing no external reference instrument demonstrate a high degree of consistency in the results they provide. ... the choice of method will consequently depend upon the size of the samples used and the computing facilities available rather than on theoretical grounds. (Nuttall et al., 1974: 91)

Nuttall et al. in their conclusion about the efficiency of methods stated the following:

... the three methods employing no external reference instrument ... are to be preferred to a method employing an external reference instrument, both on theoretical grounds and on the grounds of economy. (1974: 91)

The ANOVA method has not been adopted in the present study.

Kelly provides a reason as follows:

The ANOVA method is considerably more complex, both theoretically and computationally, than the others. However, the gains from this complexity are small (since the results are closely similar to those obtained from simpler methods), probably insufficient to justify a preference for the ANOVA method. (Kelly, 1976: 43)

She also points out that where the internal evidence of an examination is used to establish a point of comparison or consensus standard measurement, that point of comparison will be affected by the degree of leniency or severity of the grading in the subjects used in its construction. In particular, there is a tendency for candidates in certain subjects also to offer other specific subjects. For example in 1993, of the 1839 candidates who offered PHSC9, 1473 also offered MATH9, while of the 2239 candidates offering BIOL9 only 893 offered MATH9 (Natal Senior Certificate Examination Results: 1993). Hence in the establishment of a point of comparison e.g. the UBMT described above, in the calculations for PHSC9 candidates, MATH9 would be taken into account 1473 times while in BIOL9 it would only be included 893 times. If it happened that MATH9 were a subject in which the awarding of marks is somewhat severe in comparison with other subjects, then this will affect the calculation of the point of comparison in PHSC9 more dramatically than it will affect the calculation in BIOL9.

In order to overcome this problem she advocates the use of an iterative method whereby the effect of clusters of subjects being taken together can be compensated for. The method is described as follows:

Having calculated the difference between each subject and the consensus, these differences are added to each subject grade to bring it into line with the consensus. The procedure is then repeated using the adjusted grades, and, the consensus now being slightly altered, a new correction is calculated. This repetition continues until all discrepancies between subjects and the consensus are less than a specified size. (Kelly, 1976: 14)

This process is used by the Scottish Examination Board (Long, 1994) and a similar iterative procedure is used in Victoria and New South Wales (Kelly, 1976) in Australia.

A method to monitor standards between subjects that is not mentioned in the British studies is the assumption of symmetry, a theory explained by Calitz (1993). It rests on the premise that individuals have specific abilities which are reflected in their performance in different subjects. There is general agreement that an individual offering two subjects, is not likely to score the same mark in one subject as in the other subject. According to this theory, if similar marks in different subjects represent similar standards, then for a large number of candidates who offer two particular subjects, about half the candidates should perform better in the one subject and about half should perform better in the other subject. Therefore in the comparison of results of candidates taking two different subjects, if significantly less than 50% of the candidates taking both subjects, have one of the subjects as their highest score, it can be concluded that standards in this subject are more severe than in the other subject.

2.5 The impact of the standard deviation

The British studies concern themselves primarily with discussion of the mean scores when comparing standards between subjects. There is an assumption within the British studies, and their data verifies it, 'that the shapes of the distributions of grades is the same in each subject' (Nuttall et al., 1974: 90). Forrest and Vickerman (1982) make a similar claim. However, a perusal of the examination results from examining boards in South Africa indicates that there are differences in the standard deviations of subjects and therefore a study of subject comparability will need to take this aspect into account.

An inspection of subject statistics in different examining boards in South Africa indicates that some subjects, e.g. First and Second Language, consistently have a spread that is markedly narrower than the spread in other subjects (Natal Senior Certificate Examination Results: 1990 to 1993). Similarly the spread in other subjects, e.g. Physical Science and Mathematics, is considerably wider than the spread in other subjects (Natal Senior Certificate Examination Results: 1990 to 1993). Clearly it is easier to score a very high mark in a subject that has a wide standard deviation and not so easy to score a very high mark in a subject with a narrower standard deviation. By the same token it is easier to gain a pass in a subject with a narrow standard deviation than in a subject with a wider standard deviation. To illustrate this, if a subject has a large enough number of candidates for results to form a normal distribution and the mean score in that subject is 58% and the standard deviation is 11,

there would be approximately 2.3% distinctions i.e. marks of 80% and above and 5.1% failures i.e. below 40%. However if the mean score was 58% but the standard deviation was 15 there would be 7.1% distinctions and 11.5% failures.

This phenomenon has very serious consequences for subject comparability. In order to appreciate the consequences it is necessary to examine possible causes of this phenomenon. Subjects may be viewed as being intrinsically different and the different spreads are an indication of this. On the other hand it may be that examiners in different subjects assess in such a way that the resulting standard deviations of marks are different, e.g. the demands of Mathematics are not sufficiently challenging for top achievers and the demands on top achievers in English are too severe while at the same time, the demands of Mathematics on weaker candidates are too severe in comparison with the demands of English on weaker candidates. In other words, the different spreads are a result of different standards in examining and marking from subject to subject.

Calitz (1993: 2) comments on different spreads in language and subjects like Mathematics as follows: 'educationists are adamant that it should be like this.' Such an observation implies that the different spreads are the result of intrinsic differences in the subjects. If one acknowledges that subjects are intrinsically different and hence there is justification for a difference in the spread of marks from one subject to another, any mechanism of forcing the spreads to be the same should logically, and very

likely would, be resisted by subject experts... It is illogical to employ subject experts to conduct an examination in which they will apply criteria of their subject to determine critical cut-off points and then ignore their judgements when deciding on the critical levels of pass and distinction, by applying statistical manipulations to suit some other need. By forcing the standard deviation for English to be wider, using some artificial means that has no link to the actual subject matter and in this way creating more distinctions and more failures than the examiners deem correct, one is simply asking examiners to rank candidates without giving any indication of what a pass or a distinction in English actually means in terms of competence within the subject field. By the same token if the spread in Mathematics were narrowed, there would be fewer distinctions and fewer failures, in defiance of the opinion of examiners. It is not difficult to see the tension between accepting on the one hand that subjects are intrinsically different and on the other hand, forcing subjects that are intrinsically different to produce comparable results through statistical manipulation. Furthermore, it is not difficult to understand teachers' and examiners' frustration when pass rates and distinction rates are determined by factors external to the subject.

If there is agreement that subjects are intrinsically different and that some subjects provide opportunity for scoring higher or lower marks than other subjects, then the influence of features of the system that assume strict comparability must be diminished. Conceding that subjects are intrinsically different and at the same time forcing comparability in terms of the mean and

standard deviation of marks is contradictory.

The second view, favoured by Nuttall et al., and discussed in some detail earlier, claims that standards in marking and examining ought to be related, subject by subject, to the notional attainment of the average 16-year old. This implies that if standards in examining and marking were the same, English should produce a comparable spread to Mathematics. There is consensus that this is the case in Britain. Clearly, if the spreads are not the same and it is agreed that they should be the same, adjustments ought to be made in order that standard deviations become comparable. Such an adjustment requires a point of comparison against which the standard deviation in each subject can be judged. In the Queensland system, where a form of aggregation of results also takes place and hence there is demand that there be comparability between subject results, the standard deviation of a subject group within a school is determined by the performance of those candidates in the Queensland Core Skills Test.

2.6 Reflections on the literature

An important aspect of issues surrounding subject comparability including a difference in spread is that if variations are attributed to differences in examining and marking standards, it is essential for examiners to be included in the process of standardisation in order that they may see the relevance of the adjustments and alter their assessment practices accordingly. This procedure is widespread in Britain where examiners are present at

the final meeting at which grade boundaries are determined. Examiner's reports of the current examination, detailed statistical data of the current examination and the examination of the previous year as well as summary data of examinations in earlier years are available at the meeting. The historical statistical data includes subject-pairs analyses and inter-board comparability information. Also available are comments from other interested parties e.g. the subject committee. There is widespread discussion of salient features and if any adjustments are recommended by the Chief Examination Officer, the reasons for the adjustments are discussed and debated. If necessary scripts of candidates at critical points are reviewed. Hence the process of establishing grade boundaries is neither norm-referenced nor criterion-referenced. One could argue that the apparent comparability of standard deviations from one subject to another in British examining boards can be attributed to the examiners' heightened awareness of the wider issues of comparability since it is quite likely that a keener awareness of the issues must feed back into the assessment process. It is worth noting that even though examinations in Britain are not group examinations and there is no aggregate requirement thus making subject comparability a less crucial problem than it is in the South African certification system, the issue is nevertheless given a lot of attention.¹

It could be that differences in performance between subjects

1. A description of the procedures at the Examiners' Final Meeting is given by Forrest and Vickerman (1982) pgs 24 -27.

result from syllabi which make different demands and these different demands are reflected in the examining of the respective subjects. In other words, the demands of one higher grade subject as set out in the syllabus, on the learners of that subject are not of the same level of difficulty as the demands set out in the syllabus of another higher grade subject. Clearly, if this is the case, the subject committees and others involved in the drawing up of syllabi should be informed and be made aware of the broader issues of the assessment system, in the same way as examiners.

The final observation in this regard is that if there are apparent differences between subjects, examining authorities ought to decide whether this is a result of subjects being intrinsically different or whether it is attributable to standards in examining and marking. If the former applies, then any features of the system that imply quantifiable comparability ought to be scrapped. If the latter applies, examiners and syllabus makers should be included in the standardising process more fully in order that they become more aware of assessment standards across subjects. Furthermore empirical methods should be devised whereby comparability with respect to means and standard deviations in the standardising process can be claimed and justified.

Chapter 3

The Methodology of the study

3.1 Introduction

This particular study is aimed at investigating the following hypotheses:

- o The current system of standardisation, controlled by SAFCERT i.e. the determination of subject norms using the 5-year history of an examining body's performance within that subject, does not ensure that valid comparisons can be made between results in different subjects in the same year within an examining board.
- o A Core Skills Test enables comparison of difficulty between subjects and between different grades within a subject in an examining board in the same year.

The methodology in the present study is based on that used by Nuttall et al. (1974). In that study, data for comparison consisted of the results of candidates who wrote the scholastic Aptitude Test 100 in 1968 and their results in the O-level or CSE examinations of that same year. Five methods of comparison were employed. Two methods concentrated on the use of the external test as a point of comparison and the other three methods relied on a comparison of the performance of the same candidates in different subjects. One of these methods, the analysis of variance (ANOVA) has not been used in the present study for reasons already stated in Chapter 2, page 32. The other two, the sub-

ject pairs analysis and the Unbiased Mean Total, as well as the two methods using the external reference test as a point of comparison, the regression method and the guideline method, are investigated in the present study.

The use of the aggregate as a point of comparison is investigated in the present study as well as the approach outlined by Calitz (1993) using the axiom of symmetry. A profile of each subject group in the analysis was also constructed in order to compare the candidates. Kelly's use of iteration was not investigated primarily because of the limitations of the computer facilities available to the researcher.

3.2 The Sample

A sample of 2318 candidates was drawn from the 8264 Natal Senior Certificate examination entrants in 1992, i.e. 28%. For this reason, the sample consisted primarily of white children of approximately 17 years of age, who attended schools administered by the pre-election Natal Education Department and whose home languages, on the whole, were either English or Afrikaans. The candidates in the sample attended 20 schools under the control of the pre-election Natal Education Department. These schools were randomly selected with stratification according to three variables, namely size, location and language medium of the school. The urban, English schools were further stratified into single-sex boys and girls and co-educational schools.

Two sets of data per candidate in the sample were gathered.

These were:

- o His/her score in the Core Skills Test (CST);
- o His/her results in the 1992 Natal Senior Certificate (NSC) examination.

The results of 26 candidates who wrote the Core Skills Test were not used in the final analysis either because they could not be matched with their Natal Senior Certificate results or because the researcher felt that their CST scores were invalid¹. The composition of the final sample of 2292 candidates is set out in Table 5.

Table 5: The composition of the final sample

	English	Afrikaans	Totals
Boys	750	277	1027
Girls	951	314	1265
Totals	1697	591	2292

The composition of the full 1992 Natal Senior Certificate population is set out in Table 6.

Table 6: The composition of the 1992 Natal Senior Certificate (NSC) population

	English	Afrikaans	Totals
Boys	3216	1001	4217
Girls	3046	1001	4047
Totals	6262	2002	8264

1. See page 47.

Sampling was done by selecting schools rather than by selecting an exact number of individual candidates that met the stratification requirements. As a result of certain schools not participating or only allowing a portion of their candidates to participate, girls made up 55% of the final sample while the boys made up the remaining 45%. Of the candidates who actually wrote the 1992 Natal Senior Certificate 51% of the sample was male and 49% was female. Using a chi-square test for significance, it was found that the shortage of boys in the sample was significant at the 1% level of significance. There was a slightly greater number of Afrikaans speakers in the sample relative to the full 1992 Natal Senior Certificate population. This was also tested using a chi-square test for significance but the difference was not significant. Hence it can be said that the sample was not exactly representative of the full population in respect of gender but was representative in terms of language i.e. English and Afrikaans.

A major drawback of the present study is that it was conducted within the pre-election Natal Education Department in 1992. Since this department catered primarily for the white population within the province of Natal, the sample is not representative of the greater South African context. For this reason it is not possible to come to any conclusions that are of general applicability within the South African context as a whole. Furthermore discussion about cultural differences as reflected by the different language groups in Chapter 5 is limited to the two language groups represented in the sample, namely English and Afrikaans.

3.3 The construction of the Core Skills Test (CST)

In the construction of any test the first consideration should be the definition of objectives and the identification of the performances to be measured. A meeting of the subject specialists of the pre-election Natal Education Department was called and the intention of the experiment was discussed. The nature of the Australian Scholastic Aptitude Test and the Core Skills Test in Queensland, Australia was presented and discussed, and written documentation was supplied. It was felt by the researcher that the subject specialists were better placed to extract from their subject disciplines those general skills which their subject areas focussed on and aimed at developing in the programme of study. They were asked to compile a number of questions which, although based within particular disciplines, required general thinking skills for their solution and not specific subject content knowledge. The general description of the test was that it should be a test of general developed ability. The list of documents given to the subject specialists and a full copy of the document in which their part in the experiment was described more fully is included in Appendix B.

The inclusion of the subject specialists seems to have been a positive process in that the questions that were produced were varied, covering a variety of disciplines. They appeared enthusiastic and supplied a substantial number of items. Furthermore, it was better to have had the meeting and discussion rather than simply supplying the written documentation. At the discussion a number of issues surrounding the purpose of the experiment

and the nature of the test were clarified and it would have been impossible to convey this informal exchange in a written document.

From the items that were submitted by the subject specialists, questions that did not require specific subject knowledge were selected, modified and edited by members of the Research and Development Unit, translated into Afrikaans and four pilot tests were constructed. Each pilot test was administered in at least two schools in May and June of 1992 in order to determine difficulty ratings of items and the effectiveness of distractors.

After the initial testing of the items, the final test was constructed. The results of the pre-testing indicated that a number of items needed modification. However only two of these were selected for the final test. These should have been re-tested before inclusion in the final test but because of time constraints this was not done.

Items were categorised by members of the Research and Development Unit into one of three categories. As a result, the final test of 53 items was structured as follows: Section A containing 13 questions, was entitled 'Communication' and included questions of comprehension of written text; Section B containing 20 questions, was entitled 'Data Analysis' and consisted of questions that were concerned with the analysis of information presented in tables, graphs, maps, and cartoons; Section C containing 20 questions, was entitled 'Logic and Calculation' and consisted of questions concerned with logical thinking and numerical ability as well as

spatial perception. Sections B and C were translated from English into Afrikaans but Section A consisted of different questions for each of the two languages. Using the results of the pilot tests, questions with comparable levels of difficulty were chosen for the two communication sections. The final test was available in English and Afrikaans and a copy of the final test in each language is included in Appendix C. The final test was administered to the sample of Natal Senior Certificate entrants during the third term of 1992.

Translation of items poses the problem that the items may no longer measure the same skill when expressed in the other language because of its own vocabulary connotations, idiom and constructions. This problem is one faced by those who construct cross-national tests and a variety of mechanisms to address the problem are employed (Spearritt, 1990). In this study the translation of items was done by Mr J van der Venter who is the language editor for the Natal Senior Certificate examination. Part of his job entails qualitatively assessing the comparability of the English and Afrikaans versions of the examination papers. Furthermore the difficulty ratings of items as gathered in the pilot testing programme were compared across the two language groups and items where difficulty ratings differed substantially were avoided in the construction of the final test.

Principals of schools which had been selected for the experiment were approached by letter requesting their participation. Two schools gave reasons for not participating and they were replaced

in the sample. Each school was visited by two members of the Research and Development Unit who explained to the principal the intention of the experiment. One school allowed only a portion of its Std 10 class to write the test. This, to some extent, was the cause of the uneven gender split in the sample. Unfortunately the limited participation of this school was only brought to the attention of the researcher when the results were processed. As a result there was no time to supplement the sample with learners from another school.

A problem with the conducting of any experimental examination or test is the possibility that participants do not take the exercise seriously. The general impression from those members of the Research and Development Unit who visited the schools was that the principals were positive about the project and undertook to explain to their candidates the purpose of the experiment and to try and impress upon them the necessity to take it seriously. Furthermore, it was felt by the Research and Development Unit that the nature of the test questions was sufficiently interesting that most candidates would enjoy writing the test and see it as challenging and fun. Feedback from the invigilators in at least two schools was that the candidates appeared to enjoy writing the test and that they appeared to have taken the exercise seriously. From the scripts it would seem that most candidates did in fact give serious attention to the test. In only three cases was it clear beyond any reasonable doubt that candidates did not take the test seriously but had simply placed crosses on their answer sheets in specific patterns that were clearly discernible to the data capture typist. Their results

were ignored in the processing. In one school the test was administered on the day that school closed for the third term holidays. It is questionable how motivated candidates would have been to write a test on that day.

All questions were in the multiple-choice format with four options. Although there are sound educational reasons for rejecting the use of a multiple-choice format alone as the technique in assessing learners, this decision was taken because such a format would facilitate in the marking and processing of results which could be done simultaneously using a computer. The constraints on the Research and Development Unit in terms of personnel made this decision necessary.

Some limitations of a multiple-choice format are succinctly summarised as follows:

... while multiple-choice tests offer the benefits of efficiency, test reliability, and potential feedback to teachers, they are subject to a number of serious limitations. These include unduly arbitrary use of standardised marking schemes and cut-off scores attributable to the ready availability of computers, an assumption of a unitary achievement trait, psychometric procedures that reduce the content validity of a test and the neglect of important educational skills not amenable to multiple-choice test assessments. Since decisions about students are likely to be more valid and fair when based on multiple sources of information, insofar as it is feasible, candidates should be required to demonstrate their knowledge and skills in a variety of contexts. (Kellaghan and Greaney, 1992: 45)

Furthermore the recommendations in the report by Viviani (1990) to the Queensland education authorities include the replacement of the Australian Scholastic Aptitude Test, a purely multiple-choice test, with the Core Skills Test which incorporates a

short answer paper as well as a writing task in addition to two multiple-choice papers. This seems to indicate an unwillingness to accept that the multiple-choice format alone is sufficient in the assessment of general scholastic skills.

3.4 The Study

The present study has employed methods used by other studies of this nature and included variations on those methods. The methods employed in the comparisons have been presented as simply as possible and technical details of a more complex nature have been referenced. Unless specifically indicated otherwise, all mean scores and standard deviation references are expressed as percentages. Additional Mathematics is considered an additional subject which cannot be included as one of the six subjects in the package that candidates must offer. As such, it has no effect on the certification process and therefore has been excluded in all calculations. It has been included in the profile of subject groups when considering the number of subjects for which candidates have entered in the Natal Senior Certificate examination.

Points of comparison which provide the standard against which individual subjects are measured, have been provided by the results of candidates within the sample in the Core Skills Test, as an external reference test, and internal evidence from the Natal Senior Certificate examination itself. Cross moderation between grades within a subject is an acceptable point of com-

parison and was contemplated. It was rejected in that it would require reports from subject specialists whose moderating role in the marking of the Senior Certificate would make it difficult for them to give attention to such an exercise at that time of the year. Earlier discussion¹ suggested that cross moderation between different subjects is not feasible; hence the process has not been used in this study.

3.5 Operating characteristics of the Core Skills Test

Information about the 2318 candidates and their performance in the Core Skills Test is set out in Table 7.

Table 7: Operating characteristics of the Core Skills Test (CST)

Sample:	Boys	1041
	Girls	1277
	Total	2318
Test Statistics:		
Total number of items:		53
Mean:		29
Standard Deviation:		8
Reliability (Kuder-Richardson Formula 20)		0,834386
Standard Error of measurement		0,166
% of sample completing all items		72,2%
Number of items attempted by 90%+ of sample		53

According to Mulder (1982) the reliability coefficient of the majority of standardised tests is greater than 0,9 and no test worth using should have a reliability coefficient lower than 0,8. The reliability co-efficient of the Core Skills Test is then at a satisfactorily high level for the test results to be usable. The

1. Chapter 2, Page 26

mean is sufficiently close to the mid-point of the range of possible scores and the standard deviation is sufficiently high to produce an acceptable spread of scores. Since 72,2% of the sample answered all items and all fifty-three items were answered by over 90% of the candidates, it is reasonable to say that candidates were not pressed for time.

Chapter 4

Discussion of methods of comparison used in the research and the results of the research

In this chapter the specific methods that are associated with the two general approaches to subject comparability, namely the use of an external reference test and the use of internal evidence provided by results from other parts of the examination itself, are described in more detail and the results from applying these methods of comparison to the data for the sample of candidates are reported and discussed.

4.1 The use of an external reference test, the Core Skills Test (CST), in subject comparability

Discussion around the use of the Core Skills Test in the study of subject comparability will include the presentation of the rationale for the use of an external reference test such as the Core Skills Test as well as a discussion of the various methods of interpreting results using this method. Furthermore there will be a discussion of some pertinent issues that arise from the use of an external reference test.

4.1.1 The rationale and validity of the Core Skills Test in subject comparability

The rationale for using a Core Skills Test to investigate the issue of subject comparability rests on the premise that, underlying achievement in different subjects is an entity that is

common to the subjects being compared. Mathews (1985) identifies this entity as general ability. Therefore in order to gain some insight into the nature of the relationship between standards in different subjects, one needs a common yardstick i.e. a measure of the general ability of candidates in different subjects, against which standards in different subjects can be assessed.

The correlation coefficient between the aggregate scores and the Core Skills Test scores of the sample of candidates was 0.6238. The aggregate was chosen as a convenient point of reference to gain some insight into the validity and reliability of the Core Skills Test results. The usefulness of the aggregate as a measurement of scholastic achievement has been questioned (Oberholzer, 1992). However, although it should be used with caution, the fact that it combines achievement scores across a number of different subjects and disciplines, suggests that it could be a reasonably valid indicator of general ability. Cohen and Manion (1985) claim that correlation coefficients ranging from 0.35 to 0.65 are statistically significant beyond the 1% level. The correlation coefficient between the Core Skills Test scores and the aggregates of the candidates in the sample is hence significant and indicates that both indicators of performance are reporting on a similar entity in respect of achievement.

A major objection to the use of a Core Skills Test is that achievement in certain subjects which can loosely be called 'talent' subjects e.g. Music, Art, Speech and Drama, is dependent on a specific talent rather than general ability. Therefore, it

is claimed, the use of a general test of developed scholastic skills to make comparisons between standards in these subjects and other subjects is not logical. However, in a certification system that is based on a group examination and demands comparability between results in different subjects, it is not fair that 'talent' subjects be excluded from consideration in the issue of subject comparability. Furthermore it should be noted that each of the 'talent' subjects have within their course of study a substantial component that could be classified as academic, especially at the higher grade level. The topic is discussed further in Chapter 5.

Procedures which use an external reference test such as the Core Skills Test as a point of comparison, intend to give an indication or prediction of what the mean score of candidates in a particular subject would be, given their mean Core Skills Test score, if one assumes that all subjects are applying the same standards. The predicted mean score is then compared with the actual mean score achieved by the sample of candidates and any difference between predicted and actual mean scores is attributed to a lack of comparability of standards.¹

The most important assumption made in using these procedures is that the Core Skills Test score can be used to predict performance in a particular subject examination or more specifically, that there is a demonstrable relationship between general ability

1. The comparisons could be extended to include the cut-off points between an A and a B symbol and a pass and a fail.

as measured by the Core Skills Test and attainment in a specific subject. (Nuttall et al., 1974)

Table 8.1 and Table 8.2 contain information about the candidates offering those subjects chosen for analysis in the present study. These subjects were chosen for consideration because the number of candidates in the sample offering the subject is greater than 30. Subjects offered by fewer than 30 candidates in the sample were not analysed. Table 8.1 deals with higher grade subjects while Table 8.2 deals with standard grade subjects. The tables contain the following information about each subject group: the number of candidates, their mean score (as a percentage) in the subject itself, the rank position of the subject¹, the standard deviation of the subject itself, the mean score in the Core Skills Test (as a percentage) of the candidates of the subject, the rank position of the group of candidates offering the subject², the standard deviation in the Core Skills Test and the correlation coefficient of the subject scores and the Core Skills Test scores. The subject results in the tables reflect the final results i.e. after the SAFCERT norms have been applied, of the sample candidates in the 1992 Natal Senior Certificate examination in the subject.

1. This was determined by comparing the mean score of the subject in the Natal Senior Certificate examination with the mean score of other subjects at the same grade in the study, in the Natal Senior Certificate examination.

2. This was determined by comparing the Core Skills Test mean score of the group of candidates taking a particular subject with the Core Skills Test mean of the groups of candidates offering other subjects at the same grade in the study.

Table 8.1: Higher Grade subjects: General information and results of candidates in specific subjects and in the Core Skills Test (CST)

Subject	Number of candidates	Performance as a percentage in:						Correlation CST and subject
		Subject			CST			
		Mean	Rank	Std Dev	Mean	Rank	Std Dev	
ACCO9	386	57.52	4	14.74	64.00	7	12.56	0.3166
AFRM9	420	57.25	7	10.42	56.35	12	13.34	0.5124
AFRS9	1296	57.04	9	11.71	62.68	10	13.41	0.3370
ARTS9	150	56.93	11	10.52	56.93	11	13.33	0.3402
BIOL9	706	57.39	6	13.12	65.45	3	12.53	0.4792
BUSE9	107	53.13	15	15.68	54.52	14	12.55	0.3332
DRAM9	105	60.77	1	13.18	64.80	4	15.17	0.4577
ENGM9	1277	58.58	2	10.74	63.16	8	13.34	0.4932
ENGS9	453	57.03	10	11.20	55.43	13	13.47	0.5527
GEOG9	640	57.42	5	11.63	64.04	6	12.65	0.4355
HIST9	310	58.12	3	12.84	64.28	5	13.63	0.4614
HOME9	343	56.01	14	11.51	54.17	15	11.33	0.3272
MATH9	572	57.07	8	15.75	70.16	2	12.25	0.3603
PHSC9	512	56.68	12	15.54	71.29	1	11.46	0.3684
TECD9	229	56.18	13	13.93	62.70	9	12.59	0.3555

Table 8.2: Standard Grade subjects: General information and results of candidates in specific subjects and in the Core Skills Test (CST)

Subject	Number of candidates	Performance as a percentage in:						Correlation CST and subject
		Subject			CST			
		Mean	Rank	Std Dev	Mean	Rank	Std Dev	
ACCO8	317	51.10	12	13.17	50.27	5	13.10	0.2708
AFRM8	164	55.11	3	8.42	42.63	15	9.37	0.3341
AFRS8	382	53.43	7	10.28	48.02	9	12.40	0.0522
ARTS8	53	53.28	8	9.60	44.93	14	10.46	-0.0394
BIOL8	629	52.08	10	12.68	49.26	7	11.27	0.2759
BUSE8	211	47.98	16	13.82	45.56	13	12.04	0.1163
DRAM8	32	60.64	1	8.38	49.47	6	11.63	-0.2021
ENGM8	415	54.59	6	8.12	47.35	11	11.54	0.1044
ENGS8	135	54.95	5	8.77	42.18	16	9.42	0.3964
FUNM8	128	46.39	17	11.94	46.98	12	10.65	0.0483
GEOG8	351	50.78	13	10.90	49.07	8	10.69	0.2099
HIST8	131	51.91	11	13.21	51.09	3	11.44	0.2194
HOME8	158	50.45	15	10.34	42.17	17	11.36	0.0470
MATH8	1021	52.11	9	18.00	57.52	1	12.28	0.3523
PHSC8	493	50.56	14	13.81	56.47	2	12.34	0.3568
TECD8	233	55.10	4	12.66	50.78	4	11.04	0.1754
TYPG8	472	56.53	2	15.49	47.79	10	11.00	0.2212

Cohen and Manion (1985) give some guidance for the interpretation of correlation coefficients. In addition to the statement that correlations of 0.35 to 0.65 are significant, they also maintain that correlations of below 0.35 are of no value in group predictions, while in the case of correlations around 0.40, crude group prediction may be possible. An examination of the information in Tables 8.1 and 8.2 reveals that there is a demonstrable relationship between 'general ability' as measured by the Core Skills Test and attainment in a specific subject. This is especially so in the higher grade subjects where all correlation coefficients are above 0.3. In some of the standard grade subjects the relationship is not as marked. However the number of candidates in the subject samples cannot be ignored when considering correlation coefficients and these should be viewed with extreme caution in subjects with very small numbers e.g. ARTS8 and DRAM8. The assumption that there is a demonstrable relationship between 'general ability' as measured by the Core Skills Test and achievement in a specific subject would thus appear to be validated for most of the subjects considered, especially the higher grade subjects.

The differences in correlation coefficients between higher grade subjects and the Core Skills Test and standard grade subjects and the Core Skills Test is worthy of comment. The higher grade and standard grade divisions in subject syllabi came into being with the National Education Policy Act (No. 39 of 1967). One of ten cardinal principles of the act is the provision of education in accordance with the ability and aptitude of and interest shown by the learner, and the needs of the country. Hence at the senior

secondary phase for examination purposes, subjects may be offered at the higher or standard grade level.

It appears however that no concept document was provided to syllabi constructors in which the intended differences between higher and standard grade are outlined. Informal discussion with Mrs S Müller, the Biology subject advisor in the pre-election Natal Education Department, and perusal of syllabi suggest that the content and aims of teaching at the higher and standard grades do not differ substantially. There are practical reasons why this is so. Very often a teacher is required to teach both higher and standard grade learners in the same classroom at the same time. Furthermore schools do not have sufficient resources to provide different learning environments for higher and standard grade learners. Furthermore, it seems reasonable that courses should not differ substantially so that movement between grades can be facilitated.

It would seem, in the case of Biology, that the difference between higher and standard grade is reflected in the nature of assessment at the two grades. This would include demands on time, the nature and variety of question types, the range of cognitive demands of the questions, the difficulty level of the papers as a whole, the language demands of the question papers as well as the strictness in marking.

What is clear from the different correlations between the Core Skills Test and higher grade subjects and the Core Skills Test

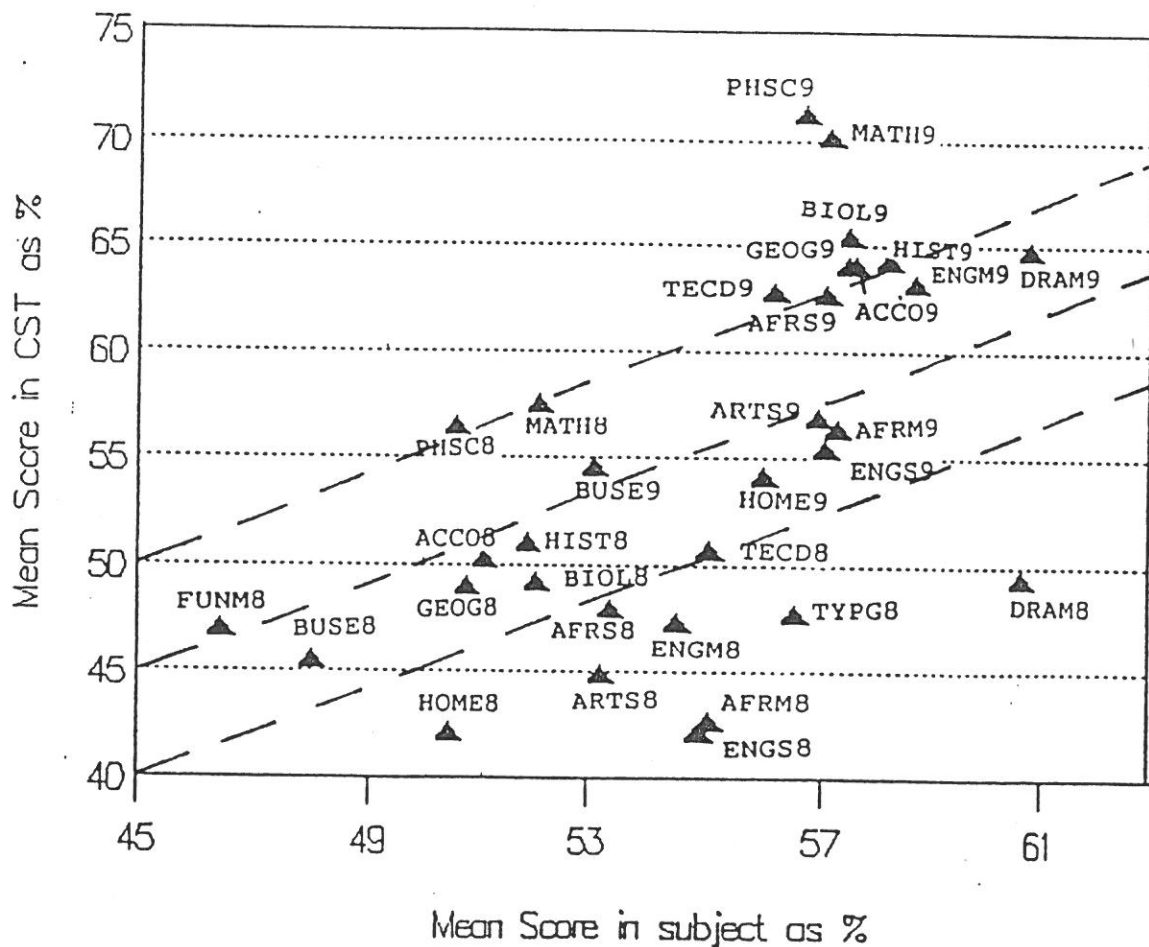
and standard grade subjects is that, those skills which are being assessed at the higher grade level in most subjects correspond with what was tested in the Core Skills Test, while in standard grade subjects it would seem that different or perhaps a smaller range of skills are being assessed than in the Core Skills Test.

In order to see the relationships between the mean score in the Core Skills Test and the mean score in each of the subjects under discussion, the pairs of mean scores have been plotted together on one graph, Graph 1.1. Graph 1.2 shows higher grade subjects separately and Graph 1.3 shows standard grade subjects separately. The vertical axis represents the mean score as a percentage in the Core Skills Test while the horizontal axis represents the mean score as a percentage in specific subjects. The resulting point on the graph represents the position of the Core Skills Test in relation to the subjects in terms of the performance of the candidates. If the mean scores in the Core Skills Test and in each of the subjects were the same, all points would lie on the central diagonal line, shown on the graphs. This is the case in ARTS9 where the mean score in the Core Skills Test and the mean in the subject itself were both 56.93%. In BIOL9 the mean score in the Core Skills Test was 65.45% while the mean score in the subject was 57.39%. For this reason the point for BIOL9 lies above the central diagonal line. With DRAM8 the mean Core Skills Test score was 49.47% while the mean score in the subject was 60.64%. For this reason the point for DRAM8 lies below the central diagonal line.

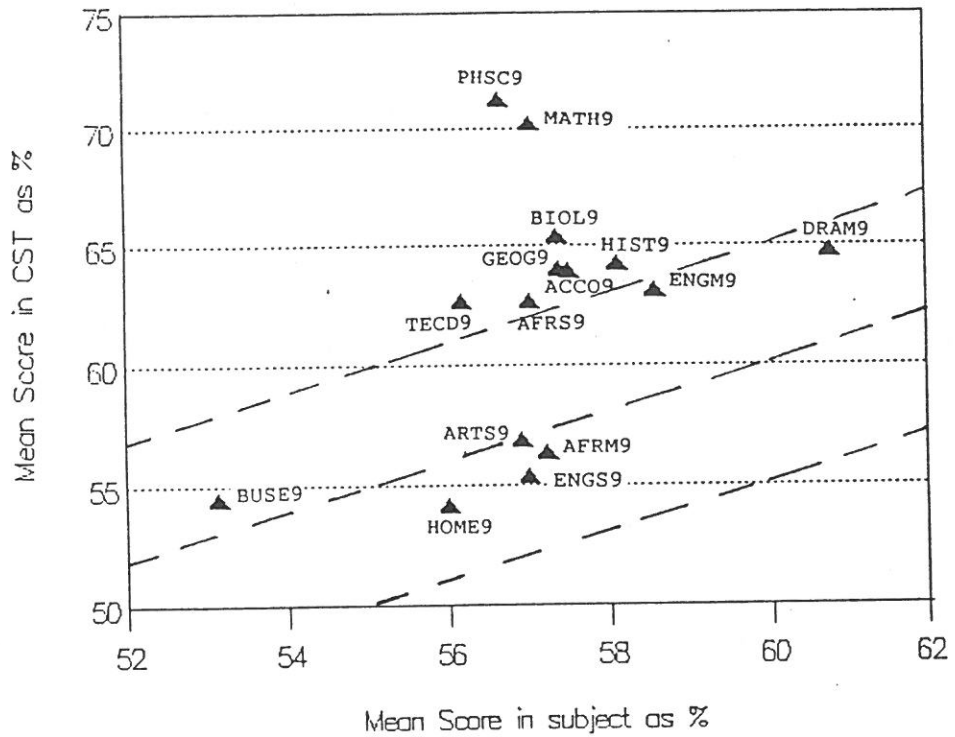
Two other diagonal lines have been drawn at distances represent-

ing 5% on either side of the central line. Any points outside these diagonals represent a subject where the difference between the mean Core Skills Test score and the mean subject score is greater than 5%. It should be noted that the choice of 5% as a degree of difference is arbitrary and serves only as an aid in interpreting the data. There is no value judgment about standards in subjects which lie outside the diagonal lines since their relative positions may result from factors other than a difference in applied standards.

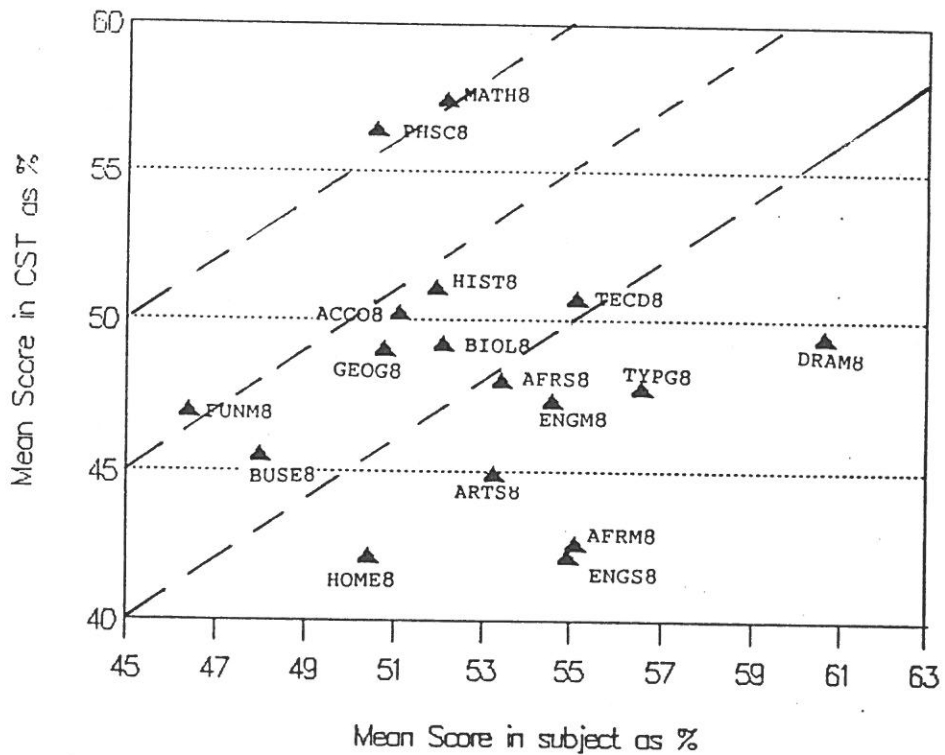
Graph 1.1: Plot of mean CST scores against mean subject scores (as percentages) of candidates in each subject - higher and standard grade subjects



Graph 1.2: Plot of mean CST scores against mean subject scores (as percentages) of candidates in each subject - 15 higher grade subjects



Graph 1.3: Plot of mean CST scores against mean subject scores (as percentages) of candidates in each subject - 17 standard grade subjects



In their reporting on Forrest's 1970 experiment, Nuttall et al. observed that the higher the mean score in the Test 100 for any subject, the worse the mean score in that subject i.e.

Subjects which attracted candidates of higher aptitude on the average tended to be those which awarded the worse grades on average. (1974: 15)

This led to the conclusion that certain subjects, Physics and Chemistry for example, were noticeably severe in their grade awards while others such as English Language and Literature, were noticeably lenient with respect to the average of all subjects in the discussion¹.

Looking at Tables 8.1 and 8.2 and Graphs 1.1, 1.2 and 1.3, it can be seen that some subjects such as Physical Science and Mathematics Higher Grade have relatively high mean Core Skills Test scores but low subject mean scores while a number of standard grade subjects have relatively low mean Core Skills Test scores but somewhat high subject mean scores. It may be interesting to compare the differences in the ranking of subjects according to the subject mean scores in the Natal Senior Certificate examination and their corresponding Core Skills Test mean scores as indicated in Tables 8.1 and 8.2. For example, among higher grade subjects, the Natal Senior Certificate ranking for AFRM9 is 7 and for ENGM9 is 2 while their corresponding Core Skills Test rankings are 12 and 8. The Core Skills Test ranking for MATH9 is

1. Nuttall et al. (1974) point out that the use of the terms 'severe' and 'lenient' are a convenient technical shorthand, indicating the direction of the differences from the point of comparison. In this case, the point of comparison is the mean score of a subject group in the Test 100. This interpretation of the terms 'severe' and 'lenient' has been adopted in the present study.

2 and for PHSC9 is 1 while their corresponding Natal Senior Certificate rankings are 8 and 12. This could indicate that the first two subjects are more lenient in their awarding of marks while the second two subjects are more severe in their awarding of marks. Among standard grade subjects, the Natal Senior Certificate rank position of AFRM8 is 3, ENGS8 is 5 and TYPG8 2 while their corresponding Core Skills Test rank positions are 15, 16 and 10. The Core Skills Test rank position for MATH8 is 1 and PHSC8 is 2 while their corresponding rank positions in the Natal Senior Certificate are 9 and 14. This could indicate that the first three subjects are more lenient in their awarding of marks while the second two subjects are more severe in their awarding of marks.

Furthermore, the Core Skills Test score of certain standard grade subjects e.g. MATH8 and PHSC8 are higher than certain higher grade subjects, indicating that these subjects attract candidates who are academically more able as measured by the Core Skills Test .

Using the mean scores in the Core Skills Test as a point of comparison and assuming that it is a sufficiently valid and reliable test of general developed ability, it is reasonable to conclude that there are differences between subjects and that some subjects are noticeably severe in their awarding of marks while others are noticeably lenient in comparison with other subjects under discussion.

The regression and guideline methods described fully in Appendix

A of Nuttall et al. (1974), attempt to quantify these differences. A description of these methods and the results obtained after applying them to the sample are set out below.

4.1.2 Regression Method

A regression line of subject-on-CST was calculated. This was used to 'predict' the mean score that would be expected for any given mean Core Skills Test score, if the awarding of marks in each subject was done according to the same standards. For example, the mean CST score in Physical Science Higher Grade was 71.29%, 16.56% higher than the mean Core Skills Test score of the full sample of candidates. The regression method predicts that the corresponding subject mean score for a mean Core Skills Test score of 71.29% should be 62.12%. The mean score in Physical Science Higher Grade was 56.68%. Therefore Physical Science Higher Grade is identified as having a difficulty measurement of 5.44% (i.e. $62.12 - 56.68$). This was done for each subject in turn and the difficulty measurements calculated in this way are recorded in Table 9 on page 66.

A positive difficulty measurement indicates that in relation to the point of comparison under discussion e.g. in this case the Core Skills Test, the demands of the subject in examining and/or marking are more severe than demands of other subjects with lower difficulty measurements while a negative difficulty measurement indicates that in relation to the point of comparison under discussion, the demands of the subject in examining and/or mark-

ing are more lenient than demands in other subjects with higher difficulty measurements i.e. the higher the positive difficulty measurement, the more severe a subject is in its demands and the higher the negative difficulty measurement, the more lenient the subject is in its demands. The results of this comparison exercise are set out fully in Appendix D of this report.

4.1.3 Guideline Method

Nuttall et al. (1974) describe the Guideline method in full in Appendix A of their report. The Guideline method is considered because of reservations about the Regression method. In a regression model, it is inevitable that there will be an error of measurement, which will be reduced the more careful one is. In the regression method described above, all the error is assumed to lie in the subject scores, since the subject-on-CST line is used. Clearly if the CST-on-subject line were used, all the error would be assumed to lie with the CST. In structural regression, of which the guideline method is a particular case, the error is assumed to lie somewhere between the two regression lines.

In the absence of any evidence, the most appropriate course of action would seem to split the error evenly, giving the structural regression line which bisects the angle between the two regression lines if the two variables are standardised. (Nuttall et al., 1974: 94)

This course of action was followed and the difficulty measurements of the subjects under discussion as described above were calculated and are shown in Table 9 on page 66.

With reference to Table 9 it should be noted that:

- o Positive difficulty measurements indicate a tendency towards severity while negative difficulty measurements indicate a tendency towards leniency.
- o Difficulty measurements of more than 5% have been indicated with an asterisk to draw attention to the subjects where the greatest discrepancies lie.

Table 9: Sample estimates of difficulty measurements: the Regression and Guideline Methods

Subject	Number of candidates	Difficulty measurement as a percentage:			
		Regression	Rank	Guideline	Rank
ACCO9	386	0.73	24	3.69	24
AFRM9	420	-3.06	11	-0.87	12
AFRS9	1296	0.51	23	3.34	23
ARTS9	150	-2.43	13	-0.19	13
BIOL9	706	1.63	27	4.74	28
BUSE9	107	0.09	20	2.09	20
DRAM9	105	-2.10	14	0.95	15
ENGM9	1277	-0.77	16	2.10	21
ENGS9	453	-3.32	10	-1.23	10
GEOG9	640	0.85	25	3.82	25
HIST9	310	0.28	21	3.27	22
HOME9	343	-2.97	12	-1.01	11
MATH9	572	4.45	31	8.04	* 31
PHSC9	512	5.44	* 32	9.14	* 32
TECD9	229	1.38	26	4.21	27
ACCO8	317	-0.13	19	1.44	18
AFRM8	164	-8.19	* 3	-7.40	* 3
AFRS8	382	-3.65	9	-2.32	8
ARTS8	53	-5.14	* 6	-4.12	5
BIOL8	629	-1.65	15	-0.18	14
BUSE8	211	0.49	22	1.58	19
DRAM8	32	-10.09	* 1	-8.61	* 1
ENGM8	415	-5.17	* 5	-3.90	6
ENGS8	135	-8.27	* 2	-7.53	* 2
FUNM8	128	2.83	29	4.07	26
GEOG8	351	-0.45	18	1.00	16
HIST8	131	-0.51	17	1.14	17
HOME8	158	-3.78	8	-3.03	7
MATH8	1021	2.70	28	5.01	* 29
PHSC8	493	3.70	30	5.89	* 30
TECD8	233	-3.86	7	-2.24	9
TYPG8	472	-6.88	* 4	-5.56	* 4

Table 9 has been divided into two sections and information for higher grade subjects, identified by the 9 in their codes, is given in the upper section while information for standard grade subjects, indicated by the 8 in their codes, is given in the lower section. A similar format is used for subsequent tables, where appropriate.

By ranking subjects according to their difficulty measurements calculated using the regression method and using the guideline method and by comparing the actual difficulty measurements, it can be concluded that the two methods produce similar results.¹ Significant differences in the difficulty measurements occur with the subjects at the extremes i.e. those with relatively high difficulty measurements, both negative viz. DRAM8 and positive viz. PHSC9, MATH9, PHSC8, MATH8.

What is clear from this table is that certain subjects appear to be more severe in their demands in comparison with other subjects while other subjects appear to be significantly lenient in their demands in comparison with other subjects. Subjects that could be deemed severe using the Core Skills Test as a point of comparison are MATH9, MATH8, PHSC9 and PHSC8 and to a lesser extent BIOL9 and TECD9 while subjects that appear lenient using the Core Skills Test as a point of comparison are DRAM8, ENGS8, AFRM8 and TYPG8. In comparison with other standard grade subjects MATH8, FUNM8, BUSE8 and PHSC8 are somewhat severe in their demands while, in comparison with other higher grade subjects AFRM9,

1. Nuttall et al. (1974) in Appendix A of their report, discuss some of the possible reasons for this.

ARTS9, ENGS9 and HOME9 are somewhat lenient in their demands.

4.1.4 Discussion

Nuttall et al. (1974) discuss the point that observed differences might be explained partially or fully in terms of a bias in the external reference test rather than in terms of a lack of comparability of standards between subjects. They present the hypothesis that the nature of the items in Test 100, the reference test used in the British experiments, may be such that those candidates entered for Mathematics or science-oriented subjects would obtain significantly higher scores on the test than candidates in other subjects simply by virtue of their having followed science- or mathematically-oriented courses. In other words, the reference test scores for different subject groups might not be directly comparable. This hypothesis may well be true for the Core Skills Test administered to the Natal Senior Certificate sample of candidates. However with the available data it is not possible to test this hypothesis. If other tests of a purely linguistic or mathematical nature were available and estimates of severity calculated by the regression method using different tests were compared, it would be easier to make some deductions about possible bias in the Core Skills Test.

Clearly, however, this discussion raises an important point, namely bias in the construction of any reference test. (1985) identifies class, school, gender, racial and geographical as areas in which test constructors must be particu-

It would be reasonable to add culture and educational philosophy which directly affect concepts of knowledge, the nature of learning and hence approaches to teaching and assessment. Nuttall et al. (1974) have raised the issue of performance according to gender in different subjects. They conclude that there is sufficient evidence to indicate considerable sex differences in respect of performance in different subjects. This topic together with that of culture, is one of great interest and importance especially within the complex society of South Africa and is discussed in more detail in Chapter 5 of this study.

Looking at Tables 8.1 and 8.2 and Graphs 1.1, 1.2 and 1.3, another dimension of the issue of subject comparability within the South African context is brought to the fore. An examination of the Core Skills Test scores indicates that some standard grade subjects attract students who, on average, have scored a higher mean score in the Core Skills Test than candidates in certain higher grade subjects. For example, Mathematics Standard Grade (MATH8) candidates have a mean Core Skills Test score of 57.52% and a mean subject score of 52.11%. Physical Science Standard Grade (PHSC8) candidates have a mean Core Skills Test score of 56.47% and a subject mean score of 50.56%. Business Economics Higher Grade (BUSE9) has a mean Core Skills Test score of 54.52% and a subject mean score of 53.13% while Home Economics Higher Grade (HOME9) has a mean Core Skills Test score of 54.17% and a subject mean score of 56.01%. In terms of the aggregate, the mean subject score for MATH8 is 156 marks and for PHSC8 is 152 marks while the mean subject score for BUSE9 is 213 marks and for HOME9 is 224. It is clear then that certain standard grade

subjects although they attract candidates of a higher level of ability, are prejudiced in the calculation of the aggregate in comparison with certain higher grade subjects. This is largely as a result of the attempt to quantify the difference between higher and standard grade at 100 marks together with a possible lack of comparability in standards between different subjects at different grades.

Clearly when Second Language is considered these problems are intensified. For example, English Second Language Higher Grade (ENGS9) has a mean Core Skills Test score of 55.43% and a subject mean score of 57.03% i.e. 171 marks, while English Second Language Standard Grade (ENGS8) has a mean Core Skills Test score of 42.18% and a subject mean score of 54.95% i.e. 165 marks. It is indeed debatable whether the difference of 6 marks in the subject mean scores adequately quantifies the difference in the level of academic achievement between higher and standard grade candidates in English Second Language.

The validity of using a Core Skills Test to make comparisons between higher grade subjects and standard grade subjects or between the different standard grade subjects can be criticised on the grounds that correlation coefficients between Core Skills Test results and standard grade subject results are sufficiently low that any statements about standard grade subjects, using the results in the Core Skills Test as a point of reference, are questionable. Certainly it would be impossible to justify statistical adjustments to results in standard grade subjects based on the Core Skills Test results. However, if the assumption is

made that the Core Skills Test is assessing those measurable skills that are intended to be developed in general education, and this test represents a standard reference point, then one could argue that the standard grade subjects, by and large, are not developing the skills that are assessed in the Core Skills Test and as such, should not contribute to the certification process. This is an extreme stand and a compromise could be their exclusion in the calculation of the aggregate since they appear to be developing different skills from higher grade subjects and therefore it is debatable whether their inclusion in the aggregate is meaningful.

4.2 The use of internal evidence in subject comparability

In the current study a number of methods of comparison, which entail the use of internal evidence from the Natal Senior Certificate examination in 1992, have been employed to investigate the issue of subject comparability. These include comparisons using subject-pairs analysis and the variations thereof, the aggregate, the assumption of symmetry and profiles of the candidates offering the different subjects.

4.2.1 Subject-pairs analysis

The principle underpinning subject-pairs analysis and the method of calculation have been described in some detail in Chapter 2.¹

1. Pages 29ff.

An example will serve to illustrate the point. If Physical Science Higher Grade (PHSC9) is the subject being analysed, the mean scores in Physical Science and, for example, Biology Higher Grade (BIOL9) of those candidates taking both Physical Science and Biology at the higher grade are calculated and compared. Using the sample, BIOL9 has a mean score of 65% while these same candidates scored a mean of 59% in PHSC9. In comparison with PHSC9, it could be said that mark awarding in BIOL9 is lenient. Alternatively, in comparison with BIOL9, mark awarding in PHSC9 might be interpreted as severe. This process is done for all subjects that PHSC9 candidates take.

Using the performance of PHSC9 candidates in the sample as a reference point, selected subject comparisons as described above yielded the following results.

Table 10: Results of Physical Science Higher Grade selected subject-pairs analyses

Subject of comparison	Number of candidates	PHSC9:		Other subject:		Core Skills:	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
ENGM9	424	58	15.78	64	10.52	72	11.09
MATH9	422	59	14.95	60	15.22	72	11.67
AFRS9	419	58	15.80	61	11.79	72	10.97
BIOL9	236	59	15.13	65	11.25	73	11.27
GEOG9	200	57	15.12	65	10.17	72	10.53
ACCO9	170	57	14.54	65	12.76	69	12.30
TECD9	101	53	16.37	63	13.12	69	9.30
HIST9	90	59	15.49	68	11.45	75	10.54
ENGS9	86	53	13.62	66	9.07	67	11.96
AFRM9	85	53	13.69	67	6.99	67	12.02

From this table it can be concluded that with the exception of MATH9 and AFRS9, mark awarding in PHSC9 is severe in comparison

with the other higher grade subjects. Furthermore, the narrower standard deviations in other subjects suggest that the PHSC9 candidates may be a more homogeneous group in terms of achievement than the PHSC9 standard deviations indicate. These conclusions are substantiated by the performance of these candidates in the Core Skills Test. The full results of subject-pairs analyses as well as performance in the Core Skills Test and correlation co-efficients in subject-pairs for all higher and standard grade subjects are contained in Appendix E.

Various methods of summarising the information contained in subject-pairs analyses tables have been employed.

4.2.1.1 The Unweighted Subject-pairs

In this method of presenting summarised information of subject-pairs analyses, the mean of the means in each subject-pair is calculated, producing finally two means for comparison in each subject. In the first instance, there is the mean of the means for the subject under consideration and in the second instance, there is the mean of the means of all the other subjects in the subject-pairs analyses. The results are recorded in the tables of results in Appendix E as Unweighted Subject-pairs (UWSP).

Using PHSC9 as an example, the mean of the means of the PHSC9 candidates in PHSC9 is 55.45%. The mean of the means in the other subjects in the subject-pairs analyses is 65%. The difficulty measurement in each subject is simply the difference between the final two means, as described. Hence continuing with

the PHSC9 example, the difficulty measurement for PHSC9 would be 9.55. The difficulty measurements for each subject as calculated using this method are set out in Table 11.

It must be noted that in small groups, the subject-pair method of comparison is inappropriate since there are too few candidates to establish any reliable trends. Hence, subject-pairs analyses where the number of candidates doing both subjects was less than 30 have been excluded in the calculation of the Unweighted Subject-pairs in the current study. Forrest and Vickerman (1982) working with larger samples, excluded pairs of less than 50 candidates.

Table 11: Difficulty measurements for each subject using the Unweighted Subject-pairs as a point of comparison

Subject	Number of candidates	Difficulty measurements	
		Unweighted S-P's	Rank
ACCO9	386	4.50	26
AFRM9	420	-2.77	9
AFRS9	1296	1.22	20
ARTS9	150	-2.43	10
BIOL9	706	5.94	28
BUSE9	107	2.34	22
DRAM9	105	-3.14	8
ENGM9	1277	0.40	16
ENGS9	453	-2.00	11
GEOG9	640	2.61	23
HIST9	310	2.93	24
HOME9	343	-0.40	15
MATH9	572	9.21	29
PHSC9	512	9.55	30
TECD9	229	-3.33	7

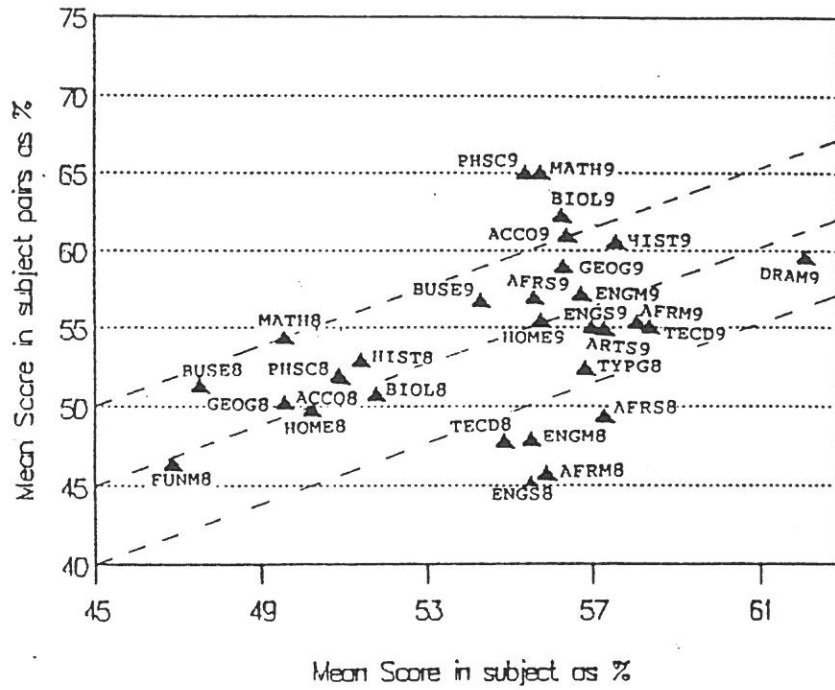
Table 11 (cont.)

Subject	Number of candidates	Difficulty measurements	
		Unweighted S-P's	Rank
ACCO8	317	1.00	19
AFRM8	164	-10.18	2
AFRS8	382	-7.94	3
ARTS8	53		
BIOL8	629	-1.04	12
BUSE8	211	3.77	25
DRAM8	32		
ENGM8	415	-7.71	4
ENGS8	135	-10.45	1
FUNM8	128	-0.43	14
GEOG8	351	0.65	17
HIST8	131	1.43	21
HOME8	158	-0.50	13
MATH8	1021	4.73	27
PHSC8	493	0.84	18
TECD8	233	-7.17	5
TYPG8	472	-4.21	6

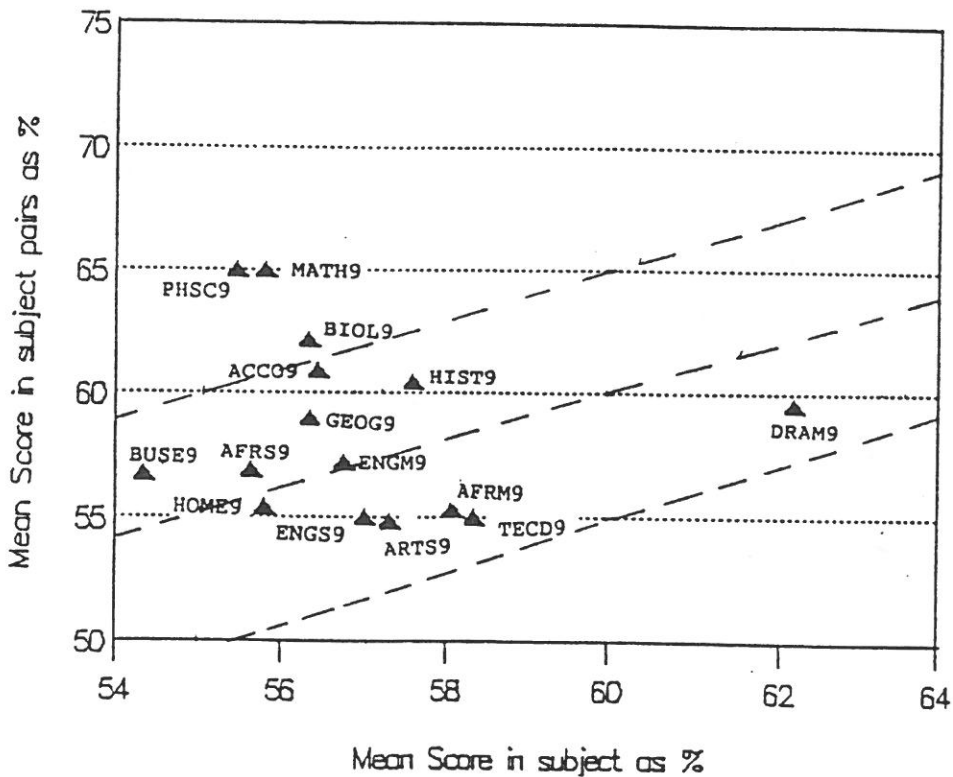
In ARTS8 there were only two subject-pairs analyses in which there were more than 30 candidates while in DRAM8 all subject-pairs analyses involved fewer than 30 candidates. For this reason in each of these subjects, the calculation of the Unweighted Subject-pairs was not done.

By examining the rank of the difficulty measurements one could conclude that, using the Unweighted Subject-pairs, mark awarding is most lenient in English Second Language Standard Grade while the subject which is most severe in mark awarding is Physical Science Higher Grade. The mean of the means of the subject itself has been plotted against the mean of the means of the other subjects in the subject-pairs as calculated using the Unweighted Subject-pairs in Graphs 2.1 (all subjects), 2.2 (higher grade subjects) and 2.3 (standard grade subjects).

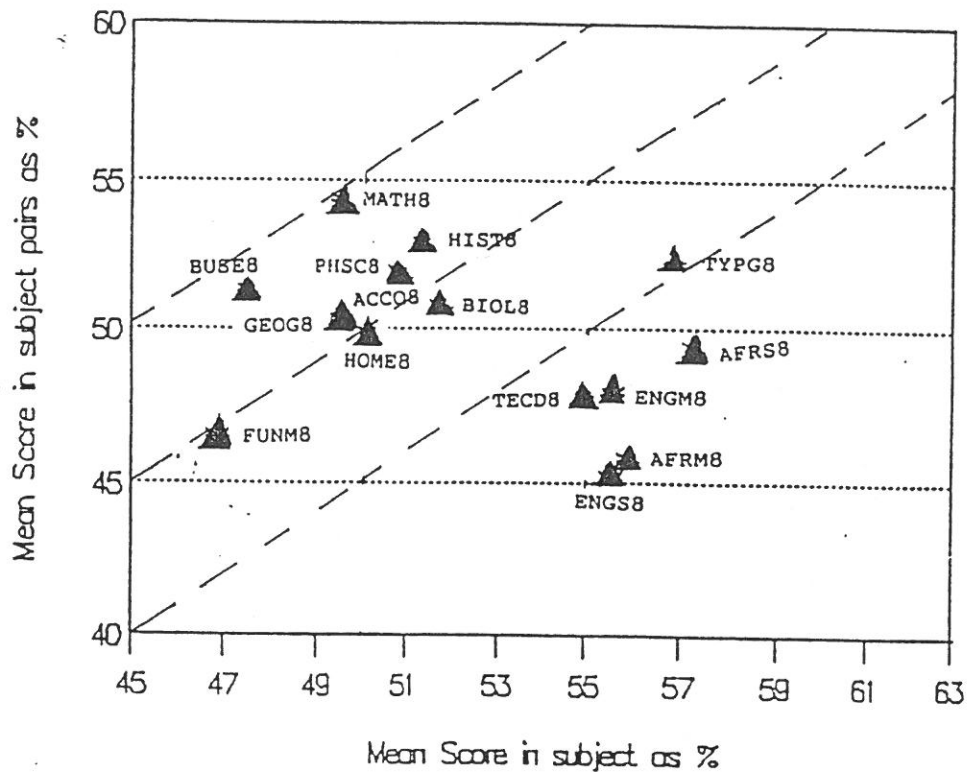
Graph 2.1: Plot of Unweighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - higher and standard grade subjects



Graph 2.2: Plot of Unweighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - higher grade subjects



Graph 2.3: Plot of Unweighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - standard grade subjects



(Only subject pairs in which there are more than 30 candidates have been included in these calculations)

4.2.1.2 The Weighted Subject-pairs

In the description of the Unweighted Subject-pairs, the calculation of the mean of the means gives each subject in the comparisons the same value, regardless of the number of candidates taking the subject i.e. a subject-pair that has 40 candidates is given the same weighting as a subject-pair that consists of 400 candidates. In the Weighted Subject-pairs, the number of candidates taking the subject-pair is taken into account. When calculating the mean of the means in a subject-pair that has 40 candidates the mean for that subject is included 40 times while in a subject-pair which has 400 candidates, the mean for that subject is included 400 times. Hence subject pairs with a greater number

of candidates influence the mean of the means more than subject pairs with fewer candidates. The results are recorded in the tables of results in Appendix E as Weighted Subject-pairs (WSP). The difficulty measurement in each subject is again simply the difference between the final two means, as described. The difficulty measurements for each subject as calculated using this method are set out in Table 12.

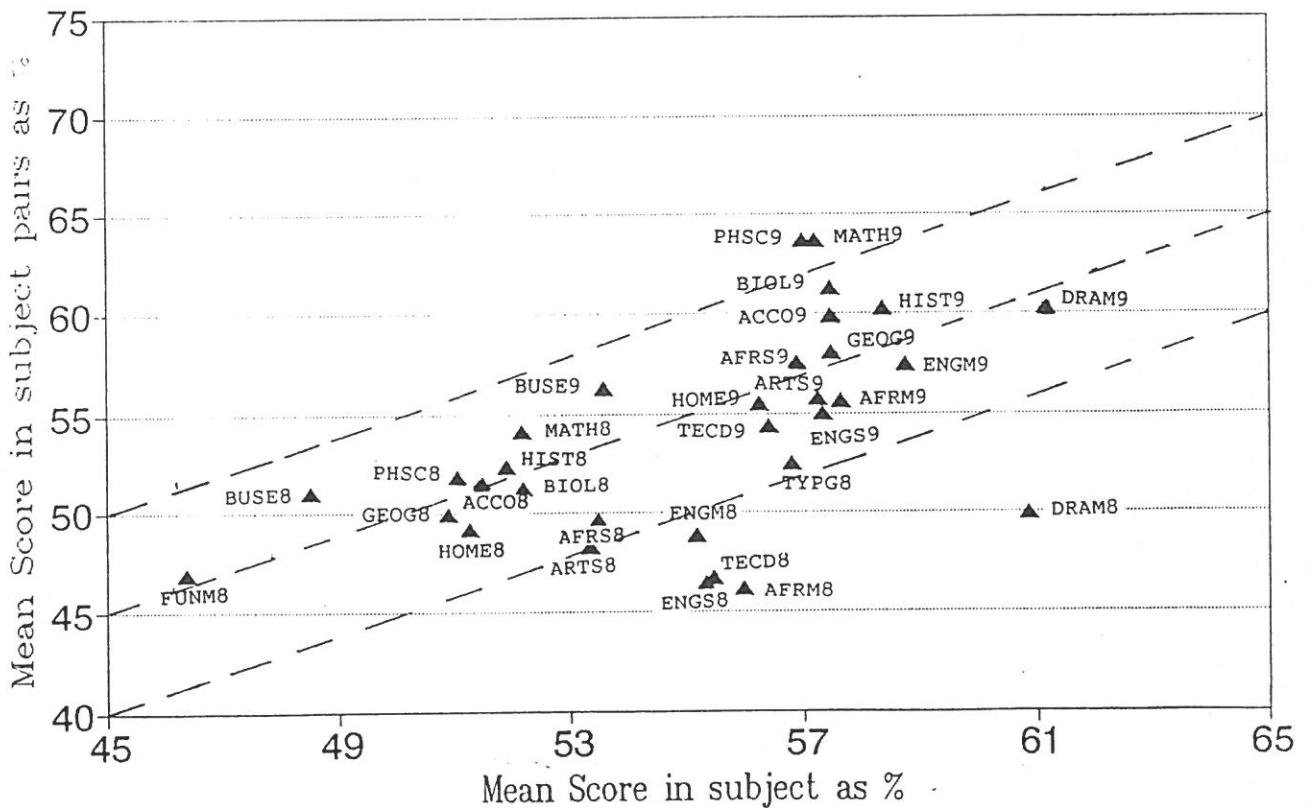
Table 12: Difficulty measurements for each subject using the Weighted Subject-pairs as a point of comparison

Subject	Number of candidates	Difficulty measurements	
		Weighted S-P's	Rank
ACCO9	386	2.40	27
AFRM9	420	-2.01	10
AFRS9	1296	0.67	23
ARTS9	150	-1.44	13
BIOL9	706	3.80	30
BUSE9	107	2.73	29
DRAM9	105	-0.99	15
ENGM9	1277	-1.30	14
ENGS9	453	-2.26	9
GEOG9	640	0.60	22
HIST9	310	1.93	25
HOME9	343	-0.75	18
MATH9	572	6.44	31
PHSC9	512	6.69	32
TECD9	229	-1.96	12
ACCO8	317	0.11	19
AFRM8	164	-9.81	2
AFRS8	382	-3.83	8
ARTS8	53	-5.09	6
BIOL8	629	-0.87	17
BUSE8	211	2.51	28
DRAM8	32	-10.94	1
ENGM8	415	-6.30	5
ENGS8	135	-8.90	3
FUNM8	128	0.53	21
GEOG8	351	-0.92	16
HIST8	131	0.47	20
HOME8	158	-2.01	10
MATH8	1021	2.04	26
PHSC8	493	0.86	24
TECD8	233	-8.72	4
TYPG8	472	-4.28	7

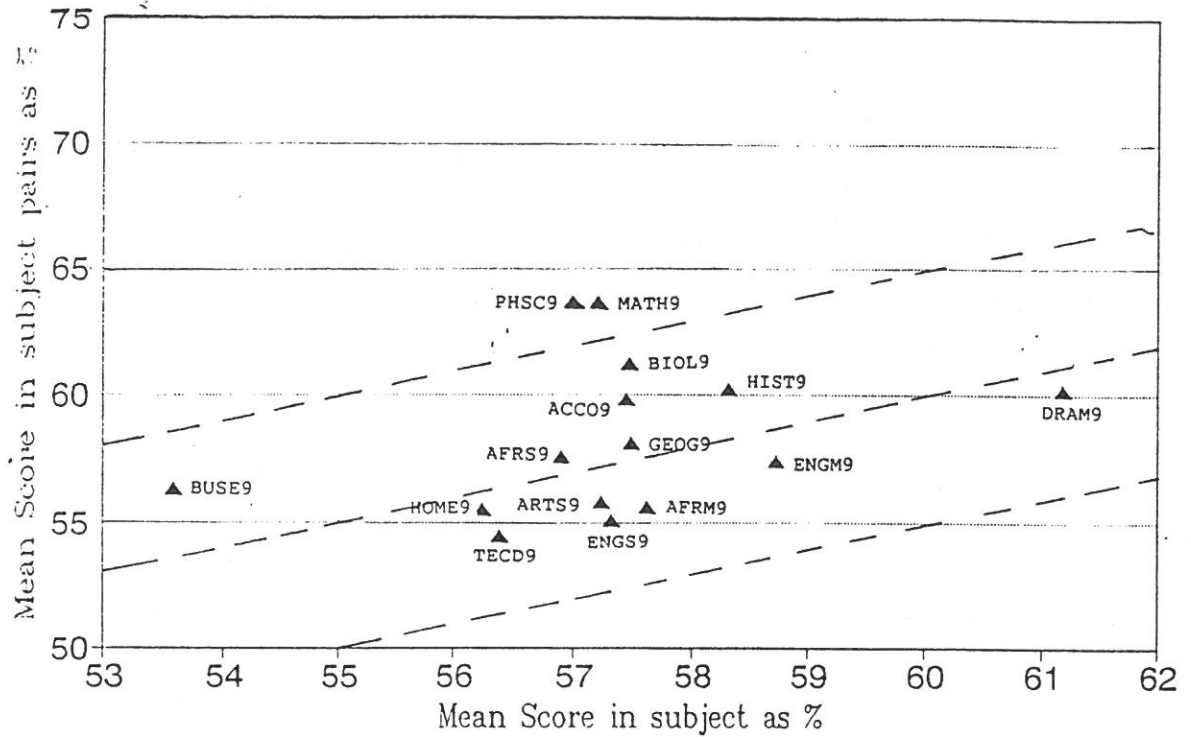
By examining the rank of the difficulty measurements one can conclude that, using Weighted Subject-pairs, mark awarding is most lenient in Speech and Drama Standard Grade while the subject which is most severe in mark awarding is again Physical Science Higher Grade.

The mean of the means of the subject itself has been plotted against the mean of the means of the other subjects in the subject-pairs as calculated using the Weighted Subject-pairs in Graphs 3.1 (all subjects), 3.2 (higher grade subjects) and 3.3 (standard grade subjects).

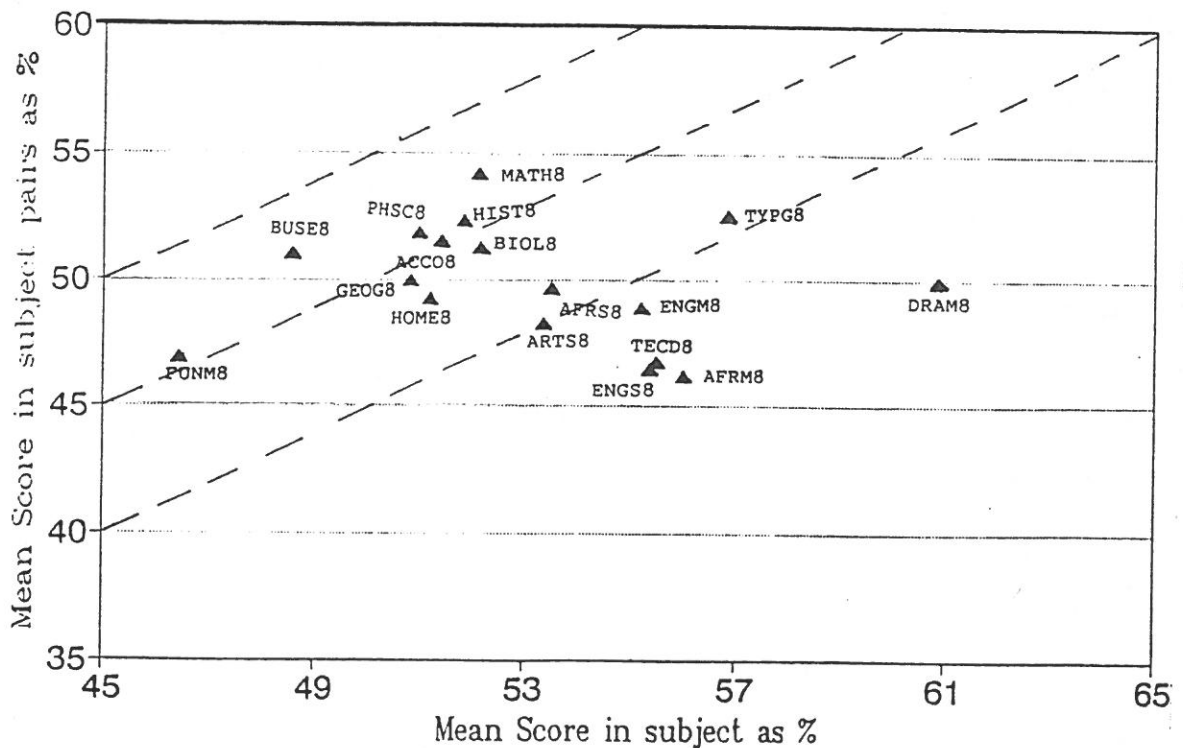
Graph 3.1: Plot of Weighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - higher and standard grade subjects



Graph 3.2: Plot of Weighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - higher grade subjects



Graph 3.3: Plot of Weighted subject pairs mean scores against the mean subject score (as a percentage) of candidates in each subject - standard grade subjects



Forrest and Vickerman (1982) and Nuttall et al. (1974) point out that a number of assumptions underpin the subject-pairs method of comparison.

The first assumption is that the grading system is norm-referenced. Comparing performance in one subject with performance in another subject is only valid if mark awarding in each subject is based on what is assumed to be the general level of performance of children of that particular age group. Both Nuttall et al. and Forrest and Vickerman argue that in Britain the marking of scripts is not strictly criterion-referenced since in a strictly criterion-referenced system, a candidate is measured totally against absolute standards that are pre-set and particular to the subject being marked - a candidate is not being measured against other candidates. In fact the relationship between norm- and criterion-referenced examining has been succinctly explained as follows:

Norm-referencing does not imply that grading needs to be done or is done statistically; all the important grade boundaries are in fact decided on the basis of the quality of work presented. But we argue that these criteria for grade boundaries have evolved from essentially statistical (i.e. norm-referenced) definitions ... (Nuttall et al., 1974: 89)

Within the South African system, the system as described by Nuttall et al. pertains during the actual marking sessions. However SAFCERT in its attempt to address comparability of results between examining authorities in South Africa, has determined for each subject within each examining authority a set of norms i.e. a prescribed percentage of candidates who should attain an A symbol and a prescribed percentage of candidates who should fail,

with the attendant mean and standard deviation. These norms are applied subsequently, to the marks produced during the marking process. In many cases adjustments are not considerable. However there have been instances where the marks produced by the examiner and his/her team of sub-examiners have differed substantially from the adjusted marks i.e. after the norms have been applied. Although the pre-election Natal Education Department makes provision for identifying and discussing those subjects where adjustments are substantial and recommending appropriate courses of action, changes to the norms rest in the hands of SAFCERT who have the right to accept or reject arguments presented by the examining authority in this regard. Hence it is clear that awarding of final marks in the Natal Senior Certificate is norm-referenced and hence within this study, this assumption is valid.

It is appropriate at this point to question the ethics of the process of standardisation using norms that is applied by SAFCERT. The absence of chief examiners at the standardisation meetings and the lack of discussion with them about the critical cut-off areas between pass-fail and A-B symbols or reference to the actual scripts and criteria indicates a reliance on statistical data from the previous five years without taking cognisance of the circumstances surrounding the current examination. The current practices have led to the following impressions cited by Gilmour (1992):

- o a complex educational bureaucracy, the procedures of which are largely hidden;
- o a technically complex examination process;

(1992: 91)

In the interests of transparency and consultation, it is essential that the current process be reviewed with the intention of including wider participation in the process, the inclusion of different relevant pieces of information in the discussion and furthermore, the education of examiners and sub-examiners about the issues involved in standardisation.

The second assumption is that candidates display on average, the same degree of ability and interest in and motivation for each of the two subjects. As Forrest and Vickerman claim:

It cannot be expected that each individual candidate shows equal ability and interest in and motivation for the two subjects; all that is required is that there is a balancing effect in that there is compensation for a candidate able and interested in one, but not the other subject, by another candidate whose abilities and interests are the other way round. (1982: 18)

Nuttall et al. claim that in an entirely norm-referenced grading system, such as the Natal Senior Certificate system, this assumption is unnecessary. With reference to the CSE in Britain, they make the following point:

... the fact that pupils studying one subject were more highly motivated than those studying another subject would raise the level of attainment in the first subject above that of the second, but that average level would still be certified as CSE grade 4 in both cases. (1974: 89)

In the Natal Senior Certificate group examination, it is essential to pass the two compulsory languages. One could therefore argue that candidates make a greater effort in these subjects than in any of the others. However to pass the examination as a whole candidates must pass at least three of the four other

subjects offered. Hence one can argue that motivation in other subjects is not necessarily diminished because it is not essential to pass these subjects. Also the other subjects are choice subjects and one could argue that motivation is increased because learners have opted to do them. Furthermore, considering Nuttall et al.'s position, this is an acceptable assumption within this study.

These arguments also apply to the assumption that the teaching of candidates in each pair of subjects is on average of an equal standard and that the resources available at the schools are comparable. Individual schools may well be better-resourced than others but on average, subject groups reflect similar standards of teaching and resources. This would be true within the pre-election Natal Education Department where resources and the calibre of teaching personnel did not differ substantially from school to school, since school provisioning and the employment of teachers were done in accordance with national guidelines. This may not necessarily be the case in the greater post-election KwaZulu-Natal Department of Education.

Forrest and Vickerman (1982) maintain that the shapes of the distributions of results in a pair of subjects should be similar, since the basis of comparison is the mean grade of candidates in a group. The current system of awarding of marks in the Natal Senior Certificate subject examinations ensures that marks are adjusted to a normal distribution in almost all subjects. Subjects with very small numbers of candidates and 'new' subjects i.e. those which have been examined at Std 10 level for less than

5 years are excluded. Therefore it is reasonable to assume that for the most part, the shapes of the distributions are similar. However they are not the same, as Nuttall et al. (1974) claim they should be. An inspection of the standard deviations of the different subjects in Tables 8.1 and 8.2 indicates that the normal curve will be wider or narrower depending on the subject. It is debatable whether the differences in standard deviations can be considered sufficiently dramatic to affect the shape of the distributions to the point that they are no longer deemed similar. The dilemma surrounding the question of differences in the standard deviations has been discussed in Chapter 2 of this thesis and will be discussed more fully on page 97 when the standard deviation specifically is discussed.

Although these assumptions have been discussed as if they are applicable only in the subject-pairs methods, it must be pointed out that they are applicable to a greater or lesser extent in all methods of comparison discussed in this report.

4.2.2 The Unbiased Mean Total (UBMT)

The Unbiased Mean Total (UBMT) is also a method of comparison that makes use of internal evidence from other aspects of the examination itself. It differs from the subject-pairs analyses that have already been described in that it takes more than one pair of subjects at a time into account. The UBMT is defined as follows: 'the mean grade in all **other** subjects attempted' (Nuttall et al., 1974: 32) For example, if MATH9 is the subject

under consideration, the UBMT of any candidate taking MATH9 is simply the sum of the scores in all the other subjects he/she has taken in the Natal Senior Certificate, divided by the total number of other subjects taken by the candidate. For all candidates taking MATH9, the UBMT is the mean of all other subjects attempted for all candidates taking MATH9. It is therefore not simply the mean of the individual candidate's UBMTs but rather the weighted mean, taking into account the number of other subjects that are offered. The difficulty measurement in each subject is the difference between the subject mean score and the UBMT score of all candidates taking the subject. The results of this process are set out in Table 13 and are recorded in the tables of results in Appendix E as Unbiased Mean Total (UBMT).

Table 13: Difficulty measurements for each subject using the Unbiased Mean Total (UBMT) as a point of comparison

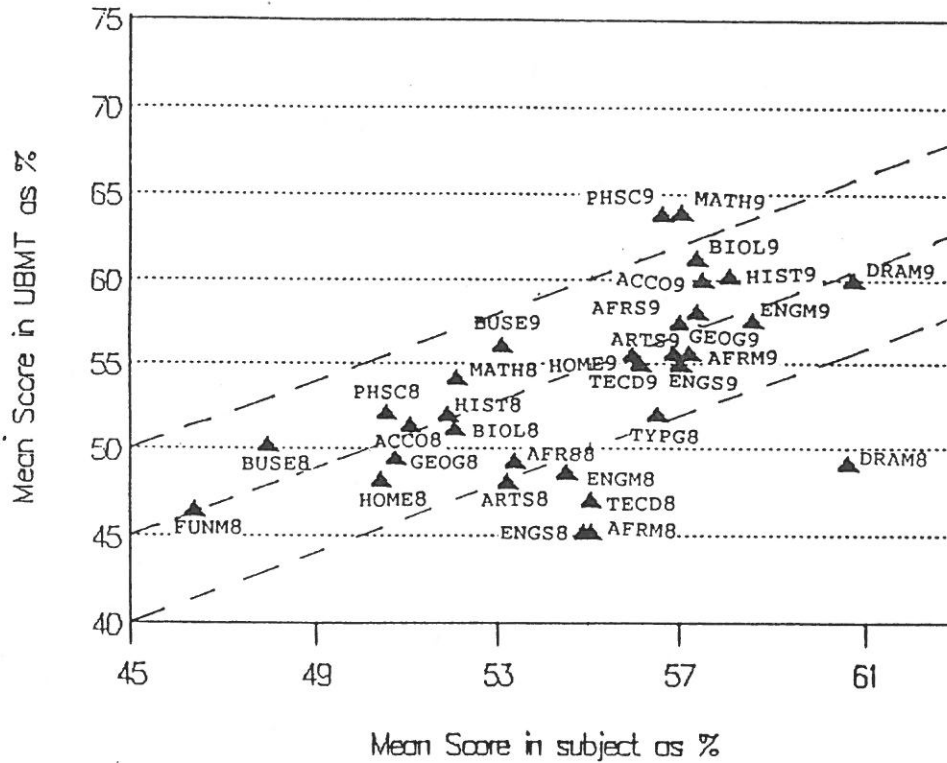
Subject	Number of candidates	Difficulty measurements	
		UBMT	Rank
ACCO9	386	2.50	28
AFRM9	420	-1.57	11
AFRS9	1296	0.45	22
ARTS9	150	-1.30	12
BIOL9	706	3.89	30
BUSE9	107	2.91	29
DRAM9	105	-0.73	17
ENGM9	1277	-1.06	15
ENGS9	453	-2.05	10
GEOG9	640	0.63	23
HIST9	310	2.08	26
HOME9	343	-0.51	18
MATH9	572	6.81	31
PHSC9	512	7.15	32
TECD9	229	-1.15	14

Table 13 (cont.)

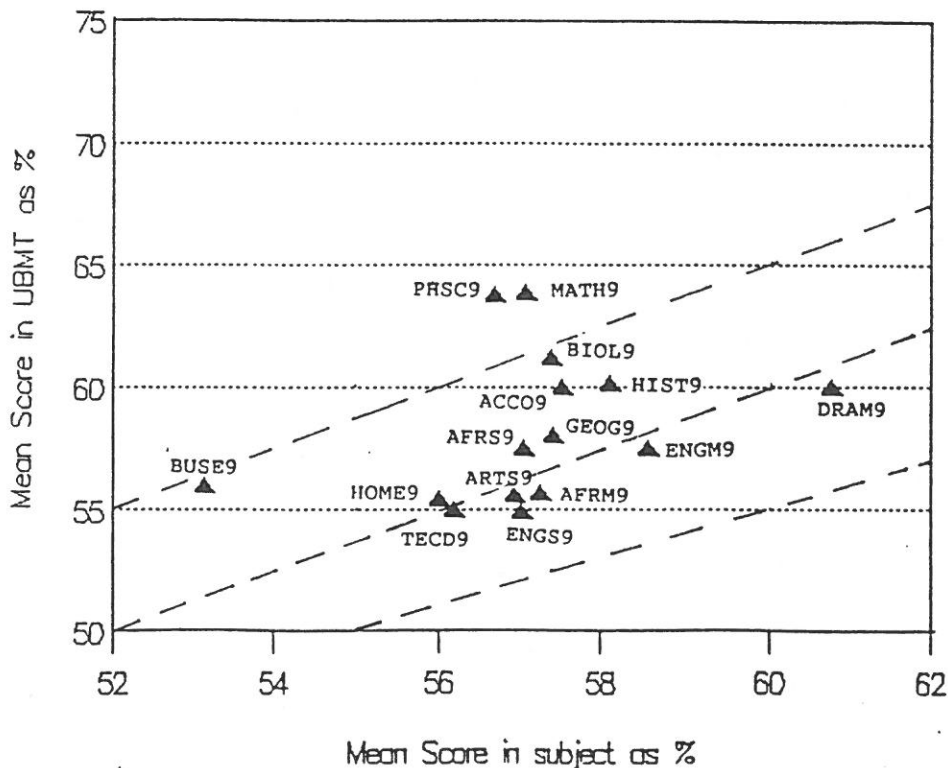
Subject	Number of candidates	Difficulty measurements	
		UBMT	Rank
ACCO8	317	0.31	21
AFRM8	164	-9.87	2
AFRS8	382	-4.19	8
ARTS8	53	-5.20	6
BIOL8	629	-0.91	16
BUSE8	211	2.27	27
DRAM8	32	-11.49	1
ENGM8	415	-6.01	5
ENGS8	135	-9.68	3
FUNM8	128	0.08	19
GEOG8	351	-1.26	13
HIST8	131	0.10	20
HOME8	158	-2.26	9
MATH8	1021	2.02	25
PHSC8	493	1.55	24
TECD8	233	-8.05	4
TYPG8	472	-4.56	7

Using the Unbiased Mean Total, it can be concluded that mark awarding is most lenient in Speech and Drama Standard Grade while the subject which is most severe in mark awarding is Physical Science Higher Grade. The mean score of each subject has been plotted against its UBMT in Graphs 4.1 (all subjects), 4.2 (higher grade subjects) and 4.3 (standard grade subjects).

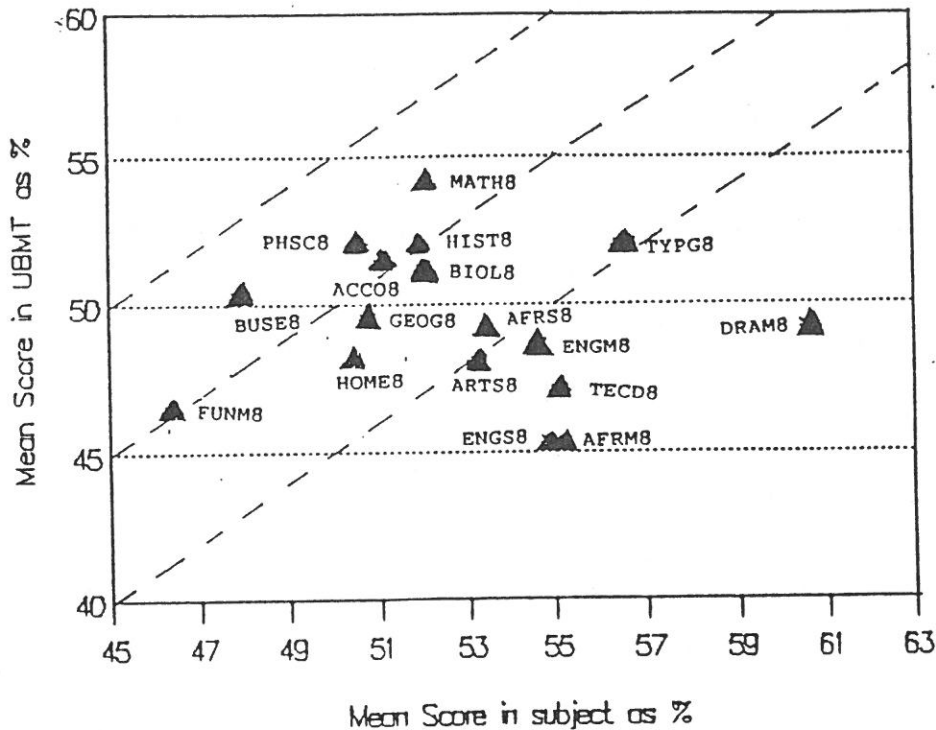
Graph 4.1: Plot of Unbiased Mean Total scores against the mean subject score (as a percentage) of candidates in each subject - higher and standard grade subjects



Graph 4.2: Plot of Unbiased Mean Total scores against the mean subject score (as a percentage) of candidates in each subject - higher grade subjects



Graph 4.3: Plot of Unbiased Mean Total scores against the mean subject score (as a percentage) of candidates in each subject - standard grade subjects



Nuttall et al. (1974) point out that the UBMT has been criticised because, by definition, it does not include the mark scored in the subject under consideration i.e. the UBMT scale is not the same for each subject.

Furthermore, because the Natal Senior Certificate is a group examination, candidates are required to offer four subjects of their choice in addition to the two compulsory languages. Hence quite naturally candidates offer a different mix of subjects. Certain of the matriculation exemption requirements indicate that certain subject combinations lead to matriculation exemption while others do not. In addition, some candidates offer seven or more subjects in their package. Moreover, there is a tendency for candidates in certain subjects to offer other specific subjects e.g. of the 512 candidates in the sample offering PHSC9, 422 also offer MATH9, while of the 706 candidates offering BIOL9

only 306 offer MATH9. Hence in the UBMT calculations of PHSC9 candidates, MATH9 will be taken into account 422 times while in BIOL9 it will only be included 306 times. The fact that MATH9 appears to be a subject in which the awarding of marks is somewhat severe in comparison with other subjects, will affect the UBMT calculation in PHSC9 more dramatically than it will affect the UBMT calculations in BIOL9.

Therefore depending on the subject under consideration, not only is that subject excluded from the calculation of the UBMT but subjects that are common in the calculation of the UBMT are included in different proportions in different subjects. If subject results were strictly comparable, these factors would not be problematic. However consideration of the evidence indicates that subject results are not strictly comparable.

4.2.3 The Aggregate

In the Natal Senior Certificate examination, the aggregate is calculated by adding a candidate's results in First and Second Language, which are compulsory subjects, to the four best results of the other subjects. A minimum aggregate score of 720 is necessary to pass the examination as a whole and an aggregate of 950 is necessary in order to qualify for matriculation exemption.

Other studies in subject comparability have not used the aggregate as a point of comparison. This is in all likelihood because the aggregate does not feature in their certification process. In this particular comparison, the mean score for the subject being analysed and the mean score of the aggregates of all candi-

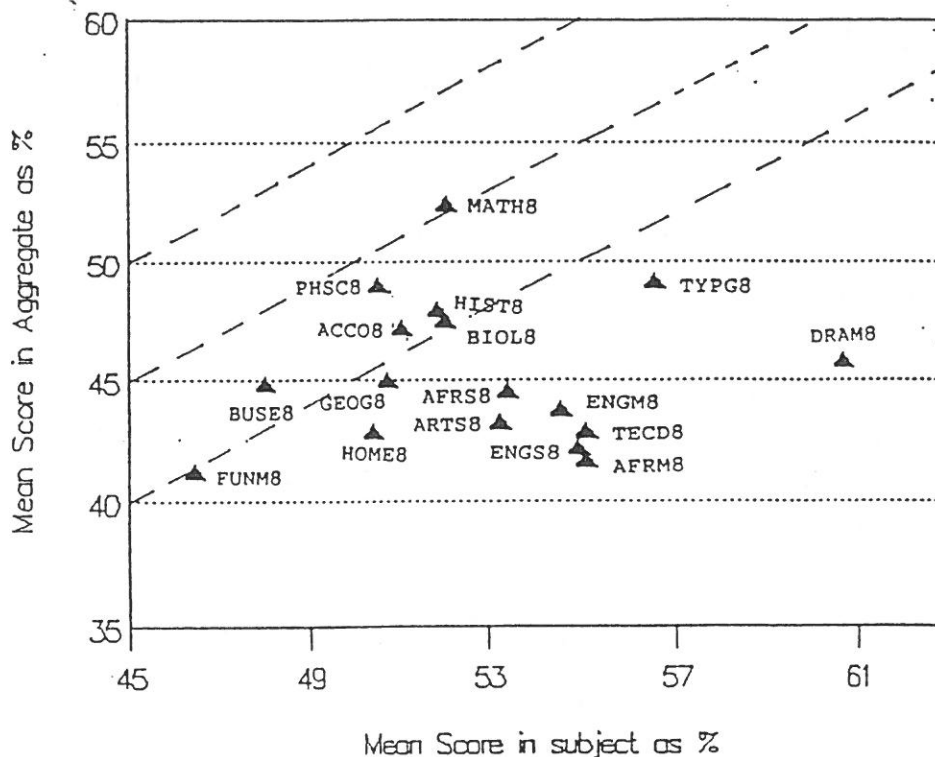
dates taking that specific subject have been calculated. The difficulty measurement in each subject is simply the difference between the subject mean score and the mean aggregate score. These results are set out in Table 14 and are recorded in the tables of results in Appendix E as Aggregate.

Table 14: Difficulty measurements for each subject using the Aggregate as a point of comparison

Subject	Number of candidates	Difficulty measurements	
		Aggregate	Rank
ACCO9	386	5.34	29
AFRM9	420	-1.67	17
AFRS9	1296	2.14	24
ARTS9	150	1.06	22
BIOL9	706	6.74	30
BUSE9	107	2.87	25
DRAM9	105	3.05	27
ENGM9	1277	1.18	23
ENGS9	453	-2.33	16
GEOG9	640	2.98	26
HIST9	310	4.69	28
HOME9	343	-0.48	19
MATH9	572	11.26	31
PHSC9	512	11.37	32
TECD9	229	0.58	21
ACCO8	317	-3.86	14
AFRM8	164	-13.43	2
AFRS8	382	-8.85	7
ARTS8	53	-10.01	6
BIOL8	629	-4.53	12
BUSE8	211	-3.08	15
DRAM8	32	-14.75	1
ENGM8	415	-10.80	5
ENGS8	135	-12.76	3
FUNM8	128	-5.13	11
GEOG8	351	-5.77	10
HIST8	131	-3.93	13
HOME8	158	-7.51	8
MATH8	1021	0.38	20
PHSC8	493	-1.53	18
TECD8	233	-12.16	4
TYPG8	472	-7.30	9

The mean of the subject itself has been plotted against the mean aggregate score in Graphs 5.1 (all subjects), 5.2 (higher grade

Graph 5.3: Plot of mean Aggregate scores against the mean subject score (as a percentage) of candidates in each subject - standard grade subjects



The use of the aggregate as a point of comparison can be criticised on the following grounds. As with the UBMT, subject choice affects the proportions in which subjects are included in the calculation of the mean of the aggregates of subject groups. If subject results were strictly comparable this would not matter. Furthermore, the two official languages, which are compulsory, and the four best results from all other subjects offered by the candidate are used in the calculation of the aggregate. If a candidate offers more than the compulsory six subjects there is a chance, be it small, that the subject under consideration may be excluded in the calculation of his/her aggregate. The questionable differentiation between higher and standard grade results especially in Second Language, further undermines the reliability of the aggregate as a point of comparison.

4.2.4 Comparison of results as calculated using internal evidence from the examination

The difficulty measurements and the ranking of each subject as calculated using the four methods already described have been set out together in Table 15 in order to facilitate comparison of the results.

Table 15: Difficulty measurements for each subject using the Weighted Subject-pairs, the Unweighted Subject-pairs, the Unbiased Mean Total (UBMT) and the Aggregate as points of comparison

Subject	Number of candidates	Difficulty measurements as a percentage:							
		Weighted S-P's Rank		Unweighted S-P's Rank		UBMT Rank		Aggregate Rank	
ACCO9	386	2.40	27	4.50	26	2.50	28	5.34	29
AFRM9	420	-2.01	10	-2.77	9	-1.57	11	-1.67	17
AFRS9	1296	0.67	23	1.22	20	0.45	22	2.14	24
ARTS9	150	-1.44	13	-2.43	10	-1.30	12	1.06	22
BIOL9	706	3.80	30	5.94	28	3.89	30	6.74	30
BUSE9	107	2.73	29	2.34	22	2.91	29	2.87	25
DRAM9	105	-0.99	15	-3.14	8	-0.73	17	3.05	27
ENGM9	1277	-1.30	14	0.40	16	-1.06	15	1.18	23
ENGS9	453	-2.26	9	-2.00	11	-2.05	10	-2.33	16
GEOG9	640	0.60	22	2.61	23	0.63	23	2.98	26
HIST9	310	1.93	25	2.93	24	2.08	26	4.69	28
HOME9	343	-0.75	18	-0.40	15	-0.51	18	-0.48	19
MATH9	572	6.44	31	9.21	29	6.81	31	11.26	31
PHSC9	512	6.69	32	9.55	30	7.15	32	11.37	32
TECD9	229	-1.96	12	-3.33	7	-1.15	14	0.58	21
ACCO8	317	0.11	19	1.00	19	0.31	21	-3.86	14
AFRM8	164	-9.81	2	-10.18	2	-9.87	2	-13.43	2
AFRS8	382	-3.83	8	-7.94	3	-4.19	8	-8.85	7
ARTS8	53	-5.09	6			-5.20	6	-10.01	6
BIOL8	629	-0.87	17	-1.04	12	-0.91	16	-4.53	12
BUSE8	211	2.51	28	3.77	25	2.27	27	-3.08	15
DRAM8	32	-10.94	1			-11.49	1	-14.75	1
ENGM8	415	-6.30	5	-7.71	4	-6.01	5	-10.80	5
ENGS8	135	-8.90	3	-10.45	1	-9.68	3	-12.76	3
FUNM8	128	0.53	21	-0.43	14	0.08	19	-5.13	11
GEOG8	351	-0.92	16	0.65	17	-1.26	13	-5.77	10
HIST8	131	0.47	20	1.43	21	0.10	20	-3.93	13
HOME8	158	-2.01	10	-0.50	13	-2.26	9	-7.51	8
MATH8	1021	2.04	26	4.73	27	2.02	25	0.38	20
PHSC8	493	0.86	24	0.84	18	1.55	24	-1.53	18
TECD8	233	-8.72	4	-7.17	5	-8.05	4	-12.16	4
TYPG8	472	-4.28	7	-4.21	6	-4.56	7	-7.30	9

An examination of the difficulty measurements as calculated using the UBMT and the difficulty measurements calculated using the Aggregate for each subject shows that the higher grade subjects have more severe difficulty measurements with the Aggregate as a point of comparison than with the UBMT as a point of comparison. The standard grade subjects on the other hand, have more lenient difficulty measurements with the Aggregate score as a point of comparison than with the UBMT as a point of comparison. The only subjects which are exceptions are ENGS9 and BUSE9.

An explanation for this could be that candidates who take higher grade subjects tend to take the majority of their subjects on the higher grade while standard grade subjects have candidates who take the majority of their subjects at the standard grade. For example, of the subjects considered in the analyses of MATH9 candidates in the sample, 115 of the 2716 subjects offered by these candidates were offered at standard grade level while in HOME8, 630 of the 697 subjects offered by the sample group were offered at standard grade level. In ENGS9 which deviates from the pattern described, 964 of the 2086 subjects offered by the sample candidates were offered at standard grade level, a substantially higher proportion than in MATH9. In BUSE9, the other exception, 118 of the 512 subjects offered by the sample candidates were offered at standard grade level.

The significance of this phenomenon is in the calculation of the aggregate. In order to calculate the final aggregate symbol (or percentage) the total of marks is divided by 21. Clearly if all

subjects are offered at higher grade the possible maximum is 2300 marks ¹. There is a difference of a possible 200 marks more than the 2100 which is used in the calculation of the aggregate. On the other hand if all subjects were offered on the standard grade the possible subject maximum is only 1800 marks². In the calculation of the UBMT scores, each subject score was reduced to a percentage first, then these were added together and the total was divided by the number of subjects i.e. the UBMT scores were calculated with all subjects reduced to the same scale first. Hence in subjects where candidates tend to do their other subjects at the higher grade, the aggregate scores are higher than UBMT scores while in subjects where candidates tend to take their other subjects at the standard grade, the aggregate scores tend to be lower than the UBMT scores.

An examination of the results in Table 15 indicates that all four points of comparison produce similar results and the rankings of subjects according to their difficulty measurements as calculated using the four different methods are comparable. The ranking of a number of subjects using the aggregate as a point of comparison differs from the ranking produced by the other three methods e.g. ENGM9, and possible reasons for this have already been discussed. The Unweighted Subject-pairs in some cases, also produces a ranking which differs from that produced by other methods. This could possibly result from the fact that the Unweighted Subject-

1. This is calculated as follows: First language HG has a total of 400 + Second language HG which has a total of 300 + 4 subjects at HG each with a total 400 i.e. 1600 leads to a possible maximum of 2300.

2. This is calculated as follows: First language SG has a total of 300 + Second language SG has a total of 300 + 4 subjects at SG each with total 300 i.e. 1200 leads to a possible maximum of 1800.

pairs do not take the number of candidates in a subject-pair into account.

However, there is agreement between all four methods that use internal evidence as points of comparison that MATH9, PHSC9 and BIOL9 are somewhat more severe in their demands while DRAM8, AFRM8, ENGS8 and TECD8 are significantly lenient in comparison with other subjects. In comparison with other standard grade subjects MATH8 and PHSC8 and to a lesser extent BUSE8, are somewhat severe in their demands while, in comparison with other higher grade subjects AFRM9 and ENGS9 and to a lesser extent HOME9, are somewhat lenient in their demands.

4.3 Results: Standard Deviation

The standard deviations for each subject and the standard deviation as calculated using the Weighted Subject-pairs, the Core Skills Test and the Aggregate as points of comparison have been recorded in Table 16. The Weighted Subject-pairs standard deviations (W S-P's Std. Dev.) refer to the pooled estimates of the standard deviations of each subject in the subject-pairs analyses. The Core Skills Test standard deviation (CST Std. Dev.) refers to the standard deviation of a particular subject group in the Core Skills Test and the Aggregate standard deviation refers to the standard deviation of the aggregates of candidates in a particular subject.

Table 16: Standard deviations as calculated for each subject, the CST, the Weighted Subject-pairs and the Aggregate

Subject	Number of candidates	W S-P's Std. Dev.	CST Std. Dev.	Subject Std. Dev.	Aggregate Std. Dev.
ACCO9	386	12.25	12.56	14.74	10.78
AFRM9	420	14.10	13.34	10.42	11.17
AFRS9	1296	13.63	13.41	11.71	12.10
ARTS9	150	13.70	13.33	10.52	10.78
BIOL9	706	12.46	12.53	13.12	10.59
BUSE9	107	12.88	12.55	15.68	10.65
DRAM9	105	13.10	15.17	13.18	12.35
ENGM9	1277	13.68	13.34	10.74	11.80
ENGS9	453	14.44	13.47	11.20	11.53
GEOG9	640	12.64	12.65	11.63	10.51
HIST9	310	13.33	13.63	12.84	11.40
HOME9	343	13.01	11.33	11.51	9.44
MATH9	572	12.81	12.25	15.75	11.13
PHSC9	512	12.90	11.46	15.54	10.88
TECD9	229	13.31	12.59	13.93	10.93
ACCO8	317	14.48	13.10	13.17	7.43
AFRM8	164	18.66	9.37	8.42	5.06
AFRS8	382	15.80	12.40	10.28	6.33
ARTS8	53	17.17	10.46	9.60	6.17
BIOL8	629	14.58	11.27	12.68	6.97
BUSE8	211	14.49	12.04	13.82	6.34
DRAM8	32	14.83	11.63	8.38	5.65
ENGM8	415	16.75	11.54	8.12	6.06
ENGS8	135	18.13	9.42	8.77	5.29
FUNM8	128	16.81	10.65	11.94	4.88
GEOG8	351	15.39	10.69	10.90	6.24
HIST8	131	13.73	11.44	13.21	7.30
HOME8	158	16.27	11.36	10.34	5.09
MATH8	1021	12.44	12.28	18.00	9.45
PHSC8	493	14.41	12.34	13.81	8.61
TECD8	233	17.42	11.04	12.66	5.35
TYPG8	472	13.42	11.00	15.49	8.42

In most subjects, the Weighted Subject-pairs standard deviations for each subject are greater than the Core Skills Test standard deviation. In all subjects the standard deviation of the aggregates is smaller than both the standard deviation of the Weighted Subject-pairs and the Core Skills Test standard deviation. These observations are particularly evident in the standard grade sub-

jects.

In certain standard grade subjects e.g. MATH8 and PHSC8, a significant number of candidates offer many of their other subjects at the higher grade. This phenomenon clearly affects the standard deviation of the aggregates of these subjects. To illustrate this, in MATH8, 59.5% of the candidates take 4 or more subjects at the higher grade and the standard deviation of MATH8 aggregates is 9.45 and while in HOME8 no candidates take 4 or more subjects at the higher grade and the standard deviation of the aggregates is 5.09. Because this phenomenon affects the aggregate standard deviations significantly, the focus of discussion will be on the Core Skills Test standard deviations and the Weighted Subject-pairs standard deviations which appear to resemble the standard deviations of the subjects themselves more closely.

There are some subjects where the subject standard deviation is markedly different from both the Weighted Subject-pairs standard deviation and the Core Skills Test standard deviation of the subject group. Such higher grade subjects are MATH9, PHSC9 and BUSE9, and to a lesser extent ACC09. Among standard grade subjects, ENGM8, DRAM8 and MATH8 fall into this category. Such subjects are at the root of the controversy cited in Chapter 2.¹ The controversy surrounds the opinion that certain subjects should, because of the nature of the subject, have a wider stand-

1. Page 34ff.

ard deviation than others. On the other hand there is the opinion that the requirement for comparability of standards between subjects suggests that the standard deviations for all subjects should be similar.

The Weighted Subject-pairs standard deviations for higher grade subjects are set out in Table 17. Upper and lower confidence limits set at a 99% level of confidence have been calculated for the Weighted Subject-pairs standard deviation in each subject. The standard deviation for each subject group in the Core Skills Test has been compared against these limits.

Table 17: Confidence limits for the Weighted subject-pairs standard deviation in comparison with the CST standard deviation of each subject group: Higher grade subjects

Subject	Number of candidates	W S-P's Std. Dev.	Upper Limit W S-P's	CST Std. Dev.	Lower Limit W S-P's
ACCO9	386	12.25	13.39	12.56	11.11
AFRM9	420	14.10	15.36	13.34	12.84
AFRS9	1296	13.63	14.32	13.41	12.94
ARTS9	150	13.70	15.74	13.33	11.66
BIOL9	706	12.46	13.32	12.53	11.60
BUSE9	107	12.88	15.15	12.55	10.61
DRAM9	105	13.10	15.43	15.17	10.77
ENGM9	1277	13.68	14.38	13.34	12.98
ENGS9	453	14.44	15.68	13.47	13.20
GEOG9	640	12.64	13.55	12.65	11.73
HIST9	310	13.33	14.71	13.63	11.95
HOME9	343	13.01	14.29	11.33	11.73 *
MATH9	572	12.81	13.79	12.25	11.83
PHSC9	512	12.90	13.94	11.46	11.86 *
TECD9	229	13.31	14.91	12.59	11.71

It can be seen that the Core Skills Test standard deviations fall within these limits in almost all the higher grade subjects that have been studied. Exceptions are HOME9 and PHSC9. However it should be noted that the Core Skills Test standard deviations in these two subjects fall just outside the confidence limits. In HOME9 the lower limit for the standard deviation as calculated using the Weighted Subject-pairs standard deviation is 11.73 and the Core Skills Test standard deviation for HOME9 is 11.33. In PHSC9 the lower limit for the Weighted Subject-pairs standard deviation is 11.86 and the Core Skills Test standard deviation for PHSC9 is 11.46. Clearly the differences are small. This suggests that, with respect to the higher grade subjects, a comparison of the subject standard deviation with the standard deviation of candidates of that subject in the Core Skills Test or the Weighted Subject-pairs standard deviation, would yield similar results.

Upper and lower confidence limits set at a 99% level of confidence were calculated for the Core Skills Test standard deviation of each of the higher grade subjects and these were compared with the standard deviation for each subject itself. The results are recorded in Table 18. If the standard deviation of any subject fell outside these confidence limits, the difference between the subject standard deviation and the upper or lower confidence limit (whichever was nearest to the subject standard deviation) was calculated. If the difference is recorded as a positive value, then the subject standard deviation was greater than the upper confidence limit, while a negative value for the difference indicates that the subject standard deviation was below the lower

confidence limit. Clearly a positive value for the difference implies that the subject standard deviation is wider than the Core Skills Test standard deviation while a negative value for the difference implies that the subject standard deviation is narrower than the Core Skills Test standard deviation.

Table 18: Confidence limits for the CST standard deviation of each subject in comparison with the standard deviation in the subject itself (Higher grade subjects)

Subject	Number of candidates	CST Std. Dev.	Upper Limit CST	Subject Std. Dev.	Lower Limit CST	Difference: Subject SD and limit
ACCO9	386	12.56	13.73	14.74	11.39	1.01
AFRM9	420	13.34	14.53	10.42	12.15	-1.73
AFRS9	1296	13.41	14.09	11.71	12.73	-1.02
ARTS9	150	13.33	15.32	10.52	11.34	-0.82
BIOL9	706	12.53	13.39	13.12	11.67	
BUSE9	107	12.55	14.76	15.68	10.34	0.92
DRAM9	105	15.17	17.87	13.18	12.47	
ENGM9	1277	13.34	14.02	10.74	12.66	-1.92
ENGS9	453	13.47	14.62	11.20	12.32	-1.12
GEOG9	640	12.65	13.56	11.63	11.74	-0.11
HIST9	310	13.63	15.04	12.84	12.22	
HOME9	343	11.33	12.45	11.51	10.21	
MATH9	572	12.25	13.18	15.75	11.32	2.57
PHSC9	512	11.46	12.38	15.54	10.54	3.16
TECD9	229	12.59	14.11	13.93	11.07	

A similar process was carried out, using the Weighted Subject-pairs standard deviations as the point of comparison. These results are recorded in Table 19.

Table 19: Confidence limits for the Weighted Subject-pairs standard deviation of each subject in comparison with the standard deviation in the subject itself (Higher grade subjects)

Subject	Number of candidates	W S-P's Std. Dev.	Upper Limit W S-P's	Subject Std. Dev.	Lower Limit W S-P's	Difference: Subject SD and limit
ACCO9	386	12.25	13.39	14.74	11.11	1.35
AFRM9	420	14.10	15.36	10.42	12.84	-2.42
AFRS9	1296	13.63	14.32	11.71	12.94	-1.23
ARTS9	150	13.70	15.74	10.52	11.66	-1.14
BIOL9	706	12.46	13.32	13.12	11.60	
BUSE9	107	12.88	15.15	15.68	10.61	0.53
DRAM9	105	13.10	15.43	13.18	10.77	
ENGM9	1277	13.68	14.38	10.74	12.98	-2.24
ENGS9	453	14.44	15.68	11.20	13.20	-2.00
GEOG9	640	12.64	13.55	11.63	11.73	-0.10
HIST9	310	13.33	14.71	12.84	11.95	
HOME9	343	13.01	14.29	11.51	11.73	-0.22
MATH9	572	12.81	13.79	15.75	11.83	1.96
PHSC9	512	12.90	13.94	15.54	11.86	1.60
TECD9	229	13.31	14.91	13.93	11.71	

It can be seen that the results using the Core Skills Test and the Weighted Subject-pairs as points of comparison produce similar results. It could be argued that in the majority of higher grade subjects, the Core Skills Test standard deviations are more in keeping with the subject standard deviations than the Weighted Subject-pairs standard deviations. MATH9 and PHSC9 are exceptions to this. The fact that the subject standard deviations in MATH9 and PHSC9 are larger than the Core Skills Test standard deviations for the candidates who offer these subjects, indicates that the candidates in these subjects are more homogeneous with respect to their general academic ability than the subject standard deviations suggest, and therefore it can be concluded that the wide subject standard deviations may be unrealistic.

A similar exercise was carried out on standard grade subjects. However the results do not indicate such distinct trends. From Table 16 on page 98 it can be seen that, for standard grade subjects, the Weighted Subject-pairs standard deviations appear somewhat greater than both the Core Skills Test standard deviations and the standard deviations of the Aggregate in each subject. The narrower Core Skills Test standard deviations and Aggregate standard deviations suggest that the standard grade subject groups may be more homogeneous with respect to general academic achievement than the Weighted Subject-pairs standard deviations suggest. Unlike the higher grade subjects, the Core Skills Test standard deviation in each subject differs substantially from the Weighted Subject-pairs standard deviation in most instances.

The Weighted Subject-pairs standard deviations together with upper and lower confidence limits set at a 99% level of confidence and Core Skills Test standard deviations are recorded in Table 20. Subjects in which the Core Skills Test standard deviation falls outside the confidence limits calculated for each Weighted Subject-pairs standard deviation, are marked with an asterisk.

Table 20: Confidence limits for the Weighted Subject-pairs standard deviation in comparison with the CST standard deviation of each subject group (Standard grade subjects)

Subject	Number of candidates	W S-P's Std. Dev.	Upper Limit W S-P's	CST Std. Dev.	Lower Limit W S-P's	
ACCO8	317	14.48	15.96	13.10	13.00	
AFRM8	164	18.66	21.32	9.37	16.00	*
AFRS8	382	15.80	17.27	12.40	14.33	*
ARTS8	53	17.17	21.47	10.46	12.87	*
BIOL8	629	14.58	15.64	11.27	13.52	*
BUSE8	211	14.49	16.31	12.04	12.67	*
DRAM8	32	14.83	19.61	11.63	10.05	
ENGM8	415	16.75	18.25	11.54	15.25	*
ENGS8	135	18.13	20.98	9.42	15.28	*
FUNM8	128	16.81	19.52	10.65	14.10	*
GEOG8	351	15.39	16.89	10.69	13.89	*
HIST8	131	13.73	15.92	11.44	11.54	*
HOME8	158	16.27	18.63	11.36	13.91	*
MATH8	1021	12.44	13.15	12.28	11.73	
PHSC8	493	14.41	15.59	12.34	13.23	*
TECD8	233	17.42	19.50	11.04	15.34	*
TYPG8	472	13.42	14.55	11.00	12.29	*

In some subjects the difference between the Core Skills Test standard deviation and the upper or lower limit of the weighted subject pairs standard deviation is minimal e.g. BUSE8 and HIST8. However in other subjects, the differences are more marked e.g. AFRM8, ENGS8 and TECD8. In view of this it is essential to compare the standard deviation in each subject itself with the Core Skills Test standard deviation and the Weighted Subject-pairs standard deviation of each subject, in order to see which of the two is more closely related to the subject itself.

As with the higher grade subjects, upper and lower confidence limits set at a 99% level of confidence were calculated for the

Core Skills Test standard deviation of each subject and these were compared with the standard deviation for each subject itself. The results are recorded in Table 21.

Table 21: Confidence limits for the CST standard deviation of each subject in comparison with the standard deviation in the subject itself (Standard grade subjects)

Subject	Number of candidates	CST Std. Dev.	Upper Limit CST	Subject Std. Dev.	Lower Limit CST	Difference: Subject SD and limit
ACCO8	317	13.10	14.44	13.17	11.76	
AFRM8	164	9.37	10.70	8.42	8.04	
AFRS8	382	12.40	13.56	10.28	11.24	-0.96
ARTS8	53	10.46	13.08	9.60	7.84	
BIOL8	629	11.27	12.09	12.68	10.45	0.59
BUSE8	211	12.04	13.55	13.82	10.53	0.27
DRAM8	32	11.63	15.38	8.38	7.88	
ENGM8	415	11.54	12.57	8.12	10.51	-2.39
ENGS8	135	9.42	10.90	8.77	7.94	
FUNM8	128	10.65	12.37	11.94	8.93	
GEOG8	351	10.69	11.73	10.90	9.65	
HIST8	131	11.44	13.26	13.21	9.62	
HOME8	158	11.36	13.01	10.34	9.71	
MATH8	1021	12.28	12.98	18.00	11.58	5.02
PHSC8	493	12.34	13.35	13.81	11.33	0.46
TECD8	233	11.04	12.36	12.66	9.72	0.30
TYPG8	472	11.00	11.92	15.49	10.08	3.57

A similar process was carried out, using the Weighted Subject-pairs standard deviations as the point of comparison. These results are recorded in Table 22.

Table 22: Confidence limits for the Weighted Subject-pairs standard deviation of each subject in comparison with the standard deviation in the subject itself (Standard grade subjects)

Subject	Number of candidates	W S-P's Std. Dev.	Upper Limit W S-P's	Subject Std. Dev.	Lower Limit W S-P's	Difference: Subject SD and limit
ACCO8	317	14.48	15.96	13.17	13.00	
AFRM8	164	18.66	21.32	8.42	16.00	-7.58
AFRS8	382	15.80	17.27	10.28	14.33	-4.05
ARTS8	53	17.17	21.47	9.60	12.87	-3.27
BIOL8	629	14.58	15.64	12.68	13.52	-0.84
BUSE8	211	14.49	16.31	13.82	12.67	
DRAM8	32	14.83	19.61	8.38	10.05	-1.67
ENGM8	415	16.75	18.25	8.12	15.25	-7.13
ENGS8	135	18.13	20.98	8.77	15.28	-6.51
FUNM8	128	16.81	19.52	11.94	14.10	-2.16
GEOG8	351	15.39	16.89	10.90	13.89	-2.99
HIST8	131	13.73	15.92	13.21	11.54	
HOME8	158	16.27	18.63	10.34	13.91	-3.57
MATH8	1021	12.44	13.15	18.00	11.73	-4.85
PHSC8	493	14.41	15.59	13.81	13.23	
TECD8	233	17.42	19.50	12.66	15.34	-2.68
TYPG8	472	13.42	14.55	15.49	12.29	0.94

An examination of Tables 21 and 22 reveals clearly that the subject standard deviations and the Core Skills Test standard deviations are more closely related than the subject standard deviations and the Weighted Subject-pairs standard deviations are. In only 8 subjects do the subject standard deviations fall outside the confidence limits of the Core Skills Test standard deviations and in only 3 of the 8 subjects is the difference between the subject standard deviation and the relevant confidence limit greater than one percent. In contrast, in 13 subjects the subject standard deviations fall outside the confidence limits of the Weighted Subject-pairs standard deviations and in 11 of the 13 subjects, the difference is more than one percent.

It is difficult to conclude this discussion of subject comparability by looking at standard deviations of the subjects themselves in comparison with other reference points because of the unresolved debate that surrounds subject comparability and its relation to subject standard deviations. Within the South African context it is essential that there is resolution to the contradiction that exists between those who maintain that different subjects should produce different standard deviations and the demands of an examining system that imply that there should be comparability between results in different subjects and hence that subjects should have similar standard deviations.

Even though this dilemma is as yet unresolved, it is possible to look at methods of comparing standard deviations of different subjects. Of the three methods that were used to provide points of comparison for the subject standard deviations, the Weighted Subject-pairs standard deviations and the Core Skills Test standard deviations are more closely related to the subject standard deviations than the aggregate standard deviations are. These two methods of producing standard deviations as points of comparison indicate that both methods produce similar results for higher grade subjects, and that these results are generally in keeping with the subject standard deviations. However with standard grade subjects, the Core Skills Test standard deviations are generally more in keeping with the subject standard deviations. Both methods, however, produce standard deviations that are somewhat different from the subject standard deviations. If differentiation according to higher and standard grade were to be abandoned, it would be necessary to monitor very carefully the

effect of this on subject standard deviations.

4.4 The assumption of symmetry

The assumption of symmetry as explained in Chapter 2¹ can be extended and generalised to take more than two subjects into account. If one were to consider 6 subjects, the minimum number of subjects that must be offered in the Natal Senior Certificate examination, it is reasonable to expect that in the case of one sixth of the candidates, the mark they score in the first subject will be the highest mark of the six. A sixth of the candidates should have their mark in that particular subject as their second highest mark and so on. Hence for candidates taking a group examination in which the majority of candidates offer six subjects, 16.7% of the candidates offering a particular subject i.e. 1/6th of them, should have their result in that subject as their highest mark, 16.7% should have their result in that subject as their second highest mark and so on until finally 16.7% should have it as their lowest mark. Therefore in order to use the assumption of symmetry to compare marks it is necessary to rank the marks of the six subjects offered, and then count the number of times each subject is assigned each rank. If there are subjects in which the proportions are not equal or at least similar, then one may conclude that there is a difference in standards in comparison with other subjects.

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At first, subjects were ranked according to the total mark in each subject. The subject results of each candidate in all the subjects offered were ranked and then the number of times each subject was assigned each rank was totalled. The results of this process are recorded in Table 23.

Table 23: Percentage of candidates with the subject indicated at the rank indicated - Subject scores not reduced to a percentage before comparison

Subject	Compa- risons	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	4+ subjects at	
								SG	HG
ACCO9	All	19.9	20.5	17.9	18.1	10.4	13.2	1.6	93.5
AFRM9	All	45.0	31.0	16.0	6.2	1.7	0.2	21.9	57.1
AFRS9	All	2.6	5.8	8.6	12.8	18.9	50.9	10.4	80.6
ARTS9	All	20.7	35.3	24.7	12.7	6.0	0.7	4.0	86.0
BIOL9	All	13.0	15.0	26.2	24.8	13.9	7.1	0.6	98.0
BUSE9	All	32.7	19.6	16.8	13.1	10.3	7.5	4.7	71.0
DRAM9	All	23.8	19.0	23.8	16.2	9.5	7.7	1.9	90.5
ENGM9	All	35.7	26.0	16.1	12.5	8.5	1.2	8.6	82.5
ENGS9	All	1.1	9.3	14.3	21.4	24.1	29.8	27.4	53.4
GEOG9	All	24.4	25.2	24.5	14.4	8.8	2.8	2.0	92.2
HIST9	All	15.2	22.6	21.9	20.3	14.5	5.5	0.6	94.5
HOME9	All	37.9	28.9	19.5	9.0	3.5	1.2	18.1	60.3
MATH9	All	9.8	10.1	12.9	20.3	26.6	20.3	0.5	99.1
PHSC9	All	6.6	13.9	13.1	21.5	26.0	18.9	0.2	99.8
TECD9	All	40.2	21.8	16.6	7.0	10.0	4.4	10.0	78.2
ACCO8	All	6.9	12.0	17.4	20.2	20.2	23.3	99.4	0.0
AFRM8	All	28.7	25.6	23.2	12.2	6.7	3.7	60.9	20.2
AFRS8	All	18.5	20.6	15.4	18.8	14.1	12.5	93.2	2.1
ARTS8	All	18.9	20.8	22.6	26.4	5.7	5.7	88.7	3.8
BIOL8	All	6.0	9.0	15.2	23.5	28.3	18.0	56.5	21.4
BUSE8	All	8.1	7.1	14.7	23.2	22.7	24.2	82.5	5.2
DRAM8	All	27.3	24.2	30.3	6.1	12.1	0.0	84.8	12.1
ENGM8	All	17.3	28.6	24.0	16.3	10.1	3.6	93.8	1.2
ENGS8	All	25.2	34.1	15.6	14.8	6.7	3.7	97.8	0.0
FUNM8	All	16.4	10.2	18.8	16.4	10.2	28.1	85.2	1.6
GEOG8	All	8.0	12.8	20.2	21.1	24.2	13.7	80.1	7.7
HIST8	All	5.3	12.1	15.2	16.7	28.0	22.8	61.4	17.4
HOME8	All	10.1	12.0	29.1	20.9	17.7	10.1	98.1	0.0
MATH8	All	4.8	7.1	10.1	12.6	26.6	38.8	28.6	59.5
PHSC8	All	1.6	7.3	12.6	21.9	30.2	26.4	43.0	42.8
TECD8	All	32.2	15.5	18.9	12.9	10.7	9.9	89.3	3.9
TYPG8	All	16.7	14.8	14.0	16.1	18.0	20.5	57.7	24.9

Included in this table is the percentage of candidates within a subject who offered more than 4 subjects at the standard grade and the percentage of candidates within a subject group who offered more than 4 subjects at the higher grade. An examination of these figures indicates that in certain subjects, there is a higher proportion of candidates offering subjects at a different grade. For example, 59.5% of the candidates offering MATH8 offer the majority of their other subjects at the higher grade and 27.4% of ENGS9 candidates offer the majority of their subjects at the standard grade. The South African system of differentiation of subjects into higher, standard and lower grade and the fact that candidates can offer different subjects at different grades does complicate what is seemingly a straight-forward exercise. With respect to the assumption of symmetry, the current system promotes a situation in which the higher grade subjects dominate the top ranks because of their maximum of 400 marks while standard and lower grade subjects dominate the lower ranks because of their maximum of 300 marks. A perusal of the results in Table 23 confirms this.

Notable exceptions occur with Second Language at the higher grade i.e. the results for AFRS9 and ENGS9. These results highlight a further problem which arises because the same maximum i.e. 300 marks, applies at the higher, standard and lower grade in Second Language. It is highly unlikely that a mark in Second Language at the higher grade level will be ranked first since a candidate who takes Second Language at higher grade is likely to be taking most of their other subjects at the higher grade as well. Since

the maximum for these higher grade subjects is 400 marks, it is likely that the mark in Second Language will be lower than the marks in these other subjects.

Furthermore, the higher maximum for higher grade subjects makes it inevitable that the top ranks will be dominated by higher grade subjects, thus obscuring any standard grade subjects that may be over-generous in mark allocation and similarly obscuring any higher grade subjects that may be rather severe in their mark allocation.

It was therefore decided to reduce all marks to percentages and then rank the scores. In this way all subjects are reduced to the same scale before comparison. These results are set out in Table 24.

Table 24: Percentage of candidates with the subject indicated at the rank indicated - All subject scores reduced to a percentage before comparison

Subject	Comparisons	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	4+ subjects at	
								SG	HG
ACCO9	All %	12.7	13.7	16.1	15.8	18.1	23.6	1.6	93.5
AFRM9	All %	6.7	21.2	29.3	21.2	14.0	7.6	21.9	57.1
AFRS9	All %	14.6	14.4	15.3	17.9	17.9	20.0	10.4	80.6
ARTS9	All %	11.3	20.0	21.3	20.7	18.0	8.7	4.0	86.0
BIOL9	All %	6.9	11.5	16.0	21.0	21.2	23.3	0.6	98.0
BUSE9	All %	13.1	15.0	10.3	16.8	20.6	24.3	4.7	71.0
DRAM9	All %	20.0	10.5	18.1	12.4	21.9	17.2	1.9	90.5
ENGM9	All %	13.3	18.9	22.0	21.5	15.9	8.3	8.6	82.5
ENGS9	All %	18.3	21.0	16.1	19.9	14.3	10.4	27.4	53.4
GEOG9	All %	12.7	16.7	21.3	17.3	18.0	14.1	2.0	92.2
HIST9	All %	9.7	17.7	11.0	20.6	21.0	20.0	0.6	94.5
HOME9	All %	15.7	14.3	23.0	19.5	16.3	11.1	18.1	60.3
MATH9	All %	9.1	7.3	9.6	11.4	24.0	38.7	0.5	99.1
PHSC9	All %	5.3	11.7	11.1	13.5	21.5	36.9	0.2	99.8
TECD9	All %	19.7	19.2	19.7	12.2	14.0	15.2	10.0	78.2

Table 24 (cont.)

Subject	Compa- risons	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	4+ subjects at	
								SG	HG
ACCO8	All %	18.3	18.6	15.1	13.6	14.2	20.2	60.9	20.2
AFRM8	All %	29.3	22.6	26.8	11.6	5.5	4.3	99.4	0.0
AFRS8	All %	23.2	21.4	16.2	19.3	9.9	9.9	93.2	2.1
ARTS8	All %	26.4	18.9	24.5	24.5	3.8	1.9	88.7	3.8
BIOL8	All %	17.8	18.3	14.3	16.7	19.5	13.5	56.5	21.4
BUSE8	All %	11.8	11.8	16.1	21.8	16.1	22.3	82.5	5.2
DRAM8	All %	45.5	24.2	15.2	12.1	3.0	0.0	84.8	12.1
ENGM8	All %	21.9	28.6	23.1	16.1	7.0	3.4	93.8	1.2
ENGS8	All %	29.6	32.6	15.6	13.3	5.9	3.0	97.8	0.0
FUNM8	All %	18.8	14.1	15.6	14.1	10.2	27.3	85.2	1.6
GEOG8	All %	19.4	15.1	17.4	19.9	16.5	11.7	80.1	7.7
HIST8	All %	20.5	14.4	11.4	14.4	22.7	16.7	61.4	17.4
HOME8	All %	12.7	17.1	23.4	19.6	17.7	9.5	98.1	0.0
MATH8	All %	22.6	11.5	11.1	8.5	17.1	29.2	28.6	59.5
PHSC8	All %	13.4	17.8	15.4	15.8	19.5	18.1	43.0	42.8
TECD8	All %	37.3	18.5	14.6	9.9	11.2	8.6	89.3	3.9
TYPG8	All %	32.3	17.1	11.0	11.2	13.7	14.6	57.7	24.9

In this instance it will be difficult for higher grade subjects to dominate the top ranks because by definition, standard grade is easier than higher grade and therefore if the marks are reduced to the same scale before comparison, it is likely that if a candidate offers a combination of higher and standard grade subjects, their results in the standard grade subjects are likely to dominate the top ranks. An inspection of the results in Table 24 verifies this.

It was then decided to rank only the higher grade subjects of a candidate and make comparisons between the higher grade subjects separately. Thereafter the standard grade subjects of a candidate could be ranked separately and comparisons could be made between the standard grade subjects. This procedure is complicated by the fact that a substantial number of the candidates in

certain higher grade subjects take the majority of their other subjects at the standard grade. Similarly candidates in certain standard grade subjects take the majority of their other subjects at the higher grade. Therefore, by ranking only the standard grade subjects or only the higher grade subjects, the top ranks in the subjects that fall into these two categories would be oversubscribed. In the case of the higher grade subjects where a substantial number of candidates take the majority of their other subjects at the standard grade, there are only a few higher grade subjects in the package and hence a dominance of the higher ranks. In the case of the standard grade subjects that fall into this category, the subject would be the candidate's only subject at the standard grade and hence the top standard grade mark.

It was therefore decided that in the ranking of standard grade subjects, the number of subjects taken by a candidate at the higher grade should be taken into account. This was done in the following way. If a candidate took five subjects at the higher grade and only one subject on the standard grade, the standard grade ranking for that subject would be 6. Similarly if a candidate took four subjects at the higher grade and two subjects at the standard grade, the higher of the two standard grade marks would be ranked fifth and the second standard grade mark would be ranked sixth. These results are set out in Tables 25 and 26.

Table 25: Percentage of candidates with the subject indicated at the rank indicated - All subject scores reduced to a percentage before comparison and only higher grade subjects compared

Subject	Compa- risons	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	4+ subjects at	
								SG	HG
ACCO9	HG %	21.5	16.1	18.4	25.9	13.2	5.0	1.6	93.5
AFRM9	HG %	24.8	46.9	21.0	5.5	1.2	0.7	21.9	57.1
AFRS9	HG %	29.2	17.9	16.1	17.4	12.0	7.4	10.4	80.6
ARTS9	HG %	22.7	27.3	29.3	10.7	7.3	2.7	4.0	86.0
BIOL9	HG %	11.2	14.7	23.7	30.3	16.6	3.6	0.6	98.0
BUSE9	HG %	30.8	20.6	23.4	19.6	5.6	0.0	4.7	71.0
DRAM9	HG %	24.8	16.2	24.8	16.2	10.5	7.7	1.9	90.5
ENGM9	HG %	26.5	31.9	20.3	12.4	6.2	2.8	8.6	82.5
ENGS9	HG %	49.0	23.2	15.0	7.9	3.5	1.3	27.4	53.4
GEOG9	HG %	21.3	24.8	27.7	18.3	5.8	2.2	2.0	92.2
HIST9	HG %	14.5	21.6	21.9	25.5	11.3	5.2	0.6	94.5
HOME9	HG %	40.2	28.9	24.5	6.1	0.3	0.0	18.1	60.3
MATH9	HG %	10.0	8.6	9.8	15.0	27.8	28.8	0.5	99.1
PHSC9	HG %	6.6	11.9	12.3	16.4	28.1	24.6	0.2	99.8
TECD9	HG %	37.6	23.6	20.5	12.7	3.9	1.7	10.0	78.2

Table 26: Percentage of candidates with the subject indicated at the rank indicated - All subject scores reduced to a percentage before comparison and only standard grade subjects compared

Subject	Compa- risons	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	4+ subjects at	
								SG	HG
ACCO8	SG %	1.6	4.4	10.4	21.8	34.4	27.4	99.4	0.0
AFRM8	SG %	22.0	34.1	25.0	12.2	6.7	0.0	60.9	20.2
AFRS8	SG %	19.6	16.7	17.0	18.3	14.1	14.4	93.2	2.1
ARTS8	SG %	18.9	11.3	24.5	28.3	11.3	5.7	88.7	3.8
BIOL8	SG %	1.0	3.3	7.6	21.0	41.3	25.9	56.5	21.4
BUSE8	SG %	1.9	3.3	13.3	29.4	36.0	16.1	82.5	5.2
DRAM8	SG %	21.2	27.3	21.2	12.1	15.2	3.0	84.8	12.1
ENGM8	SG %	11.3	27.9	26.2	20.0	9.4	5.2	93.8	1.2
ENGS8	SG %	31.1	32.6	14.1	15.6	3.7	3.0	97.8	0.0
FUNM8	SG %	10.9	9.4	20.3	18.0	21.1	20.3	85.2	1.6
GEOG8	SG %	4.0	6.6	17.7	29.6	25.1	17.1	80.1	7.7
HIST8	SG %	2.3	3.8	11.4	21.2	28.0	33.4	61.4	17.4
HOME8	SG %	7.6	13.3	38.6	27.2	9.5	3.8	98.1	0.0
MATH8	SG %	0.1	1.0	1.8	4.9	21.6	70.6	28.6	59.5
PHSC8	SG %	0.2	0.4	5.1	9.7	38.5	46.0	43.0	42.8
TECD8	SG %	19.7	16.3	19.3	19.3	18.0	7.3	89.3	3.9
TYPG8	SG %	5.1	6.8	15.0	17.1	25.2	30.8	57.7	24.9

It is difficult to say categorically that this solution actually overcomes the problem posed by differentiation into higher and standard grade as it applies in the South African examining and certification system. Since the nature of the relationship between grades within a subject and the relationship between subjects in terms of their academic demands is not clear, the only claim that can be made with any certainty is that the implementation of the assumption of symmetry in the differentiated scenario is problematic.

Nevertheless an inspection of Tables 23 to 26 does reveal certain trends with regard to subject comparability. In order to gain some indication of the relationship between subjects, the percentages of candidates in a subject whose score in that subject was ranked in first, second or third place, were added together. These totals were then compared. Those subjects in which this total percentage was greater than 70% are identified as lenient and those in which this total percentage is less than 30% are identified as severe.

Keeping in mind the limitations posed by the process used in the compilation of the results in Table 23, especially with regard to Second Language, it appears that certain higher grade subjects can be identified as lenient. These are AFRM9, ARTS9, TECD9, ENGM9 and HOME9, while MATH9 and PHSC9 could be seen as severe. Standard grade subjects that appear lenient are DRAM8 and AFRM8, while MATH8 and PHSC8 appear to be severe. When marks are reduced to percentages which is the case with results in Table

24, none of the higher grade subjects appear lenient while MATH9 and PHSC9 appear especially severe. Standard grade subjects that appear lenient are DRAM8, AFRM8, ENGS8, and TECD8. None of the standard grade subjects appear severe.

If comparisons are made only between higher grade subjects (Table 25), there are subjects which appear to apply less stringent standards in comparison with other subjects. It seems that HOME9, AFRM9, ENGS9, TECD9, ARTS9, ENGM9 fit into this category while MATH9 and PHSC9 seem to apply rather strict standards. When only the standard grade subjects are compared against each other (Table 26), it seems that ACCO8, BIOL8, BUSE8, HIST8, MATH8 and PHSC8 are more severe, while AFRM8, ENGS8 and DRAM8 are more lenient.

It must be stressed that the terms 'leniency' and 'severity' are used relatively i.e. standards in subjects identified as lenient may in fact be correct but in comparison with standards as represented by mark allocation and hence ranking in other subjects, the standards appear lenient.

4.5 Profile of the subject group

A profile of the candidates offering different subjects was constructed by determining the percentage of candidates within a subject population who:

- o scored 60%+ in the Core Skills Test;
- o scored an aggregate of 60%+ in the Natal Senior Certificate;

- o attained matriculation exemption;
- o offered 7 or more subjects;
- o passed 6 or more subjects on the higher grade;
- o offered a minimum of 5 subjects on the standard grade.

The profiles are recorded in Table 27.

Table 27: Profile of subject groups according to general achievement (ranked according to exemption attainment)

Subject	Number of candidates	Percentage of Subject population:					
		scoring: Aggregate C+	CST C+	Exemption	Offering subjects		
					7+ Subjects	6+ HG	5+ SG
PHSC9	512	78.1	86.1	94.3	26.6	72.3	0.4
MATH9	572	77.8	83.0	91.6	25.9	76.7	0.9
BIOL9	706	62.0	71.1	90.1	13.0	38.8	0.6
HIST9	310	56.1	67.1	85.5	11.0	30.0	0.6
GEOG9	640	47.5	68.6	81.9	8.9	29.4	2.0
DRAM9	105	56.2	64.8	81.9	19.0	38.1	0.0
ACCO9	386	55.2	66.1	80.6	16.6	45.6	1.0
ENGM9	1277	44.5	63.1	70.6	10.6	30.4	3.5
AFRS9	1296	43.4	61.8	68.9	10.6	29.7	5.4
ARTS9	150	43.3	55.3	66.7	6.0	22.0	4.0
TECD9	229	30.6	64.2	59.8	10.5	25.3	7.4
MATH8	1021	21.0	46.4	47.0	1.7	0.5	19.8
HOME9	343	26.5	33.8	46.4	2.3	9.0	8.2
BUSE9	107	29.0	34.6	45.8	4.7	14.0	7.5
AFRM9	420	30.7	41.7	45.4	6.4	16.0	5.0
ENGS9	453	28.7	39.3	42.4	6.2	15.0	11.9
PHSC8	493	9.3	42.6	27.8	2.8	0.2	33.9
TYPG8	473	8.7	16.1	17.8	1.7	0.4	42.3
ACCO8	317	3.2	20.8	13.2	1.3	0.0	44.8
BIOL8	630	3.7	20.6	12.9	0.6	0.0	39.5
HIST8	132	5.3	22.0	12.1	1.5	0.0	38.6
DRAM8	32	0.0	15.2	12.1	0.0	0.0	69.7
GEOG8	351	0.6	17.7	4.4	1.7	0.3	58.1
ARTS8	53	0.0	13.2	3.8	0.0	0.0	77.4
BUSE8	211	0.0	10.0	3.3	0.0	0.0	61.1
TECD8	233	0.4	21.9	2.1	0.9	0.0	76.0
AFRS8	383	0.8	14.4	1.0	0.3	0.0	85.1
FUNM8	128	0.0	14.8	0.0	0.0	0.0	78.9
ENGM8	415	0.7	12.7	0.0	1.0	0.0	86.1
AFRM8	164	0.0	5.5	0.0	0.0	0.0	98.2
ENGS8	135	0.0	4.4	0.0	0.0	0.0	94.8
HOME8	158	0.0	3.8	0.0	0.0	0.0	89.9

By comparing the percentage of candidates in each subject who scored 60%+ in the aggregate or in the Core Skills Test, the percentage who obtained matriculation exemption and the percentage who passed 6 or more subjects on the higher grade, one can see that certain subjects attract candidates of a higher general achievement level. MATH9 and PHSC9 are clearly subject groups that attract high achieving candidates. This is also the case with BIOL9, although less marked. An indication of the motivation of the candidates within a subject can be measured to some extent by the percentage of candidates who have opted to do more than the minimum of six subjects and by the percentage of candidates offering most of their subjects on the standard grade. Again the percentages in MATH9 and PHSC9 indicate that these subjects attract well-motivated candidates. This table also gives an indication that some standard grade subjects attract candidates who display a level of ability that is comparable with the ability level displayed by candidates in certain higher grade subjects. MATH8 illustrates this point well.

4.6 Concluding comments

It is clear from an examination of the results that the application of each method produces some general trends with regard to subject comparability. It would seem that among the higher grade subjects, Physical Science, Mathematics and to a lesser extent Biology can be identified as 'severe' with respect to mark awarding. English Second Language and Afrikaans First Language can be identified as 'lenient'. Among standard grade subjects, Mathematics and Physical Science are again identified as 'severe' and

to a lesser extent Business Economics, while Speech and Drama, English Second Language and Afrikaans First Language are identified as 'lenient'. The consistency of these results over all methods indicates clearly that the awarding of marks across subjects is not consistent.

A closer inspection of the results reveals some of the difficulties of subject comparability e.g. the impact of gender and culture on performance. The implications of language policy and the inclusion of so-called talent subjects in the curriculum are also issues that cannot be ignored. These issues are discussed in more detail in Chapter 5.

Chapter 5

Discussion

5.1. Relevance of the results in the sample study for the full Natal Senior Certificate population

It is appropriate to compare the composition and performance of the candidates in the sample with the full 1992 Natal Senior Certificate population to determine whether the sample differs substantially from the full population. It was also decided to compare the 1992 population with the 1991 and 1990 Natal Senior Certificate populations in order to see whether the 1992 population was unique.

Table 1 of Appendix F shows the percentage of the full 1992 Natal Senior Certificate population and the percentage of the sample population taking specific subjects. With the exception of History Higher Grade (HIST9) and Geography Standard Grade (GEOG8), the percentages of the full Natal Senior Certificate population and the sample population taking specific subjects lie within 3% of each other. HIST9 is under-represented in the sample by 4.1% and GEOG8 is under-represented in the sample by 3.3%.

The full 1992 Natal Senior Certificate population was 51% male and 49% female while in the sample, the gender split is 45% male and 55% female. The full 1992 Natal Senior Certificate population had 76% offering English at first language level i.e. English speakers while 24% offered Afrikaans at first language level

i.e. Afrikaans speakers, while in the sample 74% were English speakers and 26% were Afrikaans speakers. Gender and language as such were not specific variables according to which stratification took place.¹ The gender bias of the sample is more evident than the language bias. Since mark allocation in different subjects does not take account of gender, this bias in the sample should not influence overall comparisons of performance.

Confidence limits at the 99% level of confidence were calculated for the mean scores of the sample candidates in each subject. In only four subjects did the mean score of the full NSC population in that subject fall outside the calculated limits.

Table 28: Confidence limits for the sample mean in each subject compared with the subject mean for the full NSC population in those subjects which fall outside the confidence limits

Subject	Sample Mean	Upper Limit	Full NSC Mean	Lower Limit
AFRS9	57.04	57.88	56.08 *	56.20
GEOG9	57.42	58.61	55.93 *	56.23
BIOL8	52.08	53.38	50.35 *	50.78
TYPG8	56.53	58.37	52.19 *	54.69

In three of the subjects (AFRS9, GEOG9 and BIOL8) the difference between the mean score of the full Natal Senior Certificate population in that subject and the confidence limit boundary was very small. The difference in TYPG8 is slightly larger. The full table of confidence limits is set out in Table 2 of Appen-

1. Pages 41-43 of Chapter 3.

dix F.

Tables 4 and 5 of Appendix F show the difference between difficulty measurements of the full 1992 Natal Senior Certificate population and the sample population in the subjects considered. The points of comparison are the mean aggregate and the mean UBMT for each subject. With the exception of Typing Standard Grade (TYPG8) all difficulty measurements lie within 3% of each other. In fact, in the majority of subjects the difference is less than 2%.

Confidence limits at the 99% level of confidence were calculated for the standard deviations of the sample candidates in each subject. In only two subjects (ARTS9 and FUNM8) did the full population standard deviation fall outside the calculated limits. However the difference between the standard deviation of the full Natal Senior Certificate population and the confidence limit boundary was very small. The upper boundary for ARTS9 was 12.09 and the full Natal Senior Certificate population for ARTS9 had a standard deviation of 12.87. In FUNM8 the upper boundary was 13.87 and the standard deviation of the full Natal Senior Certificate population in FUNM8 was 14.62. The full table of confidence limits is set out in Table 3 of Appendix F.

In view of the consistency between the sample results and the results of the full Natal Senior Certificate population in each subject it would seem reasonable to conclude that the sample results reflect general trends that exist in the full Natal

Senior Certificate population of 1992.

Difficulty measurements in the subjects under consideration, using the mean UBMT and the mean aggregate in each subject group as points of comparison were calculated for the full Natal Senior Certificate population in 1990, 1991 and 1992 and these are set out in Table 6 of Appendix F. There is a consistency in the difficulty measurements of subjects from year to year. There are fluctuations in the difficulty measurements, but these are minimal, and are usually indicative of changes in the norms as laid down for the pre-election Natal Education Department by SAFCERT for the subject under consideration. Changes could also be associated with shifts in the population from one grade to another or from one subject to another. It would seem reasonable to conclude that the full 1992 Natal Senior Certificate results reflect general trends that have existed in the Natal Senior Certificate results over a number of years i.e. there is consistency from year to year.

Appendix D contains the difficulty measurements calculated using six different methods. Although different points of comparison produce different difficulty measurements, all methods produce similar trends. The assumption of symmetry and the profiles of subject groups also reflect similar trends. One expects those methods that use internal evidence to produce similar results but when these results are reflected in methods that use an external reference test as a point of comparison, it becomes clear that these results are not simply a result of chance. Furthermore the consistency of results with respect to differences in subjects as

measured by the UBMT and the aggregate in the sample with the results using the UBMT and aggregate in the full Natal Senior Certificate population suggests that these measurements cannot be attributed completely to sampling error.

It can be concluded that the variety of methods used in the sample study all indicate the same trends with regard to subject comparability. Furthermore, since the sample closely resembles the full Natal Senior Certificate population in composition and performance, one can expect that the trends displayed in the sample also exist in the full population.

In addition, since the performance of the 1992 Natal Senior Certificate population in specific subjects is consistent with the performance of the 1991 and 1990 Natal Senior Certificate populations in these same subjects, it is fair to say that the indicated trends are likely to be present from year to year.

Hence it can be concluded that the sample is sufficiently representative of the full 1992 Natal Senior Certificate population and the 1992 Natal Senior Certificate population is sufficiently similar to 1991 and 1990 Natal Senior Certificate populations to make the findings of the sample study relevant to the full Natal Senior Certificate population over a period of time.

5.2 Difficulty measurements and calibre of candidates

It is appropriate to investigate whether there is a relationship between the difficulty measurements for a subject and the calibre of the candidates taking that subject. The mean of the difficulty measurements calculated using the regression line, the guideline, the Weighted subject-pairs, the Unweighted Subject-pairs excluding subject-pairs with less than 30 candidates, the UBMT and the Aggregate, was calculated for each subject. The mean Core Skills Test score of candidates taking each subject was used as an indicator of the level of academic achievement of those candidates. These are set out in Table 29.

Table 29: Ability of candidates in subject groups as measured by the mean CST score and the mean of difficulty measurements as calculated using the six different methods of comparison

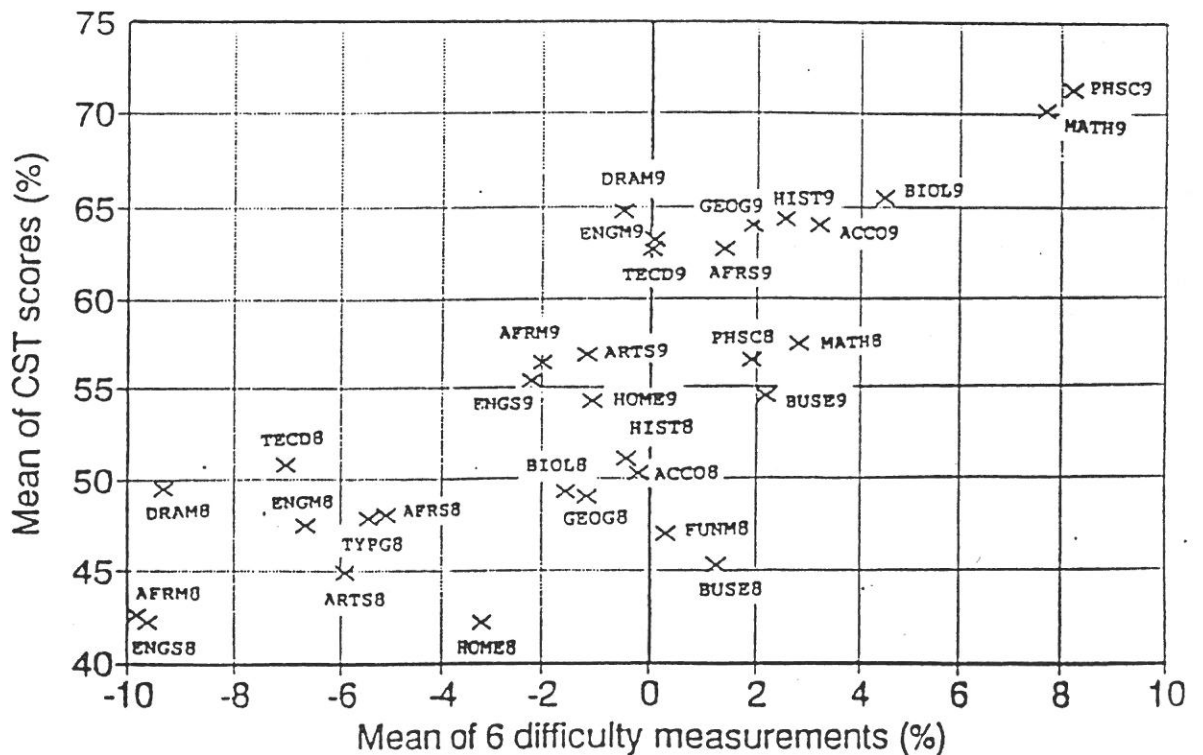
Subject	Number of candidates	CST Mean	Mean difficulty measurement by 6 methods
ACCO9	386	64,00	3,19
AFRM9	420	56,35	-1,99
AFRS9	1296	62,68	1,39
ARTS9	150	56,93	-1,12
BIOL9	706	65,45	4,46
BUSE9	107	54,52	2,17
DRAM9	105	64,80	-0,49
ENGM9	1277	63,16	0,09
ENGS9	453	55,43	-2,20
GEOG9	640	64,04	1,92
HIST9	310	64,28	2,53
HOME9	343	54,17	-1,02
MATH9	572	70,16	7,70
PHSC9	512	71,29	8,22
TECD9	229	62,70	0,05

Table 29 (cont.)

Subject	Number of candidates	CST Mean	Mean difficulty measurement by 6 methods
ACCO8	317	50,27	-0,19
AFRM8	164	42,63	-9,81
AFRS8	382	48,02	-5,13
ARTS8	53	44,93	-5,91
BIOL8	629	49,26	-1,53
BUSE8	211	45,56	1,26
DRAM8	32	49,47	-9,31
ENGM8	415	47,35	-6,65
ENGS8	135	42,18	-9,60
FUNM8	128	46,98	0,33
GEOG8	351	49,07	-1,13
HIST8	131	51,09	-0,41
HOME8	158	42,17	-3,18
MATH8	1021	57,52	2,81
PHSC8	493	56,47	1,89
TECD8	233	50,78	-7,03
TYPG8	472	47,79	-5,47

The values in this table have been plotted in Graph 6.

Graph 6: Plot of mean CST scores against the mean (as a percentage) of difficulty measurements using six methods of comparison for candidates in each subject - higher and standard grade subjects



From Table 29 and the accompanying graph, it is clear that there is a tendency for subjects in which there are high positive difficulty measurements to be those subjects in which candidates display a high level of general ability e.g. MATH9, PHSC9 and to a lesser extent BIOL9, and subjects in which there are high negative difficulty measurements to be those subjects in which candidates do not display a high level of general ability as measured by the Core Skills Test.

This trend was also observed by Nuttall et al. who stated the following:

.. there is clearly a tendency for high severities to be associated with high abilities (for example, chemistry, physics and French), and for low severities to be associated with low abilities (for example, English language and art). (1974: 67)

One could suggest possible reasons for this. It could be claimed that subjects like Mathematics, Physical Science and Biology are intrinsically more difficult and therefore are only taken by candidates who are generally higher achievers and avoided by others. It could be that examiners tend to examine according to the users of the examination i.e. the candidates and tertiary education institutions, and not necessarily against independent criteria. For example, because Physical Science attracts the higher achievers who are expected to go on to further study, examiners examine accordingly. What is clear is that this trend exists and the reasons for it cannot be established from the research data. This is an area that could be investigated in more depth in a separate study.

5.3 Gender and Culture

In Chapter 2¹ it was pointed out that more boys tend to choose certain subjects for study than girls and vice versa. There is also evidence to suggest that the choice of grade in certain subjects may be associated with gender. It was decided to scrutinise a small number of subjects to see whether there is an identifiable connection between the factors of gender and subject choice and performance.

It has been pointed out that the participants in this study came from the white population in the pre-election Natal Education Department and are largely part of the English- or Afrikaans-speaking sectors of the population. There is an assumption that English and Afrikaans speakers in general reflect somewhat different cultures. Therefore when a reference is made to differences in performance between language groups, there is the implication that culture rather than purely language is the variable at play. It was felt that the affect of culture on entry patterns should also be looked at. Do more English speakers tend to choose certain subjects for study than Afrikaans speakers? An English speaker is defined within the context of this study as someone who is offering English as their first language in the Natal Senior Certificate examination and an Afrikaans speaker is defined as someone who is offering Afrikaans as their first language in the Natal Senior Certificate examination. The observations within these subjects are set out in Table 30.

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Table 30: Subject entry patterns according to gender and first language, higher and standard grade together, expressed as percentages of the full NSC population 1992 and of the sample

	NSC Male	Female	Sample Male	Female
Full	51	49	45	55
MATH	58	42	52	48
PHSC	74	26	69	31
PHSC9	68	32	62	38
PHSC8	81	19	75	25
BIOL	32	68	26	74
ENGM9	48	52	41	59
ENGM8	60	40	54	46
AFRM9	45	55	45	55
AFRM8	59	41	51	49
	NSC Eng.	Afrik.	Sample Eng.	Afrik.
Full	76	24	74	26
MATH	80	20	81	19
PHSC	79	21	77	23
PHSC9	85	15	83	17
PHSC8	73	27	71	29
BIOL	78	22	80	20
BIOL9	88	12	87	13
BIOL8	75	25	72	28
ACCO	69	31	68	32
ACCO9	74	26	75	25
ACCO8	63	37	60	40
BUSE	37	63	39	61

It would seem that Mathematics and Physical Science are subjects that attract a greater number of boys while girls prefer Biology. Furthermore in the subjects that have been chosen for consideration, girls tend to opt for higher grade while boys tend to opt for standard grade. It would seem that more English speakers than Afrikaans speakers choose the science-oriented subjects (MATH, PHSC and BIOL) while more Afrikaans speakers choose the commercial subjects (BUSE and ACCO) than English speakers.

Furthermore in the subjects that have been chosen for consideration, English speakers tend to opt for higher grade while Afrikaans speakers tend to opt for standard grade.

Table 31 gives an indication of differences in performance according to gender and language group in certain subjects. As with subject entry patterns, only a small number of subjects have been isolated for closer scrutiny.

Table 31: Subject performance and difficulty measurements, expressed as percentages, calculated using the aggregate and the UBMT as points of comparison, in the full NSC population of 1992 and the sample, according to gender and first language

	Full NSC population 1992:						Sample:					
	Male			Female			Male			Female		
Aggregate	53.0			55.4			53.3			55.9		
CST	--			--			59.0			56.1		
Subject	Difficulty			Difficulty			Difficulty			Difficulty		
	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT
MATH9	59.2	8.7	3.4	57.5	12.2	7.9	57.6	9.5	4.4	56.6	12.9	8.4
PHSC9	57.3	9.2	4.8	55.2	15.1	11.2	56.8	9.3	5.2	56.5	14.8	10.5
ENGM9	55.8	2.7	0.4	60.3	-0.9	-3.3	55.5	3.7	1.5	60.7	-0.5	-2.7
AFRM9	56.0	0.0	-0.7	59.4	-2.9	-3.1	54.9	0.5	1.1	59.2	-3.1	-3.2
	Full NSC population 1992:						Sample:					
	English			Afrikaans			English			Afrikaans		
Aggregate	54.8			51.7			55.8			51.7		
CST	--			--			59.2			52.3		
Subject	Difficulty			Difficulty			Difficulty			Difficulty		
	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT	Subject measurement	Mean	Agg. UBMT
MATH9	59.2	9.5	4.3	55.2	13.3	9.9	58.2	10.6	5.7	52.4	14.2	11.6
PHSC9	56.8	10.7	6.3	56.0	13.1	9.4	57.4	10.7	6.2	53.3	14.7	11.7
BUSE9	52.4	2.9	2.2	57.3	0.9	0.0	49.5	3.6	4.5	55.5	2.9	1.5

Nuttall et al. (1974) examined the relationship between subject comparability and gender in some detail. They found sufficient evidence to conclude that there were considerable differences in performance in different subjects between the sexes. Furthermore they identified English language and literature and French as subjects in which difficulty measurements are lower for girls than for boys and physics, chemistry and mathematics as subjects in which difficulty measurements are lower for boys than for girls. Looking at the difficulty measurements for boys and girls in First Language and MATH9 and PHSC9 in Table 31, it is clear that a similar trend exists with the Natal Senior Certificate candidates.

Performance in PHSC9 and MATH9 does not appear to differ dramatically between the sexes. In PHSC9 the mean percentage score of the boys was 57.3% while the score of the girls was 55.2%. In MATH9 the mean score for the boys was 59.2% while the mean score for the girls was 57.5%. However one must remember that 68% of the PHSC9 population were boys and only 32% were girls. In view of this, it is likely that these girls were high achievers. This is verified by the fact that their mean aggregate was 70.3% while the mean aggregate for the PHSC9 boys was 66.5%. 59% of the MATH9 population were boys while only 41% were girls. Again these appear to be high achievers in that their mean aggregate was 69.7% while the mean aggregate for the boys was 67.9%. The achievement of girls in First Language at the higher grade is comparatively high even though the overall performance of boys and girls as measured by their aggregates is comparable. The mean aggregate of the boys taking First Language at the higher

grade was 58.5% while it was 59.4% for the girls.

It is interesting to compare the mean aggregate scores and the mean Core Skills Test scores for boys and girls. The mean aggregate score in the Natal Senior Certificate for boys was 53.3% while for girls it was 55.9%. The mean Core Skills Test score for the boys in the sample was 59% while for girls it was 56.1%. Should the conclusion be drawn that the Natal Senior Certificate is biased in favour of girls, hence their higher aggregate mean, or is it that the Core Skills Test is biased in favour of boys? Looking at differences in performance between English and Afrikaans speakers, similar debates surrounding the question of culture bias can be raised.

This is by no means a complete analysis but it does serve to illustrate the point that comparisons between subjects are not uniform but are affected by other factors, namely gender and culture. A subject which appears severe or lenient may not be as severe or lenient if just one gender group or one language group is considered. This raises the point again that the subjects chosen for analysis as well as the Core Skills Test may be gender and/or culture biased and hence produce differences in performance. This is clearly an area that needs further research before any conclusions can be drawn. What is clear is that bias in testing is a real issue and cannot be ignored in decision making with regard to national assessment policy.

Nuttall et al., in discussing the implications of differences in

performance between the two sexes in certain subjects, raise the following important debate: 'Which is preferable: identical treatment of the sexes as regards examinations, as at present, or equivalence between standards in different subjects for each sex separately (remembering that one cannot have both)?' (1974: 91)

This is an important debate with serious considerations on both sides. When this debate extends to language groups which often reflect different cultures, the debate takes on even greater significance in the multi-cultural environment of South Africa with its record of unequal provision of educational resources. As the examining authorities lose their racial definition, the question of cultural bias in education in general and in assessment in particular becomes a very real issue.

5.4 Talent subjects

Petch pointed out the following:

.. the fact has to be faced that there is no ultimate criterion of the comparative difficulty of different subjects ... Comparison of a performance in, say, History or Mathematics must be based on empirical procedures; essentially the performances are disparate. (1953: 151)

This point is even more relevant when attempting comparisons between subjects that are associated with particular practical talents e.g. Art, Speech and Drama and Music in comparison with subjects that can more loosely be described as academic.

Calitz (1993) makes it clear that it is a moot point whether

standards in certain subjects identified as 'talent' subjects e.g. Art (ARTS9 and ARTS8) and Speech and Drama (DRAM9 and DRAM8) are too low in comparison with other more academic subjects and for this reason, the percentages of candidates with scores in these subjects as their first, second or third highest mark are high. Furthermore, achievement in these subjects need not necessarily correspond with achievement in other subjects because these are talent subjects and hence are chosen only by those candidates who display talent in the field and therefore one can expect that they score highly in these subjects.

It could be argued however, that the nature of the difference in performance between each of the talent subjects and the so-called academic subjects should be comparable to a certain extent. In other words, in a system that assumes subject comparability, one can expect the difference in performance in Art and the academic subjects to be similar to the difference between Drama and the academic subjects. One could also claim that at the higher grade level these subjects have a substantial theory component which should reflect academic skills and hence results in these subjects should not be substantially different from the results of these candidates in their other subjects.

5.5 Languages

Looking at the difficulty measurements for the compulsory languages at both first and second level as well as at higher and standard grade, the different methods of comparison produce

similar results i.e. ENGS9 and AFRM9 are consistently the most lenient higher grade subjects and ENGS8 and AFRM8 are among the three most lenient standard grade subjects; ENGM9 and AFRS9 are consistently more severe than AFRM9 and ENGS9, and ENGM8 and AFRS8 are consistently more severe than AFRM8 and ENGS8.

One might expect candidates to show greater proficiency in mother-tongue than in other subjects. This expectation however contradicts the assumption of comparability that each subject should make the same demands as any other subject and this should be determined by what the average 17 year-old should be expected to know or be able to do. Since First Language is compulsory for all candidates, one can argue that if demands in First Language are lenient, all candidates receive the benefit of that apparent lenience. However, even though both English and Afrikaans First Language appear lenient, it would seem that standards applied in these subjects are not comparable. In a system that assumes comparability it is unfair if results in one compulsory language are not comparable with results in another compulsory language i.e. the demands of AFRM9 should be the same as the demands of ENGM9 and AFRM8 should be comparable with ENGM8. The inclusion of African languages as First Language options only makes this situation more complex since as yet, no African language is the language of instruction at this level for any black learner in South Africa. Hence using results in tests or examinations taken in English, to compare performance of mother-tongue Zulu speakers in Zulu with the performance of

mother-tongue English speakers in English poses some interesting ethical questions.

A similar picture emerges in the second language scenario where it seems that English Second Language is less severe in grading than Afrikaans Second Language. Clearly since Second Language is compulsory for all candidates, it is unfair if demands in one of the Second Language courses are more severe than in the other.

The problem of bias in the whole examination situation cannot be discounted but a situation in which subjects of equivalent status and nature appear to have differing standards in a system that assumes comparability is problematic.

The implications of a lack of comparability in examining standards in First Language were clearly illustrated in the report on the Std 7 Examination Project in KwaZulu-Natal (Struckmann et al., 1995). One of the debates in subject comparability and language examining, raised in that report, centres around the relationship between proficiency in mother-tongue and environment. On the one hand there is the opinion that the proficiency of one group of learners in its mother-tongue is comparable with the proficiency of another group in its mother-tongue. For example mother-tongue Zulu speakers living in the Eastern Cape, are as proficient in Zulu as mother-tongue Xhosa speakers living in the Eastern Cape because both groups are speaking their mother-tongue, regardless of where they are living. If this is the case,

then if one were to give an examination paper in Zulu First Language to a group of Zulu mother-tongue learners and an examination paper in Xhosa First Language to a comparable group of Xhosa mother-tongue learners, one would expect the means of the two groups to be more or less comparable and the symbol distributions to be more or less comparable. If they are not then one would be tempted to conclude that the differences in the symbol distributions and means and standard deviations are due to a difference in standards being applied in the two examination papers.

On the other hand there is the opinion that the proficiency of one group of learners in its mother-tongue is not necessarily comparable with the proficiency of another group in its mother-tongue. Proponents of this view would argue that the environment within which the learners find themselves will affect their proficiency in the mother-tongue. For example mother-tongue Zulu speakers, living in the Eastern Cape, would not be as proficient in Zulu as mother-tongue Xhosa speakers living in the Eastern Cape simply because their exposure to Zulu in the Eastern Cape is limited in comparison with the exposure of Xhosa children living in the Eastern Cape to Xhosa. If this is the case, then one would expect the means of the two groups and the symbol distributions to differ.

In the interests of equity it is reasonable to assume that one of the duties of those running an examination system is

to ensure that no candidate is advantaged or disadvantaged unduly in comparison with his peers as a result of subject choice. The implications of First Language examining for those running an examination system are profound and engaging in this debate is critical. In any high stakes examining situation, the necessity of ensuring comparability between subjects, and particularly compulsory subjects as is the case with First Language, cannot be ignored.

5.6 The use of an external reference test and the use of internal evidence as points of comparison

The fundamental debate in subject comparability surrounds the question of what the relationship between different subjects is. There are those who believe that subjects are intrinsically different, producing in particular different shapes in their distributions. On the other hand there are those who believe that subject results ought to be comparable. Demands made on candidates in one subject should not be greater than demands made on candidates in another subject. This further implies that the shapes of distributions should be the same, since it should not be easier to score a very high mark in one subject than in another and similarly it should not be more difficult to pass one subject than another. It seems that this debate is unresolved among educationists.

The area of subject comparability is one that has not enjoyed wide-spread attention in the past. The subject-based item bank test experiments that are currently being carried out in

South Africa, attempt to address the issue of comparability across examining authorities and comparability from year to year within a subject. However, by their very nature of being based within a subject, they do not in themselves address subject comparability. The employment of subject-pairs analyses on the results in a number of subject-based item bank tests may go some way to address the issue. However, the validity of the results of South African subject-based item bank tests as indicators of achievement has been questioned (Brown, 1990; Oberholzer and Brown, 1994). Clearly, if there is doubt about the validity of results obtained in one or more of the tests that make up points of reference in a subject-pairs analysis, the validity of the subject-pairs analysis itself comes into question.

Furthermore, one of the assumptions of the subject-pairs analysis is that the shapes of the distributions of results in a pair of subjects should be similar. If one is prepared to accept that certain subjects by nature should have different spreads from other subjects, then attempts at artificially making the spreads the same are problematic in that the initial assumption is contradicted. In addition, if one of the fundamental assumptions underlying the subject-pairs analysis is not met, its use as a mechanism for standardising becomes questionable.

In keeping with the accepted theory that general intelligence co-exists with separate independent abilities, it seems reasonable to suggest that the monitoring of results in separate examina-

tions in specific subjects against results in a general test of scholastic core skills is an acceptable means of addressing the problem. It relates performance within different subjects to an independent point of comparison namely a test of core skills which reflects general developed ability.

In the South African system where there are a number of examining boards, one will need to consider monitoring performance within the different boards. It was suggested that there should be a single national examination for all candidates at Standard 10 level. However, the validity and sensibility of such a move in South Africa has been questioned (Oberholzer, 1994).

The use of an external reference test does not only allow for comparisons of performance between subjects within a board but it also allows for comparisons of performance across boards. Research by Nuttall (1971) and Skurnik (1974) has shown that an external reference test is of value in investigations that go beyond the boundaries of one examining authority.

If one were to use an external reference test to set the consensus standard against which performance is measured one is making the assumption that the reference test is assessing the desired outcomes of education, that these outcomes are measurable and that the test is free of bias, both cultural and gender. Furthermore one is assuming that the ultimate standards in education are embraced in the test since performance within subjects and if desired, across boards is set against this backdrop.

Clearly, the structure and assessment techniques of the test and the identification of the 'essential' skills in education will be at the centre of much debate. In essence the debate is about the centralisation of education and assessment since, in such a system, if one subject develops skills other than those that are measured in the reference test, these skills are lost in the comparison process. If the reference test is assessing across examining boards, the value of any approaches or attitudes that differ from those assumed by the reference test are also lost.

The use of an external reference test is criticised by Nuttall et al. (1974) on economic grounds. However, if it is used as in Queensland, Australia, as the only external examination, costs for external examining are somewhat diminished since subject examining is school-based.

Nuttall et al. conclude that methods employing internal evidence are preferable to an external reference test both on theoretical and economic grounds. If one were working within a single examining board in which separate subjects were being examined externally, one could not argue against the validity of this statement since with the use of the computer, subject-pairs analyses and the attending summary indicators could be easily calculated.

5.7 The implications of mark adjustment to address subject comparability

It must be noted that the issue of subject comparability cannot be looked at in isolation. Nuttall et al. point out that adjustments 'in different subjects to achieve subject comparability has ramifications for other aspects of comparability.' (1974: 87). Using an example from the current study, if in 1992 adjustments as suggested by the guideline method¹ were made, there would be some dramatic changes in the final results e.g. the mean in MATH 9 would go up by 8% and the mean in MATH 8 would go up by 5%, the mean in PHSC 9 would go up by 9% and PHSC 8 would go up by 6%, the mean in TYPG 8 would drop by 5 to 6%. Clearly there would be a greater number of candidates passing Mathematics and Physical Science i.e. it would be far easier to obtain a pass in these subjects in 1993 than it had been in previous years. Similarly there would be a greater number of failures in Typing in 1993 i.e. it would be more difficult to pass this subject in 1993 than it had been previously.

1. The severity and leniency measurements calculated by this method are set out on pages 65 - 68.

Chapter 6

Conclusions, recommendations and concluding remarks

6.1 Conclusions and recommendations

6.1.1 The current system of certification in South Africa at the Senior Certificate level is based on the assumption that results in different subjects are comparable.

If one examines the difficulty measurements produced using the regression method and the guideline method i.e. using an external reference test and those produced using the Unweighted Subject-pairs, the Weighted Subject-pairs, the UBMT and the Aggregate i.e. using internal evidence from the examination itself, and also the trends indicated using the assumption of symmetry and the subject profiles, one can see a great similarity in the results. The actual difficulty measurements vary from method to method, but the subjects identified as 'lenient' and 'severe' using the different methods are markedly similar.

Among the higher grade subjects, Physical Science and Mathematics and to a lesser extent Biology can be identified as 'severe'. English Second Language and Afrikaans First Language can be identified as 'lenient'. Among standard grade subjects, Mathematics and Physical Science can again be identified as 'severe' and to a lesser extent Business Economics, while Speech and Drama, English Second Language and Afrikaans First

Language can be identified as 'lenient'. The consistency of these results over all methods indicates clearly that the awarding of marks across subjects is not consistent. Furthermore these differences lead to the conclusion that the current system of standardisation, controlled by SAFCERT through the determination of subject norms using the 5-year history of an examining body's performance within that subject, does not ensure that valid comparisons can be made between results in different subjects in the same year within an examining board.

If certification in South Africa continues to assume equivalence between results in different subjects, it is essential that a reliable and valid point of reference is found against which performance in different subjects can be measured. All methods considered produce similar trends and therefore any one, but preferably a framework for mark analysis, should be set up within all examining authorities to address the issue of subject comparability in addition to other aspects of standardisation. A framework making use of a number of methods is recommended because, as Forrest and Vickerman (1982) correctly claim:

.. it would be an over-simplification of the processes involved to suggest that a single factor, such as the previous year's subject-pairs comparisons and the observations of a Subject Committee on them, could over-ride the whole range of evidence and judgements involved. (1982: 27)

It is therefore strongly recommended that SAFCERT or its equivalent in the new education dispensation, set as one of the criteria that must be met by a body who wishes to be recognised as an examining authority, the establishment of a mark analysis framework to address this particular issue of comparability.

6.1.2 It is apparent from the results obtained using the different methods of subject comparability that the differences in the marks awarded at the higher grade and at the standard grade within a subject do not adequately address the difference in difficulty level. All methods applied to the data indicate that at the standard grade level mark awarding is lenient in comparison with mark awarding at the higher grade level. This situation is highlighted particularly in the case of Second Language study where the attempt at quantifying the difference between higher and standard grade is absent i.e. in all subjects with the exception of English and Afrikaans Second Language the mark maximum at the higher grade is 400 marks while the maximum for standard grade is 300 marks.

It is also apparent that certain standard grade subjects attract learners who are higher achievers than certain higher grade subjects. Mathematics and Physical Science at the standard grade are subjects in which the candidates performed better in the Core Skills Test than candidates offering Home Economics or Business

Economics at the higher grade. These observations suggest that the current system of differentiation compounds an already complex issue of comparability.

It is therefore imperative that in the short term Second Language Higher Grade be allocated a maximum of 400 marks to bring them into line with all the other higher grade subjects. In the long term it is recommended that the current system of differentiation be reviewed.

6.1.3 The complex nature of South African society is reflected in the number of official languages. The implications of this for subject comparability cannot be ignored and in the interests of equity it is essential that the debates surrounding language examining and issues of subject comparability be engaged in and resolved.

6.1.4 If the South African examination system continues to have a number of different boards conducting external examinations, it will be necessary for the national body responsible for the setting of national norms and standards, to put in place some mechanisms for monitoring standards in the different boards. Since comparisons between boards can only be made if a common measuring instrument is applied in all boards, and since the use of a Core Skills Test can also address the

issue of subject comparability as this study has shown, it is recommended that the potential of such a test in the South African situation be further researched.

6.1.5 The current system of standardisation does not include the examiners or subject committees of the examining boards in its processes of determining norms for the different subjects. The exclusion of examiners from the process of standardisation and hence their limited exposure to the wider issues of comparability is limiting and hence not desirable. In fact, the current process is ethically questionable. Examiners ought to be included in the standardisation process in order that they may become aware of broader issues and through their understanding of these issues, adapt their examining in an effort to address some of the more pressing issues. Furthermore, their experience and first-hand knowledge of how current candidates fared in the examination paper itself can contribute valuable information into debates surrounding the adjustment of marks. It is therefore recommended that examining authorities be encouraged to establish structures whereby the examiners and subject marking committees can be consulted about mark adjustments.

6.1.6 None of the methods indicates the reasons for the differences in the difficulty measurements.

Differences may result from factors other than marking

and standards demanded by examiners. These include the motivation and interest of candidates, the preparation of candidates for the examination, the provisioning of schools, and the gender and culture bias within an examination.

It would have been sensible to recommend that further research into the reasons why some subjects appear consistently to be severe while others are consistently lenient be undertaken. However, since the pre-election Natal Education Department will not be conducting examinations after 1995, research using the data of this thesis will be inappropriate. If on the other hand similar trends persist in the examination results of the new KwaZulu-Natal Department of Education, it is recommended that the reasons for this should be investigated.

6.1.7 A study of the results of comparisons using the variety of methods explored in the research reveals that results in respect of subject comparability produced using a Core Skills Test as a point of comparison are similar to results produced by other methods.

Furthermore if comparison of results across different examining boards is desirable, the external reference test could serve both purposes.

It is therefore recommended that SAFCERT or its equivalent in the new education dispensation, investigate alternatives to the subject-based itembank tests as a method of comparing results from different examining authorities and more specifically investigate the possibility of a Core Skills Test as is used in Queensland, Australia and how the principle could be applied in national monitoring of results in South Africa.

6.1.8 Of the three methods that were used to provide points of comparison for the subject standard deviations, the standard deviations produced by the Weighted Subject-pairs and those produced by the Core Skills Test correlated more closely with the subject standard deviations than the aggregate standard deviations did. The former two methods produced similar results for higher grade subjects and furthermore, these results were generally more in keeping with the subject standard deviations. However with respect to standard grade subjects, the Core Skills Test standard deviations were generally more in keeping with the subject standard deviations. Nonetheless both methods produced standard deviations as points of comparison that were somewhat different from the subject standard deviations. If differentiation by grades were to disappear, it would be necessary to monitor very carefully the effect of such a move on subject standard deviations.

6.1.9 The sample is sufficiently representative of the full

1992 Natal Senior Certificate population, the results of the sample candidates in their examination are sufficiently similar to the results of the full 1992 Natal Senior Certificate population, and the results of the full 1992 Natal Senior Certificate population are sufficiently similar to the 1991 and 1990 Natal Senior Certificate results, to make the findings of the research with respect to the sample candidates relevant for the full Natal Senior Certificate population over a period of time.

- 6.1.10 Subjects that have high positive difficulty measurements are also those subjects that attract high achievers.

It is recommended that curriculum developers and examiners critically examine their practice in these subjects in an effort to determine what the reasons for this could be. The current situation is unfair and in the interests of equity for all candidates it is essential that this situation be rectified.

- 6.1.11 There are distinct entry patterns in certain subjects and at certain grades associated with gender and culture and there is evidence that there are differences in performance within subjects that are associated with gender and culture.

It is recommended that the reasons for the differences in attitudes and performance be investigated. With the arrival of single examining authorities that will cater for a multi-cultural population, the issues of cultural bias in examinations take on even greater importance than they have done in the past.

6.2 Concluding remarks

It is plain that the question of subject comparability is a complex one. No matter which method is adopted in an effort to address the problem, its validity and reliability will be debated. There will even be debate about whether it is a realistic endeavour to attempt comparisons between subjects. Whether or not it is deemed appropriate or desirable to compare results in different subjects, the reality of the current system of certification in South Africa, in which subject comparability is assumed, indicates that it is essential to ensure that the demands made by the syllabus, the examining and the marking in different subjects are comparable. It is therefore incumbent upon examination policy makers, curriculum developers and examiners to become more aware of the issue of subject comparability and ensure that this issue is not ignored in discussions about national norms and standards. It is essential to establish a framework for the analysis of marks to address comparability of results in different subjects.

Furthermore, one must remember that even if the current practices in certification in South Africa that assume subject comparabili-

ty were removed, the obligation on examining authorities to ensure that one subject does not make greater demands on candidates than another will still exist.

It must be kept in mind that assessment in education is not an exact science simply because people and their talents defy precise measurement. Therefore it is imperative that should it be deemed necessary to adjust marks, these adjustments are not wholly dependent on statistical indicators. The use of statistics in the adjustment of marks should always be tempered with a 'dash of commonsense' and a review of the realities of the environment and attitudes within which assessment takes place.

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APPENDIX A

Subject codes of subjects considered in the analysis

Appendix A

Subject codes of subjects considered in the analysis

ACCO - Accounting
AFRM - Afrikaans First Language
AFRS - Afrikaans Second Language
ARTS - Art
BIOL - Biology
BUSE - Business Economics
DRAM - Speech and Drama
ENGM - English First Language
ENGS - English Second Language
FUNM - Functional Mathematics *
GEOG - Geography
HIST - History
HOME - Home Economics
MATH - Mathematics
PHSC - Physical Science
TECD - Technical Drawing
TYPG - Typing *

9 - Higher Grade

8 - Standard Grade

* - Only available on the Standard Grade

Subjects offered in the NSC examination but not included in the analysis because numbers in the sample are too small or they were regarded seventh subjects at the time of the study (#):

Additional Mathematics (HG)
Computer Studies (Both grades)
Animal Husbandry (Both grades)
Biblical Studies (Both grades)
Economics (Both grades)
Electrician Work (SG)
Field Husbandry (Both grades)
Fitting and Turning (SG)
French (Both grades)
Functional Physical Science (SG)
German (HG)
Hebrew (HG)
Latin (HG)
Metalwork (SG)
Motor Mechanics (SG)
Music (Both grades)
Practical Ballet (SG)
Practical Music (SG)
Technika - Electric (Both grades)
Technika - Electronics (Both grades)
Technika - Mechanics (Both grades)
Woodwork (SG)
Zulu Third Language (HG)

All subjects at Lower Grade

APPENDIX B

List of documents supplied to subject specialists and
a full copy of the document outlining their part in
the experiment

NATAL EDUCATION DEPARTMENT: CURRICULUM AFFAIRS

**RESEARCH PROJECT: STANDARDISATION - AN ALTERNATIVE TO THE
SUBJECT-BASED ITEM BANK**

Enclosed please find handouts related to this research project:

1. The standardisation of examination results from different examining boards: an alternative to the subject-based item bank system

This is a brief description of how the final report will be constructed, giving a short outline of the contents of each chapter as it is envisaged at present. It is a very rough draft, intended simply to give you an idea of the intention of the experiment.

2. The Standardising Test

This is a description of what is intended in the test - what it aims to measure.

3. Students Information Bulletin: Australian Scholastic Aptitude Test

This document is made available to Queensland pupils writing the test in order to explain the nature and intention of the test and to give them some idea of the type of questions they can expect.

4. Appendix IV - 6: The Core Skills Test

This appendix of **The Review of Tertiary Entrance in Queensland 1990**, a report presented to the Minister for Education by the Tertiary Entrance Reviewer, Professor Nancy Viviani, describes the revised ASAT, called the Core Skills Test.

5. Item Writing Techniques - J L Herman

For those not familiar with the writing of items! A short article on the techniques of this task.

The Standardising Test

The original Australian Scholastic Aptitude Test (ASAT) aimed to measure a range of abilities that were seen to be relevant to further education, and to tertiary studies in particular. The questions were intended to test the following skills which were believed to be those most relevant for a school-leaver with aspirations of further education:

- o an ability to reason
- o an ability to comprehend
- o an ability to interpret and make inferences

from a variety of material in the humanities and social sciences areas. The test was a 2-hour multiple-choice test. A number of ASAT sample questions has been included in the handouts. These are practice items made available to Queensland pupils writing the test.

Professor Viviani's report¹ advocates a revised version of the ASAT which she calls a Core Skills Test (CS Test).² In the report the purpose of the CS Test is described as follows:

" to assess the commonalities of senior curricula, aspects of educational performance each of which is common across a range of senior secondary studies and which taken together constitute a reasonable sample of the higher-order thinking skills expected in an educated senior student." (Pg 141, Viviani Report, 1990 - See handout)

Further on the same page of the report:

" The test **must not** be designed to test specific factual knowledge including that acquired through the study of particular senior subjects, nor must the abilities it tests be those which are developed exclusively by the study of one or two subjects."

The report also identifies a tentative list of abilities that the test should be designed to assess:

- o write at length (to achieve purpose, control structure, use the conventions of written language)
- o comprehend (facts, literal meanings, inferences, causal and other relationships)
- o calculate (exactly and approximately)
- o communicate (using appropriate words, phrases, sentences), interpret (instructions, descriptive prose, expressive prose, graphs, tables, maps, photographs, symbolic representations, diagrams)
- o select relevant information from the irrelevant
- o judge (make approximations, assess probabilities)

-
1. The Review of Tertiary Entrance in Queensland 1990 - a report submitted to the Minister for Education by the Tertiary Entrance Reviewer Professor Nancy Viviani.
 2. Appendix IV-6 of the report which describes the Core Skills Test has been included among the handouts.

- o evaluate (arguments, relevance, appropriateness, worth)
- o reason logically (when drawing conclusions, identifying logical inconsistencies and redundant information)
- o recognise patterns (pictorial, diagrammatic, symbolic, linguistic, thematic)
- o solve problems (expressed pictorially, diagrammatically, verbally, symbolically)

The widening of the scope of skills necessitates that the CS test incorporates an extended writing exercise, short answer questions and multiple-choice questions.

At this stage, the Research Unit intends to experiment only with the multiple-choice area of the test. This is essentially because of the time that would be needed for the marking of an extended piece of writing and short answer questions and furthermore, multiple-choice questions are also being currently researched in the context of subject-based item-banks. It is possible that the essay paper of Main Language could be used in the experiment as representative of the extended writing exercise and possibly the comprehension section of the Main Language paper as representative of short answer questions.

Because of the specialist knowledge in your section of the specific skills and processes required in your subject areas, you are requested to provide items that would be suitable, using assessment of the general skills outlined above as the focus of your questions. An item may test more than one of the skills listed above. Where possible please aim at setting a number of items on one theme, as in the ASAT practice items. Try to select skills and processes which are given attention not only in your subjects but also in other subjects. Candidates should not **require** content knowledge from specific topics that are studied in one or other subject syllabus in order to answer an item. The sample ASAT questions may present some ideas but an interesting variety of items would be greatly appreciated. The ASAT test, as mentioned, was 2 hours long and consisted of \pm 80 questions. Since we aim at setting a final test of approximately 1 - 1½ hours in length, it would be appreciated if each co-ordinator, using the expertise at his/her disposal, could provide items as illustrated by the sample ASAT questions.

In order for the experiment test to be acceptable, the multiple-choice items will need to be tested and analysed so that the difficulty and discrimination indices of items can be calculated and the effectiveness of distractors can be determined. Care will also need to be taken to ensure balance. Thereafter the final test can be compiled and administered.

The following time schedule is proposed:

1. First test items from co-ordinators: End March
2. Pre-test for validity and reliability in sample: April
3. Processing and preparation for final test to schools: August/September

APPENDIX C

The Core Skills Test: English and Afrikaans Version

NATAL EDUCATION DEPARTMENT: RESEARCH PROJECT

Instructions to participants

- o You may do rough work using paper, pen/pencil etc. and calculators.
- o There is only one answer for each question. Therefore please place only one cross (X) at the answer you feel is **best**.
- o Please read the explanations that precede the questions and read the questions carefully. Errors are often made through careless reading of what you are required to do.
- o **THANK YOU FOR YOUR PARTICIPATION IN THIS PROJECT.**

Please fill in the following details:

1. Full Name:
2. School:
3. Subjects: Please include grade at which you are studying it i.e. higher, standard or lower grade
.....
.....
.....
.....
.....
.....
4. If you would like to know your results, please put a mark in the appropriate place in the box.

YES / NO

--	--

Answer Sheet: Section A - Communication

Place a cross (X) through the option you have chosen as the best answer. Please place only **ONE** cross (X) per question.

Question 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Question 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Question 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Question 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Section A

Answer Sheet: Section B - Data Analysis

Place a cross (X) through the option you have chosen as the best answer. Please place only **ONE** cross (X) per question.

Question 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Question 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Question 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 5

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 6

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Section B

Answer Sheet: Section B - Data Analysis (continued)

Question 7

(a) (i) (ii) (iii) (iv)

Question 8

(a) (i) (ii) (iii) (iv)

(b) (i) (ii) (iii) (iv)

(c) (i) (ii) (iii) (iv)

Question 9

(a) (i) (ii) (iii) (iv)

(b) (i) (ii) (iii) (iv)

Section B

Answer Sheet: Section C - Logic and Calculation

Place a cross (X) through the option you have chosen as the best answer. Please place only **ONE** cross (X) per question.

Question 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Question 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Question 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 5

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 6

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Question 7

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Section C

Answer Sheet: Section C - Logic and Calculation (continued)

Question 8

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Question 9

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Question 10

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Question 11

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

ANSWERS TO THE RESEARCH PROJECT SCHOLASTIC APTITUDE TEST

Section A - Communication

Question 1

- (a) 1
- (b) 4
- (c) 4

Question 2

- (a) 4
- (b) 2
- (c) 3
- (d) 1

Question 3

- (a) 4
- (b) 1
- (c) 4

Question 4

- (a) 3
- (b) 3
- (c) 3

Section B - Data Analysis

Question 1

- (a) 3
- (b) 4
- (c) 4

Question 2

- (a) 3
- (b) 1

Question 3

- (a) 2

Question 4

- (a) 4
- (b) 3

Question 5

- (a) 2
- (b) 3

Question 6

- (a) 2
- (b) 4
- (c) 2
- (d) 1

Question 7

- (a) 3

Question 8

- (a) 1
- (b) 3
- (c) 4

Question 9

- (a) 4
- (b) 2

Section C - Logic and Calculation

Question 1

- (a) 2
- (b) 2
- (c) 4

Question 2

- (a) 3

Question 3

- (a) 4
- (b) 3

Question 4

- (a) 2
- (b) 1

Question 5

- (a) 2
- (b) 2

Question 6

- (a) 2
- (b) 3

Question 7

(a) 4

Question 8

(a) 3

(b) 3

(c) 3

(d) 2

Question 9

(a) 2

Question 10

(a) 2

Question 11

(a) 1

Section A - Communication

Question 1

This passage is taken from a novel by E M Foster, entitled "Where Angels Fear to Tread", and is about a British brother and sister who travel to Italy to rescue an 'orphaned' child from the dubious environment of its father.

Read the passage and answer the questions which follow.

- 1 And on the second day the heat struck them, like a hand laid over the mouth, just as they were walking to see the tomb of Juliet. From that moment everything when wrong. They fled from Verona. Harriet's sketch-book was stolen, and the bottle of ammonia in her trunk burst over her prayer book, so that purple patches appeared on all her clothes. Then, as she was going through Mantua at four in the morning, Philip made her look out of the window because it was Virgil's birthplace, and a smut flew in her eye, and Harriet with a smut in her eye was notorious. At Bologna they stopped twenty-four hours to rest. It was a fiesta, and children blew bladder whistles night and day. 'What a religion!' said Harriet. The hotel smelt, two puppies were asleep on her bed, and her bedroom window looked into a belfry, which saluted her slumbering form every quarter of an hour. Philip left his walking-stick, his socks, and the Baedeker at Bologna; she only left her sponge-bag. Next day they crossed the Apennines with a train-sick child and a hot lady, who told them that never, never before had she sweated so profusely. 'Foreigners are a filthy nation,' said Harriet. 'I don't care if there are tunnels; open the windows.' He obeyed, and she got another smut in her eye. Nor did Florence improve matters. Eating, walking, even a cross word would bathe them both in boiling water.

- 20 Philip, who was slighter of build, and less conscientious, suffered less. But Harriet had never been to Florence, and between the hours of eight and eleven she crawled like a wounded creature through the streets, and swooned before various masterpieces of art. It was an irritable couple who took tickets to Monteriano.
- 30

Where Angels Fear to Tread - E M Foster

Question 1 cont.

- (a) Choose the correct option to complete the sentence:
The simile describing the heat: 'like a hand over the mouth' (line 1) tells us that ...
- (i) the heat was so oppressive it seemed to suffocate them.
 - (ii) the heat was so intense it made talking difficult.
 - (iii) they were prevented from breathing by the intensity of the heat.
 - (iv) the heat was like a physical blow to them.
- (b) Choose the correct option to complete the sentence:
Harriet's comments "What a religion!" (line 12) and "Foreigners are a filthy nation" (line 16) reveal that ...
- (i) she has a fetish about cleanliness.
 - (ii) she prefers her own religion.
 - (iii) she has a very bad temper.
 - (iv) she is extremely intolerant.
- (c) Choose the correct option to complete the sentence:
The tone of the word 'only' (line 16), combined with its careful placing in the sentence, indicates that ...
- (i) both Harriet and Philip were extremely annoyed by their losses.
 - (ii) Philip had lost more and was therefore more annoyed.
 - (iii) Philip was not at all annoyed, despite his losses.
 - (iv) Harriet, despite having lost less, was more annoyed.

Question 2

The following passage is from a book written by a zoologist and published in 1986.

Read the passage and answer the questions which follow.

- 1 The domestic cat is a contradiction. No other animal has developed such an intimate relationship with humanity, while at the same time demanding and getting such independent movement and action.

10 The cat manages to remain a tame animal because of the sequence of its upbringing. By living both with other cats (its mother and littermates) and with humans (the family that has adopted it) during its infancy and kittenhood, it becomes attached to and considers that it belongs to both species. It is like a child that grows up in a foreign country and as a consequence becomes bilingual. The young cat becomes bicultural. It may be a cat physically but mentally it is both feline and human. Once it is fully adult, however, most of its responses are feline ones, and it has only one major reaction to its human owners. It treats them as pseudoparents. The reason is that they took over from the real mother at a sensitive stage of the kitten's development and went on giving it milk, solid food, and comfort as it grew up.

- 20 This is rather different from the kind of bond that develops between human and dog. The dog sees its human owners as pseudoparents, as does the cat. On that score the process of attachment is similar. But the dog has an additional link. Canine society is group-organised; feline society is not. Dogs live in packs with tightly controlled status relationships among the individuals. There are top dogs, middle dogs, and bottom dogs; and under natural circumstances they move around together, keeping tabs on one another the whole time. So the adult pet dog sees its human family both as
- 30 pseudoparents and as the dominant members of the pack, hence its renowned reputation for obedience and its celebrated capacity for loyalty. Cats do have a complex social organisation, but they never hunt in packs. In the wild, most of their day is spent in solitary stalking. Going for a walk with a human, therefore, has no appeal for them. And as for "coming to heel" and learning to "sit" and "stay", they are simply not interested. Such manoeuvres have no meaning for them.

- 40 So the moment a cat manages to persuade a human being to open a door (that most hated of human inventions), it is off and away without a backward glance. As it crosses the threshold, the cat becomes transformed. The kitten-of-human brain is switched off and the wildcat brain is clicked on. The dog, in such a situation, may look back to see if its human packmate is following to join in the fun of exploring, but not the cat. The cat's mind has floated off into another, totally feline world, where strange bipedal primates

have no place.

50 Because of this difference between domestic cats and domestic dogs, cat-lovers tend to be rather different from dog-lovers. As a rule cat-lovers have a stronger personality bias towards working alone, independent of the larger group. Artists like cats; soldiers like dogs. The much-lauded "group loyalty" phenomenon is alien to both cats and cat-lovers. If you are a company person, a member of the gang, or a person picked for the squad, the chances are that at home there is no cat curled up in front of the fire. The ambitious Yuppie, the aspiring politician, the professional athlete, these are not typical cat owners. It is hard to
60 picture football players with cats in their laps - much easier to envisage them taking their dogs for walks.

Those who have studied cat-owners and dog-owners as two distinct groups report there is also a gender bias. The majority of cat-lovers are female. The bias is not surprising in view of the division of labour evident in the development of human societies. Prehistoric males became specialised as group-hunters, while the females concentrated on food-gathering and childbearing. This difference contributed to a human male "pack-mentality" that is far less marked in
70 females. Wolves, the wild ancestors of domestic dogs, also became pack-hunters, so the modern dog has much more in common with the human male than the human female.

The argument will always go on - feline self-sufficiency and individualism versus canine camaraderie and good-fellowship. But it is important to stress that in making a valid point I have caricatured the two positions. In reality there are many people who enjoy equally the company of both cats and dogs. And all of us, or nearly all of us have both feline and canine elements in our personalities. We have moods when
80 we want to be alone and thoughtful, and other times when we wish to be the centre of a crowded, noisy room.

Question 2 cont.

- (a) Choose the correct option to complete the sentence:
The Yuppie and politician mentioned in line 58 are presented primarily as examples of people who ...
- (i) are powerful.
 - (ii) are intelligent.
 - (iii) have strong personalities.
 - (iv) seek status within a group.
- (b) Choose the correct option to complete the sentence:
In line 76 "caricatured" means ...
- (i) imitated.
 - (ii) distorted.
 - (iii) ridiculed.
 - (iv) criticised.
- (c) Choose the correct option to complete the sentence:
The last four sentences in the passage (lines 73-81) provide ...
- (i) a summary of the points made earlier.
 - (ii) a reason for the generalisations made earlier.
 - (iii) a modification of the position taken earlier.
 - (iv) a rebuttal to opposing views referred to earlier.
- (d) Choose the correct option to complete the sentence:
The author's point about the difference between people who prefer cats and those who prefer dogs is made primarily through ...
- (i) generalisation.
 - (ii) implication.
 - (iii) case histories.
 - (iv) narratives of personal experiences.

Question 3

Read the passage and answer the questions which follow.

FROM REBEL TO ICON

1 There were two Elvis Presleys. Elvis the first had a dangerous sneer, gyrating hips and a black singing style that brought rhythm and blues into the mainstream of American popular music. Elvis the second was the Las Vegas showman of the 1970s, clad in a white jump-suit encrusted in rhinestones, more inclined to sweat than sneer, but still capable of inspiring devotion.

10 Fifteen years after his death, Elvis fans are still split over which version of their hero to venerate. Those who loved the swaggering young rebel see the fatter, spangled version as an embarrassment. Others, who grew old with their hero, see the later Elvis as the real thing.

20 This dispute might have remained invisible to the normal eye, had it not been for the United States Postal Service. Its decision to issue rival designs for a commemorative Elvis stamp - one showing the young hero, the other the older version - has set off a national debate. Next month the postal service will distribute 5 million ballot papers to post offices around America, so that the country can vote on the matter. The winning stamp will be issued early next year.

Anecdotal evidence suggests that the young want Elvis to look like them, while their elders prefer the more mature version. The electorate divides in other ways as well. Rock-music fans, people who fancy themselves experts on "youth culture", northern liberals and graduate students seem to prefer Elvis the first. Southerners, country-music fans and those with a taste for costume jewellery are partisans of Elvis the second.

30 There is another camp: the "no stamp" crowd. They have argued that Elvis was either too trivial or too immoral to deserve the postal service's stamp of approval. That battle is lost; the war may go on.

40 The Elvis stamp will be part of a series on "Legends of American Music". Candidates must have been dead for ten years. Since rock stars tend to live fast and die young, there will be no shortage of candidates - or controversy. The idea of a Buddy Holly stamp arouses relatively little opposition, since Mr Holly died a blameless, indeed tragic, death in an air crash. Jimi Hendrix or Janis Joplin - victims of drug abuse - would bring the moral minority out in force.

Question 3 cont.

- (a) Choose the correct option to complete the sentence:
The evidence that the young prefer the early Elvis and that the more mature prefer the later version has been derived from ...
- (i) a general referendum in which the electorate was able to state its choice.
 - (ii) a scientific and objective survey of national opinion.
 - (iii) scientifically conducted personal interviews.
 - (iv) personal narratives.
- (b) "That battle is lost; the war may go on" (line 32) means:
- (i) A stamp of Elvis will be issued.
 - (ii) Only a stamp which celebrates a morally acceptable Elvis will be issued.
 - (iii) No stamp of Elvis will be issued.
 - (iv) A stamp of Elvis will be issued only if it can be proved that Elvis made a significant contribution to American culture.
- (c) The title of the article is apt because the text:
- (i) reveals Americans' acclaim of Elvis, who, on the one hand railed against the accepted conventions, yet on the other, learnt to accept and indeed honour them.
 - (ii) exposes the multi-faceted Elvis, the one whom moralists have learnt to respect, because Elvis transcended his own morally unacceptable past.
 - (iii) exposes the multi-faceted Elvis, the one whom the mature majority have learnt to respect because of Elvis's own triumph over his morally controversial past.
 - (iv) reveals Americans' acclaim of Elvis, a person who initially disparaged conventions and who has been transformed into an acceptable symbol.

Question 4

Read the poem and answer the questions which follow.

For Anne Gregory by W B Yeats

'Never shall a young man,
Thrown into despair
By those great honey-coloured
Ramparts at your ear,
Love you for yourself alone 5
And not your yellow hair.'

'But I can get a hair-dye
And set such colour there,
Brown, or black or carrot,
That young men in despair 10
May love me for myself alone
And not my yellow hair.'

'I heard an old religious man
But yesternight declare
That he had found a text to prove 15
That only God, my dear,
Could love you for yourself alone
And not your yellow hair.'

- (a) Choose the correct option to complete the sentence:
The word 'Ramparts' (line 4) is used to ...
- (i) show why the young man is thrown into despair.
 - (ii) show that the young girl is young and naïve.
 - (iii) indicate that her hair style is excessive.
 - (iv) indicate that the young girl portrays a romantic figure.
- (b) Choose the correct option to complete the sentence:
The young girl would 'get a hair-dye' (line 7) because ...
- (i) she does not like yellow hair.
 - (ii) she thinks that young men despair because she has yellow hair.
 - (iii) she thinks she will then know if they like her for herself or for her hair.
 - (iv) she will then have more men admirers if she can change her hair colour.
- (c) Choose the correct option to complete the sentence:
The 'old religious man' (line 13) seems to be ...
- (i) a man who is concerned for the girl's welfare.
 - (ii) a person who is more concerned with book learning than affairs of the heart.
 - (iii) a pessimist who believes that men are mainly influenced by outward appearances.
 - (iv) a religious fanatic who wants the girl to stay away from men.

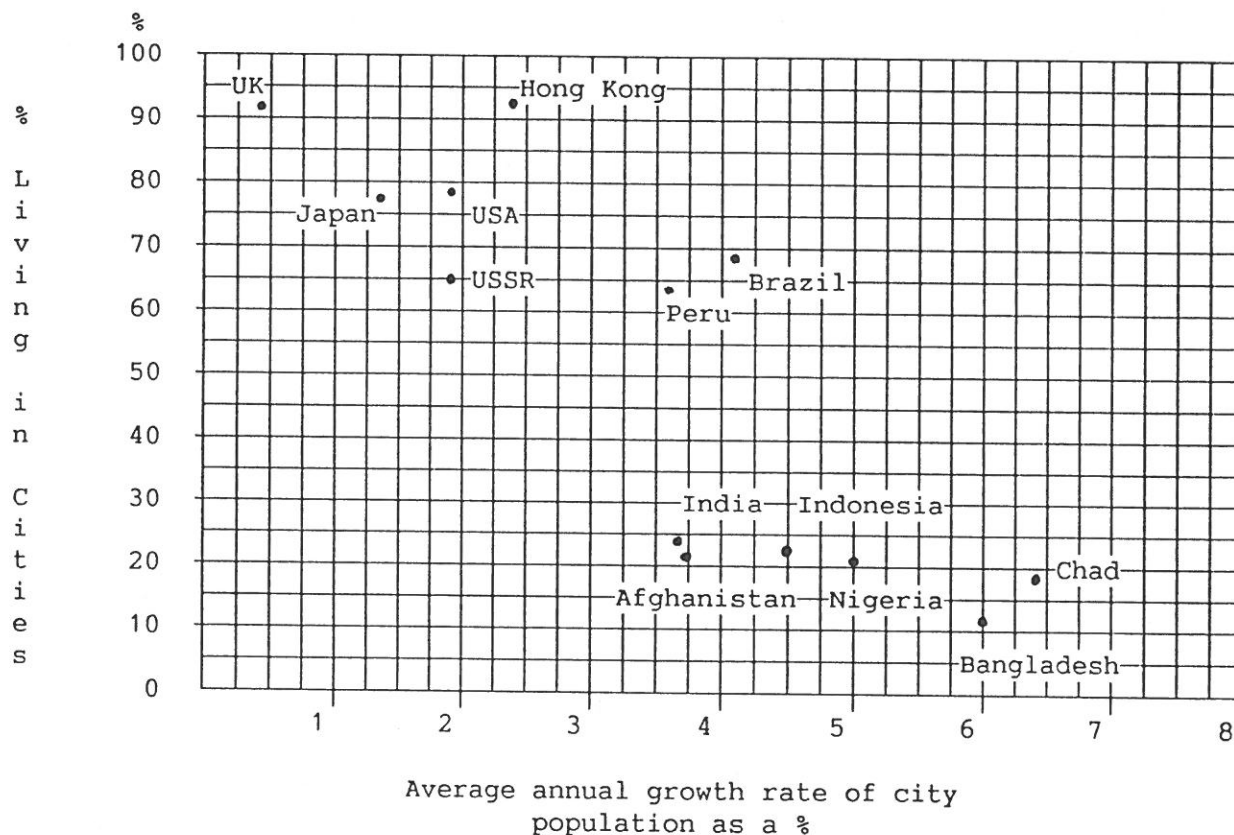
Section A

NATAL EDUCATION DEPARTMENT: RESEARCH PROJECT

Section B - Data Analysis

Question 1

The percentages on the left-hand side of the graph below reflect the percentage of the total population of a country that is living in the cities. The percentages at the bottom of the graph reflect the average annual growth rate of the population living in the cities.



(a) According to the graph, in which country is the fastest growing city population found?

- (i) Brazil
- (ii) UK
- (iii) Chad
- (iv) Hong Kong

- (b) An inverse relationship exists between the percentage population living in cities and the average annual percentage growth rate of city population. Which two countries best illustrate this?
- (i) Nigeria and Indonesia
 - (ii) Brazil and Peru
 - (iii) Chad and Japan
 - (iv) Chad and the UK
- (c) Which one of the following statements can be verified by the graph?
- (i) Hong Kong has a booming economy.
 - (ii) The percentage of population living in cities in Peru and India will increase at the same rate.
 - (iii) There are larger cities in the USA than in Bangladesh.
 - (iv) The percentage of the population living in cities in the developing countries tends to be low.

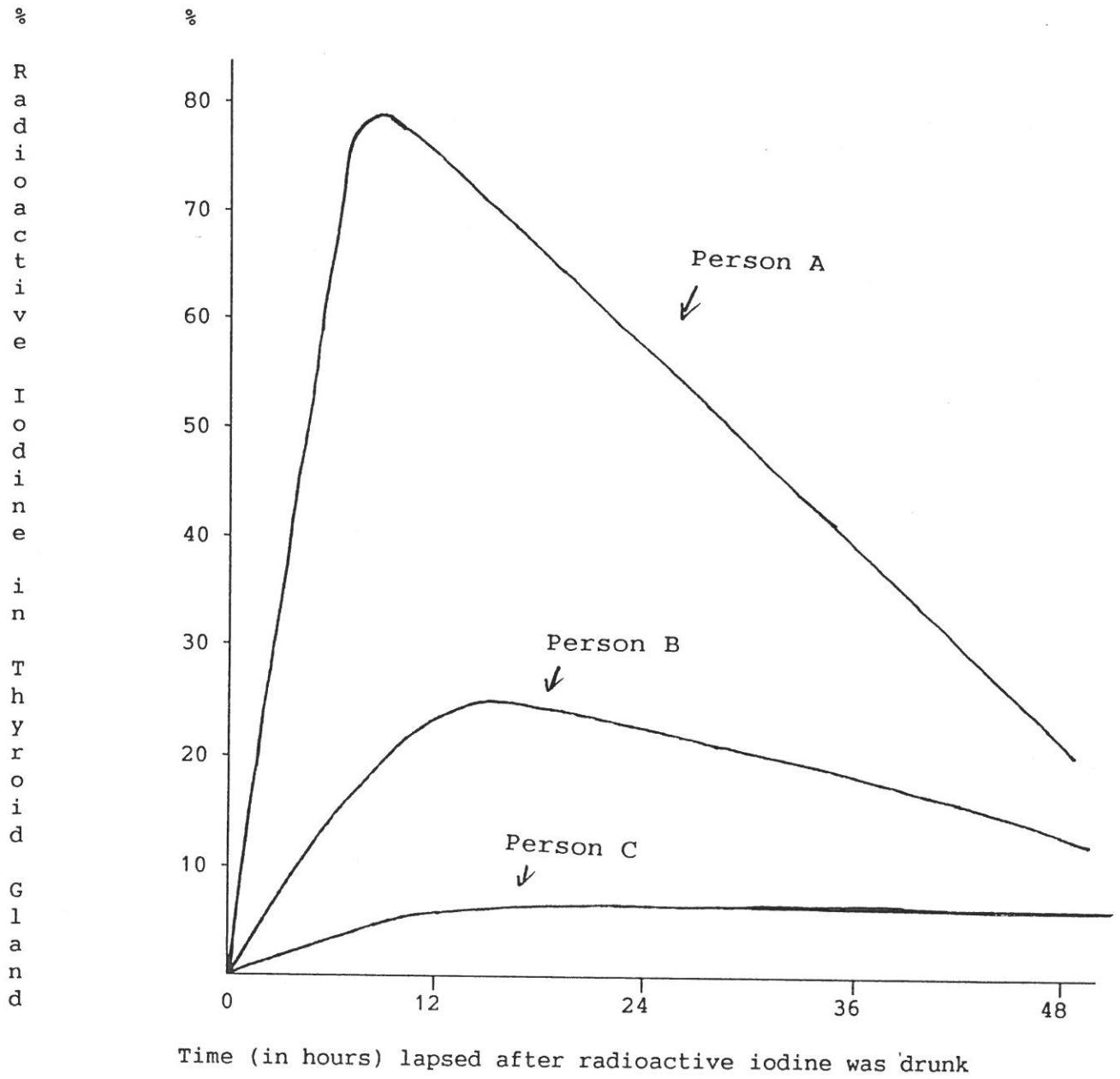
Question 2

In human beings normal growth of the body and the rate at which all the chemical reactions take place (metabolism) is controlled by a hormone (thyroxin) which is produced in the thyroid gland. In order to produce thyroxin the thyroid gland needs to take up sufficient iodine, as iodine is necessary to make up part of the thyroxin molecule. (Iodine is a chemical).

Humans usually get sufficient iodine from their drinking water but in certain areas in South Africa, there is little or no iodine in the water and alternative sources for iodine are needed. That is why one can buy iodised table salt at the supermarket. Small amounts of iodine need to be taken in constantly because, as thyroxin is produced, it is released into the blood and used up by the body.

In order to find out how the thyroid gland works, a scientist gave three different people drinks containing small amounts of radioactive iodine which can easily be traced. One of the three people tested had a **normal** thyroid gland and produced **normal** amounts of thyroxin. One person had an **underactive** thyroid gland and so produced too little thyroxin, while the third person had an **overactive** thyroid gland and so produced too much thyroxin. All three people were given exactly the same amounts of radioactive iodine. The scientist then measured the amount of radioactive iodine **in the thyroid gland** over the next two days.

The following graph shows the results that were obtained from this experiment.



Section B

- (a) What would the consequences be if a person had **no** iodine in his/her diet?
- (i) The person would grow very quickly and be very inactive.
 - (ii) The person would grow normally and be very active.
 - (iii) The person would grow very slowly and be very inactive.
 - (iv) The person would grow very slowly and be normally active.
- (b) Choose the best option to complete the sentence:
In person C the level of radioactive iodine does not decrease at all over the two days. This happens because ...
- (i) the person has an **underactive** thyroid gland and **little** thyroxin is being produced.
 - (ii) the person has an **underactive** thyroid gland and **no** radioactive iodine is being taken in.
 - (iii) the person has a **normal** thyroid gland which produces **normal** amounts of thyroxin.
 - (iv) the person has an **overactive** thyroid gland and **no** thyroxin is being produced.

Question 3

The following statements refer to the practice of smoking.

- o Lung cancer can be caused by active or by passive smoking.
- o If it is caused by active smoking then it can be caused by smoking a pipe or a cigarette.
- o People who work in a smoky dust-filled environment have a high incidence of lung cancer.

- (a) Which of the following statements is **FALSE**?
- (i) Active smoking is not the only cause of lung cancer.
 - (ii) It is not possible for people who do not smoke a pipe or cigarettes to have lung cancer.
 - (iii) Many people who work in an air-polluted environment have lung cancer.
 - (iv) The term "passive smoking" refers to inhaling the smoke from other people's cigarettes or pipes.

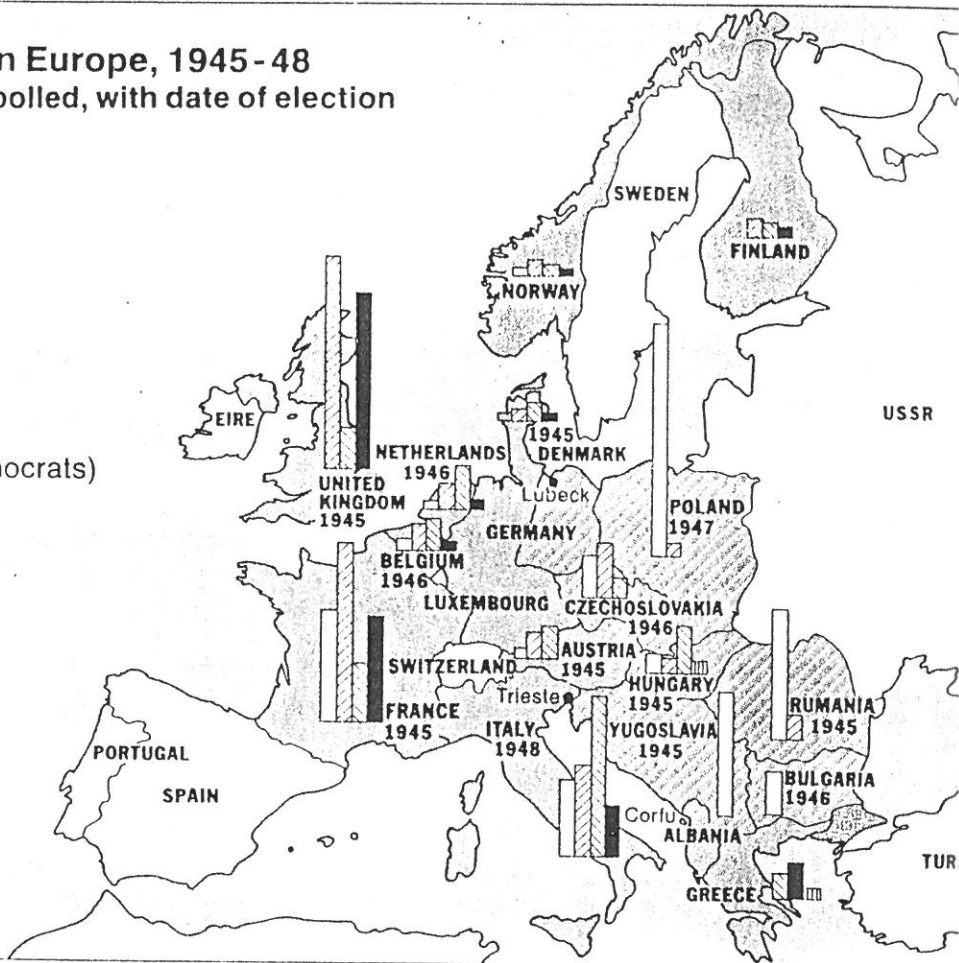
Section B

Question 4

The swing to the left in Europe, 1945-48
Percentage of national vote polled, with date of election

Key:

-  Communists and other extreme left-wing groups
-  Socialists and Social Democrats
-  Centre Parties (Liberals and some Christian Democrats)
-  Moderate right-wing parties (Conservatives)
-  Extreme right-wing parties
-  Occupied by the Russian Red Army in 1945



With reference to the map above answer the questions that follow.

- (a) Which of the following statements is **TRUE**?
- (i) Right-wing parties held a majority in Britain.
 - (ii) Of all the European countries the Communists gained the greatest percentage of the vote in Rumania.
 - (iii) The Conservatives can be classified as a left-wing party.
 - (iv) Socialists and Social Democrats had the greatest percentage of the vote in Czechoslovakia.
- (b) Using the map, which of the following statements is **FALSE**?
- (i) By 1945 the Red Army had occupied at least six countries in Eastern Europe.
 - (ii) Occupation by the Red Army had a great effect on the outcome of the various national elections.
 - (iii) In Greece the communist majority forced U.S. President Truman to intervene.
 - (iv) An "iron curtain" from Lubeck to Trieste became apparent.

Question 5

Study the data in Table 1 and then answer the questions that follow:

Table 1

Country	Birth Rate as % (BR)	Infant Mortality Rate as % (IMR)	Life Expectancy in years (LE)	Adult Literacy as % (AL)	Gross National Product per Capita in Rands (GNP/C)
RSA	4	5.5	63	57	2 676
Chad	4.2	16.1	44	15	80
Ethiopia	4.7	12.2	47	15	140
Tanzania	4.7	12.2	47	74	280
Mali	4.8	13.2	45	9	180
Ghana	4.9	8.6	55	30	360
Angola	4.9	16.5	43	5	1 247
Nigeria	5.0	10.9	50	29	860
Botswana	5.1	8.3	48	33	902
Niger	5.2	13.2	45	5	310
Zimbabwe	5.4	8.3	56	71	850
Kenya	5.5	7.7	57	50	390
Malawi	5.6	13.7	44	25	210

(a) Which of the following statements can be verified by Table 1?

- (i) The country with the lowest IMR has the highest AL.
- (ii) The lowest LE has the highest IMR.
- (iii) The highest GNP/C has the highest AL.
- (iv) The lowest GNP/C has the lowest IMR.

(b) Which one of the following statements can be deduced from the data in Table 1?

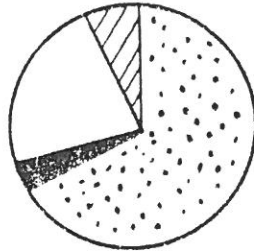
- (i) All countries with a high AL have the knowledge to control their BR better than those with a low AL.
- (ii) All countries with a high GNP/C show a high AL and low IMR.
- (iii) Medical services, schools and jobs in Chad are virtually non-existent.
- (iv) The healthy climate of the Kenyan highlands is the reason for the high LE.

Section B

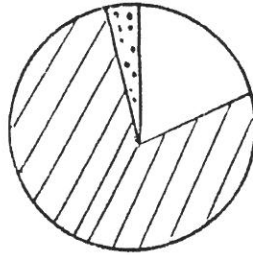
Question 6

The following pie charts show the composition of five different crop plants in terms of the percentage of carbohydrate (starch and sugars), percentage of fat and the percentage of protein. Study the pie charts and then read the additional statements.

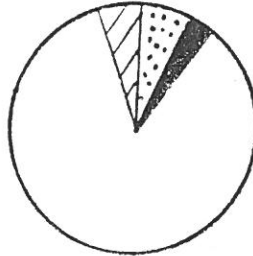
Blue-green Alga



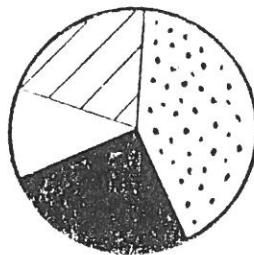
Banana



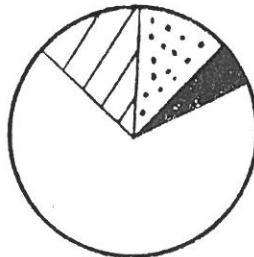
Rice



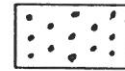
Soya



Wheat



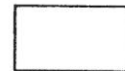
KEY



protein



fat



carbohydrate



other
(including
water, fibre,
mineral salts
and vitamins)

Section B

Question 6 cont.

STATEMENTS

- o Blue-green algae grow in warm, mineral-rich ponds in the tropics.
- o Because blue-green algae are single-celled organisms, food produced from them is called Single-Cell Protein (SCP).
- o Blue-green algae do not require fertilisers in order to grow rapidly.
- o Third World (developing) countries have rapidly growing populations.
- o Carbohydrate-rich crops provide the most energy in food.
- o Man is an omnivore and eats both plants and animals (meat).
- o Third World (developing) countries find it difficult to produce enough food.
- o The staple (most commonly used) food in most Third World (developing) countries is rich in carbohydrates.
- o Because blue-green algae are single-celled organisms, they increase in number and grow extremely quickly.
- o In Chad and Mexico blue-green algae are harvested and dried to form a biscuit-like food for feeding domestic stock (sheep and cattle).
- o Chad and Mexico are both developing countries.
- o When animals eat plants, most of the energy is used by the animal to stay alive. Very little of this energy is passed on to man when he eats the meat.
- o In biscuit-like form, SCP does not taste very pleasant.
- o The populations in First World (developed) countries e.g. USA have stabilised and are not growing rapidly.
- o Advanced technology is available in First World countries to increase food production.

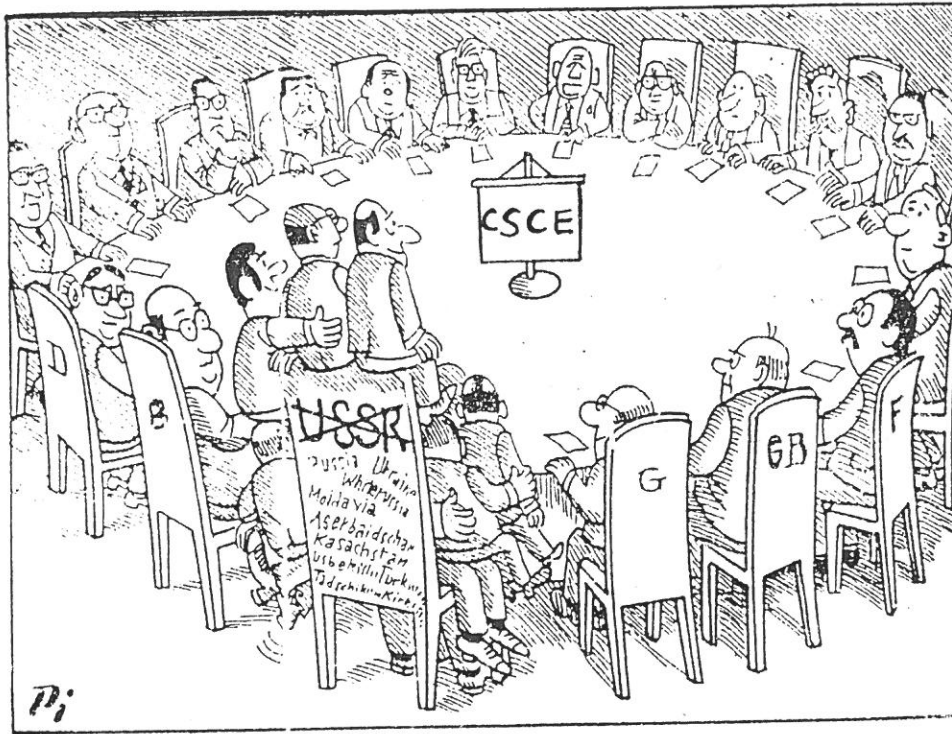
Section B

Question 6 cont.

Answer the following questions by referring to the pie charts and/or to the statements. In each case choose the best possible answer based on the information you have been given.

- (a) Which crop probably contains the highest percentage of fibre?
- (i) blue-green alga
 - (ii) banana
 - (iii) rice
 - (iv) wheat
- (b) Which of the following correctly lists crops in order of carbohydrate content, starting with one of the two crops with a very high carbohydrate content?
- (i) wheat, blue-green alga, rice, banana
 - (ii) rice, blue-green alga, soya, banana
 - (iii) rice, banana, blue-green alga, soya
 - (iv) wheat, blue-green algae, banana, soya
- (c) SCP is often used to feed domestic stock (sheep and cattle). Why would it be more efficient to feed human beings with SCP directly?
- (i) SCP is not very tasty but does provide a balanced diet.
 - (ii) More energy would be available to humans.
 - (iii) It would not be necessary to convert the blue-green algae into biscuits.
 - (iv) All available land could be used for grazing domestic stock.
- (d) What would the most important advantage be for Third World countries to use SCP as a staple food?
- (i) Sufficient food could be more efficiently produced for the whole population.
 - (ii) Land crop production could be decreased and domestic stock could be decreased, allowing grazing land to recover.
 - (iii) More food could be produced thus allowing the population to increase more rapidly.
 - (iv) Fewer land crops could be produced leaving more land available to be used as grazing so that the number of cattle could be increased.

Question 7



The Conference of Security and Co-operation in Europe: Home of security or a scene of confusion?

The cartoon points towards a serious problem which has been developing since the collapse of the USSR.

- (a) By studying the cartoon, choose the option which **best** describes this problem?
- (i) The Conference on Security and Co-operation in Europe has increased its membership and thus developed into a slow moving body which cannot take decisions quickly.
 - (ii) The Conference on Security and Co-operation in Europe has become dominated by former members of the USSR.
 - (iii) The USSR has been replaced by a confederation of independent states.
 - (iv) France and Great Britain have enough common political ground and power to dominate the Conference of Security and Co-operation in Europe.

Question 8

The table shows metals that are added to steel to make different alloys.

	Alloy steel	Properties
1	Titanium steel	high melting point, light-weight
2	Cobalt steel	improved magnetic properties
3	Nickel/Chromium steel	corrosion resistant
4	Tungsten steel	high melting point and tougher than other alloys

- (a) Which type of steel would be best suited to making the cutting tips of a high-speed saw blade for cutting soft wood?
- (i) 1
 - (ii) 2
 - (iii) 3
 - (iv) 4
- (b) Which type of steel would be best suited to making a tank for a lorry intended for carrying chemicals?
- (i) 1
 - (ii) 2
 - (iii) 3
 - (iv) 4
- (c) Which type of steel would be best suited to making a hacksaw blade for cutting metal?
- (i) 1
 - (ii) 2
 - (iii) 3
 - (iv) 4

Question 9

Four members of a family take part in four different competitions.

Jack buys a ticket for R200 in a competition which has a Toyota Corolla, valued at R80 000, as the first prize and an aluminium bicycle worth R4000 as the second prize. One thousand tickets are to be sold.

Gill buys two tickets at R15 each in a competition which has

Section B

R100 000 as a first prize and R10 000 as a second prize. Two thousand tickets are to be sold.

Rick goes into partnership with a friend and his portion of a ticket costs R5. The competition is being arranged at his place of work and the first prize is a Christmas turkey worth R50 while the second prize is a bottle of sparkling wine valued at R25. If their joint ticket should win a prize, they agreed to have a further draw between the two of them. 200 tickets are sold.

Samantha takes a R10 ticket in a competition in which she can win a year's free modelling tuition, valued at R2 400. One thousand tickets are printed but only 100 are sold.

- (a) Which family member has the best chance of winning a prize?
- (i) Jack
 - (ii) Gill
 - (iii) Rick
 - (iv) Samantha
- (b) If each member had won first prize in their particular competition, which family member would have earned the best return on his money?
- (i) Jack
 - (ii) Gill
 - (iii) Rick
 - (iv) Samantha

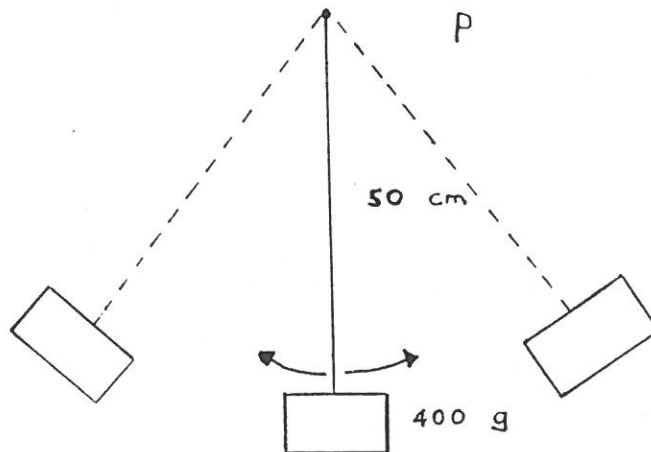
NATAL EDUCATION DEPARTMENT: RESEARCH PROJECT

Section C - Logic and Calculation

Question 1

- (a) If 10 men earn R600 in 12 days, how much will 6 men earn in 15 days? Assume that each man receives the same wage.
- (i) 480
 - (ii) 450
 - (iii) 288
 - (iv) 360
- (b) Each of the following 3-letter codes has its own internal pattern. Identify the code which has a different pattern to the others.
- (i) XBA
 - (ii) VJK
 - (iii) TON
 - (iv) RHG
- (c) The word CHOLERA falls into only one of the categories defined below. Select the category.
- (i) The second letter is 'O', the third is 'I' and the final letter is 'L'
 - (ii) The second letter is 'O', the third is anything except 'I' and the final letter is 'L'
 - (iii) The second letter is not 'O', the third is anything but 'I' and the fourth letter is anything but 'L'
 - (iv) The word does not belong to any of the above categories.

Question 2

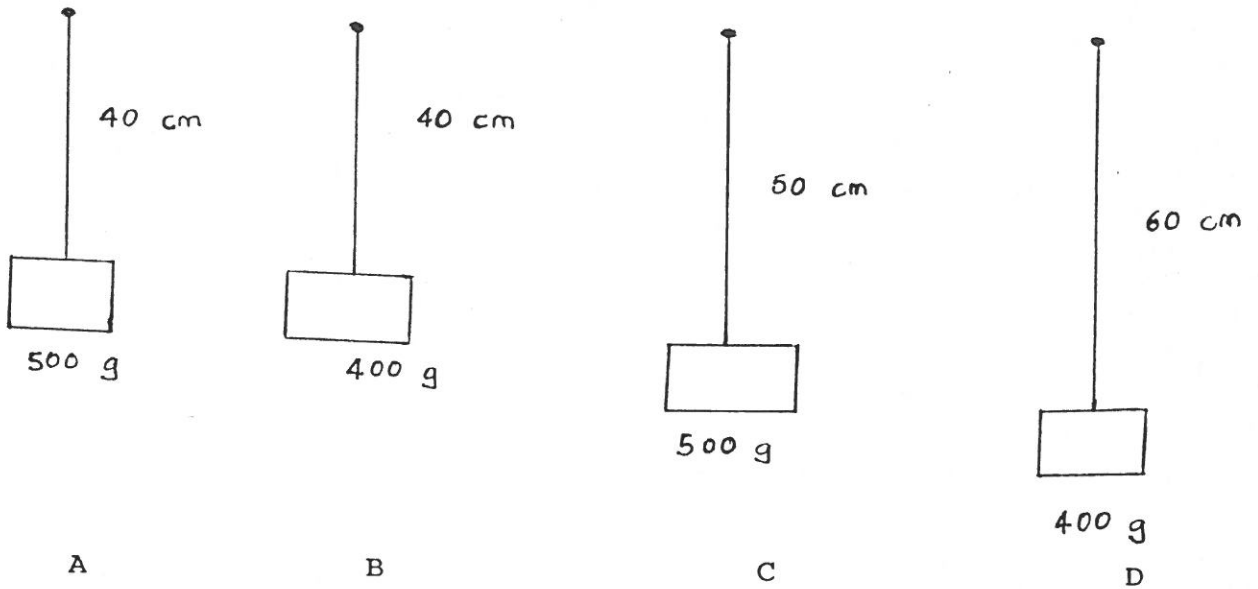


A pendulum P consists of a length of string attached to a point about which it can swing and a weight hanging from the other end. The mass of this weight is expressed in grams.

Section C

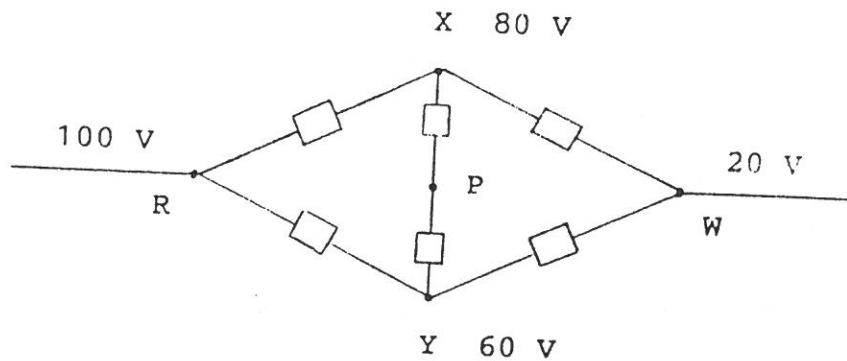
It is found experimentally that the number of swings of a pendulum in a given time (frequency of oscillation) is dependent only on the length of the string.

(a) Which of the pendulums will have the same frequency of oscillation as the pendulum P above?



- (i) A
- (ii) B
- (iii) C
- (iv) D

Question 3



Electrical potential is measured in volt (V). In the electrical network above the electrical potential at various points is as shown. In a network, electrical current flows from a point of higher potential to a point of lower potential.

- (a) Which of the following statements is true?
- (i) Current will flow from Y to R
 - (ii) Current will not flow from X to Y
 - (iii) Current will flow from W to Y
 - (iv) Current will flow from R to W

Section C

- (b) If current is flowing from X to Y, which of the following conclusions can be made?
- (i) W is at a higher potential than P
 - (ii) X is at a lower potential than P
 - (iii) P is at a potential between 60 V and 80 V
 - (iv) Y is at a higher potential than P

Question 4

The statements below refer to an electrical network and to various points in that network which are at different electrical potentials. Note that electrical potential is measured in volts (V).

Point J is 50 V lower in potential than point G.
 Point E is 15 V lower in potential than point G.
 Point E is 55 V higher in potential than point F.
 Point J is 50 V higher in potential than point H.

- (a) What is the order, from highest to lowest electrical potential, of these points?
- (i) G J E F H
 - (ii) G E J F H
 - (iii) G E F E H
 - (iv) G J E H F
- (b) Which of the following statements is true?
- (i) E is 85 V higher in potential than H
 - (ii) J is 30 V higher in potential than F
 - (iii) H is 40 V lower in potential than F
 - (iv) F is 80 V lower in potential than G

Question 5

In the following exercise, S must be repeatedly substituted with the alternative letter or groups of letters given. Any one of the given values of S can be used more than once. For example, given that

S can be substituted with aS
 or bS
 or a
 or b

in order to generate the group of letters **aabb**, the following sequence of substitutions is necessary:

Step 1: Substituting aS for S: S → aS
 Step 2: Substituting aS for S: → aaS
 Step 3: Substituting bS for S: → aabS
 Step 4: Substituting b for S: → aabb

Section C

In a further example, the sequence **bab** is generated as follows:

Step 1: Substituting bS for S : $S \rightarrow b\underline{S}$
Step 2: Substituting aS for S : $\rightarrow ba\underline{S}$
Step 3: Substituting b for S : $\rightarrow bab$

As long as there is an S in the sequence, substitution must be carried out.

- (a) Given that S can be substituted with aSa
or bSb
or a
or b

which one of the following complete sequences can be generated by starting with the letter S and substituting repeatedly, as illustrated in the above examples, using the values for S that have been given?

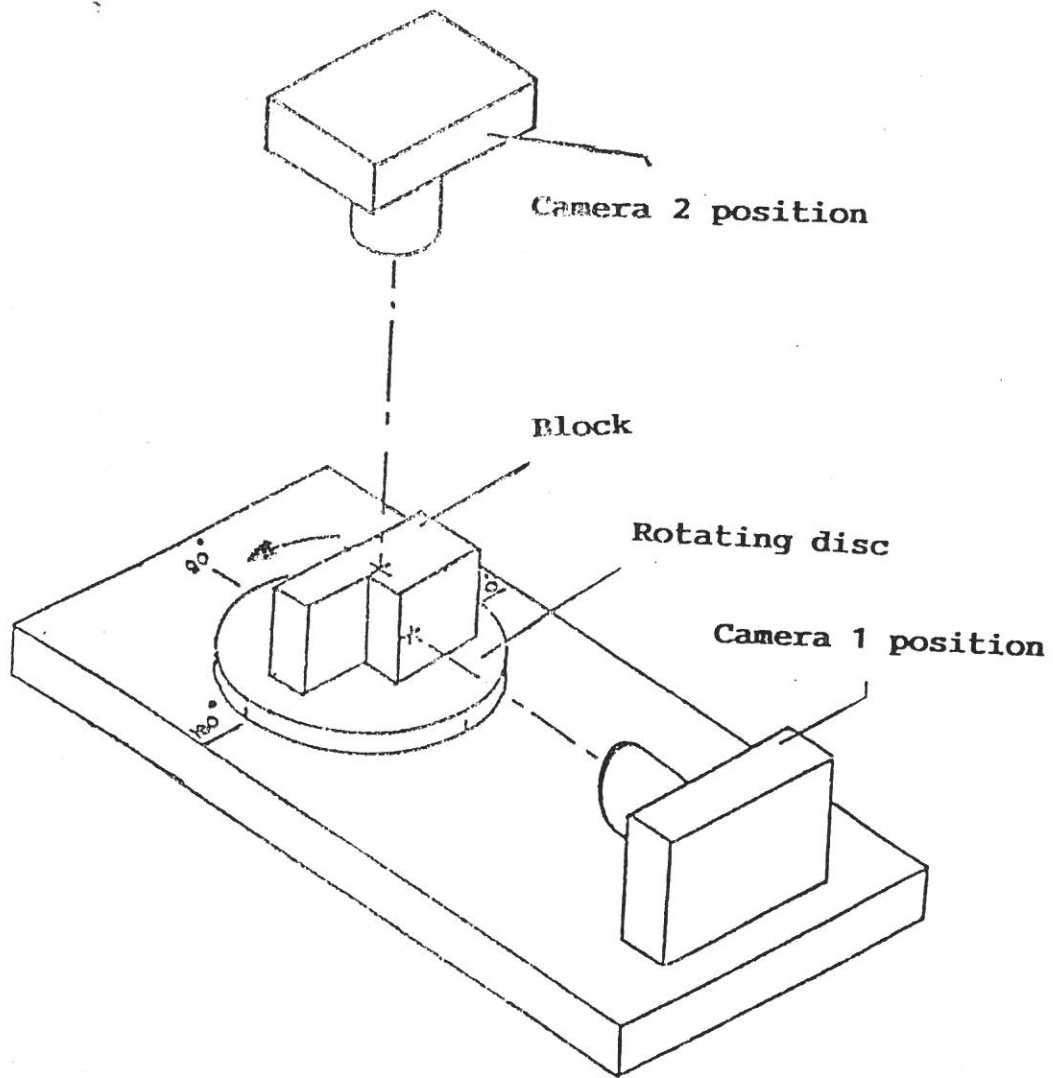
- (i) aab
- (ii) $abbba$
- (iii) $abbaa$
- (iv) $bababa$

- (b) Given that S can be substituted with aS
or aSb
or X
and given that X can be substituted with aXa
or a

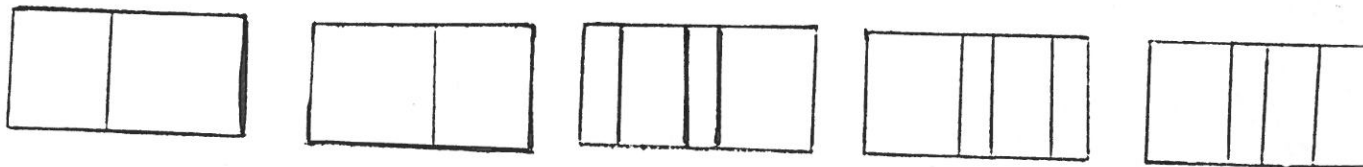
which of the following sequences of substitutions produces the sequence of letters **aaaabb**?

- (i) $S \rightarrow aS$
 $S \rightarrow aSb$
 $S \rightarrow X$
 $X \rightarrow aXa$
 $X \rightarrow a$
- (ii) $S \rightarrow aS$
 $S \rightarrow aSb$
 $S \rightarrow aSb$
 $S \rightarrow X$
 $X \rightarrow a$
- (iii) $S \rightarrow aSb$
 $S \rightarrow aSb$
 $S \rightarrow X$
 $X \rightarrow aXa$
 $X \rightarrow a$
- (iv) $S \rightarrow aS$
 $S \rightarrow aSb$
 $S \rightarrow aSb$
 $S \rightarrow X$
 $X \rightarrow aXa$
 $X \rightarrow a$

Question 6



(a) P is a photograph taken of the block when the camera was in position 1. Which of the drawings is the true version of a photograph also taken from position 1 but after the block has been rotated through 45° in the direction of the arrow.



P

A

B

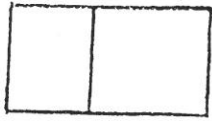
C

D

- (i) A
- (ii) B
- (iii) C
- (iv) D

Section C

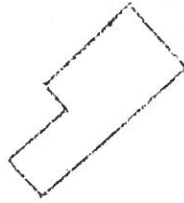
(b) P is a photograph of the block taken when the camera was in position 1. Which of the drawings is the true version of a photograph taken from camera position 2 and after the block had been rotated through 45° in the direction of the arrow?



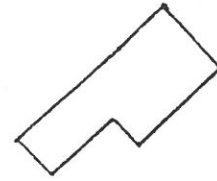
P



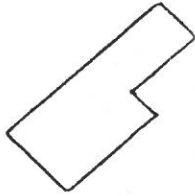
A



B



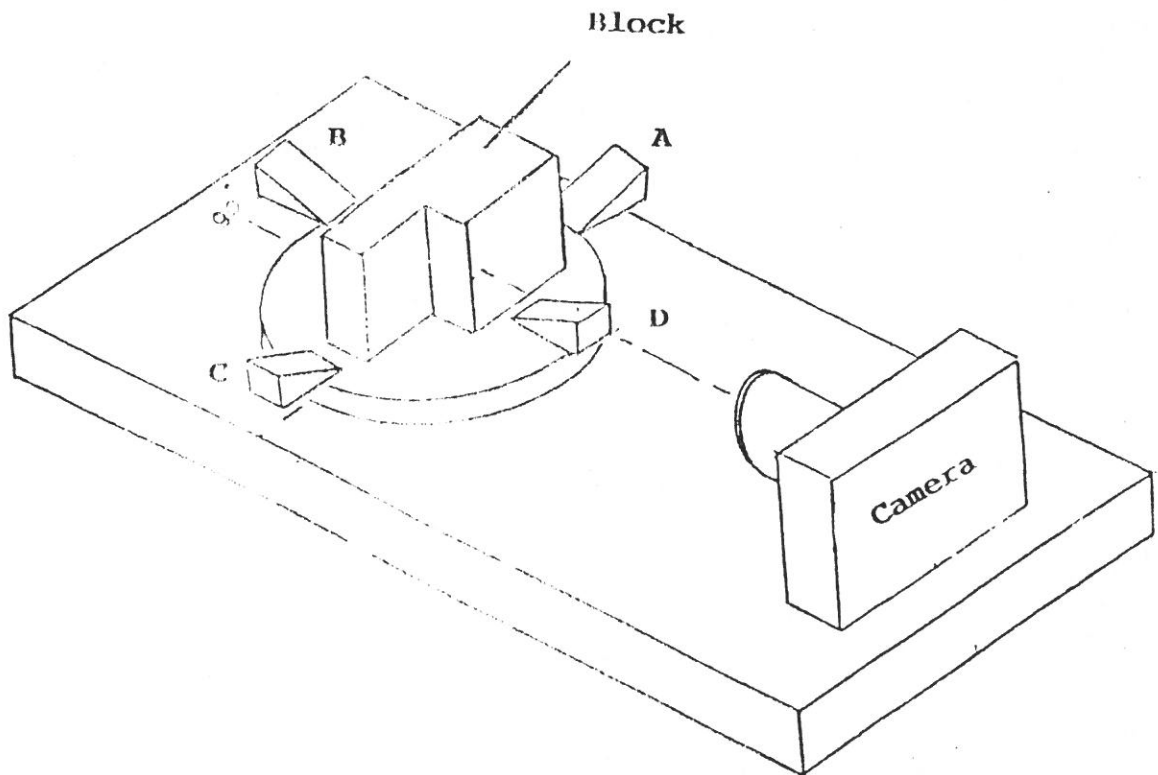
C



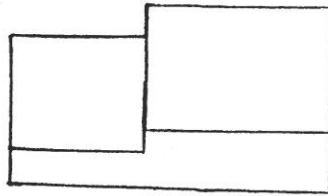
D

- (i) A
- (ii) B
- (iii) C
- (iv) D

Question 7



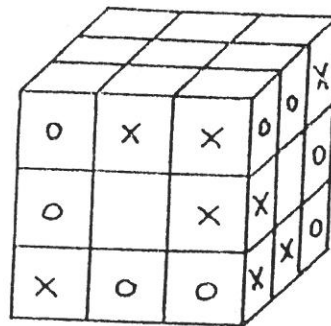
- (a) Which wedge must be placed under the block to obtain the photograph shown below? The wedge does not appear in the photograph.



- (i) A
(ii) B
(iii) C
(iv) D

Question 8

The following is a 3-dimensional diagram of a cube. A cube is a solid figure with 6 square sides. Each side of the cube is 3 centimetres in length. Lines are drawn on the cube one centimetre apart, as shown on the diagram. Blocks have been marked with noughts and crosses as shown.



- (a) How many square shapes can be seen on one side of the cube? The square shapes do not have to be the same size.
- (i) 9
(ii) 10
(iii) 14
(iv) 27

Section C

(b) If the cube were rotated to the left and then turned upside down keeping the same face showing, what would the arrangement of letters on the top row be?

- (i) x x o
- (ii) x o o
- (iii) o x x
- (iv) o o x

Four faces of the cube are painted with yellow paint. The upward-facing and the downward-facing faces are not painted. The cube is then cut through along the marked lines, making a number of little cubes.

(c) How many of the little cubes have yellow paint on them?

- (i) 36
- (ii) 26
- (iii) 24
- (iv) 18

(d) If the other two sides had been painted, how many of the little cubes would have yellow paint on only 2 sides?

- (i) 10
- (ii) 12
- (iii) 16
- (iv) 20

Question 9

For any three letters p , q and r and for the operations $*$, $\#$ and \sim , the following rules apply:

$p * q$ gives the result p

$p \# q$ gives the result q

$\sim p$ gives the result $-p$

$\sim -p$ gives the result p

If there is more than one operation involved, those in round brackets i.e. $()$ should be done first and then those in square brackets i.e. $[]$.

(a) By applying the rules described above, identify which of the following statements is **FALSE**.

(i) $[\sim(\sim r) \# p] * (r * q) = p$

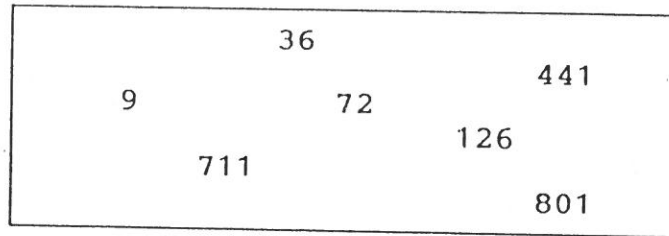
(ii) $r * (p \# q) = (r \# p) * (r \# q)$

(iii) $(\sim -r) * q = q \# (\sim -r)$

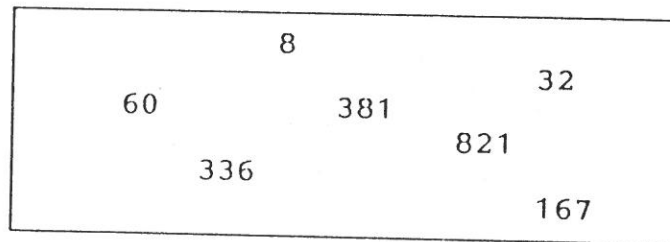
(iv) $\sim (r * t) = (\sim t) \# (\sim r)$

Question 10

These numbers all conform to a set of rules that define **Blobs**.



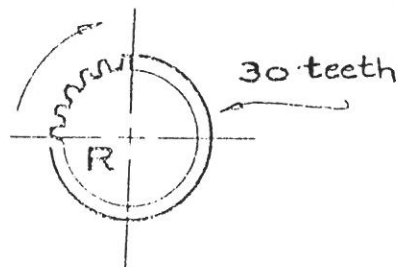
These numbers are not **Blobs**



(a) Which of the following sets contain numbers that are **Blobs**?

- (i) 224; 10081;
- (ii) 225; 10071;
- (iii) 225; 10081;
- (iv) 224; 10071;

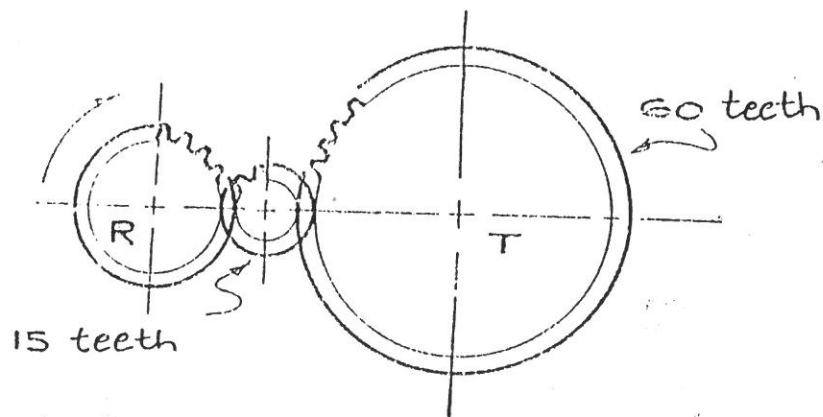
Question 11



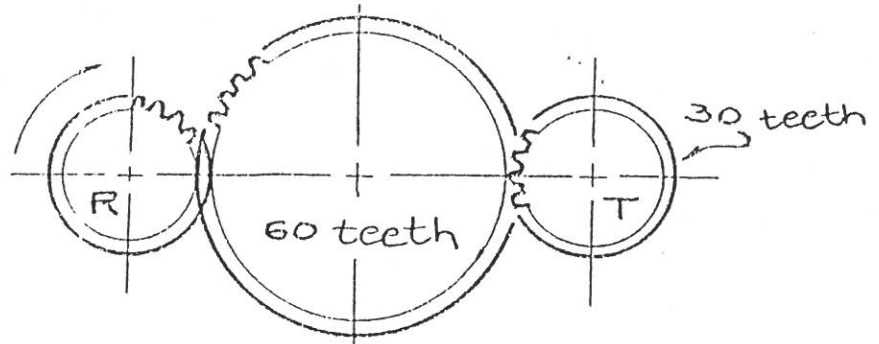
Gear R has 30 teeth and is rotating clockwise as shown. Not all the teeth on the gears are shown in the diagrams.

(a) Which combination of gears will cause gear T to also turn clockwise but at a speed which is half that at which gear R turns?

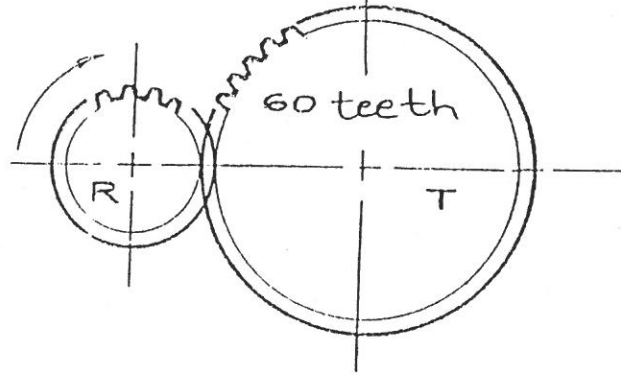
(A)



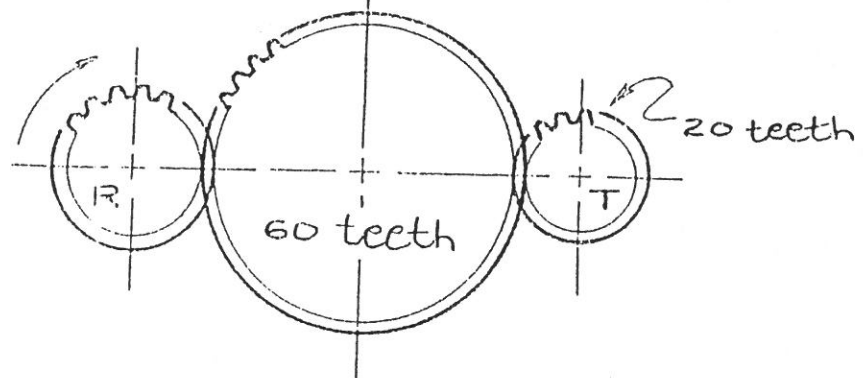
(B)



(C)



(D)



- (i) A
- (ii) B
- (iii) C
- (iv) D

NATALSE ONDERWYSDEPARTEMENT: NAVORSINGSPROJEK

Voorskrifte aan deelnemers

- o U mag papier, pen/potlood, ens. en sakrekenaars gebruik om rowwe werk te doen.
- o Daar is slegs een antwoord vir elke vraag. Trek dus asseblief slegs een kruisie (X) by die antwoord wat u as die **geskikste** beskou.
- o Lees asseblief die verduidelikings wat die vrae voorafgaan en lees die vrae noulettend. Foute word dikwels begaan deur onverskillige leeswerk van wat van u verwag word om te doen.

- o **BAIE DANKIE VIR U DEELNAME AAN HIERDIE PROJEK.**

Vul asseblief die volgende besonderhede in:

1. Volle Naam:
2. Skool:
3. Vakke: Dui asseblief die graad aan waarop u dit neem, bv. hoër, standaard of laer graad
.....
.....
.....
.....
.....
.....
4. Trek asseblief 'n kruisie in die toepaslike vierkant indien u die uitslae wil hê.

JA / NEE

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Antwoordblad: Afdeling A - Kommunikasie

Trek 'n kruisie (X) by die keuse wat jy gemaak het as die beste antwoord. Trek asseblief net **EEN** kruisie per vraag.

Vraag 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Vraag 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Vraag 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Antwoordblad: Afdeling B - Data-analise

Trek 'n kruisie (X) by die keuse wat jy gemaak het as die beste antwoord. Trek asseblief net **EEN** kruisie per vraag.

Vraag 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Vraag 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Vraag 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 5

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 6

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Afdeling B

Antwoordblad: Afdeling B - Data-analise (vervolg)

Vraag 7

(a) (i) (ii) (iii) (iv)

Vraag 8

(a) (i) (ii) (iii) (iv)

(b) (i) (ii) (iii) (iv)

(c) (i) (ii) (iii) (iv)

Vraag 9

(a) (i) (ii) (iii) (iv)

(b) (i) (ii) (iii) (iv)

Antwoordblad: Afdeling C - Logika en Berekening

Trek 'n kruisie (X) by die keuse wat jy gemaak het as die beste antwoord. Trek asseblief net **EEN** kruisie per vraag.

Vraag 1

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |

Vraag 2

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Vraag 3

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 4

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 5

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 6

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |

Vraag 7

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Afdeling C

Antwoordblad: Afdeling C - Logika en Berekening (vervolg)

Vraag 8

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
| (b) | (i) | (ii) | (iii) | (iv) |
| (c) | (i) | (ii) | (iii) | (iv) |
| (d) | (i) | (ii) | (iii) | (iv) |

Vraag 9

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Vraag 10

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Vraag 11

- | | | | | |
|-----|-----|------|-------|------|
| (a) | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|

Afdeling A - Kommunikasie

Vraag 1

Lees die onderstaande stuk noukeurig deur en beantwoord die vrae wat volg.

MANDELA GROET TOE IN KOMBUIS-AFRIKAANS

1 SPRINGBOK - "Die gemeenskap van hierdie streek, ek sê aan u almal aangename kennis. Ongelukkig kan ek nie my toespraak in suiwer Afrikaans hou nie, maar kombuis-Afrikaans kan ek praat."

Só het mnr. Nelson Mandela, onderleier van die ANC, gister onder applous gesê toe hy 'n vergadering van meer as 250 mense hier toegesprek het.

10 Mnr Mandela het gesê dit is sy boodskap aan almal om die verlede te vergeet en eerder oor eenheid in die toekoms te praat. Dit is 'n kleinlike mens wat toelaat dat foute van die verlede sy denke oor die toekoms beïnvloed.

Volgens mnr Mandela het die ANC sy stryd om grondbesit in een opsig gewen, naamlik dat die wette op grondbesit en groepsgebiede herroep is. Maar pres. F W de Klerk het sedertdien weinig gedoen sodat swart- en bruinmense en Indiërs daarby kan baat vind.

"Slegs diegene met genoeg geld kan grond koop. Vir die ander, wat dit nie het nie moet die stryd voortduur. Dit is van die hoofredes waarom ek vandag die plattelandse gemeenskap besoek."

20 Hoewel die ANC gekritiseer word oor fundamentele foute wat hy in die verlede gemaak het, is daar ook baie onwaarhede. Een daarvan is dat die ANC 'n swart meerderheidsregering bepleit. "Ons staan vir 'n meerderheidsregering wat op 'n grondslag van een mens, een stem verkies word," het hy gesê.

Mnr Mandela het afgesluit deur te sê dat dit vir die ANC maklik is om die blaam vir lyding op blankes te werp. Dit is egter veel moeiliker om te sê: "Laat ons die verlede vergeet en eerder vrede en hereniging in ons toekomsvisie insluit."

DIE BURGER, Saterdag, 25 Mei 1991

(a) Kies die **beste** opsie om die sin te voltooi:
Mnr Mandela het sy gehoor in Afrikaans toegesprek omdat hy ...

- (i) oor die gebruik van Afrikaans wil gesels.
- (ii) slegs kombuis-Afrikaans kan praat.
- (iii) die guns van sy gehoor wou wen.
- (iv) sy gehoor nie Engels kan verstaan nie.

- (b) Watter siening ten opsigte van die ANC is volgens die spreker korrek?
- (i) Die ANC het nie werklik foute begaan nie.
 - (ii) Die ANC bepleit 'n swart meerderheidsregering.
 - (iii) Die ANC het sy stryd om grondbesit in die land finaal gewen.
 - (iv) Die ANC is ten gunste van 'n een-mens-een-stem-regering.
- (c) Watter stelling is 'n bewering en **nie** 'n feit **nie**?
- (i) Die wette op grondbesit en groepsgebiede is afgeskaf.
 - (ii) Pres. De Klerk het weinig gedoen om swart- en bruinmense te help om grondbesitters te word.
 - (iii) Slegs diegene met genoeg geld kan grond koop.
 - (iv) Grondbesit is 'n hoofrede vir mnr Mandela se besoek aan die platteland.
- (d) Watter stelling ten opsigte van die strekking van die berig is **verkeerd**?
- (i) Mnr Mandela bepleit toekomsgerigte optrede.
 - (ii) Die ANC het die wette op grondbesit herroep.
 - (iii) Die stuk handel nie oor die stand of status van Afrikaans nie.
 - (iv) Die ANC bepleit 'n voortsetting van die stryd om gelykebergtiging.

Vraag 2

Lees die onderstaande stuk deur en beantwoord die vrae wat volg.

POLE-UNIVERSITEIT WIL AFRIKAANS AANBIED

Van Ons Korrespondent

- 1 **JOHANNESBURG** - Die belangstelling in Suid-Afrika onder inwoners van Oosblok-lande het daartoe gelei dat die Universiteit van Warschau in Pole 'n kursus in Afrikaans gaan aanbied.

Hongarye bied ook aan Suid-Afrikaanse regstudente die kans om daar te gaan studeer, luidens 'n berig in die jongste uitgawe van Bulletin, tydskrif van die RGN se Instituut vir Wetenskapsontwikkeling (SWO).

- Die besluit van die Poolse universiteit om van Oktober vanjaar kursusse aan te bied oor die kultuur, geskiedenis en tale van Suid-Afrika, is geneem weens die toenemende belangstelling in Suid-Afrika onder die Poolse gemeenskap, lui die berig.
- 10

Die departement van Afrikatale en -kulture gaan aansienlik uitgebrei word en onder meer inleidende kursusse in Afrikaans en moontlik in Zulu of Xhosa aanbied.

Afdeling A

Weens die geldelike probleme wil hulle graag Suid-Afrikaanse universiteite by die projek betrek. Hulle hoop om moontlik borgskappe te kry vir gasdosente uit Suid-Afrika.

Suid-Afrikaanse regstudente word ook genooi om deel te neem aan 'n uitruilskema van die Eötvös Loránd-Universiteit in Boedapest. Dié universiteit het een van die oudste regs fakulteite in Europa.

- 20 Volgens Bulletin is die doel van die uitruilskema om Hongaarse studente bloot te stel aan verskillende regstelsels en om hulle voor te berei om internasionaal te kan praktiseer.

Studente wat in Hongarye gaan studeer, kan onder meer kursusse bywoon oor die onlangse gebeure in Hongarye en die oorgangsfase wat die Oosblok-land tans ervaar.

DIE BURGER, Dinsdag, 14 Mei 1991

- (a) Watter afleiding is verkeerd?
- (i) Dit gaan in die toekoms moontlik wees om Afrikaans aan 'n Europese universiteit te bestudeer.
 - (ii) Die Universiteit van Warschau gaan 'n Departement Afrikaans stig.
 - (iii) Dit is moontlik om kursusse in die kultuur en tale van Suid-Afrika in 'n Oosblok-land te volg.
 - (iv) Afrikaans is een van die tale wat die Departement Afrikatale aan 'n Poolse universiteit aanbied.
- (b) Dui die saambindende faktor in die berig aan.
- (i) Weens hulle geldelike probleme stel Pole en Hongarye belang in Suid-Afrika.
 - (ii) Daar is toenemende belangstelling by die Oosblok-lande in Suid-Afrika.
 - (iii) Die Universiteit van Warschau gaan vanaf Oktober Afrikaans aanbied.
 - (iv) Hongarye wil studente en gasdosente uit Suid-Afrika uitnooi.

Vraag 3

Lees die onderstaande stuk deur en beantwoord die vrae wat volg.

TALE MOÉT NOU SAAMSPEEL

- 1 Wie sal nou stry dat Afrikaans van oorsprong 'n krom vorm van Nederlands is? Hy het ontstaan omdat ons voorvaders slegte of geen Nederlandse onderrig gekry het nie.

Uit onkunde het hulle Nederlands steeds krommer gepraat en uiteindelik was hy só krom dat hy sy eie identiteit gekry het. Nou staan hy op sy eie pote, en ons is lief vir hom.

Afdeling A

Party van ons gebruik hom selfs om 'n bestaan te maak. Dis lekker as jou werktuig iets van jou eie is wat jy liefhet en waarop jy trots is.

10 Wat 'n mens die trotsste maak, is wanneer Nederlanders lekker kry oor die "pittige" Afrikaans. Erkenning van 'n eie bestaansreg. Hy het selfs al sy eie uitlopers in streektale gekry.

Die lekkerste lekkerte was toe Elisabeth Eybers die eerbiedwaardige P.C. Hooft-prys vir haar Afrikaanse digkuns gekry het. Ou vader Nederlands het sy (enigste?) spruit vereer met sy hoogste erkenning van verdienste-likheid.

Hoeveel mense weet dat Nederlands tot in 1983 een van ons land se amptelike tale was? Die ou Zuidafrika-wet van 1909 het bepaal dat Engels en Nederlands ons amptelike tale is.

20 Met die grondwetwysiging van die vroeë twintigerjare is gesê met Nederlands as amptelike taal word ook Afrikaans bedoel. Die Republiek-grondwet van 1961 het verklaar Afrikaans en Engels is die amptelike tale, en met Afrikaans word ook Nederlands bedoel.

Dit was eers in 1983 se grondwet dat Nederlands as amptelike taal wegge- laat is. Minder as tien jaar gelede was die stamtaal nog 'n amptelike taal in ons land.

Staatspresident

'n Taal kruip ook waar hy nie kan loop nie. Afrikaans is Nederlands. En omgekeerd. Dit is nou weer bewys.

30 Toe ons Staatspresident in Nederland was, het koningin Beatrix gesê hy is die eerste buitelandse staatshoof wat sy in Nederlands kon toespreek. Mnr Nelson Mandela het die Nederlanders laat regop sit toe hy Afrikaans gepraat het voor hul Arbeidersparty se kongres.

Dis die soort verbintenis wat jy nooit kan verbreek nie. Wat regdenkendes nooit wil verbreek nie.

Nou is Afrikaans die jong spruit, in die Afrikakonteks in dieselfde posisie as Nederlands - Vlaandere ingesluit - in die konteks van 'n eenwordende Europa. Elkeen is 'n piepkleine minderheid in sy eie omge- wing.

40 Dis logies dat die twee in sulke omstandighede moed bymekaar moet soek. En sal kry. Maar dis onsinnig dat die spruit meer - of ewe veel - onderskraging kan gee as die oer-voorouer.

Dis ook nie 'n skande nie. Die wortels is dieselfde, maar die penwortel wat die twee vas aan die aarde aan die lewe hou, behoort nog die ou taal te wees.

Benepenes het in Nederland se politieke afkeer in die Suid-Afrikaanse stelsel 'n rede gekry om 'n soort taal-apartheid te begin bedryf. So asof hulle gesê het, as julle lelik is met ons, maak ons ons taal los van julle.

Party Nederlanders het dit ook geprobeer. Toe die Nederlandse handel-

50 sending nou die dag hier was, het 'n Nederlandse gesant - nié die ambassadeur nie - 'n lid van die sending aangesê om op 'n perskonferensie Engels te praat. Die sending se leier het hom netjies tereggewys.

Juis dié taalverbintenis, die verpersoonliking van 'n bloedverbintenis wat steeds meer verwater geraak het, het die band behou. En toe die politieke kentering hier gekom het, het die kentering in Nederland vinniger as waar dan ook gevolg.

Dis jammer alle Suid-Afrikaners kan nie lees wat veral oor ons taal in die Nedelandse pers geskryf word nie. Dis 'n lekkerte van plesier oor raakvlakke en belangstelling in verskille.

60 Ons ambassadeur in Den Haag, mnr Albert Nothnagel, het 'n pittige lys van tipies Afrikaanse woorde in Nederland gepubliseer. In sy bespreking hiervan in die NRC Handelsblad begin Derk-Jan Eppink: "Niets is mooier dan spelen met taal."

Niks is mooier as Afrikaans en Nederlands wat saamspeel nie.

Heerengracht 40 Kaapstad
(021) 25-4850 23 Julie 1991

DIE BURGER, Dinsdag, 23 Julie 1991

(a) Dui die **verkeerde** stelling aan.

- (i) Afrikaans het ontstaan omdat ons voorvaders 'n gebrekkige kennis van Nederlands gehad het.
- (ii) Die onderrig van Nederlands in die vroeë jare aan die Kaap was nie na wense nie.
- (iii) Die skrywer vra of Afrikaans uit 'n "krom vorm van Nederlands" ontstaan het.
- (iv) Ons voorvaders het swak Nederlands gepraat omdat hulle nie van beter geweet het nie.

(b) Dui die **verkeerde** stelling aan.

- (i) Afrikaans en Engels is sedert 1983 die enigste amptelike tale in Suid-Afrika.
- (ii) Nederlands was vanaf 1909 tot 1983 'n amptelike taal in Suid-Afrika.
- (iii) Afrikaans het in die twintigerjare vir Nederlands as amptelike taal vervang.
- (iv) Die Republiek-grondwet van 1961 dui aan dat Afrikaans en Engels amptelike tale is.

- (c) Watter afleiding ten opsigte van die Staatpresident se besoeke aan Nederland is **verkeerd**?
- (i) Tydens die Staatspresident se besoek is die verbinten-
nis tussen Afrikaans en Nederlands bevestig.
 - (ii) Koningin Beatrix het met president De Klerk Nederlands
gepraat tydens sy besoek.
 - (iii) Die Staatspresident is die eerste besoekende staats-
hoof wat Nederlands kan verstaan.
 - (iv) President de Klerk het tydens sy besoek die Nederlan-
ders in hulle eie taal toegesprek.
- (d) Wat beteken "taal-apartheid" (reël 45) in die stuk?
- (i) Mense wat verskillende tale praat, moet geskei word
van mekaar.
 - (ii) Afrikaans is die taal van die navolgers van apartheid.
 - (iii) Sommige Nederlanders wou Nederlands skei van Afri-
kaans.
 - (iv) Sommige Nederlanders verkies dit om Engels in plaas
van Nederlands te praat.

Vraag 4

Lees die onderstaande stuk deur en beantwoord die vrae wat volg.

- 1 En dan is hy alleen. Asof in 'n droom begin hy sy deurme-
kaar tas uitpak en hy rangskik die boeke netjies op die
tafel. Hy gaan sit. Dofweg hoor hy hoe die gange van die
skool weergalm van honderde voetstappe. Iewers klap 'n
deur. 'n Opgewonde dreuning van gedempte stemme kom nader.
Hy sien hulle eers deur die venster - die lang ry wynrooi
baadjies - voor die deur oopswaai en sy eerste klas in
algehele wanorde om voorkeurbanke skarrel. Verkieslik so
ver agter moontlik. Die opgewonde gepraat word 'n oorverdo-
wende lawaai.

10

Christo sit amper verdwaas die groeiende chaos en aanskou.
Waar begin 'n mens? Nie een van die dertig leerlinge steur
hulle blykbaar aan die stil figuur van die nuwe geskiedenis-
onderwyser nie. Christo sien hoe 'n dogter 'n pak foto's
onder haar maats uitdeel. 'n Papiervliegтуигие klief die
lug en daal sierlik voor Christo se tafel grond toe.

20

Asof die klas nie bestaan nie, gaan Christo met sy rug na
die rumoer gekeer, voor die venster staan. Hy kyk op die
rustige grasperke uit. Hy is onmagtig om die klas tot
bedaring te bring. Gisteraand het hy 'n kennismaak-toe-
sprakie deeglik uitgewerk, maar nou het hy elke woord daar-
van vergeet. Waar begin 'n mens? Hoe begin 'n mens?
'n Roeping! Dis wat mevrou Duvenhage gesê het. Maar skool-
hou, weet hy, was nooit vir hom 'n roeping nie en sal ook
nooit 'n roeping wees nie! Vrees laat sy keel toetrek. Hy
het homself alles so anders voorgestel!

Geleidelik word die klas bewus van die onderwyser wat roerloos, met sy rug na hulle gekeer, staan. 'n Onsekere stilte begin stadig neerdaal en uiteindelik heers 'n doodse, gespanne stilte. Die nuwe onderwyser wag nog minute lank voor hy omdraai en na sy eerste klas kyk. Standerd tien A, Geskiedenis.

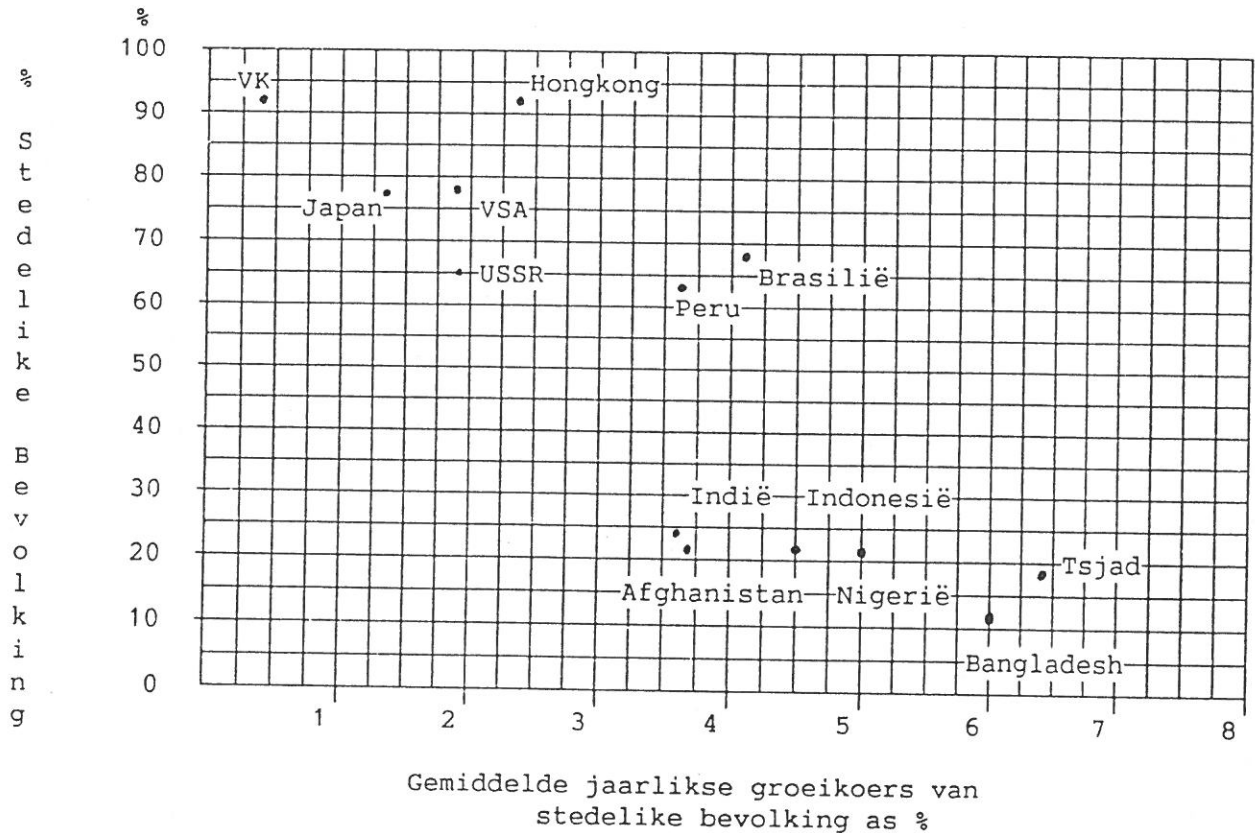
(Effens verwerk uit SKOOLDAE - Frans Marx)

- (a) Watter betekenis van "gedempte stemme" (l. 5) is **foutief**?
- (i) onderdrukte
 - (ii) gesmoorde
 - (iii) dowwe
 - (iv) luide
- (b) Hoe voel Christo, volgens die leesstuk, oor skoolhou?
- (i) Skoolhou is vir hom vol uitdagings.
 - (ii) Hy kan sy kennis hier met ander deel.
 - (iii) Skoolhou is vir hom 'n roeping.
 - (iv) Skoolhou maak hom baie benoud.
- (c) Watter een van die volgende struktuurmiddele word **nie** in die stuk gebruik om die karakters aan die leser te openbaar **nie**?
- (i) Direkte innerlike monoloog (hardop dink in die eerste persoon).
 - (ii) Indirekte innerlike monoloog (hardop dink in die derde persoon).
 - (iii) Dialoog.
 - (iv) Handeling.

Afdeling B - Data-analise

Vraag 1

Die persentasies aan die linkerkant van die onderstaande grafiek gee die persentasie weer van die totale bevolking van 'n land wat in stede woon. Die persentasies onderaan die grafiek gee die gemiddelde jaarlikse groeikoers weer van die bevolking wat in stede woon.



- (a) Volgens die grafiek, in watter land is die vinnigste groeiende stedelike bevolking te vind?
- (i) Brasilië
 - (ii) VK
 - (iii) Tsjad
 - (iv) Hongkong

- (b) 'n Omgekeerde verhouding bestaan tussen die persentasie bevolking wat in stede woon en die gemiddelde jaarlikse persentasie groeikoers van die stedelike bevolking. Watter twee lande vertoon dit die beste?
- (i) Nigerië en Indonesië
 - (ii) Brasilië en Peru
 - (iii) Tsjad en Japan
 - (iv) Tsjad en die VK
- (c) Watter een van die volgende stellings kan deur die grafiek bevestig word?
- (i) Hongkong het 'n bloeiende ekonomie.
 - (ii) Die persentasie van die stedelike bevolking in Peru en Indië sal teen dieselfde tempo vermeerder.
 - (iii) Daar is groter stede in die VSA as in Bangladesh.
 - (iv) Die persentasie van die stedelike bevolking in ontwikkelende lande is geneig om laag te wees.

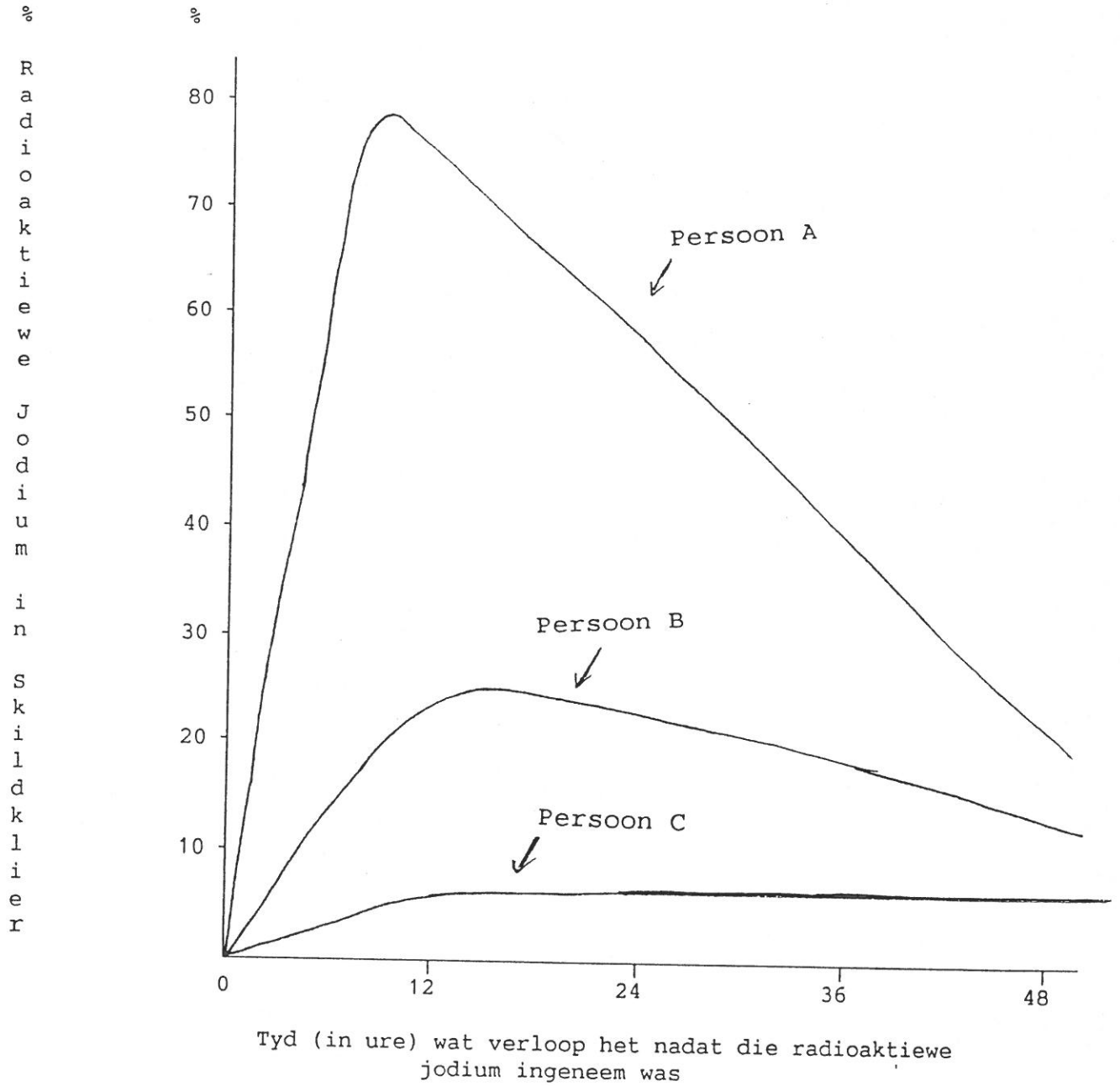
Vraag 2

In die mens word die normale groei van die liggaam en die tempo waarteen chemiese reaksies plaasvind (metabolisme) gekontroleer deur 'n hormoon (tiroksine) wat deur die skildklier vrygestel word. Om tiroksine te produseer moet die skildklier genoeg jodium inneem want jodium is noodsaaklik vir die bou van 'n deel van die tiroksine molekule. (Jodium is 'n chemikalie).

Mense kry gewoonlik genoeg jodium deur hul drinkwater in maar in sekere streke in Suid-Afrika is daar min of geen jodium in die water nie en ander bronne van jodium is nodig. Dit is hoekom 'n mens gejodeerde tafelsout by die supermark kan koop. Klein hoeveelhede jodium moet voortdurend ingeneem word want, sodra tiroksien vaardig is, word dit in die bloed vrygestel en deur die liggaam opgebruik.

Om uit te vind hoe die skildklier werk, het 'n wetenskaplike navorser aan drie verskillende mense drankies gegee wat klein hoeveelhede radioaktiewe jodium bevat wat maklik opgespoor kan word. Een van die drie mense wat getoets is, het 'n **normale** skildklier gehad en **normale** hoeveelhede tiroksien geproduseer. Een persoon het 'n skildklier met **verminderde werking** gehad en dus te min tiroksine geproduseer, terwyl die derde persoon 'n **oor-aktiewe** skildklier gehad het en dus te veel tiroksine produseer het. Dieselfde hoeveelheid radioaktiewe jodium is aan al drie mense gegee. Toe het die navorser oor die volgende twee dae die hoeveelheid radioaktiewe jodium **in die skildklier** gemeet.

Die volgende grafiek vertoon die uitslae wat van hierdie eksperiment verkry was.



- (a) Wat sal die gevolge wees as 'n persoon **geen** jodium in sy/haar dieet het nie?
- (i) Die persoon sal baie vinning groei en sal baie minder aktief wees.
 - (ii) Die persoon sal normaal groei en baie aktief wees.
 - (iii) Die persoon sal baie stadig groei en baie minder aktief wees.
 - (iv) Die persoon sal baie stadig groei en normaal aktief wees.
- (b) Kies die beste opsie om die sin te voltooi:
Die hoeveelheid radioaktiewe jodium in Persoon C verminder glad nie oor die twee dae nie. Dit gebeur omdat ...
- (i) die persoon 'n **onder-aktiewe** skildklier het en **min** tiroksine word geproduseer.
 - (ii) die persoon 'n **onder-aktiewe** skildklier het en **geen** radioaktiewe jodium word ingeneem nie.
 - (iii) die persoon 'n **normale** skildklier het wat **normale** hoeveelhede tiroksine produseer.
 - (iv) die persoon 'n **oor-aktiewe** skildklier het en **geen** tiroksine produseer nie.

Vraag 3

Die volgende stellings verwys na die rookgewoonte.

- o Longkanker kan deur óf aktiewe óf passiewe rook veroorsaak word.
- o As dit deur aktiewe rook veroorsaak word, dan kan dit veroorsaak word deur 'n pyp of 'n sigaret te rook.
- o Mense wat in 'n rokerige, stowerige omgewing werk, het 'n hoë voorkoms van longkanker.

(a) Watter van die volgende stellings is **FOUTIEF**?

- (i) Aktiewe rook is nie die enigste oorsaak van longkanker nie.
- (ii) Dit is nie moontlik vir mense wat nie 'n pyp of sigarette rook nie om longkanker op te doen nie.
- (iii) Baie mense wat in 'n lugbesoedelde omgewing werk, het longkanker.
- (iv) Die term "passiewe rook" verwys na die inaseming van rook van ander persone se sigarette of pype.

Vraag 5

Bestudeer die data in Tabel 1 en beantwoord dan die vrae wat volg:

Tabel 1

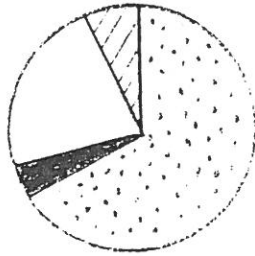
Land	Geboortekoers as % (GK)	Kinder- sterfte- koers as % (KSK)	Lewens- kans in jare (LK)	Volwasse- geletterd- heid as % (VG)	Bruto Nasio- nale produk per hoof in Rande (BNP/H)
RSA	4	5.5	63	57	2 676
Tsjad	4.2	16.1	44	15	80
Ethiopië	4.7	12.2	47	15	140
Tanzanië	4.7	12.2	47	74	280
Mali	4.8	13.2	45	9	180
Ghana	4.9	8.6	55	30	360
Angola	4.9	16.5	43	5	1 247
Nigerië	5.0	10.9	50	29	860
Botswana	5.1	8.3	48	33	902
Niger	5.2	13.2	45	5	310
Zimbabwe	5.4	8.3	56	71	850
Kenia	5.5	7.7	57	50	390
Malawi	5.6	13.7	44	25	210

- (a) Watter van die volgende stellings kan deur Tabel 1 bevestig word?
- (i) Die land met die laagste KSK het die hoogste VG.
 - (ii) Die laagste LK het die hoogste KSK.
 - (iii) Die hoogste BNP/H het die hoogste VG.
 - (iv) Die laagste BNP/H het die laagste KSK.
- (b) Watter een van die volgende stellings kan van die data in Tabel 1 afgelei word?
- (i) Alle lande met 'n hoë VG het die kennis om hul GK beter te kontroleer as dié met 'n lae VG.
 - (ii) Alle lande met 'n hoë BNP/H vertoon 'n hoë VG en 'n lae KSK.
 - (iii) Mediese dienste, skole en werk in Tsjad is feitlik nie-bestaande.
 - (iv) Die gesonde klimaat van die Keniaanse hooglande is die rede vir die hoë LK.

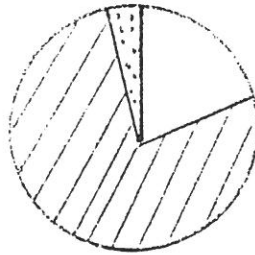
Vraag 6

Die volgende sektorgrafiese kaarte vertoon die samestelling van vyf verskillende oesplante in terme van die persentasie koolhidraat (stysels en suikers), die persentasie vet en die persentasie proteïne. Bestudeer die sektorgrafiese kaarte en lees dan die bykomende stellings.

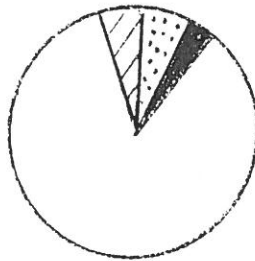
Blou-groen Alge



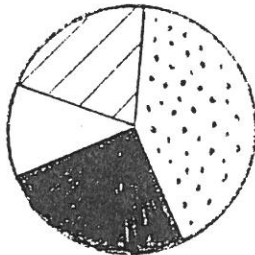
Piesang



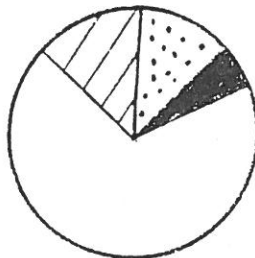
Rys



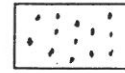
Soja



Koring



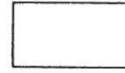
SLEUTEL



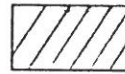
proteïne



vet



koolhidraat



ander
(insluitend
water, vesel,
minerale sout,
en vitamïnes)

Vraag 6 volg.

STELLINGS

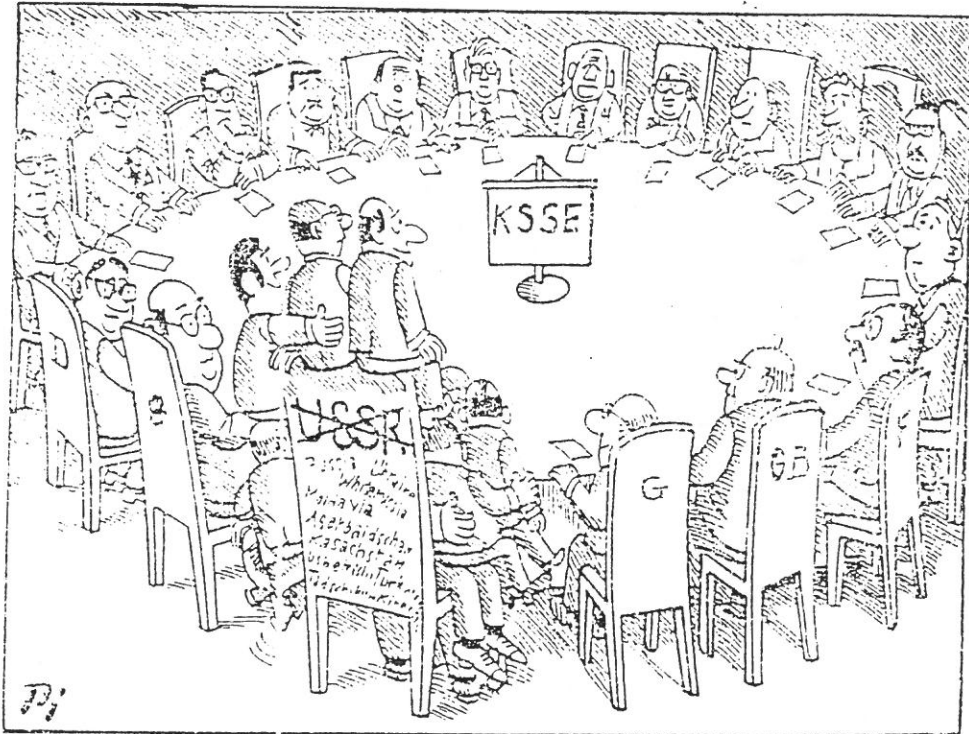
- o Blou-groen alge groei in warm, mineralryk poele in tropiese gebiede.
- o Omdat blou-groen alge eensellige organismes is, word kos wat daarvan geproduseer word, Eensellige Proteïne (ESP) genoem.
- o Blou-groen alge het nie misstowwe nodig om vinnig te groei nie.
- o Derde Wêreld (ontwikkelende) lande het vinniggroeiende bevolkings.
- o Koolhidraatrykende plante voorsien die meeste energie in kos.
- o Die mens is allesetend en eet beide plante en diere (vleis).
- o Derde Wêreld (ontwikkelende) lande vind dit moeilik om genoeg kos te produseer.
- o Die stapelvoedsel in die meeste Derde Wêreld (ontwikkelende) lande is ryk aan koolhidraat.
- o Omdat blou-groen alge eensellige organismes is, vermeerder hulle vinnig en groei baie vinnig.
- o In Tsjad en Mexiko word blou-groen alge ge-oes en gedroog om 'n beskuitagtige kos te vorm vir die voeding van vee (skape en beeste).
- o Tsjad en Mexiko is albei ontwikkelende lande.
- o As diere plante eet, word die meeste van die energie deur die dier gebruik om aan die lewe te bly. Baie min van dié energie word aan die mens deurgegee wanneer hy die vleis eet.
- o In beskuitagtige vorm proe ESP nie baie lekker nie.
- o Die bevolkings in Eerste Wêreld (ontwikkelde) lande, bv. VSA, is gestabiliseerd en groei nie vinning nie.
- o Gevorderde tegnologie is in Eerste Wêreld lande beskikbaar om kosproduksie te verhoog.

Vraag 6 volg.

Beantwoord die vrae deur na die sektorgrafiese kaarte en/of na die stellings te verwys. Kies in elke geval die beste antwoord, gebaseer op die inligting wat aan u gegee is.

- (a) Watter plant bevat waarskynlik die hoogste persentasie vesel?
- (i) blou-groen alge
 - (ii) piesang
 - (iii) rys
 - (iv) koring
- (b) Watter van die volgende lys die plante korrek in orde van koolhidraat-inhoud, beginnende met een van die twee oesplante wat 'n baie hoë koolhidraat-inhoud het?
- (i) koring, blou-groen alge, rys, piesang
 - (ii) rys, blou-groen alge, soja, piesang
 - (iii) rys, piesang, blou-groen alge, soja
 - (iv) koring, blou-groen alge, piesang, soja
- (c) ESP word dikwels gebruik vir die voeding van vee (skape en beeste). Hoekom sal dit doeltreffender wees om die mens direk ESP te laat eet?
- (i) ESP is nie baie smaaklik nie maar voorsien tog 'n gebalanseerde dieet.
 - (ii) Meer energie sal vir die mens beskikbaar wees.
 - (iii) Dit sal nie nodig wees om die blou-groen alge in beskuite te omskep nie.
 - (iv) Alle beskikbare grond kan as weiding vir vee gebruik word.
- (d) Wat sal die grootste voordeel vir Derde Wêreld lande wees om ESP as stapelvoedsel te gebruik?
- (i) Genoeg kos vir die hele bevolking kan op 'n doeltreffender wyse geproduseer word.
 - (ii) Oesproduksie op land en die veestapel kan verminder word, wat weiding kans gee om te herstel.
 - (iii) Meer kos kan geproduseer word waardeur die bevolking vinniger kan toeneem.
 - (iv) Minder oesproduksie op land sal meer grond beskikbaar stel om as weiding gebruik te word sodat die beesstapel kan vermeerder.

Vraag 7



Die Konferensie oor Sekuriteit en Samewerking in Europa: Tuiste van sekuriteit of 'n toneel van verwarring?

Die skets dui op 'n ernstige probleem wat sedert die val van die USSR ontwikkel het.

- (a) Bestudeer die skets en kies die stelling wat dié probleem die **beste** beskryf.
- (i) Die Konferensie oor Sekuriteit en Samewerking in Europa het sy ledetal verhoog en het sodoende in 'n traë liggaam ontwikkel wat nie vinnig besluite kan neem nie.
 - (ii) Die Konferensie oor Sekuriteit en Samewerking in Europa word deur vorige lede van die USSR oorheers.
 - (iii) Die USSR is deur 'n konfederasie van onafhanklike state vervang.
 - (iv) Frankryk en Brittanje het genoeg gemeenskaplikhede en mag om die Konferensie oor Sekuriteit en Samewerking in Europa te oorheers.

Vraag 8

Die tabel toon metale wat by staal gevoeg is om verskillende allooie te maak.

	Allooi-staal	Eienskappe
1	Titaanstaal	hoë smeltpunt, ligte gewig
2	Kobaltstaal	verbeterde magnetiese eienskappe
3	Nikkel/Chroomstaal	roesbestand
4	Tungstenstaal	hoë smeltpunt en sterker as ander allooie

(a) Watter soort staal sal die geskikste wees vir die snytande van 'n hoë-spoed saag om sagte hout mee te saag?

- (i) 1
- (ii) 2
- (iii) 3
- (iv) 4

(b) Watter soort staal sal die geskikste wees om 'n houer te maak vir 'n vragmotor wat chemikalieë vervoer?

- (i) 1
- (ii) 2
- (iii) 3
- (iv) 4

(c) Watter soort staal sal die geskikste wees om 'n ystersaag te maak om metaal mee te saag?

- (i) 1
- (ii) 2
- (iii) 3
- (iv) 4

Vraag 9

Vier gesinslede neem aan vier verskillende kompetisies deel.

Jan koop 'n kaartjie vir R200 in 'n kompetisie wat 'n Toyota Corolla, ter waarde van R80 000, as eerste prys het en 'n aluminium fiets ter waarde van R4 000 as die tweede prys. Een duisend kaartjies sal verkoop word.

Grieta koop twee kaartjies teen R15 elk in 'n kompetisie wat R100 000 as eerste prys het en R10 000 as tweede prys. Twee duisend kaartjies sal verkoop word.

Afdeling B

Riaan gaan 'n vennootskap met 'n vriend aan en sy deel van 'n kaartjie kos R5. Die kompetisie word by sy werksplek gereël en die eerste prys is 'n Kerfeeskalkoen ter waarde van R50 terwyl die tweede prys 'n bottel vonkelwyn ter waarde van R25 is. As hul gesamentlike kaartjie 'n prys wen, het hulle ingestem om 'n verdere trekking tussen hulle twee te hê. 200 kaartjies word verkoop.

Sannie koop 'n R10 kaartjie in 'n kompetisie waarmee sy 'n jaar se modelleeropleiding ter waarde van R2 400 kan wen. Een duisend kaartjies word gedruk maar net 100 word verkoop.

(a) Watter gesinslid het die beste kans om 'n prys te wen?

- (i) Jan
- (ii) Grieta
- (iii) Riaan
- (iv) Sannie

(b) As elke lid die eerste prys gewen het in hul spesifieke kompetisie, watter gesinslid sou die meeste wins op sy geld gemaak het?

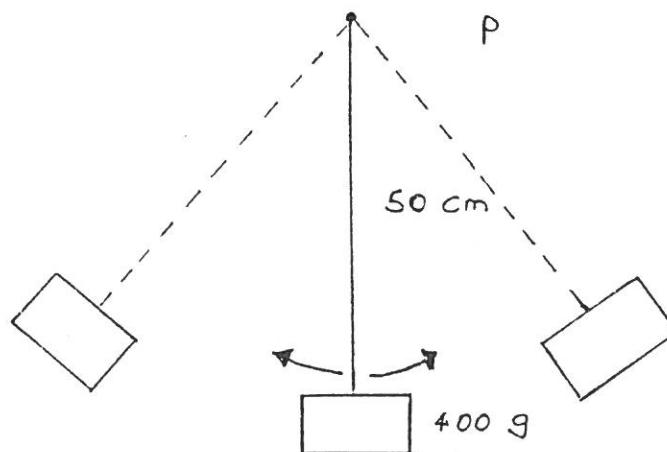
- (i) Jan
- (ii) Grieta
- (iii) Riaan
- (iv) Sannie

Afdeling C - Logika en Berekening

Vraag 1

- (a) As 10 mans R600 in 12 dae verdien, hoeveel sal 6 mans in 15 dae verdien? Veronderstel dat elke man dieselfde loon ontvang.
- (i) 480
 - (ii) 450
 - (iii) 288
 - (iv) 360
- (b) Elkeen van die onderstaande 3-letter kodes het sy eie interne patroon. Identifiseer die kode met 'n patroon wat van die ander verskil.
- (i) XBA
 - (ii) VJK
 - (iii) TON
 - (iv) RHG
- (c) Die woord CHOLERA hoort tuis in net een van die kategorieë wat hieronder gedefinieer word. Kies die kategorie.
- (i) Die tweede letter is 'O', die derde 'I' en die laaste letter is 'L'
 - (ii) Die tweede letter is 'O', die derde is enigeen behalwe 'I' en die laaste letter is 'L'
 - (iii) Die tweede letter is nie 'O' nie, die derde is enigeen behalwe 'I' en die vierde letter is enigeen behalwe 'L'
 - (iv) Die woord behoort nie in een van die bostaande kategorieë nie.

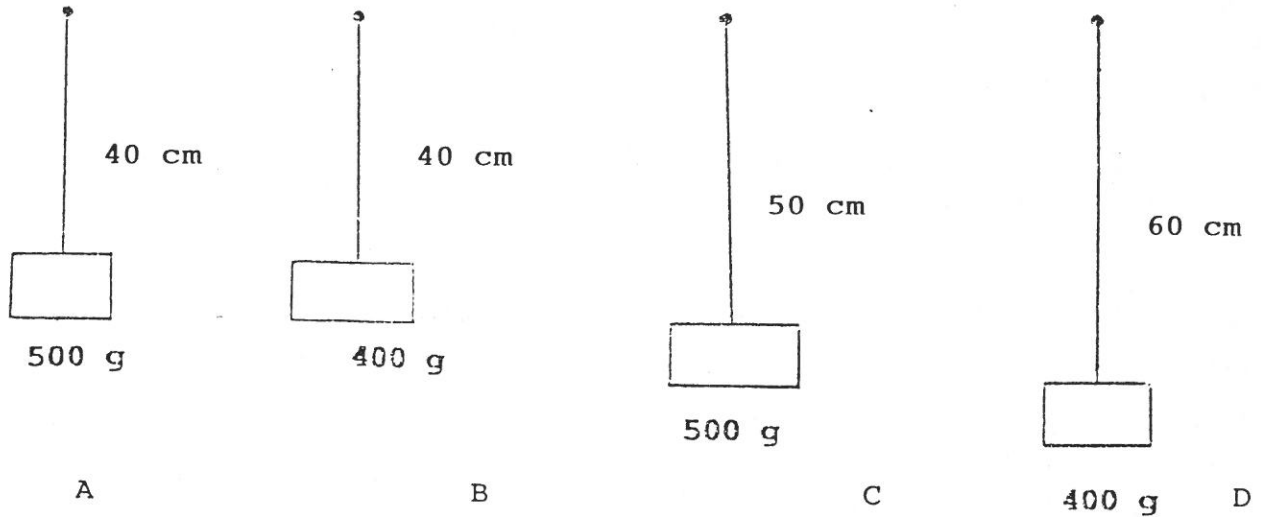
Vraag 2



'n Slinger P bestaan uit 'n stuk tou wat aan een punt vasgeheg word sodat dit om daardie punt kan swaai. Aan die ander punt word 'n gewig vasgemaak. Die massa van hierdie gewig word in gram uitgedruk.

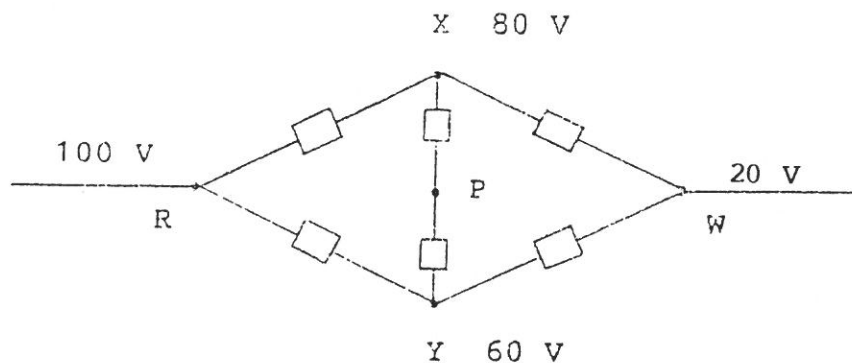
Dit word eksperimenteel bepaal dat die aantal swaaie van 'n slinger vir 'n gegewe tyd (frekwensie van ossillasie) slegs afhang van die lengte van die tou.

(a) Watter van die slingers sal dieselfde frekwensie van ossillasie hê as slinger P hierbo?



- (i) A
- (ii) B
- (iii) C
- (iv) D

Vraag 3



Elektriese potensiaal word in volt (V) gemeet. In die elektriese netwerk hierbo, word die elektriese potensiaal by verskeie punte aangedui. In 'n netwerk vloei elektriese stroom vanaf 'n punt met hoër potensiaal na 'n punt met laer potensiaal.

(a) Watter van die volgende stellings is waar?

- (i) 'n Stroom sal vloei van Y na R
- (ii) 'n Stroom sal nie vloei van X na Y
- (iii) 'n Stroom sal vloei van W na Y
- (iv) 'n Stroom sal vloei van R na W

(b) As 'n stroom van X na Y vloei, watter van die volgende gevolgtrekkings kan gemaak word?

- (i) W het 'n hoër potensiaal as P.
- (ii) X het 'n laer potensiaal as P.
- (iii) P het 'n potensiaal tussen 60 V and 80 V.
- (iv) Y het 'n hoër potensiaal as P.

Vraag 4

Die onderstaande stellings verwys na 'n elektriese netwerk en na die verskeie punte in daardie netwerk wat verskillende elektriese potensiaal het. Let wel dat elektriese potensiaal in volt (V) gemeet word.

Punt J het 'n potensiaal wat 50 V laer is as die van punt G.
Punt E het 'n potensiaal wat 15 V laer is as dié van punt G.
Punt E het 'n potensiaal wat 55 V hoër is as dié van punt F.
Punt J het 'n potensiaal wat 50 V hoër is as dié van punt H.

(a) Wat is die volgorde van hierdie punte vanaf hoogste tot laagste elektriese potensiaal?

- (i) G J E F H
- (ii) G E J F H
- (iii) G E F E H
- (iv) G J E H F

(b) Watter van die volgende stellings is waar?

- (i) E het 'n potensiaal wat 85 V hoër is as dié van H.
- (ii) J het 'n potensiaal wat 30 V hoër is as dié van F.
- (iii) H het 'n potensiaal wat 40 V laer is as dié van F.
- (iv) F het 'n potensiaal wat 80 V laer is as dié van G.

Vraag 5

In die volgende oefening moet S herhaaldelik vervang word met die alternatiewe letter of groep letters wat gegee is. Enige van die gegewe waardes van S kan meer as eenkeer gebruik word. Byvoorbeeld, gegee dat

S kan vervang word met aS
 of bS
 of a
 of b

om die groep letters **aabb** te ontwikkel, waarvoor die volgende sekvensie van vervangings nodig is:

Stap 1: Vervang S met aS: S → aS
Stap 2: Vervang S met aS: → aaS
Stap 3: Vervang S met bS: → aabS
Stap 4: Vervang S met b: → aabb

In nog 'n byvoorbeeld word die sekwensie **bab** as volg ontwikkel:

Stap 1: Vervang S met bS: S → bS
Stap 2: Vervang S met aS: → baS
Stap 3: Vervang S met b: → bab

Solank daar 'n S in die sekwensie is, moet vervanging plaasvind.

(a) Gegee dat S kan vervang word deur aSa
 of bSb
 of a
 of b

watter een van die volgende voltooide sekwensies kan ontwikkel word beginnende met die letter S en herhaaldelike vervanging soos in bostaande voorbeelde geïllustreer is, en gebruik te maak van die waardes vir S wat gegee is?

- (a) aab
- (b) abbba
- (c) abbaa
- (e) bababa

(b) Gegee dat S kan vervang word met aS
 of aSb
 of X
en gegee dat X kan vervang word met aXa
 of a

watter van die volgende sekwensies van vervangings lewer die sekwensie letters **aaaabb**?

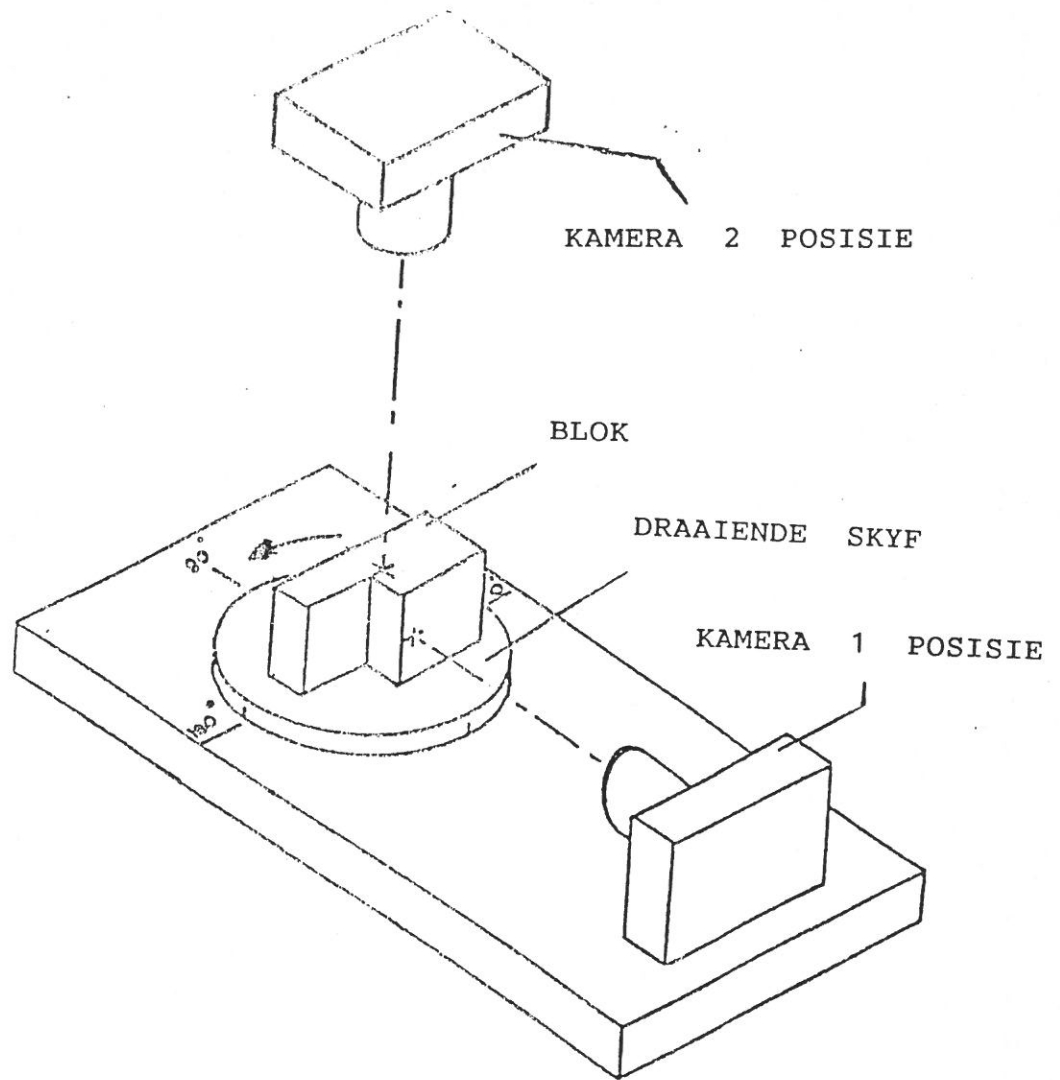
(i) S → aS
 S → aSb
 S → X
 X → aXa
 X → a

(ii) S → aS
 S → aSb
 S → aSb
 S → X
 X → a

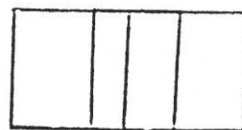
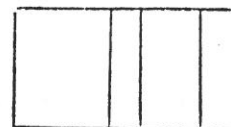
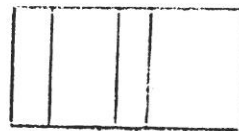
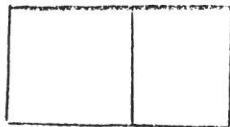
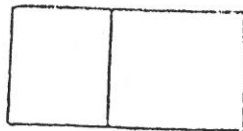
(iii) S → aSb
 S → aSb
 S → X
 X → aXa
 X → a

(iv) S → aS
 S → aSb
 S → aSb
 S → X
 X → aXa
 X → a

Vraag 6



(a) P is 'n foto van die blok wat afgeneem is toe die kamera op posisie 1 was. Watter een van die volgende tekeninge is die ware weergawe van 'n foto wat ook van posisie 1 afgeneem is maar nadat die blok 45° in die rigting van die pyltjie gedraai is.



P

A

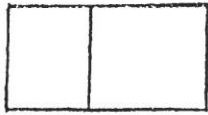
B

C

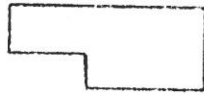
D

- (i) A
- (ii) B
- (iii) C
- (iv) D

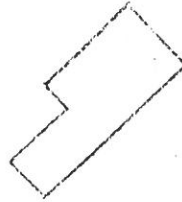
(b) P is 'n foto van die blok wat afgeneem is toe die kamera in posisie 1 is. Watter een van die volgende tekeninge is die ware weergawe van die foto wat afgeneem is toe die kamera in posisie 2 was en nadat die blok 45° in die rigting van die pyltjie gedraai is?



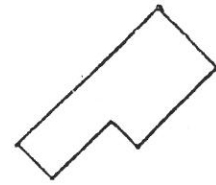
P



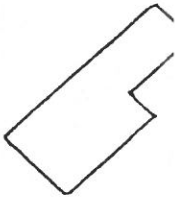
A



B



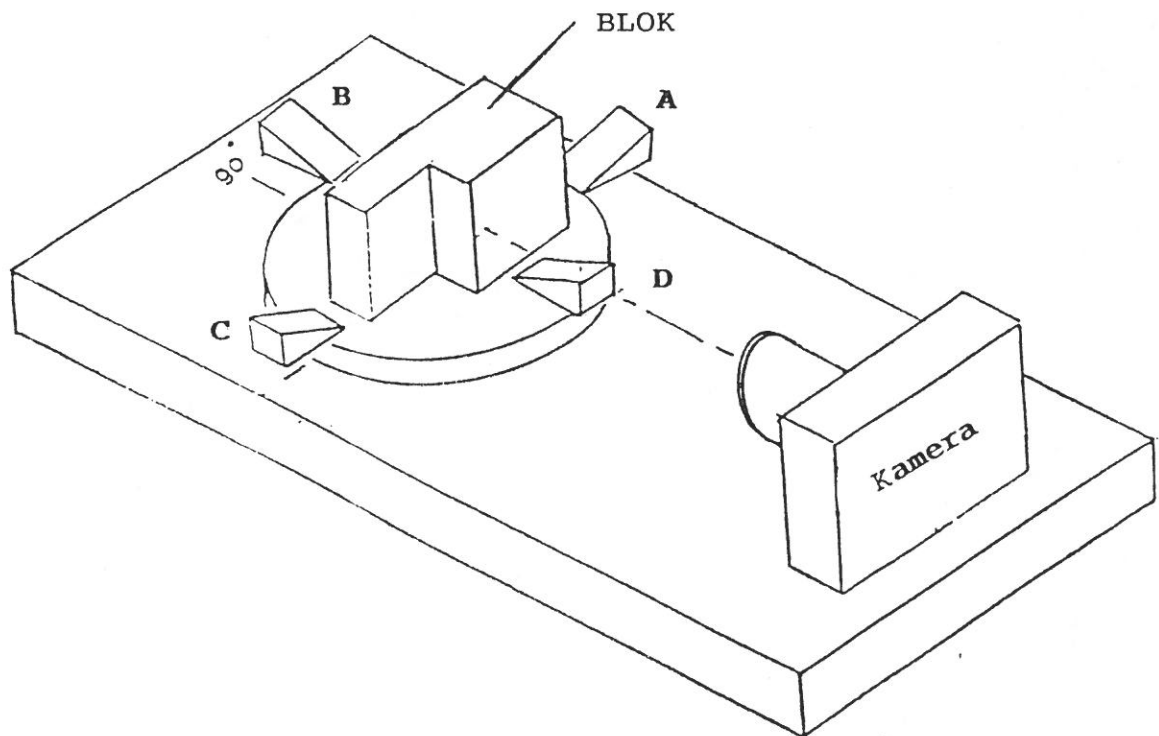
C



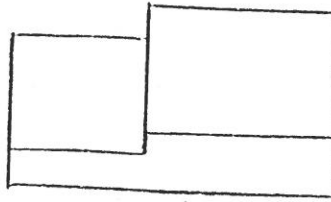
D

- (i) A
- (ii) B
- (iii) C
- (iv) D

Vraag 7



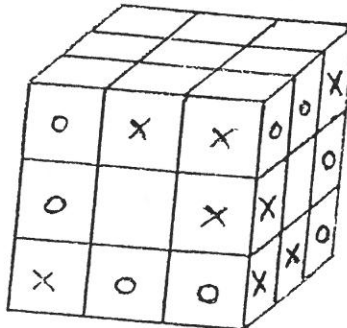
- (a) Watter wig moet onder die blok geplaas word om die foto hieronder vertoon te kry? Die wig verskyn nie in die foto nie.



- (i) A
(ii) B
(iii) C
(iv) D

Vraag 8

Vervolgens is 'n 3-dimensionele diagram van 'n kubus. 'n Kubus is 'n vaste figuur met 6 vierkantige sye. Elke sy van die kubus is 3cm lank. Strepe word een sentimeter vanaf mekaar op die kubus getrek, soos op die diagram getoon. Die blokkies is, soos getoon, met nulle en kruise gemerk.



- (a) Hoeveel vierkantige vorms kan op die een kant van die kubus waargeneem word? Die vierkantige vorms hoef nie dieselfde groottes te wees nie.

- (i) 9
(ii) 10
(iii) 14
(iv) 27

- (b) As die kubus na links roteer word en onderstebo geplaas word sodat dieselfde vlak getoon word, wat sal die rangskikking van die letters op die boonste ry wees?

- (i) x x o
(ii) x o o
(iii) o x x
(iv) o o x

Vier vlakke van die kubus word geel geverf. Die vlakke wat ondertoe en boontoe wys word nie geverf nie. Die kubus word op die strepe deurgesaag sodat daar 'n aantal klein kubusse is.

- (c) Hoeveel van die klein kubusse het geel verf op hulle?

- (i) 36
(ii) 26
(iii) 24
(iv) 18

- (d) Indien die ander twee vlakke ook geverf was, hoeveel van die klein kubusse sou geel verf op slegs 2 kante gehad het?

- (i) 10
(ii) 12
(iii) 16
(iv) 20

Vraag 9

Vir enige drie letters p , q en r en vir die volgende operasies $*$, $\#$ en \sim , geld die volgende reëls:

$p * q$ gee die resultaat p

$p \# q$ gee die resultaat q

$\sim p$ gee die resultaat $-p$

$\sim -p$ gee die resultaat p

As daar meer as een operasie betrokke is, moet dié wat tussen ronde hakies d.i. $()$ eerste gedoen word en daarna dié tussen vierkantige hakies d.i. $[\]$.

- (a) Met die toepassing van die reëls wat hierbo beskryf is, identifiseer watter van die volgende stellings **VALS** is.

(i) $[\sim(\sim r) \# p] * (r * q) = p$

(ii) $r * (p \# q) = (r \# p) * (r \# q)$

(iii) $(\sim -r) * q = q \# (\sim -r)$

(iv) $\sim (r * t) = (\sim t) \# (\sim r)$

Vraag 10

Hierdie syfers pas almal by 'n groep rëels wat **Blobs** definieer.

	36		
9		72	441
			126
	711		
			801

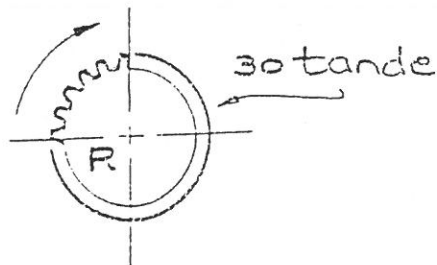
Hierdie syfers is nie **Blobs** nie.

	8		
60		381	32
			821
	336		
			167

(a) Watter van die volgende groepe bevat syfers wat **Blobs** is?

- (i) 224; 10081;
- (ii) 225; 10071;
- (iii) 225; 10081;
- (iv) 224; 10071;

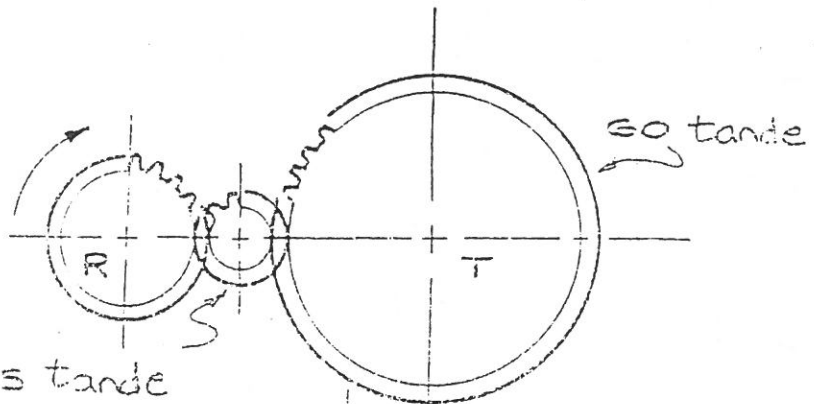
Vraag 11



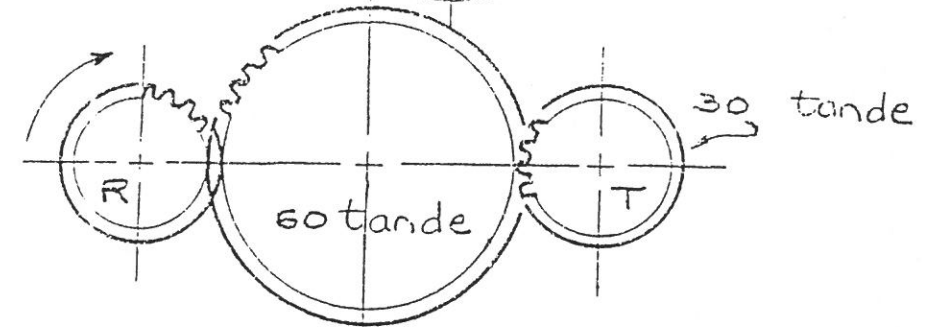
Rat R het 30 tande en roteer kloksgewys, soos getoon. Nie al die tande word op die ratte in die sketse getoon nie.

(a) Watter ratkombinasie sal veroorsaak dat rat T ook kloksgewys sal draai, maar teen die helfte van die spoed waarteen rat R draai?

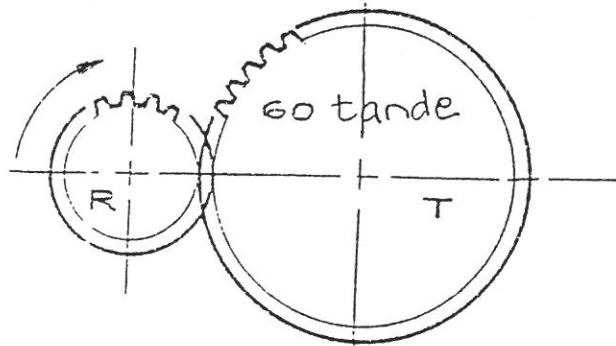
(A)



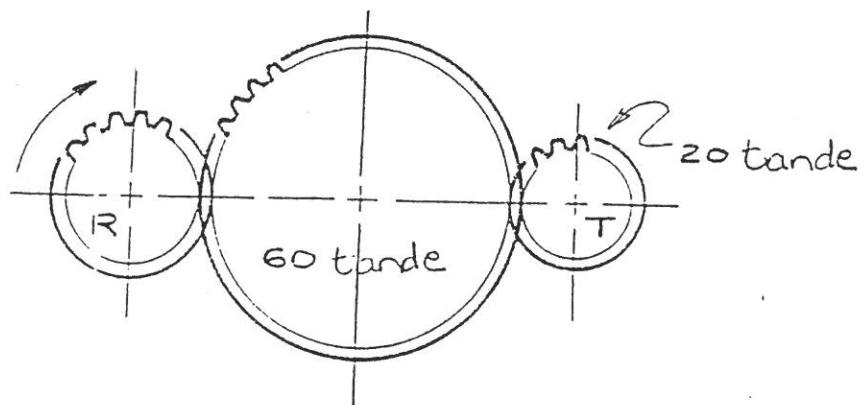
(B)



(C)



(D)



- (i) A
- (ii) B
- (iii) C
- (iv) D

ANTWOORDE OP DIE NAVORSINGSPROJEK SKOLASTIESE AANLEGTTOETS

Afdeling A - Kommunikasie

Vraag 1

- (a) 3
- (b) 4
- (c) 2
- (d) 2

Vraag 2

- (a) 2
- (b) 2

Vraag 3

- (a) 3
- (b) 3
- (c) 4
- (d) 2

Vraag 4

- (a) 4
- (b) 4
- (c) 3

Afdeling B - Data-analise

Vraag 1

- (a) 3
- (b) 4
- (c) 4

Vraag 2

- (a) 3
- (b) 1

Vraag 3

- (a) 2

Vraag 4

- (a) 4
- (b) 3

Vraag 5

- (a) 2
- (b) 3

Vraag 6

- (a) 2
- (b) 4
- (c) 2
- (d) 1

Vraag 7

- (a) 3

Vraag 8

- (a) 1
- (b) 3
- (c) 4

Vraag 9

- (a) 4
- (b) 2

Afdeling C - Logika en Berekening

Vraag 1

- (a) 2
- (b) 2
- (c) 4

Vraag 2

- (a) 3

Vraag 3

- (a) 4
- (b) 3

Vraag 4

- (a) 2
- (b) 1

Vraag 5

- (a) 2
- (b) 2

Vraag 6

- (a) 2
- (b) 3

Vraag 7

- (a) 4

Vraag 8

- (a) 3
- (b) 3
- (c) 3
- (d) 2

Vraag 9

- (a) 2

Vraag 10

- (a) 2

Vraag 11

- (a) 1

APPENDIX D

Mean scores in each subject, the predictions and difficulty measurements using regression and guideline methods, the aggregate, weighted and unweighted subject-pairs analyses and the UBMT

Appendix D

Mean scores in each subject, the predictions and difficulty measurements using regression and guideline methods, the aggregate, weighted and unweighted subject pairs analyses and the UBMT

Subject	Number candidates	Mean in Subject %	Mean in Regression Prediction	Mean in Guideline Prediction	Mean in Measure of difficulty	Mean in Subject	Mean in Aggregate	Mean in Measure of difficulty	Mean in Subject	Mean in Weighted S-Ps	Mean in Measure of difficulty	Mean in Subject	Mean in UBMT	Mean in Measure of difficulty
ACCO9	386	57,52	58,25	61,21	3,69	57,52	62,86	5,34	57,44	59,84	2,40	56,42	60,92	4,50
AFRM9	420	57,25	54,19	56,38	-0,87	57,25	55,78	-1,67	57,62	55,61	-2,01	58,06	55,29	-2,77
AFRS9	1296	57,04	57,55	60,38	3,34	57,04	59,18	2,14	56,90	57,57	0,67	55,64	56,86	1,22
ARTS9	150	56,93	54,50	56,74	-0,19	56,93	57,99	1,06	57,24	55,8	-1,44	57,29	54,86	-2,43
BIOL9	706	57,39	59,02	62,13	4,74	57,39	64,13	6,74	57,46	61,25	3,80	56,31	62,25	5,94
BUSE9	107	53,13	53,22	55,22	2,09	53,13	56,00	2,87	53,59	56,32	2,73	54,33	56,67	2,34
DRAM9	105	60,77	58,67	61,72	0,95	60,77	63,82	3,05	61,18	60,20	-0,99	62,17	60,04	-3,14
ENGM9	1277	58,58	57,81	60,68	2,10	58,58	59,76	1,18	58,73	57,43	-1,30	56,75	57,15	0,40
ENGS9	453	57,03	53,71	55,80	-1,23	57,03	54,70	-2,33	57,32	55,06	-2,26	57,00	55,00	-2,00
GEOG9	640	57,42	58,27	61,24	3,82	57,42	60,40	2,98	57,48	58,08	0,60	56,33	58,94	2,61
HIST9	310	58,12	58,40	61,39	3,27	58,12	62,81	4,69	58,31	60,25	1,93	57,57	60,50	2,93
HOME9	343	56,01	53,04	55,00	-1,01	56,01	55,53	-0,48	56,25	55,50	-0,75	55,80	55,40	-0,40
MATH9	572	57,07	61,52	65,11	8,04	57,07	68,33	11,26	57,20	63,65	6,44	55,79	65,00	9,21
PHSC9	512	56,68	62,12	65,82	9,14	56,68	68,05	11,37	57,00	63,68	6,69	55,45	65,00	9,55
TECD9	229	56,18	57,56	60,39	4,21	56,18	56,69	0,58	56,40	54,43	-1,96	58,33	55,00	-3,33
ACCO8	317	51,10	50,97	52,54	1,44	51,10	47,24	-3,86	51,45	51,56	0,11	50,89	51,89	1,00
AFRM8	164	55,11	46,92	47,71	-7,40	55,11	41,68	-13,43	55,98	46,17	-9,81	55,91	45,73	-10,18
AFRS8	382	53,43	49,78	51,11	-2,32	53,43	44,58	-8,85	53,50	49,66	-3,83	57,27	49,33	-7,94
ARTS8	53	53,28	48,14	49,16	-4,12	53,28	43,27	-10,01	53,34	48,24	-5,09	53,28	48,08	-5,20
BIOL8	629	52,08	50,43	51,90	-0,18	52,08	47,55	-4,53	52,18	51,30	-0,87	51,80	50,76	-1,04
BUSE8	211	47,98	48,47	49,56	1,58	47,98	44,90	-3,08	48,51	51,02	2,51	47,54	51,31	3,77
DRAM8	32	60,64	50,55	52,03	-8,61	60,64	45,89	-14,75	60,87	49,93	-10,94	60,64	49,15	-11,49
ENGM8	415	54,59	49,42	50,69	-3,90	54,59	43,79	-10,80	55,19	48,89	-6,30	55,57	48,58	-6,97
ENGS8	135	54,95	46,68	47,42	-7,53	54,95	42,19	-12,76	55,33	46,44	-8,90	55,56	45,11	-10,45
FUNM8	128	46,39	49,22	50,46	4,07	46,39	41,26	-5,13	46,37	46,90	0,53	46,86	46,43	-0,43
GEOG8	351	50,78	50,33	51,78	1,00	50,78	45,01	-5,77	50,87	49,95	-0,92	49,59	50,24	0,65
HIST8	131	51,91	51,40	53,05	1,14	51,91	47,98	-3,93	51,88	52,36	0,47	51,43	52,86	1,43
HOME8	158	50,45	46,67	47,42	-3,03	50,45	42,94	-7,51	51,23	49,23	-2,01	50,25	49,75	-0,50
MATH8	1021	52,11	54,81	57,12	5,01	52,11	52,49	0,38	52,14	54,18	2,04	49,58	54,31	4,73
PHSC8	493	50,56	54,26	56,45	5,89	50,56	49,03	-1,53	51,01	51,86	0,86	50,94	51,78	0,84
TECD8	233	55,10	51,24	52,86	-2,24	55,10	42,94	-12,16	55,46	46,73	-8,72	54,92	47,75	-7,17
TYPG8	472	56,53	49,65	50,97	-5,56	56,53	49,23	-7,30	56,81	52,53	-4,28	56,84	52,32	-4,21
ACCO8	317	51,10	50,97	52,54	1,44	51,10	47,24	-3,86	51,45	51,56	0,11	50,89	51,89	1,00
AFRM8	164	55,11	46,92	47,71	-7,40	55,11	41,68	-13,43	55,98	46,17	-9,81	55,91	45,73	-10,18
AFRS8	382	53,43	49,78	51,11	-2,32	53,43	44,58	-8,85	53,50	49,66	-3,83	57,27	49,33	-7,94
ARTS8	53	53,28	48,14	49,16	-4,12	53,28	43,27	-10,01	53,34	48,24	-5,09	53,28	48,08	-5,20
BIOL8	629	52,08	50,43	51,90	-0,18	52,08	47,55	-4,53	52,18	51,30	-0,87	51,80	50,76	-1,04
BUSE8	211	47,98	48,47	49,56	1,58	47,98	44,90	-3,08	48,51	51,02	2,51	47,54	51,31	3,77
DRAM8	32	60,64	50,55	52,03	-8,61	60,64	45,89	-14,75	60,87	49,93	-10,94	60,64	49,15	-11,49
ENGM8	415	54,59	49,42	50,69	-3,90	54,59	43,79	-10,80	55,19	48,89	-6,30	55,57	48,58	-6,97
ENGS8	135	54,95	46,68	47,42	-7,53	54,95	42,19	-12,76	55,33	46,44	-8,90	55,56	45,11	-10,45
FUNM8	128	46,39	49,22	50,46	4,07	46,39	41,26	-5,13	46,37	46,90	0,53	46,86	46,43	-0,43
GEOG8	351	50,78	50,33	51,78	1,00	50,78	45,01	-5,77	50,87	49,95	-0,92	49,59	50,24	0,65
HIST8	131	51,91	51,40	53,05	1,14	51,91	47,98	-3,93	51,88	52,36	0,47	51,43	52,86	1,43
HOME8	158	50,45	46,67	47,42	-3,03	50,45	42,94	-7,51	51,23	49,23	-2,01	50,25	49,75	-0,50
MATH8	1021	52,11	54,81	57,12	5,01	52,11	52,49	0,38	52,14	54,18	2,04	49,58	54,31	4,73
PHSC8	493	50,56	54,26	56,45	5,89	50,56	49,03	-1,53	51,01	51,86	0,86	50,94	51,78	0,84
TECD8	233	55,10	51,24	52,86	-2,24	55,10	42,94	-12,16	55,46	46,73	-8,72	54,92	47,75	-7,17
TYPG8	472	56,53	49,65	50,97	-5,56	56,53	49,23	-7,30	56,81	52,53	-4,28	56,84	52,32	-4,21
ACCO8	317	51,10	50,97	52,54	1,44	51,10	47,24	-3,86	51,45	51,56	0,11	50,89	51,89	1,00
AFRM8	164	55,11	46,92	47,71	-7,40	55,11	41,68	-13,43	55,98	46,17	-9,81	55,91	45,73	-10,18
AFRS8	382	53,43	49,78	51,11	-2,32	53,43	44,58	-8,85	53,50	49,66	-3,83	57,27	49,33	-7,94
ARTS8	53	53,28	48,14	49,16	-4,12	53,28	43,27	-10,01	53,34	48,24	-5,09	53,28	48,08	-5,20
BIOL8	629	52,08	50,43	51,90	-0,18	52,08	47,55	-4,53	52,18	51,30	-0,87	51,80	50,76	-1,04
BUSE8	211	47,98	48,47	49,56	1,58	47,98	44,90	-3,08	48,51	51,02	2,51	47,54	51,31	3,77
DRAM8	32	60,64	50,55	52,03	-8,61	60,64	45,89	-14,75	60,87	49,93	-10,94	60,64	49,15	-11,49
ENGM8	415	54,59	49,42	50,69	-3,90	54,59	43,79	-10,80	55,19	48,89	-6,30	55,57	48,58	-6,97
ENGS8	135	54,95	46,68	47,42	-7,53	54,95	42,19	-12,76	55,33	46,44	-8,90	55,56	45,11	-10,45
FUNM8	128	46,39	49,22	50,46	4,07	46,39	41,26	-5,13	46,37	46,90	0,53	46,86	46,43	-0,43
GEOG8	351	50,78	50,33	51,78	1,00	50,78	45,01	-5,77	50,87	49,95	-0,92	49,59	50,24	0,65
HIST8	131	51,91	51,40	53,05	1,14	51,91	47,98	-3,93	51,88	52,36	0,47	51,43	52,86	1,43
HOME8	158	50,45	46,67	47,42	-3,03	50,45	42,94	-7,51	51,23	49,23	-2,01	50,25	49,75	-0,50
MATH8	1021	52,11	54,81	57,12	5,01	52,11	52,49	0,38	52,14	54,18	2,04	49,58	54,31	4,73
PHSC8	493	50,56	54,26	56,45	5,89	50,56	49,03	-1,53	51,01	51,86	0,86	50,94	51,78	0,84
TECD8	233	55,10	51,24	52,86	-2,24	55,10	42,94	-12,16	55,46	46,73	-8,72	54,92	47,75	-7,17
TYPG8	472	56,53	49,65	50,97	-5,56	56,53	49,23	-7,30	56,81	52,53	-4,28	56,84	52,32	-4,21
ACCO8	317	51,10	50,97	52,54	1,44	51,10	47,24	-3,86	51,45	51,56	0,11	50,89	51,89	1,00
AFRM8	164	55,11	46,92	47,71	-7,40	55,11	41,68	-13,43	55,98	46,17	-9,81	55,91	45,73	-10,18
AFRS8	382	53,43	49,78	51,11	-2,32	53,43	44,58	-8,85	53,50	49,66	-3,83	57,27	49,33	-7,94
ARTS8	53	53,28	48,14	49,16	-4,12	53,28	43,27	-10,01	53,34	48,24	-5,09	53,28	48,08	-5,20
BIOL8	629	52,08	50,43	51,90	-0,18	52,08	47,55	-4,53	52,18	51,30	-0,87	51,80	50,76	-1,04
BUSE8	211	47,98	48,47	49,56	1,58	47,98	44,90	-3,08	48,51	51,02	2,51	47,54	51,31	3,77
DRAM8	32	60,64	50,55	52,03	-8,61	60,64	45,89	-14,75	60,87	49,93	-10,94	60,64	49,15	-11,49
ENGM8	415	54,59	49,42	50,69	-3,90	54,59	43,79	-10,80	55,19	48,89	-6,30	55,57	48,58	-6,97
ENGS8	135	54,95	46,68	47,42	-7,53	54,95	42,19	-12,76	55,33	46,44	-8,90	55,56	45,11	-10,45
FUNM8	128	46,39	49,22	50,46	4,07	46,39	41,26	-5,13	46,37	46,90	0,53	46,86	46,43	-0,43
GEOG8	351	50,78	50,33	51,78	1,00	50,78	45,01	-5,77	50,87	49,95	-0,92	49,59	50,24	0,65
HIST8	131	51,91	51,40	53,05	1,14	51,91	47,98	-3,93	51,88	52,36	0,47	51,43	52,86	1,43
HOME8	158	50,45	46,67	47,42	-3,03	50,45	42,94	-7,51	51,23	49,23	-2,01	50,25	49,75	-0,50
MATH8	1021	52,11	54,81	57,12	5,01	52,11	52,49	0,38	52,14	54,18	2,04	49,58	54,31	4,73
PHSC8	493	50,56	54,26	56,45	5,89	50,56	49,03	-1,53	51,01	51,86	0,86	50,94	51,78	0,84
TECD8	233	55,10	51,24	52,86	-2,24	55,10	42,94	-12,16	55,46	46,73	-8,72	54,92	47,75	-7,17
TYP														

APPENDIX E

Full Subject-pairs analysis of candidates

in the sample

Appendix C - Full Subject-pairs Analysis of candidates in the sample

ACC08												ACC09															
Subject of Comparison	Number of Candidates	ACC08:			Other subject:			Correlation			SAT:			Subject of Comparison	Number of Candidates	ACC09:			Other subject:			Correlation			SAT:		
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
MATH8	143	55	10.52	47	14.39	0.6289	54	12.62	AFRS9	281	58	14.68	58	11.67	0.1985	65	12.16										
BIOL8	142	48	12.56	50	12.25	0.3647	48	10.27	ENGM9	279	58	14.46	59	9.45	0.4854	65	12.16										
TYPG8	124	49	13.18	58	16.87	0.3535	46	10.12	MATH9	214	64	13.45	58	14.04	0.7081	67	12.64										
AFRS9	116	56	11.80	54	10.51	0.0014	55	11.70	PHSC9	170	65	12.76	57	14.54	0.6023	69	12.30										
ENGM9	102	58	11.53	52	7.48	0.2364	56	11.95	MATH8	161	50	11.87	63	14.10	0.5318	60	11.20										
ENGS9	92	52	12.28	53	10.27	0.0857	51	11.83	BIOL9	157	59	13.91	59	12.85	0.6404	65	11.75										
ENGM8	86	46	12.60	55	8.15	0.3275	46	13.90	GEOG9	125	57	13.42	60	10.32	0.6070	66	12.18										
AFRM9	85	53	11.71	52	8.37	0.3570	51	11.83	AFRM9	96	57	14.86	64	8.27	0.4527	62	13.31										
BUSE8	72	46	11.66	49	12.86	0.5622	46	15.75	ENGS9	96	57	14.90	62	12.17	0.2988	62	13.11										
AFRS8	69	47	13.72	55	10.33	0.0970	47	15.08	PHSC8	74	46	12.55	62	10.50	0.4672	60	11.91										
GEOG8	67	47	11.96	50	10.63	0.3237	49	10.34	BIOL8	41	47	13.16	63	10.23	0.3261	55	10.92										
PHSC8	55	54	11.04	45	10.57	0.4094	53	13.28	BUSE9	32	59	11.76	66	13.22	0.7216	60	12.95										
GEOG9	47	62	9.92	49	10.95	0.4761	58	12.71																			
BIOL9	46	63	7.63	47	10.54	0.4373	59	9.01	HOM9	27	56	16.29	66	11.01	0.4538	62	9.25										
HOM9	46	53	11.27	50	8.32	0.3906	52	8.80	HIST9	20	60	12.93	60	10.90	0.5815	63	13.84										
AFRM8	42	42	11.69	58	7.34	0.4475	44	10.39	TYPG8	20	49	13.79	67	11.36	0.4389	54	8.50										
HOM8	41	43	12.09	53	8.48	0.2752	43	16.76	GEOG8	10	43	10.84	53	5.83	-0.1580	56	7.77										
ENGS8	36	42	10.47	57	8.76	0.3907	43	10.58	ENGM8	9	38	7.07	58	6.36	0.6465	56	7.64										
									DRAM9	7	61	9.93	59	9.85	0.0513	70	6.55										
FUNM8	26	41	9.79	49	8.06	0.4603	46	11.81	AFRS8	6	47	10.92	47	8.84	-0.1351	61	11.08										
BUSE9	25	55	9.63	46	12.82	0.5842	50	10.92	HIST8	5	45	17.91	58	13.03	0.9115	59	13.02										
MATH9	12	69	5.46	40	7.93	0.2274	61	11.90	ARTS9	4	35	12.53	53	5.58	0.1424	57	9.86										
PHSC9	9	68	7.27	45	9.61	0.4781	66	7.23	BUSE8	4	49	16.36	60	5.57	-0.4798	50	9.41										
HIST8	5	43	7.10	51	12.51	-0.3917	53	8.31	TEC09	3	61	6.43	67	14.24	0.8750	70	12.63										
HIST9	3	69	8.11	44	5.41	-0.9797	57	5.44																			
DRAM9	3	62	8.44	51	3.01	-0.8736	57	16.32	Mean:		ACC09		Other	Severity													
Mean:		ACC08		Other		Severity			Mean:		ACC09		Other	Severity													
UBMT	317	51.10		51.41		0.31			UBMT	386	57.52		60.02		2.50												
Aggregate		51.10		47.24		-3.86			Aggregate		57.52		62.86		5.34												
Weighted S-Pairs		51.45		51.56		0.11			Weighted S-Pairs		57.44		59.84		2.40												
UWSP - 18 groups		50.89		51.89		1.00			UWSP - 12 groups		56.42		60.92		4.50												

AFRMB

Subject of Comparison	Number of Candidates	AFRMB:			Other subject:			Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev		
ENGS8	118	54	8.61	54	9.09	0.5982	42	9.79	
BUSE8	72	57	8.16	40	11.12	0.4045	43	9.00	
TYPG8	55	57	9.08	46	12.67	-0.0191	42	9.04	
HOME8	46	57	8.87	45	10.28	0.2502	39	8.25	
ENGS9	43	58	7.20	47	8.23	0.6144	44	8.26	
ACCO8	42	58	7.34	42	11.69	0.4475	44	10.39	
BIOL8	41	57	6.45	44	12.25	0.1957	44	9.35	
MATH8	40	57	6.72	37	16.09	0.0863	46	9.12	
TECD8	40	51	6.76	55	14.08	0.0924	43	8.88	
GEOG8	37	56	6.88	42	8.54	0.3758	45	8.64	
FUNM8	30	53	9.56	51	12.01	0.2677	44	9.74	
PHSC8	28	55	7.30	39	12.44	0.2900	47	8.14	
HIST8	13	62	7.63	46	8.79	-0.2198	45	9.49	
ARTS8	7	63	4.35	49	9.79	-0.2896	43	3.30	
TECD9	6	54	6.42	49	12.73	0.0960	43	5.58	
Mean:		AFRMB	Other	Other	Severity				
UBMT	164	55.11	45.24	45.24	-9.87				
Aggregate		55.11	41.68	41.68	-13.43				
Weighted S-Pairs		55.98	46.17	46.17	-9.81				
UMSP - 11 groups		55.91	45.73	45.73	-10.18				

AFRM9

Subject of Comparison	Number of Candidates	AFRM9:			Other subject:			Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev		
ENGS9	406	58	10.35	58	10.79	0.7226	57	13.30	
MATH8	205	56	9.04	52	16.70	0.4704	56	12.15	
BIOL8	136	52	8.00	58	13.22	0.4616	49	11.10	
PHSC8	115	56	8.83	55	15.04	0.5786	58	11.26	
MATH9	106	66	8.29	53	15.24	0.5144	66	12.26	
ACCO9	96	64	8.27	57	14.86	0.4527	62	13.31	
TYPG8	96	54	9.10	58	14.63	0.3393	48	11.15	
BIOL9	89	67	8.58	57	11.97	0.6913	64	12.24	
PHSC9	85	67	6.99	53	13.69	0.3996	67	12.02	
GEOG9	85	60	8.20	57	10.63	0.6501	62	12.26	
ACCO8	85	52	8.37	53	11.71	0.3570	51	11.83	
BUSE8	70	50	7.30	52	11.26	0.3960	47	11.17	
BUSE9	64	59	9.24	56	15.93	0.6727	55	13.66	
HOME9	62	57	8.37	52	10.98	0.7959	52	10.11	
TECD9	62	57	8.99	62	11.75	0.4277	62	11.83	
HIST9	59	63	9.81	58	12.61	0.6882	58	13.97	
GEOG8	46	49	7.34	49	9.49	0.2341	48	9.26	
TECD8	26	46	8.30	55	9.87	0.1818	51	9.60	
HIST8	24	52	6.30	56	16.18	0.4484	52	8.41	
FUNM8	16	47	7.73	45	10.62	-0.3002	50	9.84	
ENGS8	14	48	7.52	59	5.34	0.5608	43	5.41	
HOME8	7	45	5.26	50	7.79	0.3766	41	5.69	
ARTS9	6	66	3.51	57	7.95	0.2243	68	5.90	
Mean:		AFRM9	Other	Other	Severity				
UBMT	420	57.25	55.68	55.68	-1.57				
Aggregate		57.25	55.78	55.78	-1.67				
Weighted S-Pairs		57.62	55.61	55.61	-2.01				
UMSP - 17 groups		58.06	55.29	55.29	-2.77				

AFRS8

Subject of Comparison	Number of Candidates	AFRS8:		Other subject:		Correlation	SAT:	AFRS9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev		
ENGMB	304	54	10.48	54	8.08	0.3056	47	57	11.82	59	10.67	0.5366	64
BIOLB	187	55	10.46	47	11.37	0.0764	44	55	11.35	56	17.71	0.1889	60
MATHB	154	52	9.93	41	14.03	-0.0360	52	60	11.97	58	13.28	0.4800	66
GEOGB	152	55	10.74	51	10.36	0.0881	48	57	11.25	58	11.71	0.4239	65
TYPGB	138	55	9.94	53	14.39	0.1640	44	61	11.78	58	15.62	0.4142	71
PHSCB	118	51	10.02	43	10.77	0.0179	52	61	11.79	58	15.80	0.3674	72
TECDB	117	53	10.69	55	13.43	0.1644	52	58	11.67	58	14.68	0.1985	65
HOME8	78	55	10.08	52	8.99	0.1550	44	53	9.81	54	11.23	0.0744	54
ENGMB	77	52	9.32	51	8.39	-0.0282	52	59	11.90	59	12.53	0.5223	66
ACCOB	69	55	10.33	47	13.72	0.0970	47	56	11.13	59	11.19	0.3140	56
HOME9	51	52	8.53	51	9.22	0.1197	46	53	10.98	54	12.09	0.2287	60
FUNMB	51	51	9.13	44	11.93	-0.1025	47	55	10.23	63	14.51	0.2115	53
HIST8	36	55	11.56	50	11.40	0.4526	48	54	10.62	56	13.76	0.2740	65
ARTS8	35	53	12.08	53	9.26	-0.0175	42	54	11.54	58	10.55	0.4616	61
BUSE8	31	58	9.85	48	12.45	0.3894	48	54	10.51	56	11.80	0.0014	55
DRAMB	22	54	6.55	62	7.76	0.1155	45	54	9.77	55	10.89	0.1598	53
GEOG9	20	51	6.88	48	9.71	0.0697	50	52	8.91	56	7.98	0.1986	49
TECD9	17	50	7.20	43	10.67	0.6138	51	58	11.76	61	13.32	0.5070	66
BIOL9	13	49	11.43	48	9.52	-0.2362	58	55	9.46	53	13.15	-0.1910	54
HIST9	9	52	12.41	43	9.08	-0.6300	60	48	9.86	56	10.70	0.0990	54
ARTS9	9	46	10.37	50	7.76	-0.5854	49	56	11.51	50	14.67	0.3211	55
DRAM9	8	50	9.67	53	5.95	-0.3095	47	54	9.77	56	15.45	0.4337	47
ACCO9	6	47	8.84	47	10.92	-0.1351	61	50	8.57	46	11.60	0.3324	49
MATH9	5	43	10.83	49	16.12	-0.0234	64	55	8.84	54	11.08	-0.0574	43
PHSC9	4	52	7.13	50	8.22	-0.4135	75	54	9.47	58	8.30	0.2873	55
Mean:		AFRS8		Other		Severity		AFRS9		Other		Severity	
UBMT	382	53.43		49.24		-4.19		57.04		57.49		0.45	
Aggregate		53.43		44.58		-8.85		57.04		59.18		2.14	
Weighted S-Pairs		53.50		49.66		-3.83		56.90		57.57		0.67	
UMSP - 15 groups		57.27		49.33		-7.94		55.64		56.86		1.22	

AFRS9

Subject of Comparison	Number of Candidates	AFRS9:		Other subject:		Correlation	SAT:	AFRS9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev		
ENGMB	1193	57	11.82	59	10.67	0.5366	64	57	11.82	59	10.67	0.5366	64
MATH8	619	55	11.35	56	17.71	0.1889	60	55	11.35	56	17.71	0.1889	60
BIOL9	599	60	11.97	58	13.28	0.4800	66	60	11.97	58	13.28	0.4800	66
GEOG9	531	57	11.25	58	11.71	0.4239	65	57	11.25	58	11.71	0.4239	65
MATH9	454	61	11.78	58	15.62	0.4142	71	61	11.78	58	15.62	0.4142	71
PHSC9	419	61	11.79	58	15.80	0.3674	72	61	11.79	58	15.80	0.3674	72
ACCO9	281	58	11.67	58	14.68	0.1985	65	58	11.67	58	14.68	0.1985	65
BIOL8	258	53	9.81	54	11.23	0.0744	54	53	9.81	54	11.23	0.0744	54
HIST9	239	59	11.90	59	12.53	0.5223	66	59	11.90	59	12.53	0.5223	66
HOME9	226	56	11.13	59	11.19	0.3140	56	56	11.13	59	11.19	0.3140	56
PHSC8	226	53	10.98	54	12.09	0.2287	60	53	10.98	54	12.09	0.2287	60
TYPG8	173	55	10.23	63	14.51	0.2115	53	55	10.23	63	14.51	0.2115	53
TECD9	144	54	10.62	56	13.76	0.2740	65	54	10.62	56	13.76	0.2740	65
ARTS9	134	54	11.54	58	10.55	0.4616	61	54	11.54	58	10.55	0.4616	61
ACCO8	116	54	10.51	56	11.80	0.0014	55	54	10.51	56	11.80	0.0014	55
GEOG8	111	54	9.77	55	10.89	0.1598	53	54	9.77	55	10.89	0.1598	53
ENGMB	103	52	8.91	56	7.98	0.1986	49	52	8.91	56	7.98	0.1986	49
DRAM9	96	58	11.76	61	13.32	0.5070	66	58	11.76	61	13.32	0.5070	66
HIST8	56	55	9.46	53	13.15	-0.1910	54	55	9.46	53	13.15	-0.1910	54
TECD8	50	48	9.86	56	10.70	0.0990	54	48	9.86	56	10.70	0.0990	54
BUSE9	40	56	11.51	50	14.67	0.3211	55	56	11.51	50	14.67	0.3211	55
BUSE8	37	54	9.77	56	15.45	0.4337	47	54	9.77	56	15.45	0.4337	47
FUNMB	29	50	8.57	46	11.60	0.3324	49	50	8.57	46	11.60	0.3324	49
HOME8	24	55	8.84	54	11.08	-0.0574	43	55	8.84	54	11.08	-0.0574	43
ARTS8	10	54	9.47	58	8.30	0.2873	55	54	9.47	58	8.30	0.2873	55
DRAM8	10	52	7.61	57	8.62	0.0242	60	52	7.61	57	8.62	0.0242	60
Mean:		AFRS9		Other		Severity		AFRS9		Other		Severity	
UBMT	1296	57.04		57.49		0.45		57.04		57.49		0.45	
Aggregate		57.04		59.18		2.14		57.04		59.18		2.14	
Weighted S-Pairs		56.90		57.57		0.67		56.90		57.57		0.67	
UMSP - 22 groups		55.64		56.86		1.22		55.64		56.86		1.22	

ARTS8

Subject of Comparison	Number of Candidates	ARTS8:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev		
AFRS8	35	53	9.26	53	12.08	-0.0175	42
BIOL8	34	52	8.17	43	9.66	0.6513	44
ENGM8	29	55	10.25	56	7.19	0.3767	41
TYPG8	26	55	10.24	46	16.72	0.4320	44
GEOG8	22	53	9.54	45	8.88	0.1351	44
ENGM9	16	52	7.07	50	6.80	0.3983	52
MATH8	16	54	8.35	34	13.21	-0.0766	47
HOME8	12	53	11.37	52	7.24	0.6293	38
AFRS9	10	58	8.30	54	9.47	0.2873	55
HOME9	10	57	9.74	47	8.11	0.2529	50
BUSE8	10	57	12.85	41	14.70	0.5207	42
FUNM8	8	49	8.22	44	15.36	0.5342	48
AFRM8	7	49	9.79	63	4.35	-0.2896	43
ENGS8	5	51	10.92	63	7.41	-0.1003	44
HIST8	5	50	6.59	41	7.34	0.1947	48
PHSC8	4	45	7.81	45	6.63	-0.0424	48
ENGS9	3	51	10.39	54	4.40	0.9830	42
TECD8	3	54	4.78	44	5.72	0.8949	50
Mean:		ARTS8		Other		Severity	
UBMT	53	53.28		48.08		-5.20	
Aggregate		53.28		43.27		-10.01	
Weighted S-Pairs		53.34		48.24		-5.09	

ARTS9

Subject of Comparison	Number of Candidates	ARTS9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev		
ENGM9	135	58	10.40	61	10.33	0.5991	61
AFRS9	134	58	10.55	54	11.54	0.4616	61
MATH9	78	55	9.36	54	19.12	0.4298	58
BIOL9	70	61	8.83	54	11.95	0.6703	63
GEOG9	50	57	10.98	55	11.57	0.7054	61
MATH9	40	63	9.89	53	14.96	0.5933	71
BIOL8	38	49	9.67	53	10.99	0.5956	53
PHSC9	28	62	10.36	54	13.97	0.5678	72
TYPG8	24	55	10.23	62	12.19	0.4188	56
HIST9	23	62	8.16	55	13.10	0.5425	63
HOME9	23	58	9.56	59	10.38	0.6653	57
TECD9	13	54	6.73	54	10.38	0.4502	56
PHSC8	13	55	11.07	56	9.56	0.1923	53
GEOG8	12	47	4.87	52	10.22	0.6601	49
ENGM8	9	46	6.33	58	5.74	0.3441	48
AFRS8	9	50	7.76	46	10.37	-0.5854	49
AFRM9	6	57	7.95	66	3.51	0.2243	68
ENGS9	6	57	7.95	64	5.33	-0.4752	68
DRAM9	6	60	7.81	61	9.05	0.9361	71
HIST8	5	54	10.58	50	14.30	0.8005	61
ACCO9	4	53	5.58	35	12.53	0.1424	57
HOME8	3	48	3.37	60	7.00	0.8096	46
Mean:		ARTS9		Other		Severity	
UBMT	150	56.93		55.63		-1.30	
Aggregate		56.93		57.99		1.06	
Weighted S-Pairs		57.24		55.8		-1.44	
UMSP - 7 groups		57.29		54.86		-2.43	

BIOL8

Subject of Comparison	Number of Candidates	BIOL8:		Other subject:		Correlation	SAT:		Subject of Comparison	Number of Candidates	BIOL9:		Other subject:		Correlation	SAT:		
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev			Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
TYPG8	290	51	13.13	56	15.60	0.2991	47	10.00	ENGM9	611	58	13.26	63	9.48	0.5898	66	12.47	
AFRS9	258	54	11.23	53	9.81	0.0744	54	10.91	AFRS9	599	58	13.28	60	11.97	0.4800	66	12.40	
ENGM9	257	54	11.44	52	7.46	0.2135	54	11.11	MATH8	334	51	10.63	61	15.92	0.5260	61	11.07	
MATH8	232	56	11.37	42	15.29	0.3532	53	11.66	MATH9	306	66	11.71	58	14.75	0.6485	72	11.67	
ENGM8	193	47	10.88	57	7.35	0.3445	45	9.65	GEOG9	278	57	12.05	61	10.07	0.6919	65	11.62	
AFRS8	187	47	11.37	55	10.46	0.0764	44	9.68	PHSC9	236	65	11.25	59	15.13	0.6836	73	11.27	
GEOG8	187	49	11.15	50	10.79	0.4710	47	10.34	ACCO9	157	59	12.85	59	13.91	0.6404	65	11.75	
HOME9	157	55	10.98	50	8.33	0.5335	50	9.78	HIST9	153	59	11.85	61	12.02	0.6045	67	12.48	
ENGS9	144	57	13.96	53	8.70	0.2174	49	10.91	HOME9	133	53	13.18	63	9.53	0.6494	58	10.93	
ACCO8	142	50	12.25	48	12.56	0.3647	48	10.27	AFRM9	89	57	11.97	67	8.58	0.6913	64	12.24	
AFRM9	136	58	13.22	52	8.00	0.4616	49	11.10	ENGS9	88	57	11.92	66	10.08	0.4053	64	12.15	
GEOG9	100	59	10.16	46	8.97	0.3470	56	11.33	TYPG8	72	52	9.51	68	11.41	0.2724	59	9.49	
HIST8	91	53	10.72	50	13.05	0.5395	50	11.62	ARTS9	70	54	11.95	61	8.83	0.6703	63	12.35	
HOME8	91	42	11.13	54	9.24	0.5390	42	8.32	PHSC8	65	50	10.41	61	11.18	0.6595	64	10.64	
BUSE8	82	51	12.82	52	12.67	0.4527	46	10.63	DRAM9	61	58	12.22	65	11.94	0.5977	67	14.31	
HIST9	63	58	13.14	49	10.34	0.6511	54	10.93	ACCO8	46	47	10.54	63	7.63	0.4373	59	9.01	
FUNM8	50	44	10.59	42	11.52	0.1834	46	10.55	TECD9	26	53	10.58	58	11.14	0.5980	64	10.01	
ACCO9	41	63	10.23	47	13.16	0.3261	55	10.92	GEOG8	23	40	8.94	62	10.15	0.4772	54	10.46	
AFRM8	41	44	12.25	57	6.45	0.1957	44	9.35	HIST8	19	49	8.11	64	10.05	0.3151	56	11.02	
BUSE9	40	59	11.16	45	10.32	0.6624	49	9.29	BUSE9	16	54	14.86	63	13.97	-0.7174	61	12.93	
TECD8	39	47	9.38	55	11.99	0.3876	50	11.77	AFRS8	13	48	9.52	49	11.43	-0.2362	58	15.27	
ARTS9	38	53	10.99	49	9.67	0.5956	53	10.22	ENGM8	6	46	9.85	64	2.67	0.1048	47	6.92	
ARTS8	34	43	9.66	52	8.17	0.6513	44	9.81	TECD8	4	41	10.48	55	10.66	0.2889	49	11.17	
ENGS8	33	45	11.23	56	7.59	0.0054	43	9.39	DRAM8	3	52	8.39	57	9.49	0.9824	69	9.03	
PHSC8	33	56	11.23	47	13.61	0.4219	55	11.86										
Mean:									Mean:		BIOL9	Other	Other	Other	Severity			
UBMT	629	44	12.09	62	8.23	0.1679	48	9.61	UBMT	706	57.39	61.28	61.28	3.89				
Aggregate		55	8.90	48	5.65	-0.1112	51	9.28	Aggregate		57.39	64.13	64.13	6.74				
Weighted S-Pairs		56	5.66	47	11.23	0.4713	54	15.80	Weighted S-Pairs		57.46	61.25	61.25	3.80				
UMSP - 25 groups		63	6.17	35	9.98	0.5447	59	17.52	UMSP - 16 groups		56.31	62.25	62.25	5.94				

BIOL9

Subject of Comparison	Number of Candidates	BIOL8:		Other subject:		Correlation	SAT:		Subject of Comparison	Number of Candidates	BIOL9:		Other subject:		Correlation	SAT:		
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev			Mean	Std Dev	Mean	Std Dev		Mean	Std Dev	
TYPG8	290	51	13.13	56	15.60	0.2991	47	10.00	ENGM9	611	58	13.26	63	9.48	0.5898	66	12.47	
AFRS9	258	54	11.23	53	9.81	0.0744	54	10.91	AFRS9	599	58	13.28	60	11.97	0.4800	66	12.40	
ENGM9	257	54	11.44	52	7.46	0.2135	54	11.11	MATH8	334	51	10.63	61	15.92	0.5260	61	11.07	
MATH8	232	56	11.37	42	15.29	0.3532	53	11.66	MATH9	306	66	11.71	58	14.75	0.6485	72	11.67	
ENGM8	193	47	10.88	57	7.35	0.3445	45	9.65	GEOG9	278	57	12.05	61	10.07	0.6919	65	11.62	
AFRS8	187	47	11.37	55	10.46	0.0764	44	9.68	PHSC9	236	65	11.25	59	15.13	0.6836	73	11.27	
GEOG8	187	49	11.15	50	10.79	0.4710	47	10.34	ACCO9	157	59	12.85	59	13.91	0.6404	65	11.75	
HOME9	157	55	10.98	50	8.33	0.5335	50	9.78	HIST9	153	59	11.85	61	12.02	0.6045	67	12.48	
ENGS9	144	57	13.96	53	8.70	0.2174	49	10.91	HOME9	133	53	13.18	63	9.53	0.6494	58	10.93	
ACCO8	142	50	12.25	48	12.56	0.3647	48	10.27	AFRM9	89	57	11.97	67	8.58	0.6913	64	12.24	
AFRM9	136	58	13.22	52	8.00	0.4616	49	11.10	ENGS9	88	57	11.92	66	10.08	0.4053	64	12.15	
GEOG9	100	59	10.16	46	8.97	0.3470	56	11.33	TYPG8	72	52	9.51	68	11.41	0.2724	59	9.49	
HIST8	91	53	10.72	50	13.05	0.5395	50	11.62	ARTS9	70	54	11.95	61	8.83	0.6703	63	12.35	
HOME8	91	42	11.13	54	9.24	0.5390	42	8.32	PHSC8	65	50	10.41	61	11.18	0.6595	64	10.64	
BUSE8	82	51	12.82	52	12.67	0.4527	46	10.63	DRAM9	61	58	12.22	65	11.94	0.5977	67	14.31	
HIST9	63	58	13.14	49	10.34	0.6511	54	10.93	ACCO8	46	47	10.54	63	7.63	0.4373	59	9.01	
FUNM8	50	44	10.59	42	11.52	0.1834	46	10.55	TECD9	26	53	10.58	58	11.14	0.5980	64	10.01	
ACCO9	41	63	10.23	47	13.16	0.3261	55	10.92	GEOG8	23	40	8.94	62	10.15	0.4772	54	10.46	
AFRM8	41	44	12.25	57	6.45	0.1957	44	9.35	HIST8	19	49	8.11	64	10.05	0.3151	56	11.02	
BUSE9	40	59	11.16	45	10.32	0.6624	49	9.29	BUSE9	16	54	14.86	63	13.97	-0.7174	61	12.93	
TECD8	39	47	9.38	55	11.99	0.3876	50	11.77	AFRS8	13	48	9.52	49	11.43	-0.2362	58	15.27	
ARTS9	38	53	10.99	49	9.67	0.5956	53	10.22	ENGM8	6	46	9.85	64	2.67	0.1048	47	6.92	
ARTS8	34	43	9.66	52	8.17	0.6513	44	9.81	TECD8	4	41	10.48	55	10.66	0.2889	49	11.17	
ENGS8	33	45	11.23	56	7.59	0.0054	43	9.39	DRAM8	3	52	8.39	57	9.49	0.9824	69	9.03	
PHSC8	33	56	11.23	47	13.61	0.4219	55	11.86										
Mean:									Mean:		BIOL9	Other	Other	Other	Severity			
UBMT	629	44	12.09	62	8.23	0.1679	48	9.61	UBMT	706	57.39	61.28	61.28	3.89				
Aggregate		55	8.90	48	5.65	-0.1112	51	9.28	Aggregate		57.39	64.13	64.13	6.74				
Weighted S-Pairs		56	5.66	47	11.23	0.4713	54	15.80	Weighted S-Pairs		57.46	61.25	61.25	3.80				
UMSP - 25 groups		63	6.17	35	9.98	0.5447	59	17.52	UMSP - 16 groups		56.31	62.25	62.25	5.94				

BIOL8

Subject of Comparison	Number of Candidates	BIOL8:		Other subject:		Correlation	SAT:		Subject of Comparison	Number of Candidates	BIOL9:		Other subject:		Correlation	SAT:	
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev			Mean	Std Dev	Mean	Std Dev		Mean	Std Dev
TYPG8	290	51	13.13	56	15.60	0.2991	47	10.00	ENGM9	611	58	13.26	63	9.48	0.5898	66	12.47
AFRS9	258	54	11.23	53	9.81	0.0744	54	10.91	AFRS9	599	58	13.28	60	11.97	0.4800	66	12.40
ENGM9	257	54	11.44	52	7.46	0.2135	54	11.11	MATH8	334	51	10.63	61	15.92	0.5260	61	11.07
MATH8	232	56	11.37	42	15.29	0.3532	53	11.66	MATH9	306	66	11.71	58	14.75	0.6485	72	11.67
ENGM8	193	47	10.88	57	7.35	0.3445	45	9.65	GEOG9	278	57	12.05	61	10.07	0.6919	65	11.62
AFRS8	187	47	11.37	55	10.46	0.0764	44	9.68									

BUSE8

Subject of Comparison	Number of Candidates	BUSE8:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
TYPG8	102	47	12.65	51	12.86	0.3273	44	9.69	
BIOL8	82	52	12.67	51	12.82	0.4527	46	10.63	
ENGS9	77	49	12.96	51	9.17	0.1666	46	11.20	
AFRM8	72	40	11.12	57	8.16	0.4045	43	9.00	
ACCO8	72	49	12.86	46	11.66	0.5622	46	15.75	
AFRM9	70	52	11.26	50	7.30	0.3960	47	11.17	
ENGS8	65	42	11.61	57	9.11	0.3971	43	8.89	
GEOG8	53	46	11.92	46	9.78	0.5148	46	9.16	
ENGM8	48	46	11.82	57	7.90	0.4696	46	16.86	
HOME8	46	40	11.70	49	10.46	0.6280	42	16.25	
MATH8	44	51	12.03	40	13.50	0.2194	49	12.96	
AFRS9	37	56	15.45	54	9.77	0.4337	47	9.03	
AFRS8	31	48	12.45	58	9.85	0.3894	48	19.76	
HOME9	24	59	12.21	47	7.57	0.8337	48	7.90	
TECD8	24	45	10.81	56	12.98	0.3047	47	7.76	
ENGM9	21	65	13.25	49	6.79	0.4523	49	8.58	
HIST8	19	51	11.47	52	12.81	0.7046	48	7.74	
PHSC8	14	53	17.70	43	9.84	0.5997	53	9.19	
GEOG9	13	64	15.08	45	6.54	-0.2703	48	14.02	
FUNM8	13	45	11.05	49	12.57	-0.2250	47	7.25	
ARTS8	10	41	14.70	57	12.85	0.5207	42	5.64	
HIST9	6	67	13.35	54	10.61	-0.3369	36	9.25	
ACCO9	4	60	5.57	49	16.36	-0.4798	50	9.41	

Mean: BUSE8 Other Severity

UBMT	211	47.98	50.25	2.27
Aggregate		47.98	44.90	-3.08
Weighted S-Pairs		48.51	51.02	2.51
UMSP - 13 groups		47.54	51.31	3.77

BUSE9

Subject of Comparison	Number of Candidates	BUSE9:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
AFRM9	64	56	15.93	59	9.24	0.6727	55	13.66	
ENGS9	64	56	16.10	59	10.90	0.3880	55	13.69	
MATH8	52	53	14.13	48	15.06	0.4037	55	11.60	
AFRS9	40	50	14.67	56	11.51	0.3211	55	10.47	
BIOL8	40	45	10.32	59	11.16	0.6624	49	9.29	
ACCO9	32	66	13.22	59	11.76	0.7216	60	12.95	
ENGM9	28	52	15.36	56	9.42	0.6480	57	10.99	
ACCO8	25	46	12.82	55	9.63	0.5842	50	10.92	
HIST9	19	52	14.92	56	12.43	0.7078	53	9.10	
MATH9	18	72	11.18	52	13.46	0.7483	66	11.19	
PHSC8	18	50	13.59	60	13.97	0.8444	56	11.19	
TYPG8	18	46	12.32	62	15.09	0.1031	44	8.66	
GEOG9	17	53	15.47	54	14.84	0.8104	60	13.85	
BIOL9	16	63	13.97	54	14.86	0.7174	61	12.93	
ENGM8	14	45	10.91	60	3.87	0.7287	49	7.21	
PHSC9	12	69	12.22	55	12.49	0.2188	64	14.09	
HOME9	11	53	7.06	55	11.32	0.7435	50	9.56	
HIST8	9	44	9.83	50	14.37	0.6958	51	6.33	
GEOG8	6	44	10.43	55	7.76	0.4651	51	11.41	
TECD9	3	43	9.73	50	5.78	0.9670	54	1.77	
TECD8	3	54	6.96	62	4.91	-0.3418	61	11.59	
FUNM8	3	28	3.26	53	1.75	-0.0813	35	5.88	

Mean: BUSE9 Other Severity

UBMT	107	53.13	56.04	2.91
Aggregate		53.13	56.00	2.87
Weighted S-Pairs		53.59	56.32	2.73
UMSP - 6 groups		54.33	56.67	2.34

DRAM8

Subject of Comparison	Number of Candidates	DRAM8:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
BIOL8	24	62	8.23	44	12.09	0.1679	48	9.61	
AFRS8	22	62	7.76	54	6.55	0.1155	45	7.79	
ENG8	17	61	7.98	59	4.77	0.0031	45	8.32	
ENG9	15	61	8.82	51	3.77	0.5045	55	12.39	
TYP8	13	65	5.03	42	15.13	0.0388	44	6.93	
GEO8	12	60	7.12	51	12.37	-0.2664	49	10.28	
AFRS9	10	57	8.62	52	7.61	0.0242	60	11.78	
MATH8	10	57	9.84	44	10.19	0.2238	57	13.39	
HOME8	8	62	6.13	47	6.11	-0.0706	43	4.75	
GEO9	4	54	9.45	49	3.48	-0.0371	63	10.30	
HIST8	4	63	11.86	58	16.16	0.6854	48	10.12	
BIOL9	3	57	9.49	52	8.39	0.9824	69	9.03	
Mean:		DRAM8		Other		Severity			
UBMT	32	60.64		49.15		-11.49			
Aggregate		60.64		45.89		-14.75			
Weighted S-Pairs		60.87		49.93		-10.94			

DRAM9

Subject of Comparison	Number of Candidates	DRAM9:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
ENGM9	105	61	13.18	64	10.72	0.8541	65	15.17	
AFRS9	96	61	13.32	58	11.76	0.5070	66	14.31	
BIOL9	61	65	11.94	58	12.22	0.5977	67	14.31	
MATH8	48	56	11.79	57	16.81	0.4380	59	12.89	
MATH9	39	70	11.20	61	15.56	0.3061	78	10.36	
HIST9	34	66	12.82	61	14.28	0.7104	69	13.97	
GEO9	34	60	13.29	58	10.32	0.4251	63	14.42	
PHSC9	28	69	11.27	70	15.21	0.3262	80	9.38	
BIOL8	19	48	5.65	55	8.90	-0.1112	51	9.28	
HOME9	10	58	11.44	64	8.00	0.7551	48	9.42	
AFRS8	8	53	5.95	50	9.67	-0.3095	47	8.95	
TYP8	8	54	2.92	54	16.21	0.2589	52	8.33	
ACCO9	7	59	9.85	61	9.93	0.0513	70	6.55	
GEO8	7	45	7.05	62	6.97	-0.4624	53	8.19	
ARTS9	6	60	7.81	61	9.05	0.9361	71	17.34	
HIST8	6	51	5.34	61	6.93	0.7762	53	13.55	
ACCO8	3	51	3.01	62	8.44	-0.8736	57	16.32	
Mean:		DRAM9		Other		Severity			
UBMT	105	60.77		60.04		-0.73			
Aggregate		60.77		63.82		3.05			
Weighted S-Pairs		61.18		60.20		-0.99			
UMSP - 7 groups		62.17		59.57		-3.14			

ENGM8

Subject of Comparison	Number of Candidates	ENGM8:		Other subject:		Correlation	SAT:	
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev
AFRS8	304	54	8.08	54	10.48	0.3056	47	12.00
BIOL8	193	57	7.35	47	10.88	0.3445	45	9.65
MATH8	168	54	7.67	39	13.88	0.1565	51	10.95
GEOG8	150	56	7.36	49	10.22	0.3784	48	10.67
PHSC8	140	51	7.28	43	10.99	0.2215	51	11.10
TYPG8	136	59	6.85	54	15.71	0.1773	43	8.68
TECD8	128	51	7.39	55	13.33	0.0824	51	11.09
AFRS9	103	56	7.98	52	8.91	0.1986	49	10.11
HOME8	90	57	7.36	52	9.71	0.4387	43	13.14
ACCO8	86	55	8.15	46	12.60	0.3275	46	13.90
FUNM8	63	49	7.51	44	11.22	-0.1778	47	10.52
BUSE8	48	57	7.90	46	11.82	0.4696	46	16.86
HOME9	46	62	5.53	49	9.49	0.3971	46	8.78
HIST8	35	60	7.06	48	12.87	0.2035	46	10.12
ARTS8	29	56	7.19	55	10.25	0.3767	41	6.53
TECD9	23	53	6.43	42	9.62	0.0571	50	11.69
DRAM8	17	59	4.77	61	7.98	0.0031	45	8.32
GEOG9	15	60	5.99	47	7.84	0.4304	50	10.16
BUSE9	14	60	3.87	45	10.91	0.7287	49	7.21
-ACCO9	9	58	6.36	38	7.07	0.6465	56	7.64
ARTS9	9	58	5.74	46	6.33	0.3441	48	9.29
MATH9	6	51	5.43	39	8.54	0.5999	53	15.14
BIOL9	6	64	2.67	46	9.85	-0.1048	47	6.92
HIST9	4	61	3.46	44	6.80	0.1185	42	6.03
Mean:		ENGM8		Other		Severity		
UBMT	415	54.59		48.58		-6.01		
Aggregate		54.59		43.79		-10.80		
Weighted S-Pairs		55.19		48.89		-6.30		
UMSP - 14 groups		55.57		47.86		-7.71		

ENGM9

Subject of Comparison	Number of Candidates	ENGM9:		Other subject:		Correlation	SAT:	
		Mean	Std Dev	Mean	Std Dev		Mean	Std Dev
AFRS9	1193	59	10.67	57	11.82	0.5366	64	12.97
BIOL9	611	63	9.48	58	13.26	0.5898	66	12.47
MATH8	607	56	9.73	57	17.27	0.3125	61	11.58
GEOG9	539	59	9.24	58	11.72	0.6472	65	12.50
MATH9	457	65	9.91	59	15.60	0.4295	72	11.55
PHSC9	424	64	10.52	58	15.78	0.5019	72	11.09
ACCO9	279	59	9.45	58	14.46	0.4854	65	12.16
BIOL8	257	52	7.46	54	11.44	0.2135	54	11.11
HIST9	246	66	9.23	58	12.86	0.6384	66	12.93
HOME9	233	57	8.40	59	10.87	0.6701	56	11.31
PHSC8	207	52	10.19	55	11.74	0.4628	61	11.84
TYPG8	179	55	7.47	61	14.30	0.2368	53	10.41
TECD9	138	52	9.42	56	13.69	0.4136	66	11.10
ARTS9	135	61	10.33	58	10.40	0.5991	61	13.33
GEOG8	117	50	7.79	56	10.14	0.3283	52	11.15
DRAM9	105	64	10.72	61	13.18	0.8541	65	15.17
ACCO8	102	52	7.48	58	11.53	0.2364	56	11.95
AFRS8	77	51	8.39	52	9.32	-0.0282	52	13.30
HIST8	59	53	7.69	54	11.70	0.4622	55	11.90
TECD8	38	45	8.66	56	10.28	-0.0073	57	9.58
BUSE9	28	56	9.42	52	15.36	0.6480	57	10.99
BUSE8	21	49	6.79	65	13.25	0.4523	49	8.58
FUNM8	19	44	8.39	48	12.66	0.1153	50	11.76
ARTS8	16	50	6.80	52	7.07	0.3983	52	14.08
DRAM8	15	51	3.77	61	8.82	0.5045	55	12.39
HOME8	14	49	4.71	55	9.03	0.1196	45	7.53
Mean:		ENGM9		Other		Severity		
UBMT	1277	58.58		57.52		-1.06		
Aggregate		58.58		59.76		1.18		
Weighted S-Pairs		58.73		57.43		-1.30		
UMSP - 20 groups		56.75		57.15		0.40		

ENGS8

Subject of Comparison	Number of Candidates	ENGS8:		Other subject:		Correlation		SAT:	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
AFRMB	118	54	9.09	54	8.61	0.5982	42	9.79	
BUSEB	65	57	9.11	42	11.61	0.3971	43	8.89	
TYPGB	50	56	8.58	44	11.17	-0.0603	42	9.13	
ACCOB	36	57	8.76	42	10.47	0.3907	43	10.58	
MATHB	33	57	9.47	38	17.18	-0.2661	45	8.92	
BIOLB	33	56	7.59	45	11.23	0.0054	43	9.39	
HOMEB	32	55	8.46	46	8.92	0.3854	40	8.80	
GEOSB	30	56	8.19	41	7.57	-0.0098	44	8.33	
TECOB	30	52	9.47	54	14.33	-0.1555	43	9.76	
PHSCB	20	54	7.95	41	11.83	0.1024	46	7.49	
FUNMB	20	52	8.02	48	11.01	0.1038	43	9.85	
AFRMB	14	59	5.34	48	7.52	0.5608	43	5.41	
HISTB	9	55	7.89	45	9.06	-0.2743	43	8.43	
HOME9	5	56	4.93	42	4.82	-0.1196	45	4.71	
TECD9	5	50	3.66	51	13.31	-0.0849	44	6.04	
ARTSB	5	63	7.41	51	10.92	-0.1003	44	2.93	
Mean:		ENGS8	Other	Severity					
UBMT	135	54.95	45.27	-9.68					
Aggregate		54.95	42.19	-12.76					
Weighted S-Pairs		55.33	46.44	-8.90					
UWSP - 9 groups		55.56	45.11	-10.45					

ENGS9

Subject of Comparison	Number of Candidates	ENGS9:		Other subject:		Correlation		SAT:	
		Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
AFRMB	406	58	10.79	58	10.35	0.7226	57	13.30	
MATHB	212	57	10.36	51	16.86	0.2232	56	12.18	
BIOLB	144	53	8.70	57	13.96	0.2174	49	10.91	
PHSCB	126	56	11.07	53	15.50	0.1930	57	11.71	
MATH9	109	64	11.16	53	15.18	0.3436	65	12.77	
TYPGB	105	54	9.95	58	14.57	0.2155	48	11.18	
ACCO9	96	62	12.17	57	14.90	0.2988	62	13.11	
ACCOB	92	53	10.27	52	12.28	0.0857	51	11.83	
BIOL9	88	66	10.08	57	11.92	0.4053	64	12.15	
PHSC9	86	66	9.07	53	13.62	0.3787	67	11.96	
GEOS9	85	60	9.41	57	10.45	0.4752	62	12.13	
BUSEB	77	51	9.17	49	12.96	0.1666	46	11.20	
BUSE9	64	59	10.90	56	16.10	0.3880	55	13.69	
TECO9	63	58	9.64	62	11.97	0.3233	62	12.00	
HIST9	60	63	9.69	58	12.50	0.4502	58	13.82	
HOME9	59	56	8.89	52	11.31	0.5082	53	10.02	
GEOSB	53	51	7.61	49	9.78	0.1897	48	9.13	
AFRMB	43	47	8.23	58	7.20	0.6144	44	8.26	
TECOB	36	49	9.64	55	10.89	-0.0452	49	9.20	
HISTB	28	53	7.31	55	15.47	0.2817	52	8.69	
FUNMB	26	50	8.43	50	12.42	-0.1059	49	9.52	
HOMEB	19	49	7.80	45	12.22	-0.0780	39	6.59	
ARTSB	6	64	5.33	57	7.95	-0.4752	68	5.92	
ARTSB	3	54	4.40	51	10.39	0.9830	42	3.97	
Mean:		ENGS9	Other	Severity					
UBMT	453	57.03	54.98	-2.05					
Aggregate		57.03	54.70	-2.33					
Weighted S-Pairs		57.32	55.06	-2.26					
UWSP - 19 groups		57.00	55.00	-2.00					

GEOG8

Subject of Comparison	Number of Candidates	GEOG8:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
BIOL8	187	50	10.79	49	11.15	0.4710	47	10.34	
AFRS8	152	51	10.36	55	10.74	0.0881	48	10.91	
ENGM8	150	49	10.22	56	7.36	0.3784	48	10.67	
MATH8	149	53	10.31	40	13.32	0.2346	52	10.78	
ENGM9	117	56	10.14	50	7.79	0.3283	52	11.15	
AFRS9	111	55	10.89	54	9.77	0.1598	53	10.47	
TYPG8	110	49	11.19	53	15.59	0.3264	46	8.99	
PHSC8	76	52	9.44	42	12.40	0.3195	53	10.72	
ACCO8	67	50	10.63	47	11.96	0.3237	49	10.34	
TECD8	61	50	10.80	52	11.17	0.1288	51	10.38	
HOME9	60	57	9.01	51	8.35	0.4157	47	8.71	
ENGS9	53	49	9.78	51	7.61	0.1897	48	9.13	
BUSE8	53	46	9.78	46	11.92	0.5148	46	9.16	
AFRM9	46	49	9.49	49	7.34	0.2341	48	9.26	
FUNMB	40	44	8.87	47	11.44	0.3037	49	10.45	
AFRM8	37	42	8.54	56	6.88	0.3758	45	8.64	
ENGS8	30	41	7.57	56	8.19	-0.0098	44	8.33	
HIST8	29	50	12.06	51	9.85	0.3354	49	10.92	
HOMEB	28	45	8.28	53	11.01	0.3592	46	9.09	
BIOL9	23	62	10.15	40	8.94	0.4772	54	10.46	
ARTS8	22	45	8.88	53	9.54	0.1351	44	8.25	
TECD9	17	54	8.04	44	9.94	0.2887	56	15.78	
ARTS9	12	52	10.22	47	4.87	0.6601	49	10.71	
DRAM8	12	51	12.37	60	7.12	-0.2664	49	10.28	
ACCO9	10	53	5.83	43	10.84	-0.1580	56	7.77	
HIST9	8	62	9.28	44	10.29	0.1736	51	11.77	
DRAM9	7	62	6.97	45	7.05	-0.4624	53	8.19	
BUSE9	6	55	7.76	44	10.43	0.4651	51	11.41	
MATH9	5	57	9.78	43	7.09	0.9397	62	15.56	

Mean:	GEOG8	Other	Severity
UBMT	50.78	49.52	-1.26
Aggregate	50.78	45.01	-5.77
Weighted S-Pairs	50.87	49.95	-0.92
UMSP - 17 groups	49.59	50.24	0.65

GEOG9

Subject of Comparison	Number of Candidates	GEOG9:		Other subject:		Correlation	SAT:	Mean	Std Dev
		Mean	Std Dev	Mean	Std Dev				
ENGM9	539	58	11.72	59	9.24	0.6472	65	12.50	
AFRS9	531	58	11.71	57	11.25	0.4239	65	12.31	
MATH8	345	54	9.90	57	17.13	0.4598	62	11.22	
BIOL9	278	61	10.07	57	12.05	0.6919	65	11.62	
MATH9	215	66	10.20	58	14.75	0.5184	72	10.76	
PHSC9	200	65	10.17	57	15.12	0.5242	72	10.53	
ACCO9	125	60	10.32	57	13.42	0.6070	66	12.18	
PHSC8	116	51	8.01	58	11.23	0.4689	63	10.82	
TECD9	101	57	10.82	59	13.92	0.4755	65	9.97	
BIOL8	100	46	8.97	59	10.16	0.3470	56	11.33	
HIST9	93	59	10.46	58	10.76	0.6038	63	13.95	
AFRM9	85	57	10.63	60	8.20	0.6501	62	12.26	
ENGS9	85	57	10.45	60	9.41	0.4752	62	12.13	
HOMEB	77	53	11.42	60	11.43	0.7081	58	12.13	
TYPG8	59	50	10.57	66	12.60	0.2170	55	10.66	
ARTS9	50	55	11.57	57	10.98	0.7054	61	12.10	
ACCO8	47	49	10.95	62	9.92	0.4761	58	12.71	
DRAM9	34	58	10.32	60	13.29	0.4251	63	14.42	
AFRS8	20	48	9.71	51	6.88	0.0697	50	13.15	
BUSE9	17	54	14.84	53	15.47	0.8104	60	13.85	
ENGM8	15	47	7.84	60	5.99	0.4304	50	10.16	
BUSE8	13	45	6.54	64	15.08	-0.2703	48	14.02	
TECD8	10	50	4.75	59	10.37	0.1293	63	9.86	
HIST8	7	47	7.57	62	6.71	0.6932	50	9.29	
FUNMB	5	48	9.87	41	10.47	0.1937	44	12.24	
DRAM8	4	49	3.48	54	9.45	-0.0371	63	10.30	

Mean:	GEOG9	Other	Severity
UBMT	57.42	58.05	0.63
Aggregate	57.42	60.40	2.98
Weighted S-Pairs	57.48	58.08	0.60
UMSP - 18 groups	56.33	58.94	2.61

HIST8

Subject of Comparison	Number of Candidates	HIST8:		Other subject:		Correlation	SAT:	Subject of Comparison	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev
BIOL8	91	50	13.05	53	10.72	0.5395	50	11.62	
TYPG8	64	52	14.96	55	11.85	0.3618	50	11.10	
ENGM9	59	54	11.70	53	7.69	0.4622	55	11.90	
AFRS9	56	53	13.15	55	9.46	-0.1910	54	12.19	
AFRS8	36	50	11.40	55	11.56	0.4526	48	11.02	
ENGM8	35	48	12.87	60	7.06	0.2035	46	10.12	
MATH8	35	53	9.74	39	16.38	0.3405	53	11.83	
GEOG8	29	51	9.85	50	12.06	0.3354	49	10.92	
ENGS9	28	55	15.47	53	7.31	0.2817	52	8.69	
HOME9	28	51	14.05	53	8.12	0.4948	54	9.12	
AFRM9	24	56	16.18	52	6.30	0.4484	52	8.41	
BIOL9	19	64	10.05	49	8.11	0.3151	56	11.02	
BUSE8	19	52	12.81	51	11.47	0.7046	48	7.74	
HOME8	18	43	12.55	55	10.94	0.1916	44	10.04	
AFRM8	13	46	8.79	62	7.63	-0.2198	45	9.49	
BUSE9	9	50	14.37	44	9.83	0.6958	51	6.33	
ENGS8	9	45	9.06	55	7.89	-0.2743	43	8.43	
PHSC8	9	49	10.47	35	9.61	-0.4187	53	9.64	
GEOG9	7	62	6.71	47	7.57	0.6932	50	9.29	
DRAM9	6	61	6.93	51	5.34	0.7762	53	13.55	
FUNM8	6	43	6.31	53	11.28	0.6747	52	11.72	
MATH9	5	63	13.99	41	13.79	0.4834	64	13.83	
ACCO9	5	58	13.03	45	17.91	0.9115	59	13.02	
ARTS9	5	50	14.30	54	10.58	0.8005	61	9.00	
ACCO8	5	51	12.51	43	7.10	-0.3917	53	8.31	
ARTS8	5	41	7.34	50	6.59	0.1947	48	14.62	
DRAM8	4	58	16.16	63	11.86	0.6854	48	10.12	
Mean:		HIST8		Other		Severity			
UBMT	131	51.91		52.01		0.10			
Aggregate		51.91		47.98		-3.93			
Weighted S-Pairs		51.88		52.36		0.47			
UMSP - 7 groups		51.43		52.86		1.43			

HIST9

Subject of Comparison	Number of Candidates	HIST9:		Other subject:		Correlation	SAT:	Subject of Comparison	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev
ENGM9	246	58	12.86	66	9.23	0.6384	66	12.93	
AFRS9	239	59	12.53	59	11.90	0.5223	66	12.92	
MATH8	160	56	10.55	56	18.11	0.2329	61	11.77	
BIOL9	153	61	12.02	59	11.85	0.6045	67	12.48	
MATH9	101	67	11.68	59	15.70	0.5258	75	10.98	
GEOG9	93	58	10.76	59	10.46	0.6038	63	13.95	
PHSC9	90	68	11.45	59	15.49	0.5287	75	10.54	
BIOL8	63	49	10.34	58	13.14	0.6511	54	10.93	
ENGS9	60	58	12.50	63	9.69	0.4502	58	13.82	
AFRM9	59	58	12.61	63	9.81	0.6882	58	13.97	
PHSC8	45	51	10.02	56	14.64	0.2931	63	10.38	
DRAM9	34	61	14.28	66	12.82	0.7104	69	13.97	
TYPG8	33	50	12.19	63	14.82	0.3105	57	8.33	
HOME9	31	52	12.14	61	10.43	0.6280	58	8.44	
ARTS9	23	55	13.10	62	8.16	0.5425	63	14.32	
ACCO9	20	60	10.90	60	12.93	0.5815	63	13.84	
BUSE9	19	56	12.43	52	14.92	0.7078	53	9.10	
AFRS8	9	43	9.08	52	12.41	-0.6300	60	15.32	
GEOG8	8	44	10.29	62	9.28	0.1736	51	11.77	
BUSE8	6	54	10.61	67	13.35	-0.3369	36	9.25	
ENGM8	4	44	6.80	61	3.46	0.1185	42	6.03	
ACCO8	3	44	5.41	69	8.11	-0.9797	57	5.44	
FUNM8	3	42	5.88	32	8.77	0.9999	41	5.42	
Mean:		HIST9		Other		Severity			
UBMT	310	58.12		60.20		2.08			
Aggregate		58.12		62.81		4.69			
Weighted S-Pairs		58.31		60.25		1.93			
UMSP - 14 groups		57.57		60.50		2.93			

HOME8

Subject of Comparison	Number of Candidates	HOME8:		Other subject:		Correlation	SAT:	HOME9:		Other subject:		Correlation	SAT:	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev			
TYPG8	115	51	10.39	49	13.09	0.1660	42	8.34	59	10.87	57	8.40	56	11.31
BIOL8	91	54	9.24	42	11.13	0.5390	42	8.32	59	11.19	56	11.13	56	10.98
ENGM8	90	52	9.71	57	7.36	0.4387	43	13.14	50	8.33	55	10.98	50	9.78
AFRS8	78	52	8.99	55	10.08	0.1550	44	13.48	58	11.35	53	18.06	57	10.68
AFRM8	46	45	10.28	57	8.87	0.2502	39	8.25	52	9.14	60	14.83	50	10.46
BUSE8	46	49	10.46	40	11.70	0.6280	42	16.25	63	9.53	53	13.18	58	10.93
ACCO8	41	53	8.48	43	12.09	0.2752	43	16.76	60	11.43	53	11.42	58	12.13
ENGS8	32	46	8.92	55	8.46	0.3854	40	8.80	52	10.98	57	8.37	52	10.11
GEOG8	28	53	11.01	45	5.28	0.3592	46	9.09	51	8.35	57	9.01	47	8.71
AFRS9	24	54	11.08	55	8.84	-0.0574	43	9.44	52	11.31	56	8.89	53	10.02
ENGS9	19	45	12.22	49	7.80	-0.0780	39	6.59	51	9.22	52	8.53	46	10.41
HIST8	18	55	10.94	43	12.55	0.1916	44	10.04	49	9.49	62	5.53	46	8.78
MATH8	16	55	7.98	34	8.78	0.2110	44	8.71	50	8.32	53	11.27	52	8.80
ENGM9	14	55	9.03	49	4.71	0.1196	45	7.53	70	9.42	55	15.57	64	11.37
ARTS8	12	52	7.24	53	11.37	0.6293	38	5.63	61	10.43	52	12.14	58	8.44
DRAM8	8	47	6.11	62	6.13	-0.0706	43	4.75	53	8.12	51	14.05	54	9.12
AFRM9	7	50	7.79	45	5.26	0.3766	41	5.69	66	11.01	56	16.29	62	9.25
FUNM8	5	49	6.35	42	19.13	-0.5782	47	7.85	47	7.57	59	12.21	48	7.90
PHSC8	4	44	4.98	33	6.08	-0.1830	49	3.82	59	10.38	58	9.56	57	11.05
ARTS9	3	60	7.00	48	3.37	0.8096	46	3.20	51	12.85	50	11.10	56	9.65
Mean:		HOME8		Other		Severity		HOME9		Other		Severity		
UBMT	158	50.45		48.19		-2.26		56.01	55.50			-0.51		
Aggregate		50.45		42.94		-7.51		56.01	55.53			-0.48		
Weighted S-Pairs		51.23		49.23		-2.01		56.25	55.50			-0.75		
UMSP - 8 groups		50.25		49.75		-0.50		55.80	55.40			-0.40		

HOME9

Subject of Comparison	Number of Candidates	HOME9:		Other subject:		Correlation	SAT:	HOME9:		Other subject:		Correlation	SAT:	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev	Mean	Std Dev			
ENGM9	233	59	10.87	57	8.40	0.6701	56	11.31	59	10.87	57	8.40	56	11.31
AFRS9	226	59	11.19	56	11.13	0.3140	56	10.98	59	11.19	56	11.13	56	10.98
BIOL8	157	50	8.33	55	10.98	0.5335	50	9.78	50	8.33	55	10.98	50	9.78
MATH8	148	58	11.35	53	18.06	0.4078	57	10.68	58	11.35	53	18.06	57	10.68
TYPG8	147	52	9.14	60	14.83	0.3680	50	10.46	52	9.14	60	14.83	50	10.46
BIOL9	133	63	9.53	53	13.18	0.6494	58	10.93	63	9.53	53	13.18	58	10.93
GEOG9	77	60	11.43	53	11.42	0.7081	58	12.13	60	11.43	53	11.42	58	12.13
AFRM9	62	52	10.98	57	8.37	0.7959	52	10.11	52	10.98	57	8.37	52	10.11
GEOG8	60	51	8.35	57	9.01	0.4157	47	8.71	51	8.35	57	9.01	47	8.71
ENGS9	59	52	11.31	56	8.89	0.5082	53	10.02	52	11.31	56	8.89	53	10.02
AFRS8	51	51	9.22	52	8.53	0.1197	46	10.41	51	9.22	52	8.53	46	10.41
ENGM8	46	49	9.49	62	5.53	0.3971	46	8.78	49	9.49	62	5.53	46	8.78
ACCO8	46	50	8.32	53	11.27	0.3906	52	8.80	50	8.32	53	11.27	52	8.80
MATH9	34	70	9.42	55	15.57	0.4309	64	11.37	70	9.42	55	15.57	64	11.37
HIST9	31	61	10.43	52	12.14	0.6280	58	8.44	61	10.43	52	12.14	58	8.44
HIST8	28	53	8.12	51	14.05	0.4948	54	9.12	53	8.12	51	14.05	54	9.12
ACCO9	27	66	11.01	56	16.29	0.4538	62	9.25	66	11.01	56	16.29	62	9.25
BUSE8	24	47	7.57	59	12.21	0.8337	48	7.90	47	7.57	59	12.21	48	7.90
ARTS9	23	59	10.38	58	9.56	0.6653	57	11.05	59	10.38	58	9.56	57	11.05
PHSC8	23	51	12.85	50	11.10	0.5388	56	9.65	51	12.85	50	11.10	56	9.65
PHSC9	20	71	7.85	52	12.97	0.3076	65	12.19	71	7.85	52	12.97	65	12.19
BUSE9	11	55	11.32	53	7.06	0.7435	50	9.56	55	11.32	53	7.06	50	9.56
DRAM9	10	64	8.00	58	11.44	0.7551	48	9.42	64	8.00	58	11.44	48	9.42
ARTS8	10	47	8.11	57	9.74	0.2529	50	12.93	47	8.11	57	9.74	50	12.93
FUNM8	6	43	4.95	41	9.19	0.4165	46	4.71	43	4.95	41	9.19	46	4.71
ENGS8	5	42	4.82	56	4.93	-0.1196	45	4.71	42	4.82	56	4.93	45	4.71
Mean:		HOME9		Other		Severity		HOME9		Other		Severity		
UBMT	343	56.01		55.50		-0.51		56.01	55.50			-0.51		
Aggregate		56.01		55.53		-0.48		56.01	55.53			-0.48		
Weighted S-Pairs		56.25		55.50		-0.75		56.25	55.50			-0.75		
UMSP - 15 groups		55.80		55.40		-0.40		55.80	55.40			-0.40		

MATH8

Subject of Comparison	Number of Candidates	MATH8:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev		
AFRS9	619	56	17.71	55	11.35	0.1889	60
ENGM9	607	57	17.27	56	9.73	0.3125	61
PHSC8	393	50	15.88	51	12.38	0.7278	57
GEOG9	345	57	17.13	54	9.90	0.4598	62
BIOL9	334	61	15.92	51	10.63	0.5260	61
BIOL8	232	42	15.29	56	11.37	0.3532	53
ENGS9	212	51	16.86	57	10.36	0.2232	56
AFRM9	205	52	16.70	56	9.04	0.4704	56
ENGM8	168	39	13.88	54	7.67	0.1565	51
ACCO9	161	63	14.10	50	11.87	0.5318	60
HIST9	160	56	18.11	56	10.55	0.2329	61
AFRS8	154	41	14.03	52	9.93	-0.0360	52
GEOG8	149	40	13.32	53	10.31	0.2346	52
HOME9	148	53	18.06	58	11.35	0.4078	57
ACCO8	143	47	14.39	55	10.52	0.6289	54
TECD9	140	55	15.08	50	11.93	0.4252	59
TECD8	137	39	13.18	58	11.35	0.3132	53
PHSC9	90	71	12.94	44	11.57	0.4961	68
ARTS9	78	54	19.12	55	9.36	0.4298	58
BUSE9	52	48	15.06	53	14.13	0.4037	55
DRAM9	48	57	16.81	56	11.79	0.4380	59
BUSE8	44	40	13.50	51	12.03	0.2194	49
TYPG8	44	46	13.91	64	12.25	0.0961	52
AFRM8	40	37	16.09	57	6.72	0.0863	46
HIST8	35	39	16.38	53	9.74	0.3405	53
ENGS8	33	38	17.18	57	9.47	-0.2661	45
Mean:				Other		Severity	
HOME8	16	34	8.78	55	7.98	0.2110	44
ARTS8	16	34	13.21	54	8.35	-0.0766	47
DRAM8	10	44	10.19	57	9.84	0.2238	57
UBMT	1021	52.11		54.13		2.02	
Aggregate		52.11		52.49		0.38	
Weighted S-Pairs		52.14		54.18		2.04	
UMSP - 26 groups		49.58		54.31		4.73	

MATH9

Subject of Comparison	Number of Candidates	MATH9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev		
ENGM9	457	59	15.60	65	9.91	0.4295	72
AFRS9	454	58	15.62	61	11.78	0.4142	71
PHSC9	422	60	15.22	59	14.95	0.7816	72
BIOL9	306	58	14.75	66	11.71	0.6485	72
GEOG9	215	58	14.75	66	10.20	0.5184	72
ACCO9	214	58	14.04	64	13.45	0.7081	67
ENGS9	109	53	15.18	64	11.16	0.3436	65
AFRM9	106	53	15.24	66	8.29	0.5144	66
HIST9	101	59	15.70	67	11.68	0.5258	75
TECD9	86	55	16.59	66	11.06	0.4988	68
PHSC8	57	41	11.18	63	13.29	0.5786	59
ARTS9	40	53	14.96	63	9.89	0.5933	71
DRAM9	39	61	15.56	70	11.20	0.3061	78
HOME9	34	55	15.57	70	9.42	0.4309	64
BUSE9	18	52	13.46	72	11.18	0.7483	66
ACCO8	12	40	7.93	69	5.46	0.2274	61
TYPG8	10	46	8.77	64	15.48	0.2668	58
BIOL8	8	35	9.98	63	6.17	0.5447	59
TECD8	7	29	8.35	61	8.99	0.0886	62
ENGM8	6	39	8.54	51	5.43	0.5999	53
AFRS8	5	49	16.12	43	10.83	-0.0234	64
HIST8	5	41	13.79	63	13.99	0.4834	64
GEOG8	5	43	7.09	57	9.78	0.9397	62
Mean:				Other		Severity	
UBMT	572	57.07		63.88		6.81	
Aggregate		57.07		68.33		11.26	
Weighted S-Pairs		57.20		63.65		6.44	
UMSP - 14 groups		55.79		65.00		9.21	

PHSC8

Subject of Comparison	Number of Candidates	PHSC8:		Other subject:		Correlation	SAT:	Subject of Comparison	Number of Candidates	PHSC9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev					Mean	Std Dev	Mean	Std Dev		
MATH8	393	51	12.38	50	15.88	0.7278	57	ENGH9	424	58	15.78	64	10.52	0.5019	72
AFRS9	226	54	12.09	53	10.98	0.2287	60	MATH9	422	59	14.95	60	15.22	0.7816	72
ENGH9	207	55	11.74	52	10.19	0.4628	61	AFRS9	419	58	15.80	61	11.79	0.3674	72
ENGH8	140	43	10.99	51	7.28	0.2215	51	BIOL9	236	59	15.13	65	11.25	0.6836	73
TECDB	130	42	11.41	57	11.99	0.2862	52	GEOG9	200	57	15.12	65	10.17	0.5242	72
ENGS9	126	53	15.50	56	11.07	0.1930	57	ACCO9	170	57	14.54	65	12.76	0.6023	69
AFRS8	118	43	10.77	51	10.02	0.0179	52	TECD9	101	53	16.37	63	13.12	0.6639	69
GEOG9	116	58	11.23	51	8.01	0.4689	63	HIST9	90	59	15.49	68	11.45	0.5287	75
AFRM9	115	55	15.04	56	8.83	0.5786	58	MATH8	90	44	11.57	71	12.94	0.4961	68
TECD9	101	54	10.61	51	12.37	0.3729	58	ENGS9	86	53	13.62	66	9.07	0.3787	67
GEOG8	76	42	12.40	52	9.44	0.3195	53	AFRM9	85	53	13.69	67	6.99	0.3996	67
ACCO9	74	62	10.50	46	12.55	0.4672	60								
BIOL9	65	61	11.18	50	10.41	0.6595	64	ARTS9	28	54	13.97	62	10.36	0.5678	72
MATH9	57	63	13.29	41	11.18	0.5786	59	DRAM9	28	70	15.21	69	11.27	0.3262	80
ACCO8	55	45	10.57	54	11.04	0.4094	53	HOME9	20	52	12.97	71	7.85	0.3076	65
HIST9	45	56	14.64	51	10.02	0.2931	63	BUSE9	12	55	12.49	69	12.22	0.2188	64
BIOL8	33	47	13.61	56	11.23	0.4219	55	ACCO8	9	45	9.61	68	7.27	0.4781	66
FUNM8	33	33	8.60	54	10.02	0.1063	47	AFRS8	4	50	8.22	52	7.13	-0.4135	75
								TECD8	4	35	10.35	66	9.50	-0.5846	67
AFRM8	28	39	12.44	55	7.30	0.2900	47	TYPG8	3	50	3.30	56	4.19	0.9563	71
HOME9	23	50	11.10	51	12.85	0.5388	56								
ENGS8	20	41	11.83	54	7.95	0.1024	46	Mean:		PHSC9		Other		Severity	
BUSE9	18	60	13.97	50	13.59	0.8444	56								
BUSE8	14	43	9.84	53	17.70	0.5997	53	UBMT	512	56.68	63.83	63.83	7.15	7.15	
ARTS9	13	56	9.56	55	11.07	0.1923	53	Aggregate		56.68	68.05	68.05	11.37	11.37	
HIST8	9	35	9.61	49	10.47	-0.4187	53	Weighted S-Pairs		57.00	63.68	63.68	6.69	6.69	
TYPG8	9	47	13.05	54	14.39	0.6315	47	UMSP - 11 groups		55.45	65.00	65.00	9.55	9.55	
HOME8	4	33	6.08	44	4.98	-0.1830	49								
ARTS8	4	45	6.63	45	7.81	-0.0424	48								

Mean: PHSC8 Other Severity

UBMT	493	50.56	52.11	1.55
Aggregate		50.56	49.03	-1.53
Weighted S-Pairs		51.01	51.86	0.86
UMSP - 18 groups		50.94	51.78	0.84

MISC9

Subject of Comparison	Number of Candidates	PHSC9:		Other subject:		Correlation	SAT:	Subject of Comparison	Number of Candidates	PHSC9:		Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev					Mean	Std Dev	Mean	Std Dev		
ENGH9	424	58	15.78	64	10.52	0.5019	72	ENGH9	424	58	15.78	64	10.52	0.5019	72
MATH9	422	59	14.95	60	15.22	0.7816	72	MATH9	422	59	14.95	60	15.22	0.7816	72
AFRS9	419	58	15.80	61	11.79	0.3674	72	AFRS9	419	58	15.80	61	11.79	0.3674	72
BIOL9	236	59	15.13	65	11.25	0.6836	73	BIOL9	236	59	15.13	65	11.25	0.6836	73
GEOG9	200	57	15.12	65	10.17	0.5242	72	GEOG9	200	57	15.12	65	10.17	0.5242	72
ACCO9	170	57	14.54	65	12.76	0.6023	69	ACCO9	170	57	14.54	65	12.76	0.6023	69
TECD9	101	53	16.37	63	13.12	0.6639	69	TECD9	101	53	16.37	63	13.12	0.6639	69
HIST9	90	59	15.49	68	11.45	0.5287	75	HIST9	90	59	15.49	68	11.45	0.5287	75
MATH8	90	44	11.57	71	12.94	0.4961	68	MATH8	90	44	11.57	71	12.94	0.4961	68
ENGS9	86	53	13.62	66	9.07	0.3787	67	ENGS9	86	53	13.62	66	9.07	0.3787	67
AFRM9	85	53	13.69	67	6.99	0.3996	67	AFRM9	85	53	13.69	67	6.99	0.3996	67
ARTS9	28	54	13.97	62	10.36	0.5678	72	ARTS9	28	54	13.97	62	10.36	0.5678	72
DRAM9	28	70	15.21	69	11.27	0.3262	80	DRAM9	28	70	15.21	69	11.27	0.3262	80
HOME9	20	52	12.97	71	7.85	0.3076	65	HOME9	20	52	12.97	71	7.85	0.3076	65
BUSE9	12	55	12.49	69	12.22	0.2188	64	BUSE9	12	55	12.49	69	12.22	0.2188	64
ACCO8	9	45	9.61	68	7.27	0.4781	66	ACCO8	9	45	9.61	68	7.27	0.4781	66
AFRS8	4	50	8.22	52	7.13	-0.4135	75	AFRS8	4	50	8.22	52	7.13	-0.4135	75
TECD8	4	35	10.35	66	9.50	-0.5846	67	TECD8	4	35	10.35	66	9.50	-0.5846	67
TYPG8	3	50	3.30	56	4.19	0.9563	71	TYPG8	3	50	3.30	56	4.19	0.9563	71
Mean:		PHSC9		Other		Severity		Mean:		PHSC9		Other		Severity	
UBMT	512	56.68	63.83	63.83	7.15	7.15		UBMT	512	56.68	63.83	63.83	7.15	7.15	
Aggregate		56.68	68.05	68.05	11.37	11.37		Aggregate		56.68	68.05	68.05	11.37	11.37	
Weighted S-Pairs		57.00	63.68	63.68	6.69	6.69		Weighted S-Pairs		57.00	63.68	63.68	6.69	6.69	
UMSP - 11 groups		55.45	65.00	65.00	9.55	9.55		UMSP - 11 groups		55.45	65.00	65.00	9.55	9.55	

TECD8

Subject of Comparison	Number of Candidates	TECD8:		Other subject:		Correlation	SAT:	TECD9:		Subject of Comparison	Number of Candidates	Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev			Mean	Std Dev		
MATH8	137	58	11.35	39	13.18	0.3132	53	56	13.76	AFRS9	144	54	10.62	65	
PHSC8	130	57	11.99	42	11.41	0.2862	52	50	11.93	MATH8	140	55	15.08	59	
ENGB8	128	55	13.33	51	7.39	0.0824	51	56	13.69	ENGM9	138	52	9.42	66	
AFRS8	117	55	13.43	53	10.69	0.1644	52	63	13.12	PHSC9	101	53	16.37	69	
GEOG8	61	52	11.17	50	10.80	0.1288	51	59	13.92	GEOG9	101	57	10.82	65	
FUNM8	56	51	13.10	46	11.15	0.2796	48	51	12.37	PHSC8	101	54	10.61	58	
AFRS9	50	56	10.70	48	9.86	0.0990	54	66	11.06	MATH9	86	55	16.59	68	
AFRM8	40	55	14.08	51	6.76	0.0924	43	62	11.97	ENGS9	63	58	9.64	62	
BIOL8	39	55	11.99	47	9.38	0.3876	50	62	11.75	AFRM9	62	57	8.99	62	
ENGM9	38	56	10.28	45	8.66	-0.0073	57								
ENGS9	36	55	10.89	49	9.64	-0.0452	49	58	11.14	BIOL9	26	53	10.58	64	
ENGS8	30	54	14.33	52	9.47	-0.1555	43	42	9.62	ENGM8	23	53	6.43	50	
AFRM9	26	55	9.87	46	8.30	0.1818	51	43	10.67	AFRS8	17	50	7.20	51	
BUSE8	24	56	12.98	45	10.81	0.3047	47	44	9.94	GEOG8	17	54	8.04	56	
GEOG9	10	59	10.37	50	4.75	0.1293	63	54	10.38	ARTS9	13	54	6.73	56	
MATH9	7	61	8.99	29	8.35	0.0886	62	47	11.23	BIOL8	9	56	5.66	54	
PHSC9	4	66	9.50	35	10.35	-0.5846	67	49	12.73	AFRM8	6	54	6.42	43	
BIOL9	4	55	10.66	41	10.48	0.2889	49	51	13.31	ENGS8	5	50	3.66	44	
TYPG8	4	48	14.57	46	6.96	-0.4489	55	67	14.24	ACCO9	3	61	6.43	70	
BUSE9	3	62	4.91	54	6.96	-0.3418	61	50	5.78	BUSE9	3	43	9.73	54	
ARTS8	3	44	5.72	54	4.78	0.8949	50								

TECD9

Subject of Comparison	Number of Candidates	TECD8:		Other subject:		Correlation	SAT:	TECD9:		Subject of Comparison	Number of Candidates	Other subject:		Correlation	SAT:
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev			Mean	Std Dev		
MATH8	137	58	11.35	39	13.18	0.3132	53	56	13.76	AFRS9	144	54	10.62	65	
PHSC8	130	57	11.99	42	11.41	0.2862	52	50	11.93	MATH8	140	55	15.08	59	
ENGB8	128	55	13.33	51	7.39	0.0824	51	56	13.69	ENGM9	138	52	9.42	66	
AFRS8	117	55	13.43	53	10.69	0.1644	52	63	13.12	PHSC9	101	53	16.37	69	
GEOG8	61	52	11.17	50	10.80	0.1288	51	59	13.92	GEOG9	101	57	10.82	65	
FUNM8	56	51	13.10	46	11.15	0.2796	48	51	12.37	PHSC8	101	54	10.61	58	
AFRS9	50	56	10.70	48	9.86	0.0990	54	66	11.06	MATH9	86	55	16.59	68	
AFRM8	40	55	14.08	51	6.76	0.0924	43	62	11.97	ENGS9	63	58	9.64	62	
BIOL8	39	55	11.99	47	9.38	0.3876	50	62	11.75	AFRM9	62	57	8.99	62	
ENGM9	38	56	10.28	45	8.66	-0.0073	57								
ENGS9	36	55	10.89	49	9.64	-0.0452	49	58	11.14	BIOL9	26	53	10.58	64	
ENGS8	30	54	14.33	52	9.47	-0.1555	43	42	9.62	ENGM8	23	53	6.43	50	
AFRM9	26	55	9.87	46	8.30	0.1818	51	43	10.67	AFRS8	17	50	7.20	51	
BUSE8	24	56	12.98	45	10.81	0.3047	47	44	9.94	GEOG8	17	54	8.04	56	
GEOG9	10	59	10.37	50	4.75	0.1293	63	54	10.38	ARTS9	13	54	6.73	56	
MATH9	7	61	8.99	29	8.35	0.0886	62	47	11.23	BIOL8	9	56	5.66	54	
PHSC9	4	66	9.50	35	10.35	-0.5846	67	49	12.73	AFRM8	6	54	6.42	43	
BIOL9	4	55	10.66	41	10.48	0.2889	49	51	13.31	ENGS8	5	50	3.66	44	
TYPG8	4	48	14.57	46	6.96	-0.4489	55	67	14.24	ACCO9	3	61	6.43	70	
BUSE9	3	62	4.91	54	6.96	-0.3418	61	50	5.78	BUSE9	3	43	9.73	54	
ARTS8	3	44	5.72	54	4.78	0.8949	50								

Since groups of less than 30 candidates have been excluded the number of groups in the subject-pairs analysis becomes rather low. For this reason the readings in subjects with less than 10 subject groups in the analysis should be used carefully. 10 has been arbitrarily chosen. Subjects that fall into this category are: ARTS8, ARTS9, BUSE9, DRAMB, DRAM9, ENGS8, FUNM8, HIIST8, HOMEB, TECD9.

FUNMB

Subject of Comparison	Number of Candidates	FUNMB:		Other subject:		Correlation	SAT:	Subject of Comparison	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev
ENGB	63	44	11.22	49	7.51	-0.1778	47	10.52	
TECDB	56	46	11.15	51	13.10	0.2796	48	10.54	
AFRSB	51	44	11.93	51	9.13	-0.1025	47	11.41	
BIOLB	50	42	11.52	44	10.59	0.1834	46	10.55	
GEOGB	40	47	11.44	44	8.87	0.3037	49	10.45	
PHSCB	33	54	10.02	33	8.60	0.1063	47	11.74	
AFRMB	30	51	12.01	53	9.56	0.2677	44	9.74	
AFRS9	29	46	11.60	50	8.57	0.3324	49	9.51	
ENGS9	26	50	12.42	50	8.43	-0.1059	49	9.52	
ACCOB	26	49	8.06	41	9.79	0.4603	46	11.81	
ENGSB	20	48	11.01	52	8.02	0.1038	43	9.85	
ENGM9	19	48	12.66	44	8.39	0.1153	50	11.76	
AFRM9	16	45	10.62	47	7.73	-0.3002	50	9.84	
BUSEB	13	49	12.57	45	11.05	-0.2250	47	7.25	
ARTSB	8	44	15.36	49	8.22	0.5342	48	10.39	
TYPGB	7	39	5.86	48	9.54	0.1318	51	8.86	
HOMEB	6	41	9.19	43	4.95	0.4165	46	4.71	
HISTB	6	53	11.28	43	6.31	0.6747	52	11.72	
GEOG9	5	41	10.47	48	9.87	0.1937	44	12.24	
HOMEB	5	42	19.13	49	6.35	-0.5782	47	7.85	
HIST9	3	32	8.77	42	5.88	0.9999	41	5.42	
BUSE9	3	53	1.75	28	3.26	-0.0813	35	5.88	

Mean: FUNMB Other Severity

UBMT	128	46.39	46.47	0.08
Aggregate		46.39	41.26	-5.13
Weighted S-Pairs		46.37	46.90	0.53
UKSP - 9 groups		46.86	46.43	-0.43

TYPGB

Subject of Comparison	Number of Candidates	TYPGB:		Other subject:		Correlation	SAT:	Subject of Comparison	
		Mean	Std Dev	Mean	Std Dev			Mean	Std Dev
BIOLB	290	56	15.60	51	13.13	0.2991	47	10.00	
ENGM9	179	61	14.30	55	7.47	0.2368	53	10.41	
AFRS9	173	63	14.51	55	10.23	0.2115	53	10.59	
HOMEB	147	60	14.83	52	9.14	0.3680	50	10.46	
AFRSB	138	53	14.39	55	9.94	0.1640	44	9.22	
ENGB	136	54	15.71	59	6.85	0.1773	43	8.68	
ACCOB	124	58	16.87	49	13.18	0.3535	46	10.12	
HOMEB	115	49	13.09	51	10.39	0.1660	42	8.34	
GEOGB	110	53	15.59	49	11.19	0.3264	46	8.99	
ENGS9	105	58	14.57	54	9.95	0.2155	48	11.18	
BUSEB	102	51	12.86	47	12.65	0.3273	44	9.69	
AFRM9	96	58	14.63	54	9.10	0.3393	48	11.15	
BIOL9	72	68	11.41	52	9.51	0.2724	59	9.49	
HISTB	64	55	11.85	52	14.96	0.3618	50	11.10	
GEOG9	59	66	12.60	50	10.57	0.2170	55	10.66	
AFRM8	55	46	12.67	57	9.08	-0.0191	42	9.04	
ENGSB	50	44	11.17	56	8.58	-0.0603	42	9.13	
MATHB	44	64	12.25	46	13.91	0.0961	52	10.31	
HIST9	33	63	14.82	50	12.19	0.3105	57	8.33	
ARTSB	26	46	16.72	55	10.24	0.4320	44	9.42	
ARTS9	24	62	12.19	55	10.23	0.4188	56	11.14	
ACCO9	20	67	11.36	49	13.79	0.4389	54	8.50	
BUSE9	18	62	15.09	46	12.32	0.1031	44	8.66	
DRAMB	13	42	15.13	65	5.03	0.0388	44	6.93	
MATH9	10	64	15.48	46	8.77	0.2668	58	14.32	
PHSCB	9	54	14.39	47	13.05	0.6315	47	10.75	
DRAM9	8	54	16.21	54	2.92	0.2589	52	8.33	
FUNMB	7	48	9.54	39	5.86	0.1318	51	8.86	
TECDB	4	46	6.96	48	14.57	-0.4489	55	7.92	
PHSC9	3	56	4.19	50	3.30	0.9563	71	5.83	

Mean: TYPGB Other Severity

UBMT	472	56.53	51.97	-4.56
Aggregate		56.53	49.23	-7.30
Weighted S-Pairs		56.81	52.53	-4.28
UKSP - 19 groups		56.84	52.32	-4.21

APPENDIX F

The full 1992 NSC population and the sample

Appendix F: The full 1992 NSC population and the sample

Table 1: Percentage of candidates of the full NSC population and of the sample offering each subject.

Subject	Candi- dates	% of NSC	Candi- dates	% of Sample	% Diff- erence
ACC09	1275	15,4	386	16,8	1,4
AFRM9	1363	16,5	420	18,3	1,8
AFRS9	4545	55,0	1296	56,5	1,5
ARTS9	735	8,9	150	6,5	-2,4
BIOL9	2382	28,8	706	30,8	2,0
BUSE9	364	4,4	107	4,7	0,3
DRAM9	418	5,1	105	4,6	-0,5
ENGM9	4694	56,8	1277	55,6	-1,2
ENGS9	1484	18,0	453	19,7	1,7
GEOG9	2459	29,8	640	27,9	-1,9
HIST9	1455	17,6	310	13,5	-4,1
HOME9	934	11,3	343	14,0	2,7
MATH9	1997	24,2	572	24,9	0,7
PHSC9	1934	23,4	512	22,3	-1,1
TECD9	772	9,3	229	10,0	0,7
ACC08	1021	12,4	317	13,8	1,4
AFRM8	600	7,3	164	7,1	-0,2
AFRS8	1575	19,1	382	16,6	-2,5
ARTS8	360	4,4	53	2,3	-2,1
BIOL8	2183	26,4	629	27,4	1,0
BUSE8	614	7,4	211	9,2	1,8
DRAM8	151	1,8	32	1,4	-0,4
ENGM8	1536	18,6	415	18,1	-0,5
ENGS8	498	6,0	135	5,9	-0,1
FUNM8	650	7,9	128	5,6	-2,3
GEOG8	1537	18,6	351	15,3	-3,3
HIST8	582	7,0	131	5,7	-1,3
HOME8	568	6,9	158	6,9	0
MATH8	3700	44,8	1021	44,5	-0,3
PHSC8	1788	21,6	493	21,5	-0,1
TECD8	794	9,6	233	10,2	0,6
TYPG8	1489	18,0	472	20,6	2,6

Table 2: Confidence limits for the sample mean in each subject compared with the subject mean for the full NSC population of each subject

Subject	Sample Mean	Upper Limit	Full NSC Mean	Lower Limit
ACC09	57.52	59.46	58.28	55.58
AFRM9	57.25	58.56	57.81	55.94
AFRS9	57.04	57.88	56.08	56.20
ARTS9	56.93	59.15	56.60	54.71
BIOL9	57.39	58.66	55.38	51.18
BUSE9	53.13	57.04	55.26	49.22
DRAM9	60.77	64.09	58.67	57.45
ENGM9	58.58	59.36	58.13	57.80
ENGS9	57.03	58.39	57.96	55.67
GEOG9	57.42	58.61	55.93	56.23
HIST9	58.12	60.00	57.17	56.24
HOME9	56.01	57.66	55.34	54.36
MATH9	57.07	58.77	58.48	55.37
PHSC9	56.68	58.45	56.66	54.91
TECD9	56.18	58.55	54.95	53.81
ACC08	51.10	53.01	52.25	49.19
AFRM8	55.11	56.81	54.86	53.41
AFRS8	53.43	54.79	53.53	52.07
ARTS8	53.28	56.68	51.30	49.88
BIOL8	52.08	53.38	50.35	50.78
BUSE8	47.98	50.43	49.90	45.53
DRAM8	60.64	64.40	60.80	56.88
ENGM8	54.59	55.62	54.29	53.56
ENGS8	54.95	56.90	56.66	53.00
FUNM8	46.39	49.11	48.39	43.67
GEOG8	50.78	52.28	50.45	49.28
HIST8	51.91	54.89	49.94	48.93
HOME8	50.45	52.57	51.52	48.33
MATH8	52.11	53.56	52.23	50.66
PHSC8	50.56	52.16	50.39	48.96
TECD8	55.10	57.24	53.14	52.96
TYPG8	56.53	58.37	52.19	54.69

Table 3: Confidence limits for the sample standard deviations in each subject compared with the subject standard deviations for the full NSC population in each subject.

Subject	Sample S Dev	Upper Limit	Full NSC S Dev	Lower Limit
ACC09	14.74	16.11	15.21	13.37
AFRM9	10.42	11.35	10.75	9.49
AFRS9	11.71	12.30	11.82	11.12
ARTS9	10.52	12.09	12.87	8.95
BIOL9	13.12	14.02	13.87	12.22
BUSE9	15.68	18.45	15.39	12.91
DRAM9	13.18	15.53	12.76	10.83
ENGM9	10.74	11.29	10.64	10.19
ENGS9	11.2	12.16	11.16	10.24
GEOG9	11.63	12.47	12.23	10.79
HIST9	12.84	14.17	13.35	11.51
HOME9	11.51	12.64	11.85	10.38
MATH9	15.75	16.95	15.81	14.55
PHSC9	15.54	16.79	15.49	14.29
TECD9	13.93	15.61	14.17	12.25
ACC08	13.17	14.52	13.66	11.82
AFRM8	8.42	9.62	8.06	7.22
AFRS8	10.28	11.24	10.87	9.32
ARTS8	9.6	12.01	10.77	7.19
BIOL8	12.68	13.60	13.53	11.76
BUSE8	13.82	15.56	14.42	12.08
DRAM8	8.38	11.08	9.99	5.68
ENGM8	8.12	8.85	8.37	7.39
ENGS8	8.77	10.15	8.96	7.39
FUNM8	11.94	13.87	14.62	10.01
GEOG8	10.9	11.96	11.36	9.84
HIST8	13.21	15.32	14.28	11.10
HOME8	10.34	11.84	10.81	8.84
MATH8	18	19.03	17.47	16.97
PHSC8	13.81	14.94	14.21	12.68
TECD8	12.66	14.17	13.01	11.15
TYPG8	15.49	16.79	15.71	14.19

Table 4: Measures of severity using the UBMT as calculated on the full NSC population and in the sample in each subject.

Subject	Full NSC population:		Sample:		Difference in severities
	Subject Mean	UBMT Mean	Subject Mean	UBMT Mean	
ACC09	58,28	60,06	57,52	60,02	0,76
AFRM9	57,81	55,87	57,25	55,68	0,37
AFRS9	56,08	57,06	57,04	57,49	-0,53
ARTS9	56,60	55,36	56,93	55,63	-0,06
BIOL9	55,38	60,44	57,39	61,28	-1,17
BUSE9	55,26	56,22	53,13	56,04	1,95
DRAM9	58,67	56,46	60,77	60,04	1,38
ENGM9	58,13	56,59	58,58	57,52	0,48
ENGS9	57,96	54,93	57,03	54,98	0,98
GEOG9	55,93	56,79	57,42	58,05	-0,23
HIST9	57,17	59,25	58,12	60,20	0
HOME9	55,34	55,18	56,01	55,50	-0,35
MATH9	58,48	63,74	57,07	63,88	1,55
PHSC9	56,66	63,42	56,68	63,83	0,39
TECD9	54,95	54,92	56,18	55,03	-1,12
ACC08	52,25	51,28	51,10	51,41	1,28
AFRM8	54,86	46,28	55,11	45,24	-1,29
AFRS8	53,53	48,77	53,43	49,24	0,57
ARTS8	51,30	47,79	53,28	48,08	-1,69
BIOL8	50,35	50,51	52,08	51,17	-1,07
BUSE8	49,90	49,33	47,98	50,25	2,84
DRAM8	60,80	48,92	60,64	49,15	0,39
ENGM8	54,29	48,17	54,59	48,58	0,11
ENGS8	56,66	45,86	54,95	45,27	1,12
FUNM8	48,39	47,91	46,39	46,47	0,56
GEOG8	50,45	49,08	50,78	49,52	0,11
HIST8	49,94	49,63	51,91	52,01	0,41
HOME8	51,52	48,58	50,45	48,19	0,68
MATH8	52,23	53,29	52,11	54,13	0,96
PHSC8	50,39	51,95	50,56	52,11	-0,01
TECD8	53,14	47,94	55,10	47,05	-2,85
TYPG8	52,19	51,87	56,53	51,97	-4,24

*

Table 5: Measures of severity using the aggregate as calculated on the full NSC population and in the sample in each subject.

Subject	Full NSC population:		Sample:		Difference
	Subject Mean	Aggregate Severity	Subject Mean	Aggregate Severity	
ACC09	58,28	63,17	57,52	62,86	0,45
AFRM9	57,81	56,26	57,25	55,78	-0,12
AFRS9	56,08	58,85	57,04	59,18	-0,63
ARTS9	56,60	57,59	56,93	57,99	0,07
BIOL9	55,38	63,10	57,39	64,13	-0,98
BUSE9	55,26	57,00	53,13	56,00	1,13
DRAM9	58,67	59,45	60,77	63,82	2,27
ENGM9	58,13	58,98	58,58	59,76	0,33
ENGS9	57,96	54,98	57,03	54,70	0,65
GEOG9	55,93	59,05	57,42	60,40	-0,14
HIST9	57,17	61,92	58,12	62,81	-0,06
HOME9	55,34	55,61	56,01	55,53	-0,75
MATH9	58,48	68,62	57,07	68,33	1,12
PHSC9	56,66	67,71	56,68	68,05	0,32
TECD9	54,95	56,69	56,18	56,69	-1,16
ACC08	52,25	47,28	51,10	47,24	1,11
AFRM8	54,86	42,07	55,11	41,68	-0,64
AFRS8	53,53	44,41	53,43	44,58	0,27
ARTS8	51,30	43,18	53,28	43,27	-1,89
BIOL8	50,35	46,73	52,08	47,55	-0,91
BUSE8	49,90	44,36	47,98	44,90	2,46
DRAM8	60,80	45,55	60,64	45,89	0,50
ENGM8	54,29	43,17	54,59	43,79	0,32
ENGS8	56,66	42,45	54,95	42,19	1,45
FUNM8	48,39	42,50	46,39	41,26	0,76
GEOG8	50,45	44,17	50,78	45,01	0,51
HIST8	49,94	45,27	51,91	47,98	0,74
HOME8	51,52	43,28	50,45	42,94	0,73
MATH8	52,23	51,84	52,11	52,49	0,77
PHSC8	50,39	48,97	50,56	49,03	-0,11
TECD8	53,14	43,18	55,10	42,94	-2,20
TYPG8	52,19	48,48	56,53	49,23	-3,59

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Table 6: Measures of severity using the UBMT and aggregate as calculated on the full NSC population 1990 - 1992

Subject	Severity of Subject as measured by:				
	UBMT	1992	1991	1990	Aggregate
ACC09	1,78	0,42	2,87	4,89	3,94
AFR09	-1,94	-1,79	-1,3	-1,55	-1,14
AFR09	0,98	0,88	0,37	2,77	2,83
ARTS9	-1,24	-0,19	2,16	0,99	1,96
BIOL9	5,06	4,79	5,62	7,72	7,49
BUSE9	0,96	-0,48	4,18	1,74	0,78
DRAM9	-2,11	-2,58	-2,81	0,78	0,34
ENG09	-1,54	-1,62	-2,11	0,85	0,8
ENG09	-3,03	-1,84	-1,72	-2,98	-1,56
GEO09	0,86	0,47	1,85	3,12	2,89
HIST9	2,08	1,78	-0,86	4,75	4,63
HOME9	-0,16	-0,55	1,16	0,27	-0,06
MATH9	5,26	4,79	5,57	10,14	9,78
PHSC9	6,76	7,18	7,34	11,05	11,38
TECD9	-0,03	-0,02	-4,35	1,74	1,66
ACC08	-0,97	-0,75	-5,36	-4,97	-4,75
AFR08	-8,58	-9,2	-7,44	-12,79	-13,48
AFR08	-4,76	-6,91	-6,22	-9,12	-10,68
ARTS8	-3,51	-0,64	-21,11	-8,12	-5,65
BIOL8	0,16	0,5	1,18	-3,62	-3,4
BUSE8	-0,57	-1,07	1,23	-5,54	-5,76
DRAM8	-11,88	-1,93	7,73	-15,25	-6,51
ENG08	-6,12	-8,62	-12,43	-11,12	-13,17
ENG08	-10,80	-8,53	-6,28	-14,21	-12,52
FUN08	-0,48	-3,7	2,15	-5,89	-8,71
GEO08	-1,37	-0,99	-0,15	-6,28	-6,03
HIST8	-0,31	-0,14	2,03	-4,67	-4,64
HOME8	-2,94	-2,15	0,81	-8,24	-7,45
MATH8	1,06	1,32	0,07	-0,39	-0,04
PHSC8	1,56	1,73	2,11	-1,42	-1,24
TECD8	-5,20	-4,59	-3,38	-9,96	-9,31
TYP08	-0,32	-0,74	-2,41	-3,71	-3,94
ACC07	4,98	3,94	4,98	4,98	4,98
AFR07	-1,61	-1,14	-1,61	-1,61	-1,61
AFR07	1,91	2,83	1,91	1,91	1,91
ARTS7	2,09	1,96	2,09	2,09	2,09
BIOL7	7,65	7,49	7,65	7,65	7,65
BUSE7	0,88	0,78	0,88	0,88	0,88
DRAM7	-3,6	0,34	-3,6	-3,6	-3,6
ENG07	0,01	0,8	0,01	0,01	0,01
ENG07	-2,43	-1,56	-2,43	-2,43	-2,43
GEO07	3,67	2,89	3,67	3,67	3,67
HIST7	1,03	4,63	1,03	1,03	1,03
HOME7	-0,09	-0,06	-0,09	-0,09	-0,09
MATH7	9,81	9,78	9,81	9,81	9,81
PHSC7	10,79	11,38	10,79	10,79	10,79
TECD7	-4,2	1,66	-4,2	-4,2	-4,2