THE SEGREGATION OF GIRLS IN MATHEMATICS

by

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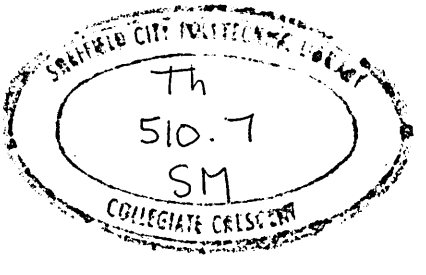

ABSTRACT

The Segregation of Girls in Mathematics - by Stuart W. Smith

This thesis is a study of the effects of segregation by sex on learning in Mathematics. The attitudes and performance of a group of secondary girls who were taught Mathematics in segregated sets for five years have been compared with a group of similar girls who were taught in co-educational sets for five years in the same school.

Comparisons were carried out using:-

a) the 'Tameside Numeracy Test';

b) four short Mathematics tests;

c) the external Mathematics examination results;

d) an attitude questionnaire.

Additionally a number of fifth year girls from both groups who regarded Mathematics as difficult were interviewed. Six Mathematics teachers were also interviewed.

The segregated girls as a group performed better than the co-educated girls on the Tameside Numeracy Test, but on the four short tests the overall performance of the two groups was very similar. The results achieved by the two groups in the Mathematics external examinations were also very similar.

The co-educated girls regarded Mathematics as significantly more useful than segregated girls, but there were no significant differences in the attitudes of both groups to the difficulty and enjoyment of Mathematics.

The co-educated girls who were interviewed were generally critical of the behaviour of boys in lessons, but they mainly attributed their difficulties in Mathematics with the speed they were expected to move from topic to topic. Most of the segregated girls who were interviewed approved of segregated setting in Mathematics.

The Mathematics teachers who were interviewed all felt that segregated setting benefited girls more than boys and younger pupils more than older ones. Several teachers expressed reservations about segregating older pupils.

Although the results suggest that girls gain no long term benefit from segregated Mathematics setting, it is nevertheless felt that segregation may be worth preserving in the first and second years at the school.

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TABLE OF CONTENTS

APPENDICES

CHAPTER 1

INTRODUCTION

Since the raising of the school leaving age in 1974, almost all pupils of both sexes in secondary schools in the United Kingdom have been compelled to study Mathematics until the age of 16. Despite this apparent equality of opportunity, secondary girls still do not perform as well as boys in this subject. In 1980, the Assessment of Performance Unit (APU) conducted its Third Secondary Survey of Mathematical Development. Written tests were administered to a representative sample of approximately 13,300 15-year old pupils attending some 700 secondary schools. When the results were analysed by sex, it was noted that boys performed better than girls in every one of the 13 sub-categories of the test, and that the differences were significant on six of them. Girls are also less successful in external Mathematics examinations at age 16. In GCE 'O' Level Mathematics examinations taken in England and Wales in 1983, girls comprised only 43·6% of successful candidates (achieving grade A, B or C passes). In CSE Mathematics examinations taken in the same year, girls comprised 48·2% of the candidates successful at Grade 1 level (Equal Opportunities Commission, 1985).

Of even greater concern than this difference in performance at 16 is the very low uptake of girls choosing to study Mathematics beyond 'O' Level. In the summer of 1983, for instance, girls comprised only 29·4% of the total candidates in 'A' Level Mathematics examinations (Equal Opportunities Commission, 1985).

These differences between boys and girls in Mathematics are naturally reflected in their attitudes to the subject.

The APU Second and Third Secondary Surveys of Mathematical Development (1981 and 1982) both found that 15-year old girls perceived Mathematics to be a more difficult subject than boys of the same age which suggested that girls generally have less confidence in their Mathematical ability. Girls also tended to regard Mathematics as less enjoyable and less useful than boys. In a survey of pupils attending eight Sheffield co-educational comprehensive schools, Preece and Sturgeon (1981) observed that the attitudes of girls to Mathematics declined more sharply between the ages of 11 to 15 than did the attitudes of boys.

The process by which girls become disenchanted with Mathematics is defined by Byrne (1978) as 'cumulative attrition'. She also outlines some consequences of this process:

> "Girls are often discouraged from Mathematical work in the primary years. They therefore dislike it in secondary years. They therefore drop it at 'O' Level and 'A' Level in far greater numbers than boys. There are therefore fewer women graduates. As a result, fewer women are employed in industry in posts needing Mathematical ability and very few women teach Mathematics in Polytechnics."

In an Appendix to the Cockcroft Report 'Mathematics Counts' (1982), Shuard stressed the need for research into the causes of girls' under-achievement in Mathematics. In her list of suggested reasons for differences in performance between boys and girls she stated that:

> "In mixed schools, in groups in which boys and girls are following the same course, there is some evidence that boys still have more opportunity to learn than do girls."

It is therefore a matter of considerable interest to discover whether the establishment of segregated sets in co-educational secondary schools can benefit the performance and attitudes of girls in Mathematics.

The main objective of this thesis is to assess the effects of segregation by comparing a group of girls who have been taught Mathematics in segregated sets at Stamford High School, Tameside for a period of five years with a similar group of girls who have been taught Mathematics in co-educational sets for the same period.

From 1974 to 1982 the author was Deputy Headteacher at Stamford High School, and one of his responsibilities was to head a working party which was set up in 1977 to improve the academic performance of girls in the school. One measure taken was the establishment of a single-sex girls' Mathematics set as a 'pilot experiment' for a two year period in 1978. The results of this 'pilot experiment' (which are described in some detail in Chapter 3) led the school to place the whole of its first year intake of September 1980 in segregated sets for Mathematics for a period of five years and the author was asked to investigate the effects of this action on boys and girls alike. The author left the school in 1982, but it was agreed by the school that he should continue this investigation and in 1983 he was awarded a research grant by the Equal Opportunities Commission (EOC) to complete the work. The full results of the investigation are expected to be published by Her Majesty's Stationery Office (HMSO) under the title 'Separate Tables? An Investigation into Single-sex Setting in Mathematics' later in 1986.

Whereas the complete investigation conducted for the EOC included boys and girls alike, this thesis concentrates its attention on girls alone. The next chapter begins by reviewing evidence which suggests that girls face serious problems to learning in a co-educational environment.

CHAPTER 2

LEARNING IN CO-EDUCATIONAL AND SEGREGATED ENVIRONMENTS - A REVIEW OF THE LITERATURE

DIFFERENTIAL TREATMENT OF BOYS AND GIRLS IN CO-EDUCATIONAL SCHOOLS

Although this review concentrates on secondary education, it needs to be noted briefly that some research suggests that girls are treated differently to boys in the primary classroom. Clarricoates (1978) conducted a study of four different primary schools over a period of 18 months. She noted that teachers generally geared their lessons to the interests of boys (despite the fact that the teachers claimed to treat the sexes equally). Most of the teachers interviewed believed that boys had much more imagination and also had 'the real ability'. In an earlier study, Sears (1965) observed that boys gain greater interaction with their primary teachers for approval, disapproval, instruction and being listened to.

The preferential treatment accorded to primary boys by their teachers seems to extend to secondary schools. In a survey of the attitudes of 30 male and 30 female Canadian secondary teachers, Ricks and Pyke (1973) noted that a clear majority of teachers of both sexes preferred to teach boys rather than girls in the belief that male pupils are more interesting and critical and that their education is more important than that of girls. In another American study, Spaulding (1963) stated that teachers accorded boys' work and efforts in class more approval than they accorded girls' work and they also spent more time teaching and listening to boys. In a major study of secondary classrooms, Good, Sykes and Brophy (1973), also found that teachers interacted more with male students, and that boys perceived as high achievers far surpassed all other pupils in the amount of positive

contact they received from teachers.

Stanworth (1983) interviewed a number of pupils attending 'A' Level classes in the humanities department of a College of Further Education. She found that boys and girls alike believed that teachers were more concerned about boys and that the teachers considered boys to be more conscientious and capable than girls. Mahony (1985), in her interpretation of Stanworth's work, pointed out that this constituted a serious situation from the point of view of the girls, bearing in mind the importance of teacher expectation in the learning process.

Stanworth (1983) additionally noted that for every four boys who participated in classroom discussion there was only one girl. Similar observations of male domination of co-educated discussion groups have been made by Parker (1973), Zimmerman and West (1975) and Horrocks (1984).

In an analysis of her own classes, Spender (1982) was also aware of boys almost monopolising oral work. She deliberately attempted to rectify this imbalance, but found that in ten of her own lessons which she taped, the maximum time she spent interacting with girls was 42% and on average 38%, and the minimum time with boys was 58%. Sarah (1980), as a student teacher, also tried to give the girls in her classes an equal share of time, but she concluded:

> "It is difficult, or even impossible, because they (boys and girls) have learned their different socially sanctioned roles and their classroom behaviour makes different demands on the teacher. I found that I spent a lot of time focussing attention on the boys who were misbehaving and practically ignored all the girls who were getting on with their work."

Similar observations were recorded by Griffiths (1977).

Eliot (1974) also attempted to involve the girls in his mixed ability fourth year class more actively in oral discussion. He found that the majority of girls were not prepared to participate and that the small number of girls who did join in felt isolated. Eliot tried to protect and encourage these girls, but his efforts only reinforced their unease at behaving in an 'unfeminine' manner.

Spender (1980) believes that although teachers attempt to impose the rules of classroom discussion, it is often the boys themselves who lay down the rules and ensure that they are understood and adhered to by the girls. She has observed the frequency with which boys make insulting and abusive (often sexually abusive) comments to girls. Farley (1978), McKinnon (1979), Whitbread (1980) and Brina (1981) have all recorded similar observations, and Shaw (1980) noted that girls become increasingly vulnerable to boys' insults as they mature sexually. She concluded:

> "As boys of the same age are easing themselves into their futures by adopting the styles and manners of the shop floor, girls naturally have little option, but to withdraw from the danger zones where their presence simply invites abuse."

Boys also on occasion use more subtle techniques to intimidate girls who try to speak in class. For example, Stanworth (1983) recorded the following comments from girls she interviewed.

> "Well they put their pens down - you know - time for a break. If she carries on they fold their arms, lean back in their chairs and - sort of - look deliberately bored. Do you know what I mean? The boys always act bored whenever a girl says anything in class. It doesn't matter what she says. She's soon ground down with groaning and sighing."

Some researchers believe that in co-educational secondary schools the physical space is dominated by the boys.

For example, in a study of co-educational playgrounds, Wolpe (1977) observed that boys monopolised the main area and girls were relegated to the periphery and Wildy, Howe, Crosbie, Collins and Berman (1984) noted that many girls spent much of their break time in small groups in inconspicuous corners. They also observed that boys' activities commonly involve large groups and large areas of space and girls frequently become spectators of boys' activities.

This alleged domination of physical space by boys has also been noted in classrooms. In her observations of co-educational Physics classes in a large number of co-educational schools, Harding (1983) became aware that boys generally sat in the front benches with girls at the rear. As a result, teachers interacted more personally with the boys. Discussions between teacher and boys frequently did not reach the back of the class. The girls generally sat passively and turned to each other with questions.

Similar observations were recorded by Hawes (1981) in her work over many years as tutor to student teachers on teaching practice. She noted an apparent loss of confidence by girls in the third year in co-educational science classes. They kept to themselves, working quietly or whispering together and very rarely volunteered any contributions of information. She also described, from her own teaching experience, a remarkable change in behaviour by the girls of a third year co-educational science class on an occasion when the boys were withdrawn for an entire lesson:

> "The girls became more responsive, not to say assertive. They were certainly more at ease in an all female set and became recognisable as 'normal' people."

An additional problem faced by many capable adolescent girls in co-educational classrooms has been described by Horner (1976) as:

> "a general inability to reconcile competence, ambition and intellectual accomplishment and success with femininity."

She found that 65% of the female 18 and 19-year old students who she tested described a successful woman in negative terms whilst only 10% of the male students she tested described a successful man in similar terms. In tests conducted by Monahan, Kuhn and Shaver (1974) a majority of both male and female 16-year old students completed a story concerning a successful female medical student in a negative way. These tests suggest that the academically successful female has an unattractive image and Horner therefore believes that in co-educational schools, able girls have to choose between reduced achievement in order to gain popularity and the approval of peers and maximised achievement with the acceptance of disapproval.

All this suggests that there are many influences operating in the co-educational school which hinder girls from participating as fully in school life as do boys and this led Shaw (1980) to conclude:

> "mixed schools are essentially boys' schools in so far as they are dominated by boys' interests."

These influences represent a particular handicap in the classroom. Girls are apparently pressured into adopting a passive role in the co-educational class, and the inability to participate as freely in oral work as do the boys is particularly cruel when we consider the importance of talk in the learning process. This was underlined by Barnes (1976):

> "The more a learner controls his own language strategies, and the more he is enabled to think aloud, the more he can take responsibility for formulating explanatory hypotheses and evaluating them. It is not easy to make this possible in a typical lesson: my contention at this point is that average pupils of secondary school age are capable of this if they are placed in a social context which supports it."

The evidence presented here suggests that secondary school girls in co-educational classes are very rarely placed in such a context. The situation when girls are segregated from boys is entirely different as Spender (1980) noted:

> "In single sex schools, girls do not experience the same constraints upon talk. In an all girls classroom, those who talk are girls. In a single sex environment, it is possible for girls to pursue their interests without having to hide the results."

Spender (1980) continues the argument from the spoken to the written word. She believes that the language used to express knowledge tells us that the world is male, and that this is one of the major ways in which school girls are marginalized. It is ironic that in the quotation by Barnes above, he equates 'the learner' with the masculine gender as Spender sees this as one of the techniques by which knowledge is expressed in male form. Spender's views are supported by analyses of text books and other written materials used in schools by Lobban (1977), Davies and Meighan (1975), Butler and Paisley (1979), Moys (1980), Scott (1980) and Sandra (1982).

Naturally, most of the male biased materials referred to above would be used in girls' schools as well as co-educational schools, but it seems reasonable to assume that opportunities to counteract such bias would be far greater in the segregated classroom. Indeed Mahony (1985) like Spender believes that the advantages of being educated in a girls' school are considerable:

> "it becomes evident that although girls in single sex schools are not free from the constraints imposed by the biased context of education, from the he/man language in which it is formed, from the contradictions between femininity and academic success, or from the models of status, power and authority generated by the structuring of female and male career patterns, their situation is consistently better than that of their counterparts in mixed sex schools."

If this is true, then it would appear probable that a policy of segregating secondary school girls from boys would have a positive effect on academic performance in the classroom.

DIFFERENTIAL TREATMENT IN MATHEMATICS

When attention is transferred from the co-educational classroom in general to co-educational Mathematics lessons in particular, it is apparent that the problems facing girls become intensified.

Mathematics, of course, is widely regarded as having a 'masculine' image, and this image cannot fail to have detrimental consequences for many girls. The EOC in an undated submission to the (Cockcroft) Committee of Inquiry into the Teaching of Mathematics stated that the 'masculinity' of Mathematics resulted in many parents and teachers not encouraging girls to persevere with the subject.

The EOC then went on to discuss the effect of female primary teachers on the attitudes of girls to Mathematics:

> "The fact that children up to the age of 11 are taught almost exclusively by women can result in girls being conditioned to reject those activities which develop Mathematical skills in favour of more traditionally feminine pursuits. This occurs because female teachers have themselves been alienated from Mathematics and conditioned to accept certain roles,

> behaviour patterns and school subjects as more befitting girls than boys. If a female teacher lacks numerical ability and confidence in activities which foster such skills, she may perpetuate this in girl pupils who respond to an adult's attitudes and expectations."

The EOC welcomed the decision of the Department of Education and Science that from 1980 students enrolling for BEd and PGCE courses had to possess an 'O' Level or its equivalent in Mathematics, but recognised that the beneficial effects of this decision would only filter slowly into primary schools.

Dweck (1976 and 1978) was also concerned about the effect of primary teaching on the self-confidence of girls in Mathematics. In her observations of American 9 and 10-year old pupils, she noted that although boys were criticised more frequently than girls, approximately half this criticism was related to behaviour. With girls, however, only 10% of the criticism they received was related to behaviour and the balance related to the quality of their work. Dweck suggests that this difference in treatment causes a girl to associate failure with lack of ability whereas a boy will associate failure with lack of effort or with the teacher having 'a down' on him. Consequently boys can equate a new task or a new teacher with a new opportunity whereas a girl who doubts her ability may 'retreat' from new tasks and challenges. Dweck calls this phenomenon 'learned helplessness' and she suggests that its effect is particularly serious in Mathematics where new concepts frequently lead to initial failure. 'Helpless' children will give up, but those with a sense of competence will meet the challenge.

An analysis of the results of the APU Primary Surveys of Mathematical Development by Shuard (1981) noted that whereas the girls were better at straightforward computation and verbal tasks (such as naming shapes), the boys

performed better at tasks involving problem solving, spatial perception and measuring. As 'O' Level Mathematics papers stress problem solving skills and the use of graphs and diagrams rather than straightforward computation, Shuard speculated that possibly the major cause of the lack of success of girls in 'O' Level Mathematics may be associated with primary rather than secondary education. She also noted that in a separate survey, primary teachers considered the questions from the Primary Surveys which were done more successfully by the girls to be of greater importance than the questions done more successfully by the boys.

Stewart (1984) was disturbed by the implications of this teacher survey:

> "So we see girls conforming successfully to teacher priorities which in the main are directed to the acquisition of computational skills. The problem resides in the fact that these skills which girls diligently acquire are important, but do not become progressively more important at secondary level like problem solving skills, application of number in measuring and so on. There exists the danger that excessive concentration on number computation could very well inhibit the development of these other skills."

and she later referred to her own classroom observations:

> "It is not uncommon to find teachers rewarding girls for useful, but lower level cognitive skills like writing neatly, colouring well and presenting work attractively in Mathematics. This becomes dangerous when the girl who would be better challenged by some investigatory practical task takes on the role of 'recorder' because she sees this as being valued by her teacher."

Thus a picture emerges of many primary school girls being singularly ill-prepared to face the challenge of Mathematics in the co-educational secondary school.

Secondary Mathematics is largely taught by subject specialists whose priorities may well differ from those of the primary teachers at the schools from which the girls have just departed. Furthermore, whereas female teachers far outnumber men in primary schools, the Mathematics departments of most co-educational secondary schools are male dominated. Unfortunately, a recent breakdown of secondary Mathematics teachers by sex is not available. However, in March 1984 only 35·3% of teachers in the state sector (nursery, primary and secondary) with first degrees in Mathematics were female. Furthermore, the DES 1977 Survey of Secondary School Staffing revealed that only 36% of secondary teachers whose first qualification was in Mathematics were female. Byrne (1978), however, suggested that as many as 75% of Mathematics teachers in Britain were male.

Male teachers also tend to dominate the senior posts in the Mathematics departments of co-educational secondary schools. Once again accurate statistical details are not available, but in 1982 the author recalls being invited by a Mathematics Adviser to address the Heads of Mathematics Departments of secondary schools in his authority. Of the sixteen teachers who attended the meeting, only three were female and two of these were Heads of Mathematics in girls' schools. It is also worth noting that in the academic year 1978/79, 15·7% of female Mathematics graduate teachers under the age of 35 left the profession compared with only 6·3% of male Mathematics graduates in the same age group. No doubt much of the difference between these leaving rates was caused by maternity, but it does indicate that most male Mathematics teachers acquire longer continuity of service and greater experience and are therefore more likely than female Mathematics teachers to gain promotion.

It therefore seems reasonable to assume that pupils in co-educational secondary schools spend approximately twice

as much time with male Mathematics teachers as they do with female Mathematics teachers. Furthermore it is highly probable that the Head of Department will be male and that much of the senior work in Mathematics will be taught by male teachers because of their greater experience. It is also probable that if the school concerned covers the 11-18 age group, the 'A' Level Mathematics classes will be dominated by boys.

The strong masculine image of Mathematics in co-educational schools is further enhanced by the use of male biased text books. A great deal of research is still needed in this area, but Scott (1980) in her detailed study of many of the text books in a co-educational comprehensive school did analyse the two main series of Mathematics text books used there. These were Marshall's 'World of Mathematics' (published by Nelson 1970) and Smith's 'Common Core Mathematics' (published by Hulton 1967). She concluded:

> "Everyday according to these texts is a world of football, cricket, men driving cars and traditional boys' hobbies. The world of Maths is male, and this is re-inforced in several books by the number of questions which revolve around men and boys doing things susceptible to Mathematical calculation. Occasional gestures towards the girls being included are made, typically via a girl sipping tea or standing decoratively posed in a mini skirt in a phone booth.
>
> It would be a short-sighted solution to try to remedy this bias by showing Mathematics operating in the domestic realm to the same extent as it operates outside it, just to draw the girls' interest. The main point is that when examples could be non-sex specific, these books make them sex-specific. No attempt is made to integrate girls into the world of engineering or technology."

A similar analysis of 24 Mathematical text books used in American high schools by Kepner and Koehn (1977) came

to similar conclusions:

> "Males and females were seldom treated equally in illustrations and problems in these texts. The number of males identified was greater than females in twenty out of the twenty four texts examined. Males participated in a greater variety of activities and occupations than females. Typically female activities were passive except when they participated in household activities."

Another survey of American Mathematics text books by Berrill and Wallis (1976) noted how these books emphasised traditional sex roles.

A small survey of English primary Mathematics texts by Weiner (1980) disclosed a similar pattern of sexism. Females tended to be displayed in one of only three stereotyped roles: the familial (mother, sister, grandmother), the housewife and the teacher.

It is, of course, extremely difficult to assess the impact of male biased text books on the attitude and performance of girls in Mathematics, but it is worth reiterating the argument of both Spender and Mahony that the opportunities for countering sexism in text books are much greater in girls' schools than in co-educational schools.

One effect of the powerful masculine image of Mathematics in secondary education was illustrated by Ernest (1976) in a detailed study of pupils aged between 8 and 18 attending schools in Southern California. Whereas a considerable majority of pupils of all ages (boys and girls alike) approached their mother rather than their father for help with English homework and whereas a considerable majority of pupils in elementary school (boys and girls alike) approached their mother rather than their father for help with Mathematics homework, the

pattern was reversed when the boys and girls entered high school for it became the father rather than the mother who was approached for help. One can only speculate that this change was related to the masculine image of Mathematics in high school, but the approaches to father rather than mother for assistance would certainly emphasise the masculine image of Mathematics in the minds of sons and daughters alike.

It would be interesting to investigate whether similar results to these of Ernest would be obtained in British schools, and particularly whether girls attending girls' schools would behave differently to girls attending co-educational schools in approaching parents for help with Mathematics.

It seems probable that one reason for the lack of interest, motivation and achievement of many girls in Mathematics is related to their categorisation of this subject as 'unfeminine'. Edwards (1979) additionally links this phenomenon to adolescence:

> "The perception of Mathematics may form part of an overall conception of masculinity and femininity and the child attempts to match his or her behaviour to this conception. The drop in achievement in Maths occurs during adolescence when girls are particularly concerned with self-definition. Girls who display liking or ability in Maths can fear isolation and being treated as eccentric."

Edwards's view is supported by Fox (1975) who has concentrated her research on gifted young Mathematicians in Baltimore schools. She found that many more 13-year old boys than girls were eager to enrol for a special Mathematics course for gifted pupils and furthermore that many more girls than boys dropped out of the course:

> "Girls appeared afraid that their participation would have negative social consequences for them."

Fox and Cohn (1980) additionally conducted a survey of some 200 pupils who had displayed precocious Mathematical talent. They noted that on average the more able a boy was, the younger he tended to be when he graduated from high school. No such relationship was evident for the able girls. They concluded that able girls tended to develop their Mathematical abilities to a considerably lesser degree than able boys.

Good, Sykes and Brophy (1973) were also concerned about the problems of able girls in Mathematics. In their observations they noted that high achieving girls received significantly less attention in Mathematics classes than did high achieving boys. In an earlier piece of research, Sears (1965) noted that teachers gave boys more opportunity to respond to higher level cognitive questions, both in terms of time to answer and in terms of helpful supplementary questions and hints. Becker (1981) was also concerned about the differential treatment of males and females in Mathematics. From her observations of high school Geometry classes in Maryland she noted that boys received 70% of positive contacts while girls received 83% of non-encouraging or discouraging comments and she concluded:

> "Teacher expectations closely followed sex-role stereotypes; correspondingly they gave more encouragement to males than to females and the latter were even discouraged in some cases. If a boy gave a wrong answer, the teachers were more likely to give hints or to ask a new question and by these means made it possible for the student to solve the problem."

The implication of this research is that Mathematics teachers (consciously or unconsciously) frequently display bias against girls in co-educational classes. Becker related this bias to teacher expectation and Ernest (1976) came to a similar conclusion. In a small survey which he conducted among Californian Mathematics teachers he

found that whereas 41% of these teachers expected boys to do better than girls in Mathematics, none of them expected girls to do better than boys. Ernest suggests that:

> "We may be observing the so-called 'Pygmalion effect' in education according to which the student performs to some (measurable) extent in response to the expectations of the teacher."

It will have been noted that much of the research quoted in this section was undertaken in the USA. In the absence of appropriate British research, it is clearly necessary to make use of American research findings even though it is not always apparent how useful or appropriate these findings are in relation to the British educational system.

Nevertheless, it is suggested that the inappropriate preparation which many girls apparently receive in Mathematics at primary school added to the masculine domination of Mathematics teaching in most co-educational secondary schools, the use of male biased text books, and the apparently unequal treatment which girls receive in many co-educational Mathematics classes all conspire against girls at a particularly sensitive time in their physical and emotional development. Furthermore, American research suggests that these factors have been particularly damaging to girls who displayed Mathematical talent at an early age.

This does not mean that the segregated classroom will eliminate all of the negative pressures which secondary school girls face in the study of Mathematics, or that girls-only classes will result in equity in Mathematics education. Indeed Fennema (1980) and Harding (1984) both fear that the establishment of segregated Mathematics classes could lead to second class provision for girls

and the recent work of Walden and Walkerdine (1985) indicates that despite the many handicaps which girls face in Mathematics classes, their performance does not decline through secondary school. In a fourth year Mathematics test which they analysed, the girls consistently out-scored the boys. Although this result is clearly at variance with other research (particularly the APU Secondary Surveys of Mathematical Development) they go on to suggest that the quiet, conformist approach adopted by most girls is undervalued by many Mathematics teachers who are inclined to admire the rule challenging and outspoken traits displayed by many boys.

Although segregation by sex is a controversial issue, there can be no doubt that the learning experience of secondary girls in co-educational classrooms is radically different from that of girls who have been taught in segregated classrooms. Consequently there is a need to discover what effect the segregation of girls for Mathematics lessons will have on their performance in and attitudes to this subject, despite the fact that many comparisons have already been made between pupils taught in co-educational schools and pupils taught in segregated schools.

The next section of this thesis reviews those comparisons which have dealt with Mathematics.

COMPARISONS OF ATTITUDES AND PERFORMANCE

At first sight, it may not appear necessary to review research which compared the performance in Mathematics of pupils attending segregated schools with those attending co-educational schools in the period between the two World Wars. After all, what was happening in secondary schools then bears little relationship to the

current educational scene. However, this work is interesting because it highlights some of the problems the researcher faces in comparing academic performance in different schools.

This section therefore begins with the work of Cameron (1923) who applied her own Mathematics tests to a sample of 500 14 and 15-year old pupils from six girls', five boys' and three co-educational schools. At the time of testing, the girls from the co-educational schools were on average somewhat younger than the girls from the girls' schools (the precise difference was not calculated), although both groups had spent approximately the same amount of time in secondary Mathematics lessons. Despite the difference in age, the girls from the co-educational schools (who had been taught Mathematics in mixed classes, mainly by male teachers)performed better on the tests than the girls from the girls' schools and Cameron speculated that this superior performance was 'related to continual contact with the masculine outlook.'

Tyson (1928) conducted a large survey of the School Certificate examination statistics of the Northern Universities Joint Matriculation Board for 1925 and 1926. These examinations were taken mainly by maintained grammar schools in the North and Midlands of England. He analysed the percentage of boys and girls from co-educational and segregated schools obtaining credits in nine different subjects. In the case of Mathematics, he found that the girls from co-educational schools performed significantly better than the girls from girls' schools in both 1925 and 1926 even though in both years the girl candidates from co-educational schools were somewhat younger on average than the girls from girls' schools.

Field (1935) analysed the School Certificate marks obtained by pupils in ten grammar schools in the Birmingham area

in six subjects for the years 1930, 1931, 1932 and 1933. Unfortunately, Field (who was mainly concerned with the difference of performance between girls and boys) did not specify the number of segregated and co-educational schools involved in her survey, but she did compare the mean scores obtained from co-educational schools with those obtained by girls from girls' schools. In Mathematics, the co-educated girls performed significantly better than the girls from girls' schools in 1931, but the differences in the other three years were not significant. It was noted that on average the candidates from the girls' schools were some months older than the candidates from the co-educational schools (boys and girls combined) for each of the four years.

Thus research conducted between the two World Wars suggests strongly that during this period girls attending girls' grammar schools were less likely to succeed in Mathematics than girls attending co-educational grammar schools. However, it is interesting to note that the research of both Tyson and Field indicated that in the other academic subjects which they analysed, the girls from the girls' schools generally achieved a superior performance. It would therefore seem that there were special factors relating to Mathematics which handicapped girls attending girls' schools.

An indication of some of these special factors can be found in a memorandum published by the Girls' Schools Committee of the Mathematical Association (1926). To begin with, this committee stated that on average girls spent approximately 45 minutes less per week in Mathematics lessons than did boys. Unfortunately, no figures were provided for pupils in co-educational Mathematics classes, but Field calculated that in the schools covered by her survey, girls in girls' schools spent less time in Mathematics lessons and less time on Mathematics homework

than pupils in co-educational schools. Secondly, the committee referred to the chronic shortage of well-qualified Mathematics mistresses. As girls' schools were almost entirely staffed by female teachers, there is no doubt that girls in co-educational schools stood a better chance of being taught Mathematics by a well-qualified teacher during this period. Finally, the committee pointed out that most girls' schools were singularly ill equipped to teach Physics. Bearing in mind the relationship between Physics and Mathematics, this would constitute an additional handicap for girls' schools in terms of Mathematical performance.

In the post-war era, Sutherland (1961) made a major analysis of the Nothern Ireland Senior Certificate examination results for 1957 in all the Protestant grammar schools of Ulster. The mean scores obtained by girls taught in girls' schools were compared with the mean scores of girls from co-educational schools and the differences were not significant in either of the two Mathematics Syllabuses which were taught.

Although these results may have little relevance to the rest of the United Kingdom, it is worth noting that the co-educated girls were on average three months younger than their segregated counterparts. Furthermore, an analysis of the candidates by the social class of their parents revealed that the segregated schools had a distinct advantage in this respect. Both these variables therefore place a doubt regarding the fairness of this comparison.

Dale (1962) reviewed previous research in this field and described his own work in 1949 and 1950 when he conducted intelligence tests with samples of pupils entered for the School Certificate examination in a range of girls', boys' and co-educational grammar schools. He then matched the pupils on the twin basis of scores on intelligence

tests and on social class of parents for the purpose of comparing examination results. Arithmetic, Geometry and Algebra results were analysed separately. Girls from girls' schools generally achieved better results than girls from co-educational schools in both 1949 and 1950, but none of the differences reached the level of statistical significance. Dale pointed out however that the girls from the girls' schools were more finely selected for examination entry and that consequently there was a higher proportion of weaker candidates among the girls from co-educational schools. Dale concluded that in general girls educated in co-educational schools performed somewhat better in Mathematics than girls educated in girls' schools.

King (1966) disagreed with this conclusion. He believed that comparisons of performance in Mathematics needed complete year groups and testing needed to take place before the compulsory school leaving age was reached and before any pupils dropped Mathematics. His own research dealt with a stratified sample of 46 grammar and secondary modern schools and was based on performance in NFER (National Foundation for Educational Research) Mathematics Test I and the Step 3A Mathematics Test. He found the differences in the mean scores of the two groups of grammar school girls in both of these tests, and the differences in the mean scores of the two groups of secondary modern school girls in both of these tests were all highly significant and all in favour of the segregated schools.

Douglas (1964) and Douglas and Ross (1966) however reached rather different conclusions than King. They analysed the educational statistics provided by the National Survey of Health and Development which studied over 5,000 children born in the first week of March 1946. Using tests taken by these children at 11 and 15, they found that middle class girls attending co-educational grammar schools made greater progress in Mathematics than middle class girls

attending girls' grammar schools. Among working class girls however, those attending girls' grammar schools made the greater progress in Mathematics. Girls attending co-educational secondary modern schools generally made greater progress in Mathematics than girls attending girls' secondary modern schools. Unfortunately, no comparisons of performance in the GCE Mathematics examinations were made.

This work is additionally interesting because Douglas and Ross indicated many of the pitfalls in making comparisons of performance between co-educational and segregated schools. They pointed out for instance, that the acute shortage of women teachers in the 1960's had a serious effect on girls' schools generally, and that furthermore girls' schools were bedevilled by an extremely rapid turnover of teachers. They further noted that whereas rural secondary schools were almost entirely co-educational, segregated schools were overwhelmingly located in urban areas. They also believed that girls had to achieve a higher educational standard at 11 to gain entry into a girls' grammar school than into a co-educational grammar school. Their work was also handicapped by the changeover from selective to comprehensive education which was taking place in several areas at this time, and also by many amalgamations of segregated schools to form co-educational schools.

Pidgeon (1967) reported the results of a series of NFER Mathematics tests taken by some 12,000 pupils attending all types of secondary schools in 1964. Six age groups (from 13 - 18 inclusive) were tested and girls from girls' schools had higher mean scores than co-educated girls in all six groups. However, these results need to be qualified. Statistics published by DES(Department of Education and Science) for 1965 show that whereas 37% of all girls' schools were in the grammar school sector, only 14% of co-educational schools were grammar schools.

Consequently, able girls were much more likely to attend a segregated school than a co-educational school. Furthermore, Steedman and Fogelman (1980) demonstrated that segregated schools at this time had a marked advantage in terms of social class.

Meanwhile, Dale was completing a major work assessing the relative merits of co-educational and segregated schools. Dale conducted surveys at many levels of the education system and his work also included detailed and critical reviews of previous research. He eventually published his findings in three volumes of 'Mixed or Single Sex School?' (Dale 1969, 1971 and 1974). Perhaps his greatest achievement was that his work established beyond reasonable doubt that co-educational and segregated schools were communities which exerted quite different psychological influences on children.

Dale, an enthusiast of co-education, eventually concluded that:

> "the average co-educational grammar school is a happier community for both staff and pupils than the average single sex school; it has been equally demonstrated that this happiness is not at the expense of educational progress."

With regard to Mathematics, Dale's study of previous research, plus his own findings led him to state (1974):

> "When we consider boys and girls together, we can say that co-education in some way or other appears to exert a beneficial influence on attainment in Mathematics, as measured by external examinations and tests at the age of 16 plus. Though this cannot be said to be proved in a scientific sense, there is considerable evidence in support, especially on the boys' side, while there is none whatever for any claim that sex segregation improves attainment in Mathematics."

Dale's work is also interesting because he was the only researcher noted by the author who has compared the attitudes to Mathematics of pupils attending co-educational and segregated schools. He applied a research questionnaire to samples of (mainly 13-year old) pupils in over 40 co-educational and segregated grammar schools in South Wales and Yorkshire in 1964 and again in 1966. The schools had all been matched in terms of social background. Pupils were asked to indicate the degree to which they liked or disliked both Mathematics and Arithmetic. The overall differences in the responses to both questions between girls attending co-educational schools and girls attending segregated schools were minimal. Dale noted, however, that the liking of Mathematics varied considerably from school to school and that this was equally true of co-educational and segregated schools. He, therefore, concluded that the ability, enthusiasm and personality of individual teachers was of far greater importance in forming attitudes to Mathematics than the type of school which girls attended.

Dale's findings in terms of performance were questioned by Wood and Ferguson (1974). They pointed out that much of Dale's data were out-of-date and the value of his surveys were limited because they dealt with grammar schools alone. Furthermore the corrections which Dale made to adjust for social class (generally to the benefit of co-educational schools) were considered dubious. They went on to analyse the results of 100,000 pupils taking the London Board 'O' Level examinations in 1973 by subject and by type of school (grammar or comprehensive). They concluded that with contemporary data they were:

> "unable to confirm the claim made by Mr. Dale for the superior academic results of co-educational schooling."

In terms of girls and Mathematics, Wood and Ferguson noted that a higher percentage of girls from girls' grammar schools passed 'O' Level than did girls from co-educational grammar schools. For girls attending comprehensive schools

the results were not clear cut. Girls attending co-educational comprehensive schools achieved a higher pass rate on one of the two Mathematics Syllabuses, but the two groups of girls attending comprehensive schools performed equally well on the other syllabus.

In a later report, Wood (1976) analysed the responses to the London Board 'O' Level Syllabus 'C' Mathematics papers of 1973 and 1974. Girls from girls' schools performed better than girls from co-educational schools, but on this occasion Wood did not analyse the grammar school and comprehensive school results separately and as the girls' schools almost certainly contained a higher proportion of more able girls, the value of this particular comparison is limited.

In research connected with the National Child Development Study (NCDS), Steedman (1980) was able to measure the progress of girls in Mathematics through their secondary school years, for the 16,000 children involved in the NCDS took a special Maths Test at 11 and another (in 1974) when they were 16. The results for segregated and co-educational schools were analysed separately for each type of secondary school. They showed that as far as comprehensive schools and secondary modern schools were concerned, segregated schools offered no advantage to girls as far as progress in Mathematics was concerned. Girls in girls-only grammar schools however made much more progress than girls in co-educational grammar schools.

In a later study, Steedman (1983) analysed the external examination results at age 16 of pupils involved in the NCDS. The great value of the NCDS is that it is a longitudinal study. Steedman showed that even at the age of 7, pupils destined for secondary education in segregated schools had a superior attainment than pupils who would attend co-educational schools. At age 11, pupils who were

to attend segregated schools had marked advantages in terms of ability, attainment and social class. When these factors were taken into account, Steedman concluded that the only subject which was enhanced for both boys and girls by segregated teaching was French, and certainly there was no case for or against segregated teaching for girls in Mathematics.

The second and third Secondary Surveys of Mathematical Development by the APU (1981 and 1982) attempted to compare the test results of 15-year old pupils attending co-educational and segregated schools. The schools were first divided into two groups - comprehensive and other maintained (grammar and secondary modern).

For the comprehensive group, the second survey found no difference in performance between the co-educational and segregated schools for either girls or boys. In the third survey, girls and boys attending segregated comprehensive schools did perform better (respectively) than girls and boys attending co-educational comprehensive schools, but the differences were not large and rarely reached statistical significance.

For the other maintained group, in both surveys boys and girls attending segregated schools had a marked advantage in performance over their equivalents in co-educational schools. However, these results need very careful interpretation. In 1980, 75% of grammar schools were segregated compared with only 30% of secondary modern schools. It is therefore apparent that able pupils in the other maintained group were much more likely to attend segregated than co-educational schools, and that conversely less able pupils were much more likely to attend co-educational schools than segregated schools.

Similar care needs to be taken with a survey of the 'O' Level and CSE results for 1980 of schools in ILEA (the Inner London Education Authority). This survey showed that both boys and girls in segregated schools obtained superior results than boys and girls in co-educational schools respectively in all eight of the subjects analysed (one of which was Mathematics). No account was taken of the differing abilities of these pupils on entry into secondary school.

A more recent analysis of the 1983 external examination results at age 16 of ILEA schools was reported by Wilce (1986). This survey revealed that when individual pupil exam results were combined, girls attending girls' schools performed better than girls attending co-educational schools even when the results were adjusted to account for intake ability.

Despite this last finding, most recent research suggests that the superior performance of girls attending girls' schools over girls attending co-educational schools is largely accounted for by differing ability at age 11 and other variables such as the social class of the parents of pupils which generally act in favour of segregated schools.

A similar conclusion was reached by Bone in her major research review of girls' schools (1983):

> "The consistent lead of single sex schools in examination results makes it easy to see how the idea became current that girls do better in single sex schools. However it is clear from those studies which have attempted to correct the raw results of the schools by taking into account the ability of their intakes, that if an advantage exists, it is very small."

When it came to Mathematics, Bone stated that:

> "Girls do not appear to achieve particularly well in Mathematics at 'O' Level and CSE because their schools are single sex."

In other words, Bone believes that despite the considerable body of evidence that secondary girls face discrimination and deprivation in many forms in co-educational schools in general, and in co-educational Mathematics lessons in particular, the act of segregation for Mathematics classes does not appear to improve the academic performance of girls.

Whilst not seeking to disagree with Bone's conclusion, it seems that in terms of Mathematics, the number of variables between co-educational and segregated schools are so considerable that any fair comparison between the two types of education is almost impossible. It is true that both Dale and Steedman took ability at 11 and social class of parents into account in their findings, but there are other variables which have either been ignored, or cannot be calculated. To take one example: Sharma and Meigham (1980) demonstrated the important relationship between Physics and Mathematics in their study of over 12,000 Mathematics 'O' Level entrants for 1977. They showed that whereas the boys overall achieved a higher pass rate than the girls, when the candidates who sat both Mathematics and Physics were analysed separately, the girls actually achieved a slightly higher pass rate in Mathematics than the boys. Bearing in mind the close relationship of Physics and Mathematics, should we not take into account the proportions of girls from co-educational and segregated schools who opt to study Physics beyond the age of 14? Should we not also consider whether co-educational or segregated schools has the better qualified and most experienced Mathematics teachers? Which type of school devotes more time to teaching Mathematics and to Mathematics homework? Should we not also consider Mathematics class size and the quality of resources

available for teaching Mathematics in both types of school? Under these circumstances, one can understand the assertion of Fennema (1980) that the question of effectiveness of segregated classrooms is at least partially 'nonresearchable'.

SEGREGATED SETTING

However, it is important to recognise that if a piece of research into co-educational and segregated classes is confined to one school, most of the variables which have just been mentioned can be either eliminated or greatly reduced. In other words, if an all girls' set is established in a co-educational school, it should be quite possible to measure the performance of that group against a similar number of girls who have been taught in co-educational classes. Furthermore, it is possible to have control over many variables such as the ability of the pupils, teachers, class sizes, educational resources and schemes of work.

Research in this field is still in its infancy and records to date are very sparse. However, one interesting experiment at the Henry Box School, Witney was reported by Powell (1979). Some pupils who had been taught foreign languages in mixed ability co-educational groups in the first year were placed in segregated sets at the beginning of the second year. There was an immediate improvement in performance in terminal tests by pupils in the segregated groups. At the end of the second year, the results of the segregated groups were considerably better than those of the co-educational groups in comparison with their performance in the first year. This improvement was particularly marked among the boys. One of the teachers involved in the experiment stated:

> "My overall impression is that of motivation, attitude, work, behaviour and competence all improve when pupils are taught languages in segregated classes, provided that a proper match of teacher personality and group is made."

Powell concluded that:

> "It is possible that boys and girls might benefit both psychologically and academically by being placed in single sex groups for foreign languages at the crucial ages of 12, 13 and 14."

In the field of Mathematics, Fox (1975) described various special Algebra classes which were established to meet the need of mathematically precocious boys and girls (mainly 6th and 7th grade) attending schools around Baltimore. She found that more boys than girls were eager to enrol for these classes which resulted in sexually imbalanced sets, and the drop-out rate from these classes was higher for girls than boys. Accordingly, an all girls set was established (drawing pupils from various schools) with a woman teacher and the work pattern of the class was based on co-operation rather than competition. Fox stated that these girls were more successful than the girls placed in co-educational classes, but she noted that:

> "not all of these girls chose to accelerate their programs in normal high school."

Additionally, a special all girls class was set up at Roland Park High School in 1974. Only one girl dropped out of this class and Fox described the class performance as 'highly successful' suggesting that the class being placed in the regular high school of the pupils was an important factor.

Finally, we come to the segregated Mathematics sets established as a 'pilot experiment' at Stamford High School,

Tameside in 1978 and which became the forerunner of the investigation which led to this thesis. This 'pilot experiment' will be described in some detail in the next chapter.

CHAPTER 3

DESIGN OF THE RESEARCH

THE PILOT EXPERIMENT

Stamford High School is a co-educational 11-16 comprehensive school situated on the outskirts of Ashton-under-Lyne, a large industrial town lying six miles to the east of Manchester. The school was created in its present form by the amalgamation of two single sex secondary modern schools in 1970. This amalgamation was a stepping stone toward the development of comprehensive education in Tameside. In the event, comprehensive re-organisation was not introduced until September 1980. The school is currently seven-form entry with a population of some 1,000 pupils, approximately 15% of whom are descended from Asian immigrant families (mainly from the Indian sub-continent). The catchment area is socially very mixed, and the school recruits from a large number of feeder primary schools.

In the years following amalgamation, an analysis of external examination results revealed that girls, in the main, were doing less well than boys. Girls appeared to be under-achieving across the ability range, and this under-achievement, whilst found in most subject areas, was most acute in Mathematics.

Although the initial Mathematics selection test, applied to all pupils during their first term at the school, generally revealed a similar range of performance between boys and girls, by the end of the first year the mean test score of the boys was always higher. During the second and third years, the gap between the mean scores of boys and girls in Mathematics tests tended to increase and boys dominated the top 25% of the mark lists. Consequently when the external examination sets were established at the beginning of the fourth year, it was normal for boys to out-number girls by four or five to one in the top

Mathematics sets (which prepared for 'O' Level). The small groups of girls in these sets found it difficult to cope with lessons, despite having sympathetic teachers. They tended to cluster on the fringe of the class and became reluctant to draw attention to themselves by volunteering any oral contribution. They were particularly self conscious about asking the teacher for help whenever they did not understand. Meanwhile the boys were quite content to monopolise the teacher's time and attention, and 'O' Level Mathematics came to be regarded as a male domain. It was usual for more than 20 boys to pass 'O' Level Mathematics each year, but rare for as many as 2 girls to reach this standard. In the early 1970's the majority of the Mathematics teachers was male, and the 'O' Level Mathematics sets were traditionally taught by a male teacher. In the late 1970's however, three female Mathematics teachers were appointed to the school and this created a more even sex balance. During this period, the Mathematics Department held a number of meetings to discuss various means of improving the academic performance of the girls. The syllabus and various test and exam papers were searched for obvious signs of male bias. Topics and problems felt to be of greater interest to girls were introduced. Strategies for involving the girls more actively in the Mathematics lessons were discussed and each teacher was forced to consider his or her own classroom technique. At one of these meetings, the suggestion that girls might be more successful in Mathematics if they were segregated from the boys was raised for the first time. Although most members of the department were sceptical about the effects of segregation, it was decided that there was nothing to lose by establishing a single all-girls set as a pilot experiment for a two year period.

Consequently, in October 1978, a single first year all-girls Mathematics set was established, and its progress

was measured against that of a group of girls in a co-educational Mathematics set who had obtained similar scores in the initial Mathematics selection test. Both sets were taught similar lessons by the same two teachers (one in the first year, the other in the second year).

It was decided to make no comparisons between the two sets during the first year, nor was any attempt made to explain what was happening to the pupils. The girls in the all-girls set displayed a singular lack of curiosity about their position, possibly because they were still newcomers to the school.

In the second year however, the two sets sat three identical Mathematics tests. The first two tests (held in November and February) were wide ranging with emphasis being placed on recently covered topics. The third test (held in June) was the end of year examination and included all topics covered during the second year. The results are shown in Table 1:

Table 1: Pilot Experiment

Mean Scores (percent) of the All-Girls Set and Boys and Girls in the Equivalent Co-Educated Set

	October 1978 (initial selection test)	November 1979	February 1980	June 1980
All Girls Set	58•9	55•1	54•7	51•6
Girls in Equivalent Co-Educated Set	58•0	50•0	43•9	38•1
Boys in Equivalent Co-Educated Set	59•0	59•0	56•4	49•3

All three tests held in the second year indicated clearly that most of the girls in the co-educated set had fallen

well behind the boys in the same set; in other words these girls were conforming to the typical pattern of the school. The girls in the all-girls set however consistently achieved a far better mean score than the girls in the co-educated set and a detailed examination of individual marks revealed that whereas many girls in the co-educated set were clearly falling behind, most of the girls in the all-girls set were making satisfactory progress. For instance, in the February test, nine of the 16 girls in the co-educated set scored below 40 percent and only four of the 31 girls in the all-girls set failed to achieve this standard.

The two teachers involved in the pilot experiment were interviewed in July 1980. They both noted that the girls in the all-girls set had been much more boisterous and lively than the girls in the co-educated set, and were more difficult to settle down at the start of the lessons. Nevertheless, they said that the girls in the all-girls set were much more forthcoming in lessons and that furthermore the working atmosphere was generally better and a greater degree of co-operation was observed both between girl and girl and between girl and teacher.

More detailed accounts of this pilot experiment have been written by the author (1980 and 1984).

The headteacher and senior staff at the school recognised that the results of this pilot experiment were far from conclusive. The number of pupils involved had been small and the statistics produced were clearly open to question. Nevertheless it was felt that the results were promising enough to make a firmer commitment towards segregated setting in Mathematics. Accordingly, it was decided that from September 1980 the new intake would be taught Mathematics in segregated sets. The performance of this intake would be investigated carefully over its five years at the school

in the hope that some conclusions regarding the benefits and drawbacks of segregated setting could be obtained.

This investigation became the basis of this thesis.

In November 1980 discussions were held with the girls from the segregated set of the original pilot experiment. This was the first time that any formal discussion with these girls took place. By this stage, these girls were part way through their third year in the school, and they had been working in co-educational Mathematics sets since September 1980. The opinions expressed in the main received strong support from all the girls. There was little dissension.

The following quotation, which describes these discussions is taken from a submission made by the author in 1981 to the (Cockcroft) Committee of Inquiry into the Teaching of Mathematics in Schools.

> "All the girls disliked being placed in mixed Mathematics sets. The childish behaviour of the boys was criticised. Boys sought attention from the teacher by shouting out answers and by crowding round the teacher's desk. Rowdy behaviour sometimes disturbed the girls' concentration. The boys teased the girls (although some reciprocation was admitted). The girls felt that they were not given enough opportunity to answer questions in class or to gain the attention of the teacher and this was particularly resented because the girls recognised Mathematics as a subject requiring a great deal of individual help. They regarded competing for attention with the boys as very undignified behaviour.
>
> The girls also claimed that they were more sensitive to the moods of teachers and they would react accordingly. By contrast, boys are much more gauche and their failure to adjust behaviour frequently led to tension in the classroom.

> By contrast, they all had happy memories of the all-girls set. The girls had had more opportunity to answer orally and also received more individual attention from the teacher. They spoke of a strong community feeling and a sense of team spirit in lessons."

These discussions re-inforced the belief of the senior staff at the school that the effects of segregated setting in Mathematics were worthy of serious investigation. Naturally, they were equally concerned about the effects of segregation on boys and girls alike, and the full investigation dealt with both sexes. This thesis however, concentrates on the effects of segregation in Mathematics on girls alone.

DESIGN OF THE MAIN INVESTIGATION

Before any assessment of the girls of the Stamford High School 1980 intake could be made, it was necessary to select a control group comprising similar girls who would be taught Mathematics in conventional mixed sets for five years. The girls selected for this purpose came from the school's 1979 intake, for clearly the two intakes had much in common. Both intakes came from the same catchment area and had been educated at the same group of primary schools. Furthermore the school was able to control many variables in the teaching of Mathematics to the two intakes. Both intakes were allocated the same amount of time for Mathematics lessons for instance and set sizes were very similar. Details of the organisation of Mathematics teaching at the school have been inserted in Appendix A.

Much of this thesis therefore consists of a comparison of performance in, and attitudes to, Mathematics between girls from the 1979 intake (hereinafter referred to as 'the co-educated girls') and girls from the 1980 intake (hereinafter referred to as 'the segregated girls').

Comparisons were carried out using:

a) The Tameside Numeracy Test, taken by both intakes in the summer term of the third year.

b) Four Short Mathematics Tests, taken by both intakes in the summer term of the fourth year.

c) The APU Mathematics Attitude Questionnaire completed by both intakes in the summer term of the fourth year.

d) The external Mathematics examinations taken by both intakes in the summer term of the fifth year.

These comparisons are supported by interviews with a number of girls from both intakes which were held as they neared the end of their fifth year at the school.

Additionally, six Mathematics teachers were interviewed towards the end of the investigation.

It was recognised at the outset that segregated setting was in some ways a clumsy device. The initial division of an intake into boys' sets and girls' sets reduces other possibilities on the timetable. There is less flexibility in varying set sizes for instance, and it is not as easy to break up unsuitable liaisons between pupils among the different sets. Furthermore, the sets cannot be set as finely by ability. However, this would not be a problem in the first, second and third years at the school, for the timetable traditionally split each intake into two separate half year groups of five sets each; five boys' sets and five girls' sets would be just as flexible as this traditional division.

A more serious problem in comparing the two intakes was that comprehensive education was introduced at the school

in September 1980. Consequently, the co-educated girls were secondary modern and the segregated girls were comprehensive. Although the change did not completely transform the calibre of intake, the segregated girls did contain a wider range of ability and a higher proportion of more able pupils than the co-educated girls.

The differences in ability can be seen most clearly by comparing the breakdown of scores achieved by the girls of both intakes on NFER Test DH(see Table 2). This well-established test of non-verbal reasoning, which is standardised over the age range 10 years 6 months to 12 years 0 months, was administered to both intakes in the October of their first term at the school.

Table 2: NFER Test DH Score Breakdown

DH Score	Girls Scoring Below 86	Girls Scoring Between 86-105	Girls Scoring Between 106-125	Girls Scoring Above 125	'Non* Counters'	Total
CO-EDUCATED GIRLS	13	55	37	1	19	125
SEGREGATED GIRLS	4	30	44	11	24	113

*'Non Counters' comprise absentees and girls who joined the school after Test DH was completed.

It was decided to exclude 'Non Counters' from the investigation and also girls scoring below 86 on Test DH because their ability was extremely limited.

A comparison of all the girls who remained would obviously be inappropriate, for it would be reasonable to expect that the segregated girls would achieve higher mean scores in any Mathematics test because they contained a higher

proportion of more able pupils.

Consequently, it was decided to 'pair' the girls on the basis of individual DH scores. A 'pair' comprises two girls (one from each intake) with the same, or very similar DH scores. It was eventually possible to construct 65 of these 'pairs'. Although some of the pairings did differ slightly, the composition of the two groups of 65 girls was statistically very similar and it would therefore be reasonable to compare the performance of these two groups in Mathematics tests and examinations.

The similarity between the two groups is illustrated in Figure 1 which consists of a 'Box and Whisker' plot displaying the range of DH scores of both groups of girls together with other statistical details.

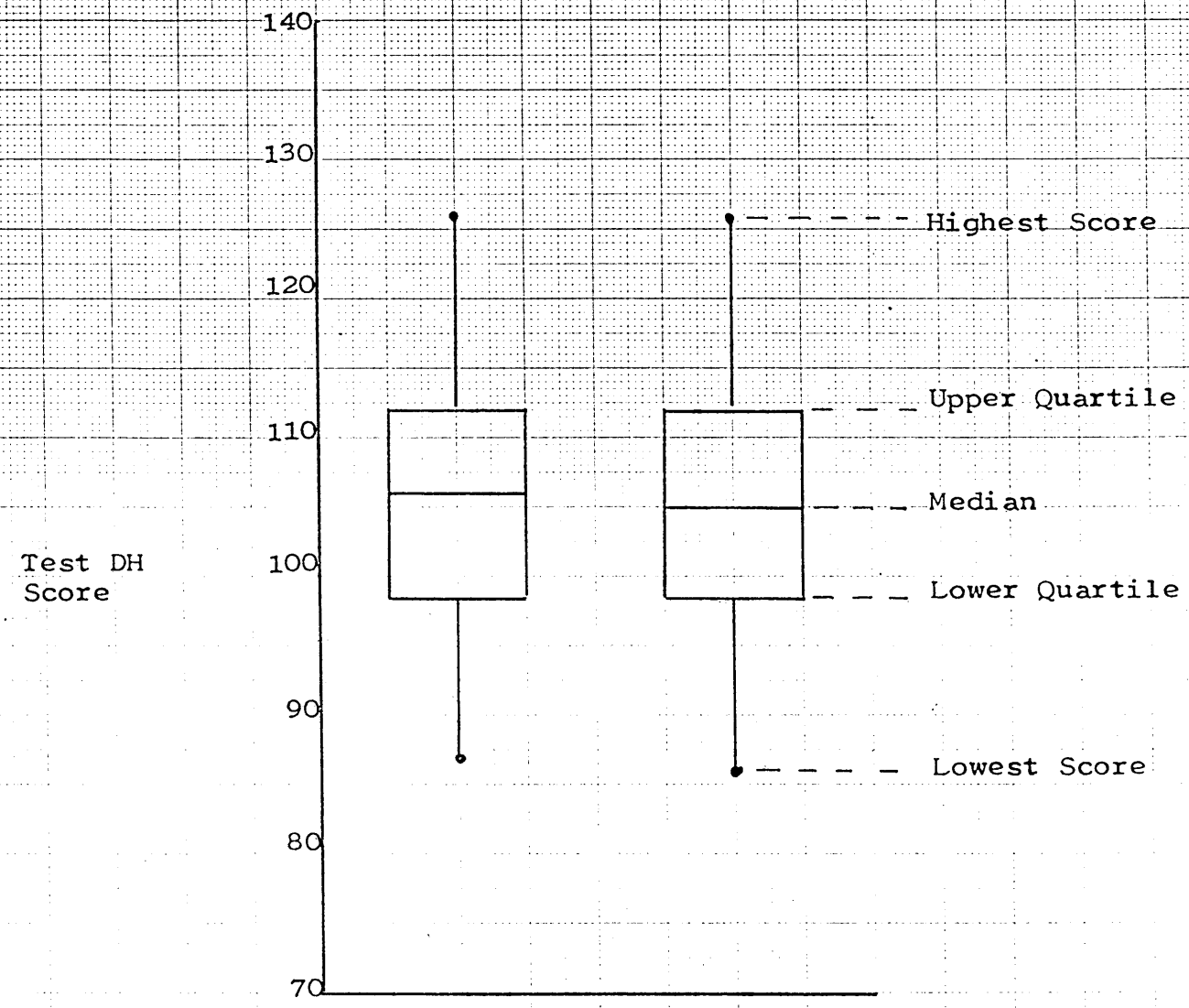
(The 'Box and Whisker' plot is used frequently throughout this thesis as a simple means of comparing ranges of scores. In each case, the 'Box' contains the 50% of scores in each group which lie between the upper and lower quartile scores. The width of the 'Box' has no statistical meaning).

The major disadvantage of the pairing process was that some girls from both intakes had to be discarded (particularly below average ability girls from the co-educated intake and above average ability girls from the segregated intake). Nevertheless the girls who were retained contained an even balance across the middle ability range and an examination of Table 2 indicates that the number of girls discarded was not excessive.

Individual DH scores (together with scores on the various tests, the APU Questionnaire and Mathematics examination grades) are displayed in Appendix B.

Figure 1: NFER Non-Verbal Test DH

Distribution of Scores by Group (range 70-140)



	Co-educated Girls	Segregated Girls
Number in Group (n) =	65	65
Mean Score ($\bar{x}$) =	105·38	105·43
Standard Deviation (σn) =	8·93	9·16

SIGNIFICANCE TESTING

Throughout this thesis the terms 'significant' and 'statistically significant' mean that the probability of the differences between the two sets of scores being compared having occurred by chance is 5% or less, and the term 'highly significant' means that the probability of such differences occurring by chance is 1% or less.

The null hypothesis which has been taken throughout this thesis is that the segregation of a group of 65 girls for Mathematics lessons over a period of five years has had no effect on either their attitude or performance in Mathematics. Consequently, on all the significance tests which have been undertaken, the results which indicate that the differences between the scores of the segregated girls and the co-educated girls are significant suggest that the null hypothesis be rejected. Those where the differences between the scores of the two groups of girls are not significant suggest that the null hypothesis should not be rejected. The thesis is concerned in each case with whether the segregated girls have performed better or worse than the co-educated girls, and consequently all the significance testing has been two-tailed.

The decision to pair the girls by ability for this research led to the conclusion that if possible, a paired t test as described by Guilford and Fruchter (1981 pp 152-155), should be used to compare the scores of the two groups of girls on the following:-

Tameside Numeracy Test	(total scores)
Four Short Tests	(combined scores)
Difficulty Score) Utility Score) Enjoyment Score)	Attitude Questionnaire

As the paired t test is a parametric significance test, its use is dependent on each of the sets of scores to be compared conforming fairly closely to the normal curve of distribution. Consequently, the sets of scores achieved by each of the two groups of girls referred to in the paragraph above were subjected to Geary's Test, as described by Burroughs (1971 pp 194-195). Geary's Test revealed that although only one set of scores (the Difficulty Score of the co-educated girls) differed significantly from normality, the distribution of some of the other sets of scores were also rather irregular.

Under these circumstances, it was decided that these sets of scores should <u>also</u> be subjected to a non-parametric significance test, and bearing in mind that the number of scores in each set tested was above 60, the Wilcoxon Matched-Pairs Signed-Ranks Test, as described by Siegel (1956 pp 75-83), was selected as suitable.

In the event, the significance scores produced by the paired t test and the Wilcoxon test were mainly very similar, and such differences as did occur between the pairs of significance scores were never great enough to affect the findings of this thesis.

When it came to comparing the performance of the two groups of girls on the individual topics of the Tameside Numeracy Test and on each individual one of the Four Short Tests, a different procedure was adopted, for in both these cases, the significance test was to be applied on an item by item basis (that is, by comparing the number of girls in each group who answered each item correctly). Many of these sets of results had an irregular distribution and consequently non-parametric testing was appropriate. Eventually, two separate tests were selected for this group of comparisons as follows:

Where the number of items to be tested exceeded five	The Wilcoxon Matched-Pairs Signed-Ranks Test
Where the items to be tested numbered five (in effect, only four of the individual topics on the Tameside Numeracy Test)	The Randomization Test for Matched Pairs, as described by Siegel (1956 pp 88-91)

Finally, the chi-square significance test, as described by Guilford and Fruchter (1981 pp 196-198), was used to compare both the external examination results of the two groups of girls and the responses of these groups to individual statements on the Mathematics Attitude Questionnaire. The initial analysis of the statements on this questionnaire revealed that many cells contained very few responses and this placed a limitation on the use of the chi-square test. Consequently, on each statement, the Agree and Strongly Agree cells were combined and the Disagree and Strongly Disagree cells were also combined to increase the number of responses. Unfortunately, some statements were still unsuitable for chi-square testing because the expected responses in the Undecided cells were five or below. In these cases, the small number of responses in the Undecided cells were distributed by ratio between the Agree and Disagree cells. The results of these combinations (and the chi-square values obtained) are displayed in Appendix E.

CHAPTER 4

FINDINGS

THE TAMESIDE NUMERACY TEST

The first test available for comparison was the Tameside Numeracy Test, which was taken in identical form by both intakes during the summer terms of their third year at the school.

As its title implies, this test is basically concerned with numeracy and the majority of questions test straightforward computational skills. The main purpose of the test is diagnostic being designed to expose the weakness of both individuals and groups of pupils.

The test comprises 112 written items divided into 13 topics (Integers; Fractions; Decimals; Percentages; Volume and Capacity; Length; Mass; Money; Time; Area; Number; Tables, Graphs and Charts; Spatial Relationships). A further eight oral items were eliminated from the investigation.

A copy of the test has been included in Appendix C.

The test was completed by both intakes during the course of normal Mathematics lessons and was supervised by the Mathematics teachers. The test has no time limit and all pupils were given sufficient time to complete the test.

The test papers of the co-educated intake were marked by the individual Mathematics teachers, but the test papers of the segregated intake were marked by the author, partially to familiarise himself with the test and partially as a gesture of goodwill to the Mathematics teachers for their support of the investigation.

One of the co-educated girls failed to take the test because of long term absence. In consequence, the score of the segregated girl she was paired with has been ignored, and the analysis which follows compares the scores of the 64 girls in each group who remained. (The same technique was adopted for dealing with the girls from both groups who failed to take the Four Short Tests and the APU Attitude Questionnaire because of absence).

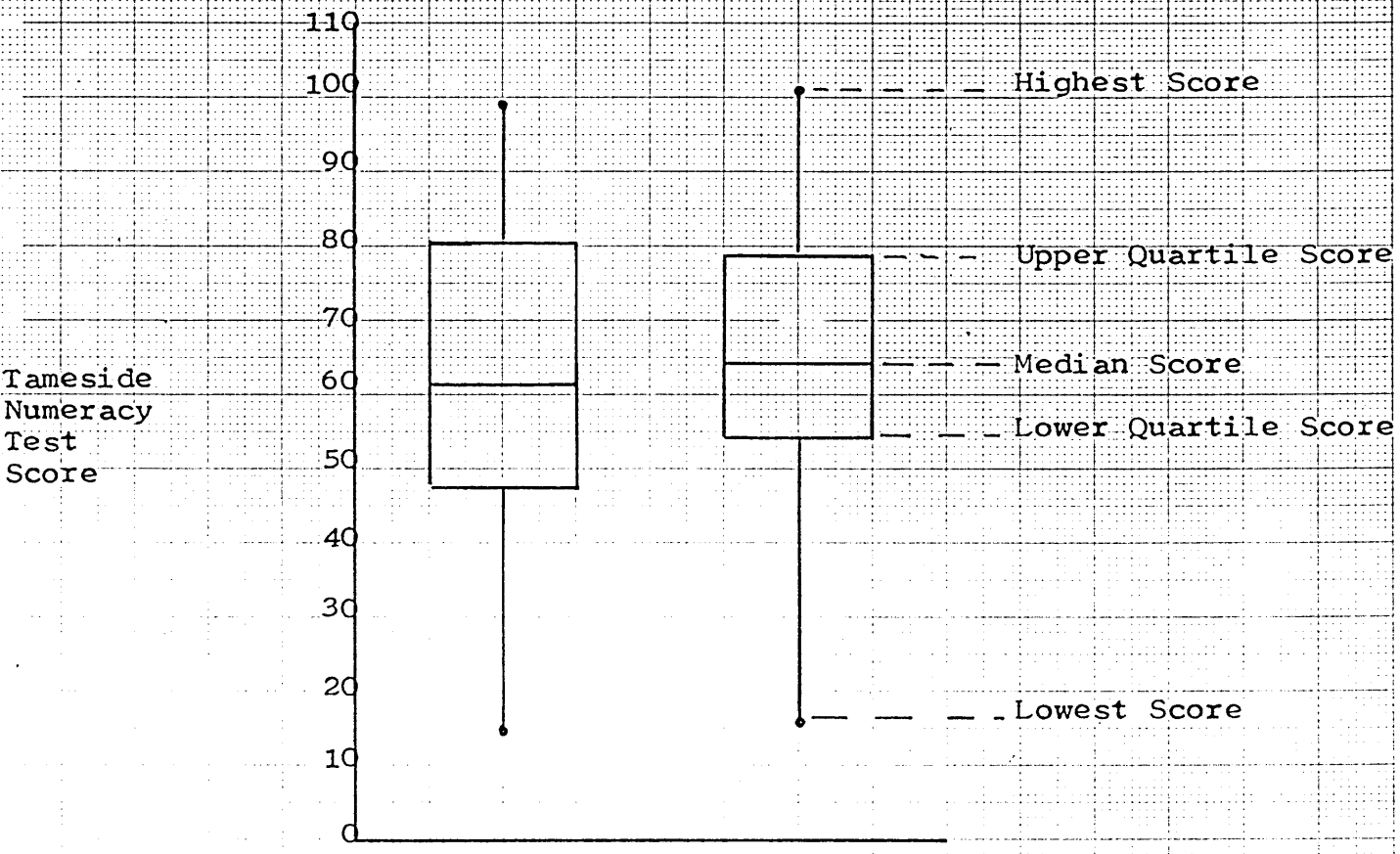
The overall test results are summarised in Figure 2 which contains a 'Box and Whisker' plot illustrating the range of scores achieved by both groups of girls together with other statistical details.

The segregated girls as a group performed better on this test achieving a mean score which was over four marks higher than that of the co-educated girls. The superior lower quartile score of the segregated girls suggests that fewer of these obtained low scores on this test (indeed, only five of the segregated girls scored below 40 compared with 10 of the co-educated girls). Nevertheless, the difference between the two sets of scores fell below the level of statistical significance.

The test scores were next analysed by topic, and the results are displayed in Table 3. The segregated girls performed better than the co-educated girls on 11 of the 13 topics and the differences were significant on five of the topics, all in favour of the segregated girls.

Figure 2: Tameside Numeracy Test

Distribution of Scores by Group (range 0-112)



	Co-educated Girls	Segregated Girls
Number in Group (n) =	64	64
Mean Score ($\bar{x}$) =	61•94	66•03
Standard Deviation (σn) =	20•73	18•25
Geary Test (z) =	0•27	0•07
Paired t Test (z) =	1•58	
Wilcoxon Test (z) =	1•05	

Table 3: Tameside Numeracy Test

Mean Scores (Percent) By Topic

Topic	No. of Items	Mean Score (Percent) Co-educated Girls	Mean Score (Percent) Segregated Girls	Significance Test	z	Significant (✓)
Integers	19	74•3	76•1	Wilcoxon	1•05	
Fractions	19	36•7	39•6	Wilcoxon	1•33	
Decimals	15	39•4	44•0	Wilcoxon	2•24	✓
Percentages	8	31•0	32•5	Wilcoxon	0•28	
Volume and Capacity	6	63•0	73•8	Wilcoxon	2•20	✓
Length	6	52•6	57•9	Wilcoxon	1•36	
Mass	5	60•0	65•3	Randomization	-	
Money	5	74•1	80•0	Randomization	-	✓
Time	7	69•9	74•5	Wilcoxon	1•86	
Area	6	53•9	53•3	Wilcoxon	0•52	
Number	5	69•7	77•5	Randomization	-	✓
Tables, Graphs and Charts	6	79•7	77•7	Wilcoxon	0•94	
Spatial Relationships	5	50•9	56•9	Randomization	-	✓

The 13 topics were next ranked by group in terms of their relative difficulty (based on the mean percentage score achieved for each topic) and the results are displayed in Table 4.

Table 4: Tameside Numeracy Test

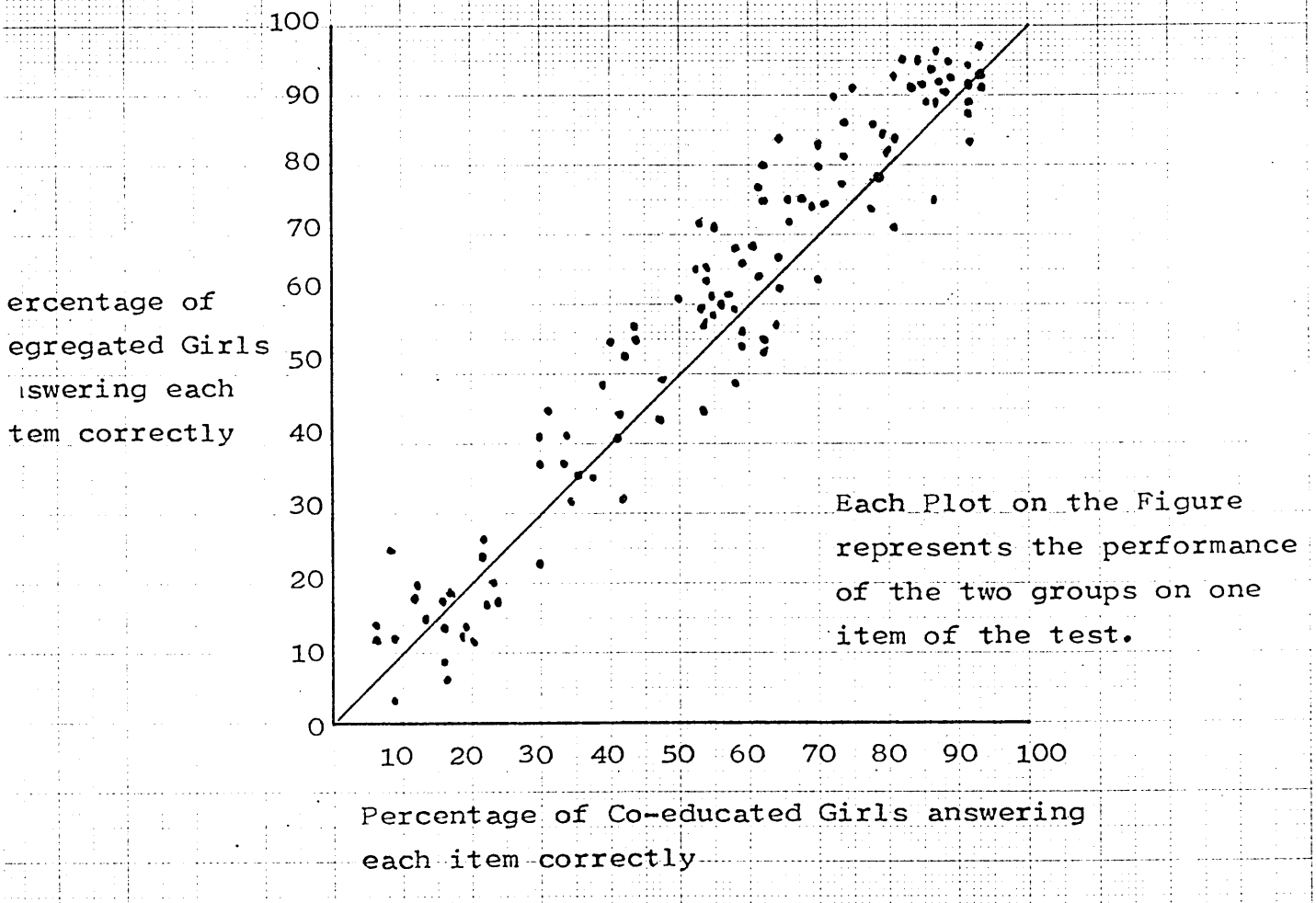
Topics Ranked in Order of Difficulty (1 = Most Difficult)

	Co-educated Girls	Segregated Girls
1	Percentages	Percentages
2	Fractions	Fractions
3	Decimals	Decimals
4	Spatial Relationships	Area
5	Length	Spatial Relationships
6	Area	Length
7	Mass	Mass
8	Volume and Capacity	Volume and Capacity
9	Number	Time
10	Time	Integers
11	Money	Number
12	Integers	Tables/Graphs/Charts
13	Tables/Graphs/Charts	Money

The two lists are clearly highly correlated (Spearman Correlation Co-efficient: •95), both groups finding percentages, fractions and decimals to be the most difficult topics (in that order). This suggests that segregated setting for girls has had no appreciable effect on the relative difficulty of individual Mathematics topics.

Finally, the 112 individual items of the test were analysed in terms of the percentage of girls in each group who answered each item correctly, and the results of this analysis are displayed in Figure 3. Each plot in this figure represents a different item on the test. Plots in the bottom left hand corner represent items which few girls

Figure 3: Tameside Numeracy Test
Item by Item Comparison of Performance



answered correctly and plots in the top right hand corner represent items answered correctly by most girls. The vertical axis represents the percentage of segregated girls answering each item correctly, and the horizontal axis represents the percentage of co-educated girls answering correctly. Plots above the diagonal line represent the items which a higher percentage of segregated girls answered correctly. The general superiority in the performance of this group can be recognised by the number of plots above the diagonal line which heavily outnumber the plots below it.

A detailed breakdown of this item analysis is contained in Appendix C.

In conclusion, the analysis of the Tameside Numeracy Test results does indicate that the segregated girls generally appeared to be more competent in the basic numerical skills at the time of testing than the co-educated girls. Certainly fewer of the segregated girls did badly on this test, and Figure 3 indicates that more of the segregated girls were answering most of the items of average and below average difficulty correctly. To this extent, segregated setting appears to have been of benefit to the girls involved.

FOUR SHORT MATHEMATICS TESTS

The Four Short Tests were designed to cover various areas of Mathematics not dealt with in the Tameside Numeracy Test. They were intended to be more searching than the Tameside Numeracy Test and included many items requiring problem solving skills. Several items were derived from the tests used in the APU Secondary Surveys of Mathematical Development. The remainder were devised by the recently retired Head of Mathematics at the school working in conjunction with the author. The tests were not standardised. To eliminate errors and ambiguities, a trial was held with a small number

of fourth year girls from another secondary school.

Copies of the Four Short Tests have been included in Appendix D. The tests were taken in identical form by both intakes.

Arrangements were made for the Four Short Tests, together with the APU Attitude Questionnaire to be completed by both intakes during the summer term of the fourth year.

It was decided that the papers should be attempted during normal Mathematics lessons, and should be supervised by the Mathematics teachers. The author held a full briefing session with the Mathematics Department before the co-educated intake was tested. As all the papers (including the APU Questionnaire) were untimed, it was arranged that they should be spaced out to ensure that every pupil had ample opportunity to complete each paper. (It was anticipated that slower pupils might need 15 - 20 minutes for each paper and so it was agreed that only two papers would be attempted in a 70 minutes lesson. The APU Questionnaire was allocated a separate 70 minutes lesson).

Unfortunately a briefing session was not possible before the segregated intake was tested (because of teacher action). However, the author issued brief reminder notes to each Mathematics teacher involved and as there has been no personnel changes in the Mathematics Department during that year, and as the arrangements were identical, the testing proceeded without hitch.

The author was present at school for all testing sessions by both intakes and he distributed and collected all papers himself. He also stood in as supervisor on the two occasions when a Mathematics teacher was absent.

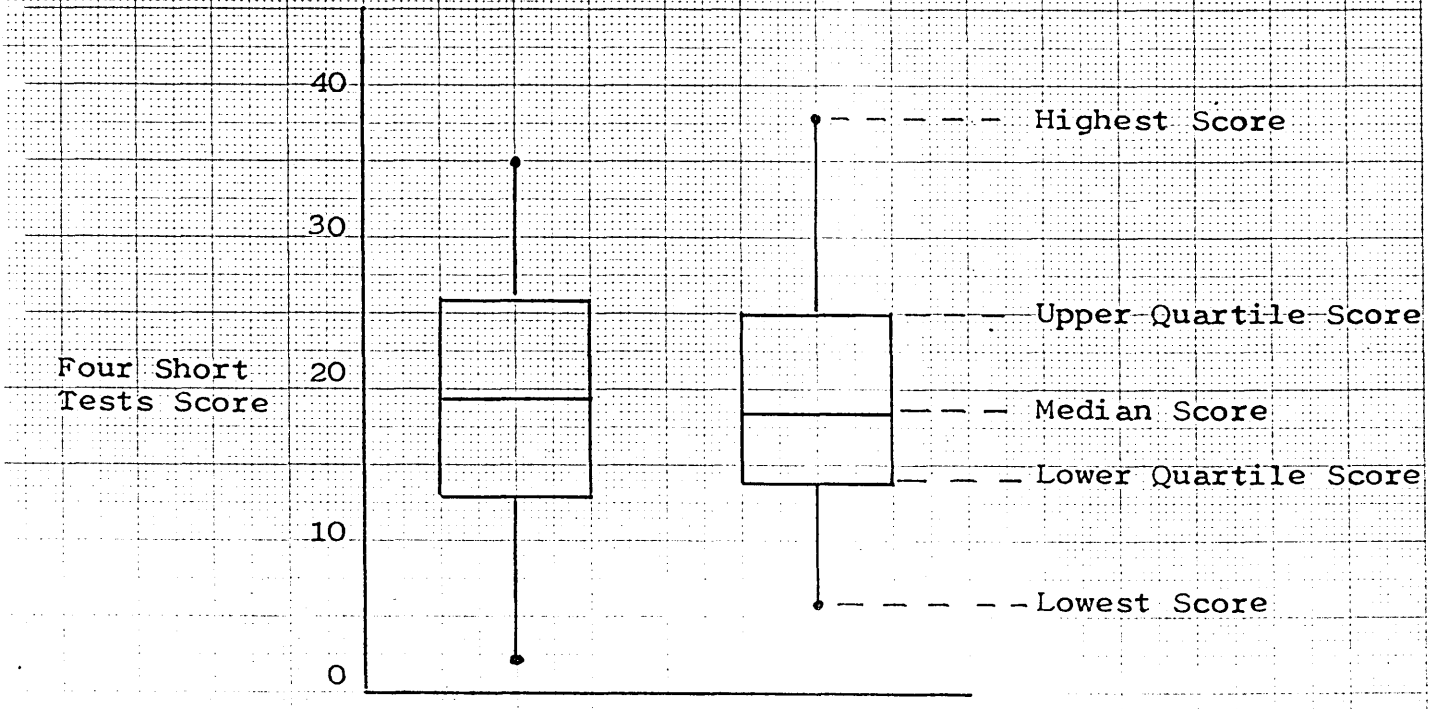
The school was only prepared to allow the testing programme to take place during the last three weeks of term and this was unfortunate because this period immediately followed the completion of the fourth year examinations, and it would

be natural for the pupils to resent a further extensive series of tests immediately afterwards. The author attempted to overcome this problem by speaking to each intake in turn in an Assembly a day or two before the testing programme began. He explained that he was engaged in 'an important piece of research' and that he needed the pupils' support and co-operation with a series of tests. He said that he would personally be marking all the papers and that individual results would be confidential and would not be discussed with anyone from the school. He also explained that some of the papers were difficult, and that pupils were not to worry if they could not cope. He merely wanted each pupil to attempt each item that was understood. Finally, he explained that the Questionnaire was not a test with correct and incorrect answers. Pupils were expected to respond in different ways, and he needed each pupil to complete the Questionnaire as honestly as possible.

Feedback from various teachers indicated that pupils from both intakes approached the tests positively and the author himself encountered no hostility whatsoever from any pupil.

An additional problem was that absenteeism from lessons is traditionally very high in the last three weeks of the summer term. Not only do many parents take their children on holiday immediately after the examinations, but there are also many activities such as field trips, and sports events which disrupt the timetable. The author attempted to solve this problem himself by going into school for each of the last few days of term and arranging to take various pupils who had missed the tests from their normal lessons to complete the tests with himself. All of the teachers who had their lessons disrupted in this way were quite co-operative and the author eventually managed a completion rate of over 93% on every test. The results of the two groups of girls on the Four Short Tests combined are summarised in Figure 4 which contains a 'Box and Whisker'

Figure 4: Four Short Mathematics Tests
Distribution of Scores by Group (range 0-43)



		Co-educated Girls		Segregated Girls
Number in Group (n)	=	62		62
Mean Score ($\bar{x}$)	=	19·66		19·90
Standard Deviation (σ_{n})	=	8·61		7·91
Geary Test (z)	=	1·89		·34
Paired t Test (z)	=		·24	
Wilcoxon Test (z)	=		·18	

plot illustrating the range of scores achieved by both groups together with other statistical details.

The two sets of scores were very similar with a difference in the two means (in favour of the segregated girls) of less than one third of a single mark. The Standard Deviation of the scores of the co-educated girls was somewhat greater, and indeed the distribution of scores achieved by this group was somewhat more erratic than that of the segregated girls. Nevertheless these results suggest that as far as the work covered by the Four Tests is concerned, the segregated girls as a group gained no benefit from single-sex setting in Mathematics.

The similarity of performance between the two groups is further illustrated in Figure 5 which analyses the results in terms of the percentage of girls in each group answering each item correctly. Not only are the plots evenly distributed on both sides of the diagonal line (indicating that each group answered approximately half the items more successfully than the other group), but the distribution is also even along the diagonal line indicating that the two groups performed similarly on easy and difficult items alike.

The item by item analysis of the results has been included in Appendix D.

Finally, the results of the two groups on each of the Four Tests were analysed separately and the results are displayed in Table 5.

Figure 5: Four Short Mathematics Tests
Item by Item Comparison of Performance

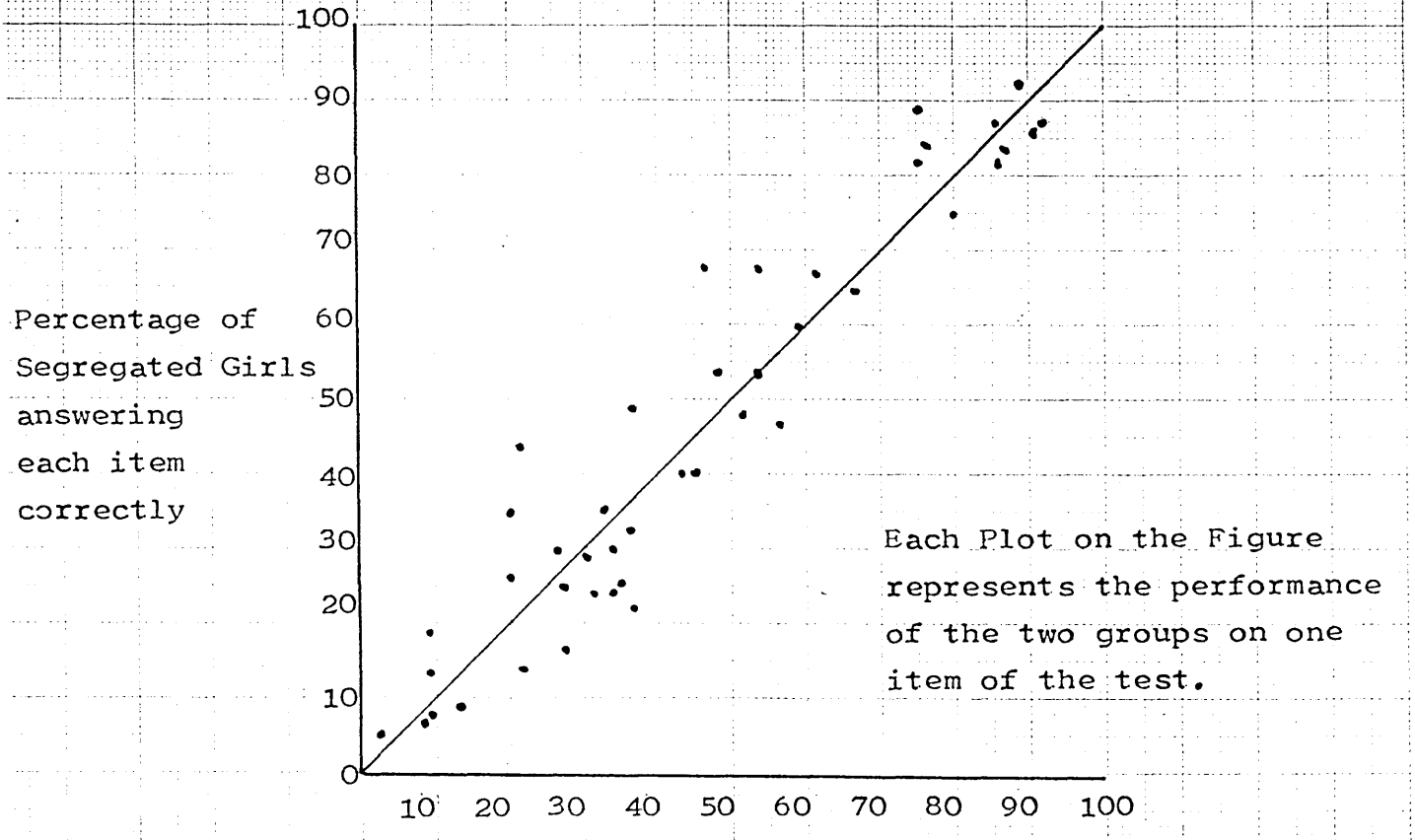


Table 5: Four Short Mathematics Tests
Mean Scores (Percent) By Test

Test	No. of Items	Mean Score (Percent) Co-educated Girls	Mean Score (Percent) Segregated Girls	Significance Test	z	Significant (✓)
Test 1 (Geometry)	13	46•9	48•9	Wilcoxon	0•31	
Test 2 (Proportion, Rates, Ratio)	8	49•4	44•2	Wilcoxon	2•37	✓
Test 3 (Mensuration)	8	31•0	34•7	Wilcoxon	0•91	
Test 4 (Algebra)	14	50•9	51•7	Wilcoxon	0•13	

The differences in the mean scores of both groups on Test 1 (Geometry) and Test 4 (Algebra) were quite small (both in favour of the segregated girls). On Test 3 (Mensuration) the difference was greater (again in favour of the segregated girls) but was not statistically significant. On Test 2 (Proportion, Rates, Ratio) however, the difference was in favour of the co-educated girls and this time it was significant.

The differences in performance in Tests 2 and 3 were interesting enough for the author to discuss them with various Mathematics teachers at the school, but none of these teachers could recall any major differences in the treatment of the topics covered by these tests between the two intakes.

On balance, however, it is the similarity of performance between the two groups of girls that is the dominating feature of these results and this of course contrasts sharply with the superior performance of the segregated girls on the Tameside Numeracy Test twelve months previously. Bearing in mind the nature of the work covered in the Four Short Tests, the results suggest that both groups were about equally well prepared at this half-way stage of the two year external examination courses which most of the girls were following. Segregated setting had apparently been neither a benefit nor a hindrance in this preparation.

THE APU MATHEMATICS ATTITUDE QUESTIONNAIRE

The APU Mathematics Attitude Questionnaire was developed from the second and third of three Secondary Surveys of Mathematical Development conducted by the National Foundation for Educational Research on behalf of the Assessment of Performance Unit. These surveys were designed to present a national picture of Mathematical performance of 15-year olds, and the Attitude Questionnaire was ideal for the

purpose of this research.

Both intakes completed the questionnaire during the summer term of their fourth year at the school. The administration of the Questionnaire was described earlier in this Chapter.

The Questionnaire is divided into four sections, but only the responses to the first two (Parts A and B) have been analysed. These are as follows:-

Part A is a series of 37 statements, 34 of which express feelings about how difficult, useful and enjoyable Mathematics is, as a school subject. Pupils are asked to rate the degree to which they agree with each statement and each response is scored on a five point scale.

Part B is a list of 27 Mathematics topics. Pupils are asked to express the degree to which they find each topic useful and difficult. The responses are scored on a three point scale and each topic can be ranked by both usefulness and difficulty.

A copy of the relevant sections of the Questionnaire, together with the appropriate section of the administration instructions and an analysis of the responses to individual statements are contained in Appendix E.

Difficulty There are 17 separate statements concerned with the difficulty of Mathematics, and as each statement is scored on the scale one to five, the total score range is 17 to 85. A high individual difficulty score indicates that the pupil perceives Mathematics as a difficult subject and a low score indicates the pupil perceives Mathematics as relatively easy.

The results are displayed in Figure 6 which contains a 'Box and Whisker' plot illustrating the ranges of scores achieved

by both groups of girls together with other statistical details.

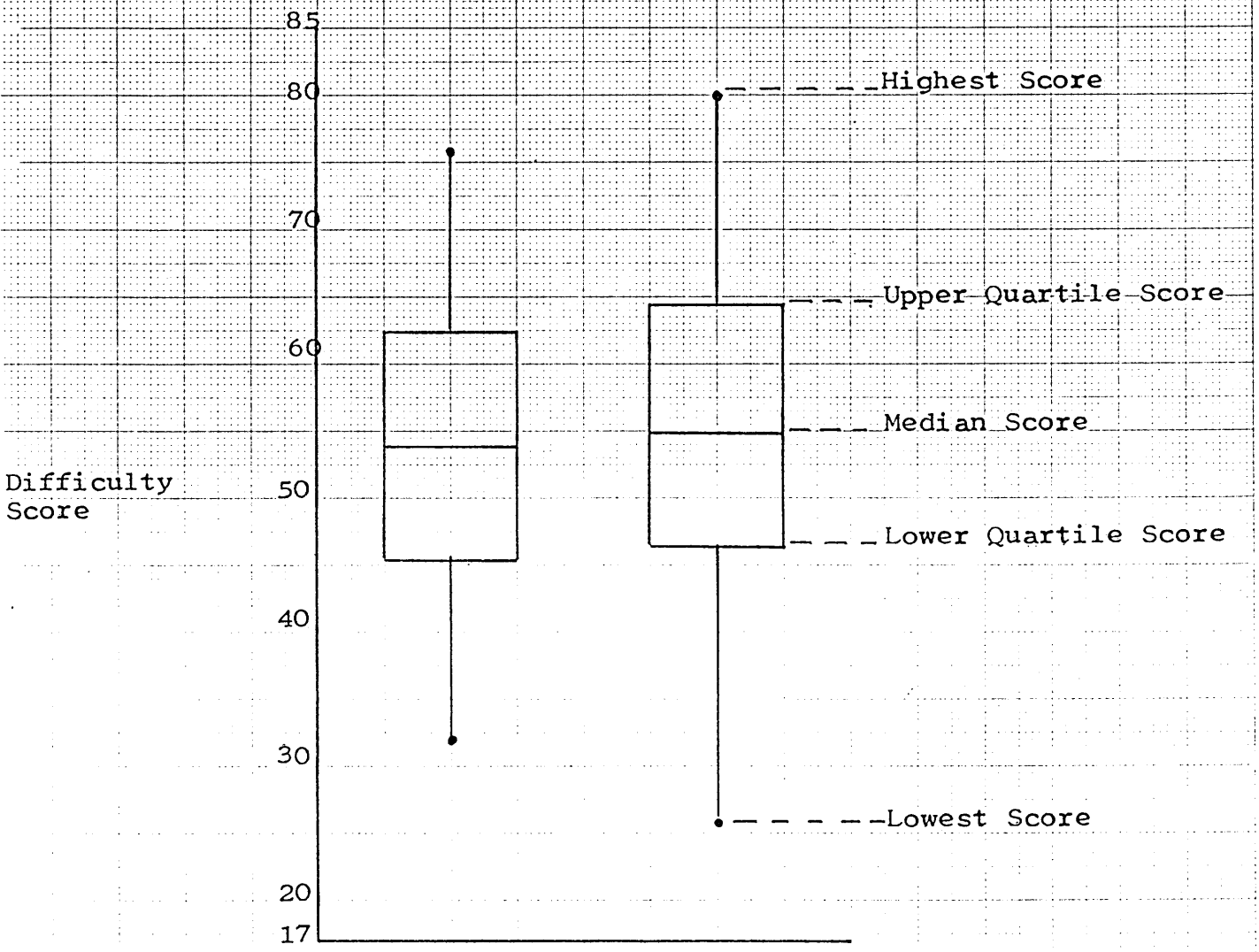
The difference in the mean scores of the two groups of girls was less than one tenth of a single mark. The range of scores achieved by the segregated girls was greater than that of the co-educated girls and this is reflected in a higher standard deviation. It is also worth noting that the distribution of scores of the co-educated girls differed significantly from normality. It is the similarity of the responses of the two groups of girls rather than the differences between them which needs to be stressed however and it seems apparent from these results that the segregation of girls for Mathematics has had little or no effect on their perception of the difficulty of the subject. This conclusion is supported by the analysis of individual difficulty statements which revealed significant differences between the two groups on only two of the 17 statements.

When pupil responses to the relative difficulty of individual Mathematics topics were analysed, it was found that there were sufficient responses to analyse 24 of the 27 topics on the Questionnaire.

Segregated girls found 15 of the 24 topics more difficult than the co-educated girls, but the overall differences on the majority of these topics were very small and the same was true of the majority of the nine topics which the co-educated girls found more difficult.

The 24 topics were next ranked in order of difficulty for each group and the results are displayed in Table 6. The two lists are highly correlated (Spearman correlation co-efficient: •82) which suggest that segregation has had little effect on the girls' perception of the relative difficulty of various Mathematical topics.

Figure 6: Mathematics Attitude Questionnaire - Difficulty Scale
Distribution of Scores by Group (range 17:85)



		Co-educated Girls	Segregated Girls
Number in Group (n)	=	61	61
Mean Score ($\bar{x}$)	=	54•23	54•16
Standard Deviation (σn)	=	10•34	12•63
Geary Test (z)	=	2•04	•82
Paired t Test (z)	=	•03	
Wilcoxon Test (z)	=	•23	

Finally, individual difficulty scores were related to individual total scores on the Four Short Tests and the following (Pearson) correlation co-efficients were calculated:-

Co-educated girls:-	-·03
Segregated girls:-	·20

These co-efficients indicate that the relationship between performance in Mathematics and the perceived difficulty of the subject was extremely weak with both groups of girls

Table 6: Mathematics Attitude Questionnaire

Topics Ranked in order of Perceived Difficulty (1 = Most Difficult

	Co-Educated Girls		Segregated Girls	
	Topic	Mean Score	Topic	Mean Score
1.	Trignometry Problems	2·10	Trignometry Problems	2·37
2.	Using Formulas	2·07	Problems about Scale	2·07
3.	Problems about Scale	1·98	Geometrical Constructions	2·05
4.	Solving Equations in Algebra	1.94	Reflections or Rotations	2·03
5.	Reflections or Rotations	1·89	Using Formulas	1·96
6.	Finding Volume	1·88	Finding Volume	1·92
7.	Multiplying or Dividing Fractions	1·86	Multiplying or Dividing Fractions	1·83
8.	Adding or Subtracting Fractions	1·80	Multiplying or Dividing Decimals	1·77
9.	Geometrical Constructions	1·78	Using Negative Numbers	1·68
10.	Sets and Venn Diagrams	1·77	Adding or Subtracting Fractions	1·65
11.	Calculating with Percentages	1·73	Adding or Subtracting Decimals	1·62
12.	Using Negative Numbers	1·62	Sets and Venn Diagrams	1·61
13.=	Estimating Lengths	1·51	= Calculating with Percentages	1·59
13.=	Measuring Angles	1·51	= Solving Equations in Algebra	1·59

	Co-Educated Girls		Segregated Girls	
	Topic	Mean Score	Topic	Mean Score
15.	Averages	1·49	Measuring Angles	1·57
16.	Multiplying or Dividing Decimals	1·48	Finding Areas of Shapes	1·56
17.	Adding or Subtracting Decimals	1·39	Averages	1·50
18.	Finding Perimeters	1·37	Using Graphs or Charts	1·42
19.	Number Patterns	1·36	Finding Perimeters	1·41
20.	Everyday Problems	1·35	Number Patterns	1·37
21.	Reading Timetables	1·32	Everyday Problems	1·34
22.	Finding Areas of Shapes	1·31	Estimating Lengths	1·33
23.	Using Graphs or Charts	1·24	Reading Timetables	1·16
24.	Using Calculators	1·00	Using Calculators	1·05

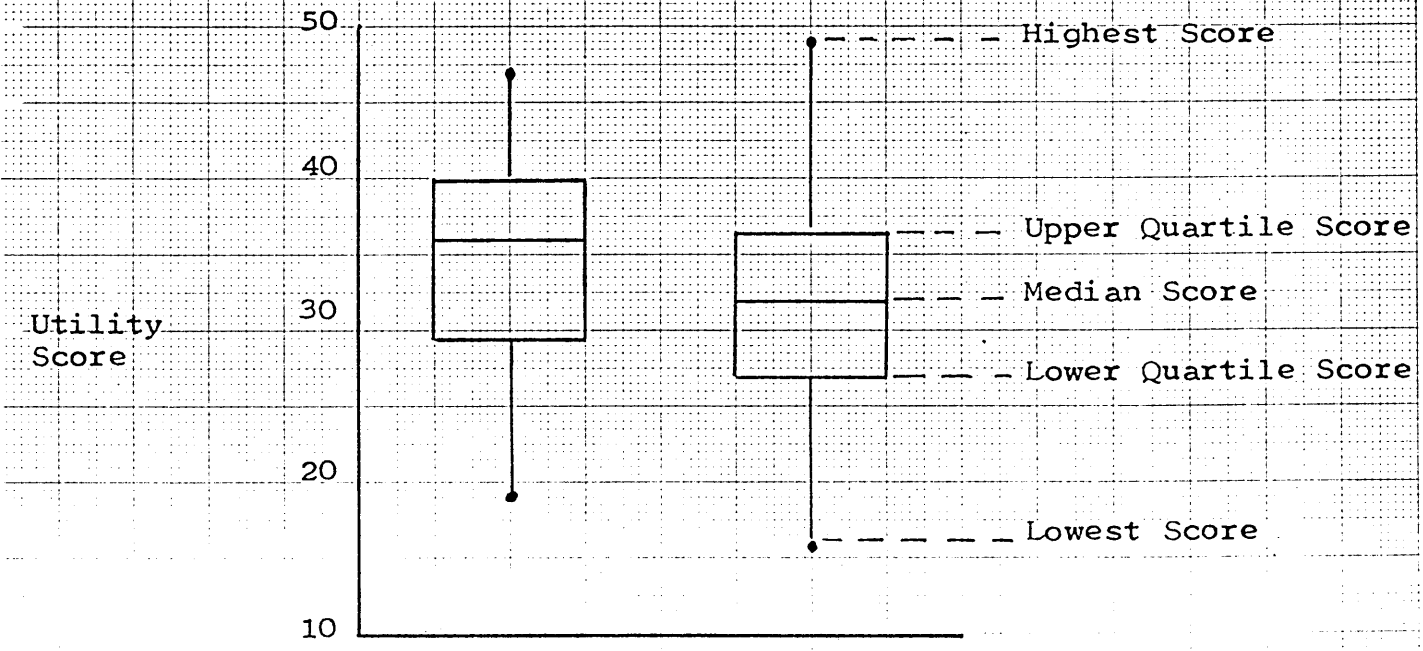
Utility There are 10 separate statements on the Questionnaire related to utility, and as each statement is scored on the scale one to five, the score range is 10 to 50. A high individual utility score indicates that the pupil perceives Mathematics as a very useful school subject.

The results are displayed in Figure 7 which contains a 'Box and Whisker' plot illustrating the ranges of scores achieved by both groups of girls together with other statistical details.

The diagram indicates clearly that the co-educated girls as a group perceived Mathematics as being more useful than the segregated girls and when the two sets of utility scores were compared it was found that the difference between the two groups was statistically significant.

This finding is supported by the analysis of the individual utility statements which revealed that on all 10 statements, the co-educated girls found Mathematics more useful than the segregated girls. On the following two statements,

Figure 7: Mathematics Attitude Questionnaire - Utility Scale
Distribution of Scores by Group (range 10:50)



		Co-educated Girls	Segregated Girls
Number in Group (n)	=	61	61
Mean Score ($\bar{x}$)	=	34•33	31•97
Standard Deviation (σ_{n})	=	6•93	7•02
Geary Test (z)	=	1•31	•74
Paired t Test (z)	=	1•98	
Wilcoxon Test (z)	=	2•22	

the differences were significant:-

		Agree and Strongly Agree	Disagree and Strongly Disagree	Undecided
I don't find much usefor Maths outside school.	Co-educated Girls	16	45	0
	Segregated Girls	27	31	3
Most people only need to learn enough Maths to take care of their money.	Co-educated Girls	18	39	4
	Segregated Girls	32	25	4

Individual utility scores were next related to individual total scores on the Four Short Tests and the following (Pearson) correlation co-efficients were calculated:-

Co-educated Girls:	•22
Segregated Girls:	•19

Although these co-efficients suggest that the relationship between performance in Mathematics and the perceived utility of the subject was very weak with both groups of girls, it is still a matter of concern that the segregated girls as a group should produce such a low set of utility scores. Schildkamp-Kündiger (1980) noted that 'the perceived usefulness of Mathematics is one aspect that may help us to understand differences in achievement and course-taking behaviour' and she went on to quote the research of Haven (1971) who found that this (utility) attitude was a good predictor of advanced course-taking in Mathematics. Furthermore Hilton and Berglund (1971) in a longitudinal study concluded that sex-related differences in achievement in Mathematics could be partly accounted for 'by the growing conviction by girls that the study of Mathematics had little real usefulness.'

Although this research was conducted in the USA, it would seem to be a reasonable assumption in British schools that girls who have a high perception of the utility of Mathematics would

be more likely to study the subject beyond the age of 16.

This study of course is particularly concerned with the effect of segregated lessons on the perceived utility of Mathematics, but the author could unfortunately find no evidence from other research to refute or support his finding that segregation apparently has a harmful effect on this attitude. It would certainly appear that the relationship between segregated lessons and attitudes to Mathematics is a fruitful field for further research.

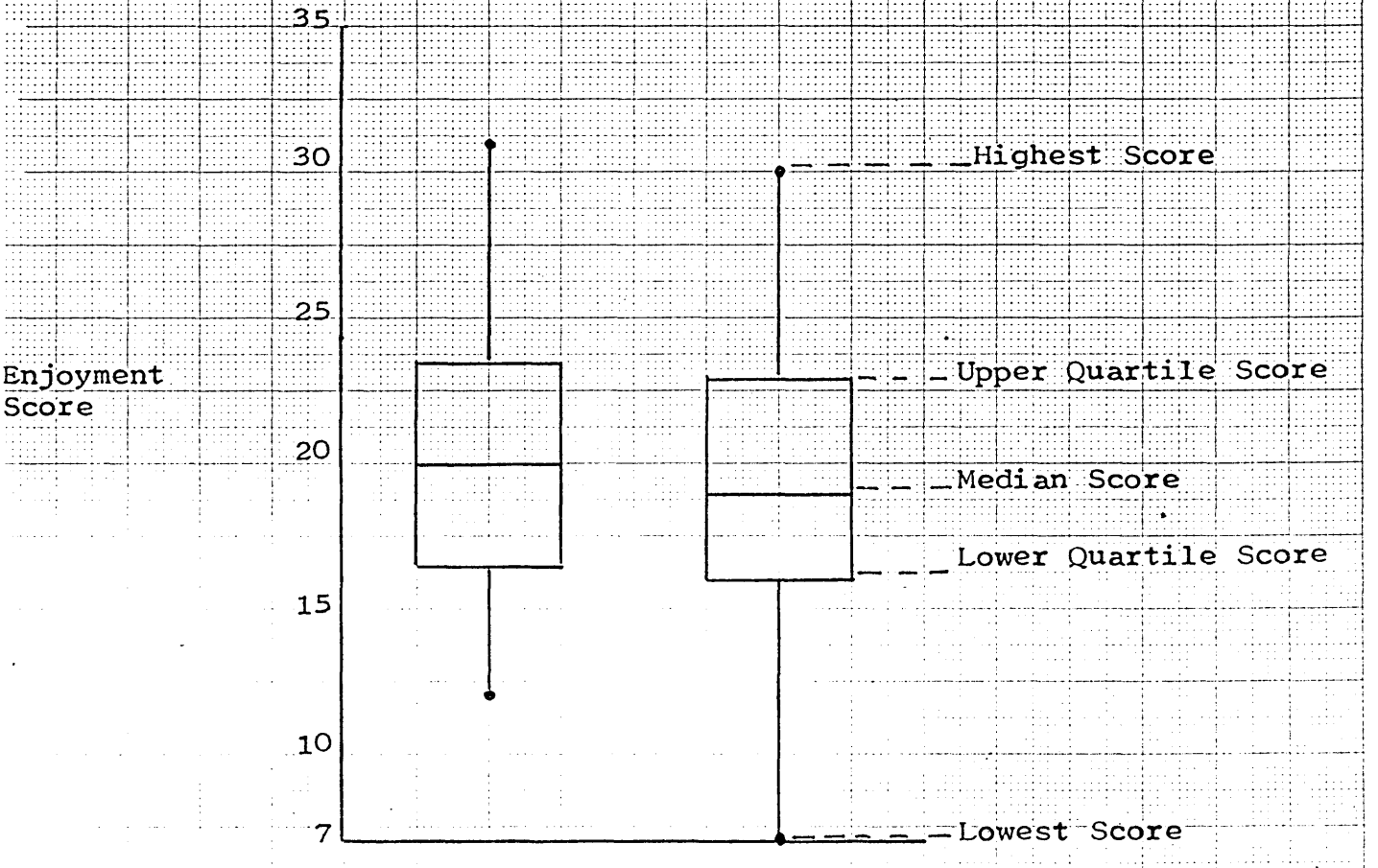
Enjoyment There are seven separate statements on the Questionnaire related to enjoyment, and as each statement is scored on the scale one to five, the score range is seven to 35. A high individual enjoyment score indicates the pupil enjoys Mathematics whereas a low score indicates dislike of the subject.

The results are displayed in Figure 8 which contains a 'Box and Whisker' plot illustrating the ranges of scores obtained by both groups of girls together with other statistical details.

The segregated girls had a lower mean enjoyment score than the co-educated girls, but when the two sets of scores were compared, the difference was well below the level of statistical significance. This finding is supported by the analysis of the individual enjoyment statements which revealed that the differences between the two groups were significant on only two of these statements. One of these two statements indicated that segregated girls enjoyed Mathematics more, but the other one indicated that co-educated girls enjoyed the subject more.

The relatively low scores of the segregated girls on the enjoyment scale apparently contrast sharply with the

Figure 8: Mathematics Attitude Questionnaire - Enjoyment Scale
Distribution of Scores by Group (range 7:35)



	Co-educated Girls	Segregated Girls
Number in Group (n) =	61	61
Mean Score ($\bar{x}$) =	20•20	19•39
Standard Deviation (σ_{n}) =	4•86	5•02
Geary Test (z) =	•37	•16
Paired t Test (z) =	•94	
Wilcoxon Test (z) =	•76	

positive views expressed by the girls who had been taught in segregated sets in the pilot experiment (see Chapter 3). It should be borne in mind however that the latter group was referring to Mathematics lessons in the first and second years whereas the Attitude Questionnaire was administered to the segregated girls at the end of their fourth year. Preece and Sturgeon (1981) in their major survey of Sheffield schoolchildren noted that the liking of Mathematics declined significantly between girls aged 12 and 13 and again declined significantly between girls aged 13 and 14. Thus any contrast between the two groups of segregated girls at Stamford High School could well be related to age difference.

EXTERNAL EXAMINATIONS

At the beginning of the fourth year, all those pupils who had perfomed well in Mathematics from both the co-educated and segregated intakes began two-year courses leading to either the 'O' Level or 16+ examinations (in which pupils were awarded either 'O' Level or CSE Grades according to performance). The next group began courses leading to the CSE Mathematics examinations and finally a minority of low achievers was placed on a non-examination course.

The external examinations were taken by both intakes in the summer term of the fifth year and the detailed Mathematics results of the two groups of girls are displayed in Table 7.

Table 7: Detailed Breakdown of Mathematics External Examination Results

Exam Grade	Co-educated Girls	Segregated Girls
GCE 'A'	1	1
GCE 'B'	2	5
GCE 'C' or CSE 1	8	6
GCE 'D' or CSE 2	7	8
GCE 'E' or CSE 3	10	5
CSE 4	16	17
CSE 5	5	14
CSE Unclassified	3	2
Absent	2	3
Did Not Enter	11*	4
TOTAL	65	65

*One girl from the co-educated intake left the school in the November of her fifth year. As she belonged to a non-examination Mathematics set, she has been included as 'Did Not Enter'. The remainder of the girls were on the register of the school at least until they were legally old enough to leave school.

The large number of categories in this table makes statistical comparison difficult. However, it is interesting to note that whereas 11 of the co-educated girls were not entered for any Mathematics examination, the number fell to four with the segregated girls. This might be taken to

indicate that the segregated girls had a greater number of competent Mathematicians, but the difference in the numbers of girls from the two groups achieving a CSE Grade 5 suggests that the extra examination entries among the segregated girls merely resulted in more low grade passes. This is hardly an indication of Mathematical competence.

For the purposes of statistical comparison, the detailed breakdown of Table 7 was simplified by placing all of the girls in one of three classifications:-

Classification A: Girls who reached an acceptable 'O' Level standard in Mathematics by obtaining an 'O' Level Grade 'A', 'B' or 'C' or a CSE Grade 1.

Classification B: Girls who gained a useful Mathematics qualification below an acceptable 'O' Level standard by obtaining an 'O' Level Grade 'D' or 'E' or a CSE Grade 2,3 or 4.

Classification C: Girls who left school with a Mathematics qualification of little value (CSE Grade 5) or no Mathematics qualification at all.

This simplified breakdown is displayed in Table 8.

Table 8: Simplified Breakdown of Mathematics External Examination Results

Exam Grade	Co-educated Girls	Segregated Girls
GCE Grades 'A', 'B' or 'C' or CSE Grade 1	11	12
GCE Grades 'D' or 'E' or CSE Grades 2,3 or 4	33	30
CSE Grade 5 or unclassified or absent or did not enter	21	23

This analysis immediately reveals that the examination results achieved by the two groups of girls were very similar. A chi-square test of these two sets of results produced a value of only 0·28 compared with the chi-square value of 5·99 necessary to indicate a significant difference between two sets of results with two degrees of freedom.

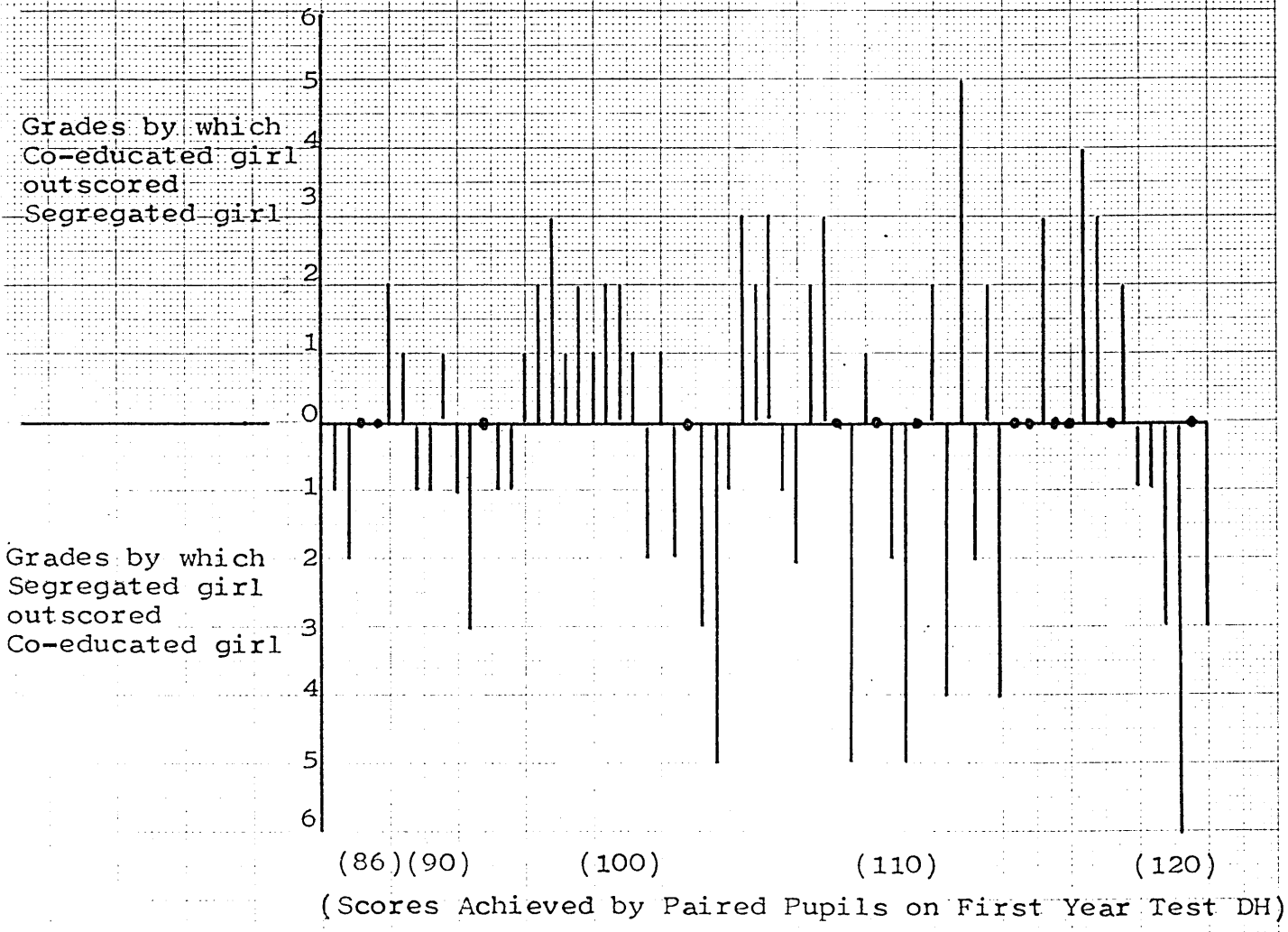
In other words, the difference between the two sets of results is statistically insignificant; indeed it is their similarity which is remarkable and this indicates strongly that single sex setting in Mathematics had little effect on the examination performance of the segregated girls as a group. The performance of some individuals may of course have been helped or hindered by segregated setting, but these results do suggest that segregation alone has little impact on the collective performance of a group of girls in Mathematics.

The similarity of examination performance between the two groups is clearly illustrated in Figure 9 which compares each individual segregated girl with the co-educated girl she has been paired with on Non-Verbal Test DH (see Chapter 3). In this figure, girls who achieved an 'O' Level Grade 'A' were awarded a grade value of seven, girls who achieved a Grade 'B' pass were awarded a grade value of six and so on down to girls who left school without any Mathematics qualification who were awarded nought. Each perpendicular rising from the horizontal line indicates the number of grades by which a co-educated girl outscored her segregated partner and each perpendicular falling from the horizontal line indicates the number of grades by which a segregated girl outscored her co-educated partner. Dots on the horizontal line indicate a pair of girls achieving the same grade.

The even distribution of perpendiculars above and below the horizontal demonstrates the similarity of performance between the two groups right across the ability range of the girls as measured by their Test DH scores.

Figure 9: Mathematics External Examination Results

Analysis by Paired Pupils



Finally, the individual examination grade values obtained for Figure 9 were related to the individual combined scores on the Four Short Tests and the following (Spearman) correlation co-efficients were obtained:-

Co-educated girls:	·79
Segregated girls:	·67

It would be a mistake to place much emphasis on these correlation co-efficients, for the examination grade value is a crude statistic to work with, but it does suggest that with the segregated girls at least performance on the Four Short Tests was not a particularly accurate guide to eventual performance in the Mathematics external examinations.

Despite this conclusion, the similarity in the performance of the two groups of girls in both the Four Short Tests and the external examinations suggests that segregated setting in the fifth year had very little impact on the segregated girls as a group.

It would be a mistake however to limit the analysis of the external examination results to the co-educated and segregated girls alone. No full evaluation of the effects of segregating the girls for Mathematics lessons can be made until consideration is given to the general improvement in the performance of girls in Mathematics in recent years. An attempt has been made to illustrate this point in Table 9 which details the 'O' Level Mathematics passes of boys and girls since the school was created in its present form in September 1970.

Table 9 - Stamford High School
'O' Level Passes in Mathematics by Sex 1971 - 1985
('O' Level Grades, 'A', 'B', 'C' or CSE Grade 1)

YEAR OF EXAMINATION	BOY PASSES	GIRL PASSES
1971	Precise details not	Precise details not
1972	available, but	available, but
1973	between 20 and	not more than two
1974	30 boys passed	girls passed in
1975	every year	any year between
1976	between 1971 and 1976	1971 and 1976
1977	24	1
1978	13	2
1979	24	9
1980	25	1
1981	28	13
1982	29	9
1983	28	15
1984	22	15*
1985	28	23*

*The numbers shown here are greater than those shown in Table 7 because they include many girls excluded from this thesis (e.g. high ability girls, non-counters from Table 2 and late-comers to the school).

In every year from 1971 to 1978 there were never more than two girls who passed 'O' Level Mathematics, but in recent years there has been a dramatic improvement. It should be noted that this improvement has taken place both with girls who have been taught in co-educated sets and girls who have been taught in segregated sets (including girls from the pilot experiment of 1978-80 who sat 'O' Levels in 1983).

This improvement in the girls' results has apparently not been made at the expense of the boys, for the boys' passes in Mathematics have remained remarkably stable (with the sole exception of 1978) throughout the 15 years covered by Table 9.

There has, of course, been a national improvement in the performance of girls taking 'O' Level Mathematics over the same period. In 1970, girls comprised only 37·5% of successful candidates whereas by 1983 girls comprised 43·6% of successful candidates (Equal Opportunities Commission, 1985). Despite this national improvement, it would appear that the changing image of Mathematics at the school has also contributed to the improvement in the girls' results there. There is no doubt that most of the girls at the school (whether they have been taught in co-educated or segregated sets) no longer regard Mathematics as a predominantly masculine subject. One possibly influential factor was the appointment of three female Mathematics teachers in the late 1970s which has meant that in recent years over 50% of Mathematics lessons has been taught by females. The sustained efforts by all Mathematics teachers (male and female alike) to ensure that girls play an active part in class (whether the sets have been co-educated or segregated), is also believed to have had a beneficial effect. Additionally, efforts have been made to change the male bias of the syllabus. In recent years, the improving performance of many girls has also improved the ratio of girls to boys in the top co-educational Mathematics sets. Consequently, these girls in the top sets have not had to endure the isolation of their predecessors in the 1970s.

These points all seem to suggest that a school which mounts a sustained and coherent campaign to provide equal opportunities for girls in Mathematics classes can succeed without the device of segregated setting; indeed the analysis of the Four Short Tests and the external examination results

suggest that segregated setting had a negligible effect on the performance of the older girls. This brings to mind Dale's assertion (referred to in Chapter 2) that individual teachers are of far greater importance in forming the attitudes of girls to Mathematics than the type of school which the girls attended. The major conclusion that could be drawn at Stamford High School is that the long-term efforts of a group of enthusiastic Mathematics teachers in the classroom has made a far greater impact in improving the performance of girls than special segregated setting arrangements.

CHAPTER 5

INTERVIEWS

CO-EDUCATED GIRLS

Possibly the most interesting feature to emerge from the first analysis of the responses of the co-educated intake to the APU Mathematics Attitude Questionnaire was the large number of girls who perceived Mathematics as a difficult subject. Consequently, it was decided to interview a group of co-educated girls who regarded Mathematics as difficult. At this time, the co-educated intake was in the second term of its fifth year at the school.

The main purposes of the interviews were firstly to find out when the girls began to regard Mathematics as a difficult subject and secondly to investigate whether the presence of boys in Mathematics had contributed to their difficulties.

The 15 girls eventually selected for interview were all willing to take part. All of these girls had been regarded as being of average or above average ability in the first year, for they had all achieved scores over 100 on the DH Non-verbal Reasoning Test. Additionally, they had all recorded scores over 59 on the difficulty scale of the Attitude Questionnaire. Finally, the list of girls had been screened by the pastoral staff at the school. All of the girls selected were believed to have stable home backgrounds and none of them had a serious disciplinary record at the school.

In the week before the interviews began, the girls were asked to complete a short questionnaire which had been designed to focus their attention on some of the themes to be discussed in the interviews. It was not intended that the completed questionnaires would be subjected to serious

statistical analysis, but some of the responses were particularly interesting.

A copy of this supplementary questionnaire together with the transcripts of the interviews with seven of these girls are contained in Appendix F.

The interviews indicated that only two of the 15 girls associated their first difficulties in Mathematics with primary school. One of these had always found Mathematics difficult and the other had had a serious personality clash with one of her teachers and for a time had virtually ceased to make any effort in lessons at all. She later found she had serious problems in making up lost ground in Mathematics.

The remaining girls generally expressed both an enjoyment of Mathematics and an ability to cope with the work both in Junior School and in the first year at Stamford High School.

Dorothy: Yes, I enjoyed it then. He went through it dead good. Thorough like. I could understand it then.

The 'thoroughness' which Dorothy referred to is an important element in the teaching of first year Mathematics at the school. As the pupils are drawn from a large number of feeder primary schools, the quality of the Mathematics teaching they have received, and the range of topics they have covered differs considerably. Consequently, a great deal of consolidation is necessary when they begin secondary education.

The Mathematics Reports which each of these girls received at the end of the first year do support the view that they were mainly coping well at this stage. Most of the girls were said to have settled down well and were making good progress.

It became quite clear from the interviews that the majority of the girls began to regard Mathematics as a difficult

subject sometime between the early part of the second year and the early part of the fourth year (when the external examination courses began). The girls frequently identified their difficulties with a change of teacher.

Sally: Yes, and then in the second year we started having Mr. H and it started getting difficult. At first we did similar stuff what we had with Mr. T.B. . Then we started moving on. You go over things too quick. We'd no sooner start one thing than we'd move on to another thing. And then those that are dragging behind, he sorts of leaves dragging behind.

Barbara: I don't know, the teacher wasn't explaining enough. Mind you, Mr. T.B. went through things again and again, but with Mr. T.A. , she just explains once, then tells you to do it. I need to be told over and over again before I get it.

Jane: Yes. I think (pause), I think for me we began to move too fast in the fourth year. I just begin to grasp something, then we have to move on. Last year, it was very hard. We were pushed and pushed, we moved so fast. I couldn't really grasp anything.

The problem of speed bothered most of the girls as is made quite clear from their responses to the following statement:

	Strongly Agree	Agree	Undecided	Disagree	Strongl Disagre
We go on to new work in Maths far too quickly for me.	6	7	2	0	0

One girl made the interesting suggestion that the speed with which they moved on to new topics was associated with the behaviour of the boys.

Dawn: Well, they(the boys) muck and mess about. They always want to talk. So we have to change about. The topics and that. When the boys have finished their work, we move on to something new whether we've finished or not.

Despite Dawn's comment, it was apparent that almost all the girls primarily associated their difficulties with an inability to comprehend much of the work in Mathematics lessons. Some of the girls regarded the presence of boys as an additional factor which compounded their problems, but others were quite content to be in mixed classes.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
I think I would do better if there were no boys in my Maths class.	1	7	1	4	2

The girls who would have preferred single sex Mathematics classes sometimes complained that the boys were not serious enough.

Audrey: Well, they don't buckle down to their work as well as girls do. The girls try to do it. And the boys often just mess about. And talk and that.

Audrey was one of the girls who had apparently suffered most from the presence of boys in Mathematics. Like most of the girls, however, she had enjoyed Mathematics in the first year.

Audrey: I think it was the fact that there weren't many boys in our set. And we got on better with it being a woman teacher. There was a good relationship. She's always like that. Nice. And there weren't many boys. Only three or four. I find if there aren't many boys about, I work a lot better.

She was asked later when she became conscious of boys in Mathematics.

Audrey: I think (pause) late third year, early fourth year. (pause) Because they started opening their mouths then. If they got something wrong they'd say something. And they behaved worse. And I stopped asking questions because they always had something to say.

Interviewer: What sort of things might they say?

Audrey: 'Oh can't you do it?' 'Anyone can do that.' 'You must be right thick.' And I felt right embarrassed.

Audrey was by no means the only girl who wouldn't ask for help in class.

Barbara: Maths would be better with no boys. Most girls you know won't tell Sir if they haven't understood. They won't tell him. I don't care whether lads laugh or not. The other girls easy get upset. They won't ask. They stay quiet.

Barbara went on to say that she felt that her Mathematics teacher gave more attention to the boys than the girls, but in this she was in a minority. Almost all the girls believed that the teachers tried to devote equal attention to both sexes. Indeed, they were generally complimentary about all

their Mathematics teachers and they recognised the problems which teachers faced in the classroom.

Almost without exception, whether they were in favour of segregated Mathematics classes or not, the girls were critical of boys' behaviour. The following comments came from a girl who approved of mixed Mathematics sets:

Sally: I suppose you've got to get used to mixing haven't you? If you're with girls all the time, then you're in a situation where you're with boys, you'd be sort of shy with them being there. It all depends on what sort of boys they are. If they're loud and noisy, I just ignore them or tell them to shut up, you know. But most of them in our set are quiet, so it's all right.

Sally was later asked why she had requested a demotion to a lower set at the end of the second year. After stating that she was near the bottom of her set she went on:

Sally: And I didn't get on with the people in the top set. It were XC , he used to sit behind me, poking me, calling me names and everything.

There was almost no positive communication between any of the girls interviewed and the boys in their Mathematics classes. Each girl generally sat with a close friend in a cluster of girls. The girls frequently helped each other with the work, and did not appear to involve the boys in this activity.

Joan: Well, it just doesn't bother me. I pay no attention to them (the boys). I just get on with my work. The only people I talk to are the girls around me.

Sally: Well, I suppose, well in the lessons girls just talk to girls don't they? I talk quite a bit to the four girls who sit behind the empty desk. I sometimes talk to them, but I mostly just talk to Lynn.

SEGREGATED GIRLS

In the winter of 1985, it was decided to interview a group of girls from the segregated intake who perceived Mathematics as a difficult subject. The same criteria to those used in selecting the co-educated girls were applied, and eventually 10 segregated girls were interviewed.

The preliminary questionnaire used with the co-educated girls was not given to the segregated girls (for many of the questions were not appropriate to this group). Transcipts of the interviews with all 10 of these girls are contained in Appendix F.

The main purpose in interviewing the 10 girls was to find out their opinions of segregated setting in Mathematics. At the time of their interviews, the girls were all approaching the end of their five years at the school and thus had considerable experience of segregated lessons in Mathematics. Furthermore, they would be able to compare this experience to lessons with boys in all other academic subjects.

All 10 girls were asked whether in general they felt that segregated setting in Mathematics had been a good idea or not and they responded as follows:

In Favour	Undecided	Against
6	1	3

This result was probably in line with the opinions of all the segregated girls. No attempt was ever made to record

the preference of the whole intake to co-educated or segregated setting, but casual conversations and occasional spontaneous discussion in Mathematics lessons generally revealed that segregated sets were popular with a clear majority of girls. Nevertheless, there were many girls who believed that co-educated sets would have been preferable.

Some of the girls who believed they preferred Mathematics without boys commented that segregation created a more serious working environment.

Angela: I think it's better. We act daft with boys around. I think I've done better in Maths than I would have done. I think girls on their own, it gets more serious.

Maureen: Well, you sort of settle down quicker, no boys messing about, and you can talk more freely with the teacher without having boys about, and when you answer, the girls are OK, but boys laugh at you.

Maureen was not the only girl concerned about the boys laughing at her.

Jennifer: Yes, it's better. Because the lads, they put you down. If you get anything wrong, they laugh and say 'You should have got that'. And with all the girls, you sort of get on better.

The interviews with the co-educated intake suggested that some girls (such as Audrey) were so self-conscious of the boys that their performance in Mathematics had been hindered. One girl at least from the segregated intake was similarly embarrassed by boys.

Karen: Well, if we were mixed, I'd be in a lower set. And I'd be really embarrassed with boys around. When the test marks were read out,

I'd be petrified in case I was near the bottom.

It's freer in a girls' set. You can speak more freely. I'd always be wondering what I looked like, or if my hair was sticking up (giggle). I'm much more relaxed with girls.

Despite the perceived advantages of segregation to this group of girls, there was general agreement that segregated sets should not be expanded to other subjects.

Jennifer: They (the boys) just sit there as though they're the best. It puts you off. But I don't really mind in the other subjects. I just keep my concentration.

Maureen: Well, I suppose in English, I seem to get on better. I'm more sure of myself.

The girls who would have preferred co-educated Mathematics sets felt that the presence of boys created a livelier and more competitive atmosphere in lessons.

Sarah: Well, It's quieter (in Mathematics), there's no joking like with the boys. It's livelier somehow (with boys). The girls are competing with the lads, but it breaks up the lesson, and things go better somehow.

Christine: I prefer mixed, because you find lads, they sort of break the ice, the girls can be dead bitchy with each other, can't they? And I've got to do this, and I've got to do that, but lads, they soon break the ice. They take everything in their stride.

A handful of interviews such as those conducted with the girls of both intakes, cannot go very far in untangling the complexity of factors which cause so many secondary schoolgirls to under-achieve in Mathematics and come to regard Mathematics as a very difficult subject. Nevertheless the interviews did provide some interesting pointers.

The great majority of girls of both intakes believed that the onset of their difficulties in Mathematics came in the middle three years of secondary education, and this was generally associated with an inability to cope with the speed at which they were expected to move from topic to topic. Several girls expressed the need to go over difficult points again and again until comprehension was achieved.

Several of the interviews with the co-educated intake did suggest that some of the girls at least had suffered from the presence of boys in Mathematics lessons, and none of the co-educated girls could suggest the positive benefits of mixed Mathematics classes: indeed, there was apparently very little or no positive communication between boys and girls in Mathematics classes.

The girls of the segregated intake generally agreed that the atmosphere in their Mathematics classes was quiet and serious. This was appreciated by those girls who were bothered by the presence and behaviour of boys in co-educated classes, but other girls, who were not intimidated by boys, would have preferred the lively, competitive atmosphere of co-educated Mathematics classes.

Finally, the Mathematics teachers were generally highly regarded by the girls of both intakes. Help was readily available for the girls whether they were in co-educated or segregated sets. Most teachers were considered to be supportive.

These opinions are valuable for the Mathematics teachers at the school have been very concerned about the general performance of girls in Mathematics for many years. It is a matter of policy at the school that every effort should be made to encourage the girls whether they are taught in co-educated or segregated sets, and each teacher is conscious of the need to involve girls actively in the lessons. Furthermore, the majority of Mathematics teachers is female and there is a strong commitment to this work. Perhaps the most significant point to emerge from these interviews is that despite this strong commitment to equal opportunity for girls in Mathematics, some of the girls from the co-educated intake still seem to have been handicapped by the presence of boys in Mathematics lessons.

MATHEMATICS TEACHERS

Interviews were held with six full-time Mathematics teachers, (four female, two male) who had been on the staff of the school when segregated setting in Mathematics was introduced, and all of them had therefore acquired considerable experience of teaching both segregated and co-educated sets by the winter of 1985 when these interviews began. Transcripts of all six interviews are contained in Appendix G.

The only two full-time Mathematics teachers not be be interviewed were the Head of Department (male), who was a new appointment in September 1982, and the remedial specialist (female) most of whose pupils were not included in this investigation.

The teachers' comments were inevitably highly subjective being based on personal experiences with individual sets. Nevertheless, there was a considerable unanimity of opinion on many of the points raised in the interviews.

When segregated setting had been discussed in department meetings in the late 1970s, despite the general concern about

the under-achievement of so many girls, several teachers had been sceptical about the potential benefits of single-sex sets. Furthermore concern was expressed about forming segregated Mathematics sets from pupils who had opted to attend a co-educational school. By 1985, most of these doubts had disappeared.

Female Teacher: 'I suppose some people would argue that boys and girls have to compete when they leave school, so they should be mixed for Maths. But all we're trying to do is enable them to cope and gain more confidence. It's like anything else. There's no point in sticking to a rigid system if it isn't working well. We had to do something about it to help the girls.'

Male Teacher 'In 1980, I was very much against the idea (of segregated setting), but I was largely looking at it from my point of view, but for reasons I've mentioned before, I do think the girls have benefited from it, certainly the two sets I've taught, there's been greater participation from girls than had boys been present.'

Female Teacher: 'In a lot more cases than I expected, there has been some benefit. Not just girls. When I think of my second year boys' group last year, I think some of those boys benefited being on their own.'

Some of the teachers felt that some boys had gained from segregated Mathematics lessons, but the others felt that segregation had not really affected the boys at all. All six teachers however believed that girls had gained more

from segregated setting than boys.

Female Teacher: 'Girls benefit most from single setting. It gives them confidence. The boys don't seem to miss out. Hopefully, the results will show the girls doing better. When I think a few years ago, there were only four girls in the top Maths set. We've come a long way since then. The gap between boys and girls has dropped enormously.'

Male Teacher: 'I think girls do benefit from it in that they tend to get more confident, mainly the fact that they are all together, they're more confident as a social group and therefore it comes through in their work. I know we try to involve everyone, but you find that girls will not offer comments or answers when the boys are there.'

Female Teacher: 'I think that girls on the whole benefit more from single sex setting. Just thinking back to the classes I've had, I would say, yes, the girls I have at the moment, a third year set (of girls), who need, despite the fact they're the top set, they need a couple of explanations on most points. And on the third explanation, perhaps most of them will have understood it! And I don't think they mind. I feel there's more contact between me as a teacher and them as pupils because they're not afraid to say 'I don't know what you're talking about; or 'I don't understand that'. And I feel they're more inclined to say that than if there are boys present.'

The popularity of segregated sets for Mathematics with the majority of boys and girls was recognised by most of the teachers.

Female Teacher: 'Most of the children like to work in single sex sets. It's very popular, even the fifth year. I have a boys' set this year. They're happier as a boys' set. They don't want to be mixed with the girls for Maths.'

Female Teacher: 'I think the girls are in favour of being on their own; indeed, they've told me they prefer being on their own.'

All six teachers felt that segregated setting was of much greater value in Lower School (first and second years) than in Upper School (third, fourth and fifth years).

Female Teacher: 'I like single setting in Lower School. I really do. I think it's smashing there. Both girls on their own and boys on their own. You can really get to grips with a class, you can develop a relationship which works. I wouldn't want to go back to mixed sets lower down the school.'

Female Teacher: 'I think to the majority of children, single sex sets are better (surprisingly), early on than further up the school. I think the first year children - particularly the girls - appreciate not having to put up with boys who, at that point, can be an annoyance, and I think they appreciate being able to get on with it without them prodding and poking and making rude comments.'

One teacher described how first year boys and girls differed in their approach to a particular lesson. This example provides support to the view that 11 and 12 year old girls are both less interested and less competent in practical work than boys.

Male Teacher: 'We did practical work with a first year all-boys set and then an all-girls set. Same ability. It was practical work on measuring. We did the estimations in class, we talked about estimating, and the attitude then was the boys were really, really keen and wanted to get out and measure and when they went out to measure, they were very, very accurate and worked extremely hard. They wanted to make sure their results were right. They did the exercise, and then checked their work. The estimations and measurements of the two sets were similar, but the way the girls worked when they had to go out, they did not have the same attitude. They weren't enthusiastic, and their approach was very haphazard, they would put the tape measure down and squabble as to who should hold it. Then someone would walk off with it. They didn't seem to be able to organise themselves. A rough guide or estimate was good enough. Most of them were not prepared to measure carefully and check their answers. They lacked the willingness to ensure the work was right and accurate.'

One serious disadvantage of segregated setting was that it inhibited fine setting (the practice of placing pupils in sets where they are very closely matched by ability). This did not matter in the first and second years, because the pupils were traditionally placed in broad ability bands for Mathematics at this stage, and this was still possible with

segregated sets. When it came to exam work in the fourth and fifth years, however, the teachers felt it important that the most able boys and girls in particular should be combined in a co-educated set.

Female Teacher: 'The very top end feel they would have been happier with the opposite sex because there would have been closer setting - there would not have been such a wide ability range. They say quite a lot - at timesthe brighter girls and boys have been very bored because the teacher has had to go over particular points again and again. At that ability level there is no question of them being bothered by the presence of the opposite sex, they would revel in the competition. Even the shyest girl in the top set - who is very capable - would have preferred mixing for Maths.'

Four of the teachers interviewed believed that segregated setting had created discipline problems in some Mathematics lessons with the older pupils. These problems were most serious in the lower ability boys' sets, but the girls' sets too were sometimes difficult to teach. These four teachers believed that among older pupils, mixed sets were better behaved.

Female Teacher: 'I think we have created discipline problems at the top end of the school - the older pupils. There isn't the flexibility to separate Bill Bloggs from Joe Soap as you would have been able to with mixed sets. It's not only the boys' sets, some of the girls' sets are very difficult, in the upper age bracket, and I think this is because they're separated.

The fourth year boys' set I had last year are very hard to teach. I do feel that if they had been leavened with some girls, they wouldn't have been quite so difficult, and some of the behaviour wouldn't have taken place, because they wouldn't have done the sort of thing they were doing in front of girls. They would have lost face.'

Male Teacher: 'I think that with low ability boys, the discipline problems are immense. One third year boys set I had were particularly bad, there were many discipline problems and motivation was very difficult. They didn't have the concentration, and nothing seems to settle them.

Mixing the sets does have a settling effect, because even the girls when they're together (pause) they tend to set each other off. When they're mixed, they wouldn't say some of the things they say in a single sex group.'

One teacher, however, strongly disagreed with these views about discipline.

Female Teacher: 'I personally think that discipline is better in single sex sets - they're far too easily distracted, sort of not by the amount of work they're doing or the type of work they're doing, but by distractions that have nothing to do with the work. The fifth year group I took last year - a mixed group - I'd had some of those boys and girls for three years and I felt that some of the girls would have benefited from not being with boys. They would have settled and concentrated more on their own.'

The teachers were asked whether they were generally in favour or against segregated setting in Mathematics. All six had mixed opinions and were unable to give a simple positive or negative reply. They felt that many individual pupils had benefited from segregated setting, and this was particularly noticeable among first and second year girls. Nevertheless, they all recognised that segregating the sexes for Mathematics had also created problems.

Female Teacher: 'Summing up; it isn't simple to judge single sex setting. It's not black and white. It's a beautiful collection of shades of grey.'

CHAPTER 6

CONCLUSIONS AND IMPLICATIONS OF THE STUDY

The main objective of this study has been to assess the effects of segregating a group of girls for Mathematics lessons for a period of five years in terms of both performance and attitude.

In terms of performance, the findings do not provide a clear picture. The results of the Tameside Numeracy Test (taken in the third year) do suggest that segregation improved basic numerical skills in the first and second years, for the segregated girls performed better on 11 of the 13 topics of this test, and on five of these topics the difference was significant. This finding supported the results of the 'pilot experiment' of 1978-80 in which a group of segregated second year girls performed considerably better on a series of Mathematics tests than a group of girls of similar ability who had been taught in co-educated sets.

On the other hand, the results of the Four Short Tests, which were taken at the end of the fourth year and which contained many items requiring problem solving skills, suggested that segregation had not improved performance; indeed the co-educated girls performed significantly better than the segregated girls on one of these tests. The segregated girls performed better in the other three tests however, although in each case the difference was not significant.

The results of the two groups of girls in the Mathematics external examinations taken in the fifth year were very similar, again suggesting that single-sex Mathematics sets had had little effect on the overall performance of the segregated girls as a group.

An analysis of the 'O' Level Mathematics results of both boys and girls at the school since 1971 revealed that the performance of girls (whether they have been taught in co-educated or segregated sets) has improved considerably in recent years. This supports the view that a school which devotes attention to providing girls with an equal opportunity in Mathematics lessons over a number of years can be successful without resorting to segregated teaching.

The responses to the APU Mathematics Attitude Questionnaire, taken at the end of the fourth year, indicated that both groups of girls had similar perceptions of both the difficulty and the enjoyment of Mathematics. The segregated girls however regarded Mathematics as significantly less useful than the co-educated girls.

Almost all of the co-educated girls who were interviewed first began to experience difficulty with Mathematics after the beginning of the second year of secondary education. The girls were generally critical of the behaviour of boys in Mathematics lessons, but this apparently caused much less difficulty to most of them than the speed with which they were expected to move from topic to topic. Nevertheless it appeared that a minority of these girls were intimidated by boys to the extent that performance in Mathematics was affected.

A majority of the segregated girls who were interviewed approved of all girls' Mathematics sets and they suggested that segregation provided a congenial working atmosphere. A minority of this group however believed they would have benefited from the livelier classroom environment which they felt the boys create.

All six Mathematics teachers who were interviewed had mixed feelings about segregated setting. There was general agreement that first and second year girls benefited more from this arrangement than either boys or older girls.

Some of the teachers were concerned that segregation prevented fine setting. This was perceived as a disadvantage among older and more able pupils and could at least partially explain why the segregated girls performed no better than the co-educated girls in the fourth and fifth years. Additionally some teachers believed that segregated setting increased discipline problems with older pupils although this was more apparent in the boys' sets.

Even though this study indicates that segregation was of no long-term benefit to the girls in terms of either attitude or performance, it is felt that segregated setting may nevertheless be worth preserving in the first and second years. Research referred to in Chapter 2 suggests that girls from primary schools generally experience greater problems than boys in adjusting to secondary Mathematics and the findings of this study do indicate that 11 and 12 year old girls benefit from segregated Mathematics teaching. (It is perhaps worth mentioning at this stage that the author is presently conducting a supplementary piece of research into the Stamford High School intake of 1981, which was taught Mathematics in segregated sets in the first three years and co-educated sets in the fourth and fifth years, in an attempt to discover if this 'balance' is of long-term benefit in terms of performance and attitude).

If segregation in the first and second years is persevered with,more thought could be given to the design of a distinctive Mathematics course for girls. It is not appropriate here to outline such a course, but it is worth referring to the work of Kelly (1981) who was similarly concerned that girls should begin their secondary science education on a more equal footing with boys. Many of her guidelines for an introductory science course for girls would be equally appropriate for Mathematics.

Furthermore, such a course could well give more attention to problem solving skills, for the results of the Four Short Tests revealed that boys generally performed better than both groups of girls. Similar findings were obtained by Fennema (1974) and Wood (1976).

Practical Mathematics should undoubtedly be an important element of a distinctive course for girls. This particular need was highlighted by the male Mathematics teacher at the school who noted the superior approach of first year boys over a girls' set on a practical exercise (see Chapter 5), and all three of the APU Secondary Surveys of Mathematical Development (1980, 1981 and 1982) refer to practical items on which boys performed significantly better than girls.

Thought should also be given to designing many individual problems in terms which refer to feminine activities and interests, for there is evidence that not only do girls respond more positively to such problems, but also that they are more likely to be successful with them (Milton 1958, Graf and Riddell 1972).

It is, of course, recognised that nothing novel has been suggested here. After all, the Cockcroft Report (1982) stated that for all pupils, computational skills should be related to practical situations and applied to problems, and there is no doubt that the Mathematics Department at the school is attempting to apply the major recommendations of this Report.

Although the school has made considerable progress in improving the performance of girls in Mathematics, it is apparent that some older girls are still under-achieving in Mathematics whether they have been taught in segregated or co-educated sets. A special scheme of work designed to stimulate the interest and imagination of 11 and 12 year old girls taught in segregated sets could not only improve

attainment but also help those girls to form more positive attitudes to Mathematics. A sound foundation in the first and second years could eventually lead to parity of performance with the boys in external examinations.

In terms of attitude, it is a matter of some concern that the segregated girls perceived Mathematics as significantly less useful than co-educated girls for this finding has disturbing implications particularly in terms of the relationship between the perceived utility of Mathematics and the likelihood of studying the subject beyond the age of 16. Too much emphasis should not be placed on this finding, however, for the author could find no evidence of other research which could be used to refute or support this result. It would certainly appear that the effects of segregation on attitudes to Mathematics would be a fruitful field for further research.

Finally, some words of caution are needed concerning the interpretation of the results of this study. It must be remembered that the work was confined to one school, and although this had the great advantage that many of the variables which occur when pupils from different schools are compared it does mean that the number of girls who were involved was small and this naturally limits the value of the results. Additionally Stamford High School (like all other schools) is a unique institution, and it would therefore be quite wrong to assume that if similar segregated setting arrangements were established in another co-educational secondary school the same results would occur. In other words, extreme care needs to be taken in applying the findings of this study to the wider educational scene.

It was also unfortunate (from the point of view of this study) that comprehensive education was introduced in 1980. Although the transition seemed to be made very smoothly, and care was taken in this research to account for the differences between the two intakes, there would have been greater confidence in the results had the two intakes been more closely matched in terms of ability.

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APPENDIX A

The Organisation of Mathematics at Stamford High School

APPENDIX A:

THE ORGANISATION OF MATHEMATICS AT STAMFORD HIGH SCHOOL

Throughout the six academic years covered by this thesis (September 1979 - July 1985) the full-time establishment of the Mathematics Department was as follows:-

1 (Male) Head of Department
1 (Female) 2nd in Department
2 Male teachers
3 Female teachers
1 (Female) Remedial specialist

All of these teachers were both experienced and fully qualified Mathematics teachers. The only staff change to affect this group during the period covered by this thesis was the retirement of the Head of Department in July 1982. He was replaced by an outside appointment.

The balance of Mathematics teaching on the timetable was taken by teachers who taught the subject in combination with other subjects or responsibilities. The constitution of this second group varied from year to year, but all teachers used in this way were both experienced and fully qualified Mathematics teachers. Most of the teachers in the second group were male and this helped to redress the numerical superiority of female teachers in the first group.

Meetings of the Mathematics Department were held at frequent intervals throughout the period of this study to discuss administrative matters as well as classroom problems and teaching methods.

The syllabus covered a very broad spectrum of Mathematics and during the period of this study no major revisions to the syllabus were made. An attempt was made to introduce most topics on the syllabus to all sets, although the lower ability sets spend more time on 'everyday' Mathematics than on more academic topics. An element of practical work was included

for all sets each term.

Both the co-educated intake and the segregated intake spent the first three weeks of the first year in mixed ability sets before taking an initial Mathematics test (which was amended between 1979 and 1980 and could therefore not be used for comparing the two intakes). After this test, both intakes were placed in broad ability sets. They remained in ability sets throughout the five years at the school although both intakes were set more finely as they proceeded up the school.

The set sizes of both intakes were similar throughout the five years, although there were slight variations from time to time. At the beginning of the third year, the mean set size of the non-remedial sets in the co-educated intake was 26, and in the segregated intake, the mean size of the non-remedial boys' sets was 25 and the non-remedial girls' sets was 26.

Both intakes were allocated an equal amount of time for Mathematics. In the third year this comprised two lessons of 70 minutes and one of 35 minutes each week, and in each of the other four years it comprised three lessons of 70 minutes each week.

Finally, as far as Mathematics was concerned, the school followed a policy of combining the best teams of teachers available for each year group irrespective of the sex of the teacher and no attempt was made with the segregated intake of placing the girls' sets exclusively with female teachers or the boys' sets exclusively with male teachers. However, two teachers (one male, one female) did express a preference for teaching pupils of their own sex in the segregated intake whenever possible and this factor was taken into account. Consequently the segregated girls did spend a higher proportion of their time in Mathematics with female teachers than did the co-educated girls and this point is illustrated in the table overleaf.

Percentage of Mathematics lessons spent with male and female teachers throughout the period of this study

	Female teachers	Male teachers
Co-educated girls	52	48
Segregated girls	61	39

APPENDIX B

Individual Test Scores and Examination Grades

APPENDIX B: INDIVIDUAL TEST SCORES AND EXAMINATION GRADES

a) CO-EDUCATED GIRLS

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
1	87	15	44	38	26	4	1	2	4	11	Ab	
2	89	50	50	36	26	4	3	2	2	11		
3	91	22	69	33	25	1	0	0	1	2		
4	91	25	63	33	18	4	0	0	1	5		
5	92	57	69	43	18	4	2	3	3	12	4	
6	93	75	44	33	20	10	3	5	9	27		D
7	94	17	51	30	17	1	1	1	2	5		
8	94	36	66	36	15	4	1	0	4	9	5	
9	95	60	69	22	15	5	3.	2	5	15	4	
10	95	41	52	36	18	3	2	0	4	9		
11	95	38	45	36	27	6	2	0	5	13	5	
12	95	27	60	34	20	1	1	0	4	6	U	
13	96	55	62	21	21	4	5	2	5	16	5	
14	96	86	42	44	28	6	2	2	8	18	3	
15	97	50	45	47	19	8	5	2	6	21	4	
16	98	61	59	39	20	6	4	3	9	22	3	
17	99	62	51	42	24	8	5	2	9	24	2	
18	99	43	46	40	21	4	4	3	1	12	4	

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
19	99	61	49	29	17	10	5	1	7	23	2	
20	100	73	66	34	22	6	4	3	11	24	3	
21	101	65	66	32	15	4	2	1	3	10	3	
22	101	67	57	40	28	8	4	5	14	31		E
23	101	62	66	32	18	5	1	2	6	14	4	
24	101	45	49	37	23	7	3	0	4	14		
25	102	51	62	31	19	5	4	1	6	16	4	
26	103	61	67	30	21	4	4	1	6	15	U	
27	104	83	54	39	18	7	7	7	11	32	3	
28	104	61	50	41	24	7	4	4	8	23	5	
29	105	60	51	39	21	4	3	1	4	12	U	
30	105	32	58	26	15	1	1	2	4	8		
31	105	65	42	39	22	4	3	2	5	14	3	
32	105	47	45	36	24	3	2	2	5	12	4	
33	105	88	49	36	19	Ab	Ab	Ab	Ab	Ab		C
34	106	48	72	29	15	5	3	2	5	15	4	
35	106	36	76	19	12	9	6	4	12	31		
36	107	89	40	43	30	10	6	4	12	32		B
37	108	77	57	31	20	9	3	4	12	28		C
38	108	Ab	55	37	15	7	4	0	7	18	3	
39	109	28	42	41	20	5	3	1	5	14		
40	109	83	40	38	28	9	7	4	13	33		C
41	110	61	71	25	16	4	2	0	5	11	4	

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
42	110	44	57	26	18	9	6	3	4	22	4	
43	110	43	33	41	31	3	2	0	2	7		
44	110	81	64	31	16	4	3	2	6	15	4	
45	110	73	48	38	22	10	5	2	9	26	2	
46	111	71	59	32	17	6	7	2	8	23		
47	111	83	58	40	25	9	7	4	13	33		C
48	112	81	65	26	13	7	5	2	7	21	Ab	
49	112	75	69	23	12	7	5	3	7	22	4	
50	112	54	50	43	18	7	3	4	8	22	4	
51	112	61	67	29	12	6	2	1	4	13	4	
52	112	73	55	37	14	5	6	1	8	20	2	
53	112	91	58	23	16	9	7	6	12	34		C
54	113	94	60	22	14	8	7	8	12	35		C
55	113	97	32	46	31	8	7	7	13	35		B
56	113	82	47	26	18	7	4	3	11	25		D
57	114	80	42	39	25	10	6	3	9	28	2	
58	117	65	50	36	20	6	5	4	6	21	4	
59	117	99	62	43	21	8	6	7	13	34		A
60	118	58	67	20	15	6	5	2	6	19	4	
61	120	83	46	34	28	9	7	5	10	31		C
62	121	70	51	34	21	5	4	3	8	20		E

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
63	122	65	53	40	19	7	5	0	7	19	5	
64	122	95	41	41	26	10	6	3	11	30		C
65	126	83	38	40	23	7	7	1	9	24		E

Ab = Absent

INDIVIDUAL TEST SCORES AND EXAMINATION GRADES

b) SEGREGATED GIRLS

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
1	86	33	49	41	27	3	1	1	2	7	5	
2	89	43	39	42	27	3	2	1	6	12	4	
3	90	16	Ab	Ab	Ab	1	2	2	1	6		
4	90	64	26	44	28	7	3	3	7	20		
5	92	40	58	27	18	3	0	2	1	6	U	
6	92	64	40	43	27	7	3	2	6	18	3	
7	93	59	47	29	15	7	1	1	6	15	5	
8	94	51	70	32	21	3	1	4	3	11	4	
9	95	63	56	26	16	4	5	1	6	16	5	
10	95	62	35	35	19	5	2	3	3	13	5	
11	95	60	41	32	21	4	4	1	10	19	2	
12	95	34	40	32	23	3	3	2	3	11		
13	96	64	80	18	7	7	3	4	6	20	4	
14	96	60	42	47	28	6	3	1	5	15	2	
15	97	50	53	32	23	Ab	Ab	Ab	Ab	Ab	5	
16	98	43	57	37	18	8	3	2	5	18	5	
17	99	87	Ab	Ab	Ab	8	3	2	10	23	5	

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
18	99	44	48	36	24	2	1	1	3	7	5	
19	99	60	48	30	18	5	2	1	4	12	4	
20	100	77	60	43	24	5	4	2	9	20	4	
21	100	39	Ab	Ab	Ab	5	3	2	4	14	5	
22	100	60	35	35	22	5	4	1	7	17	5	
23	100	37	67	23	12	6	1	1	6	14	5	
24	100	43	62	16	16	4	2	4	4	14	4	
25	101	52	51	35	20	5	1	1	4	11	5	
26	102	68	53	33	17	8	5	3	7	23	4	
27	103	54	65	26	18	6	3	2	8	19	3	
28	104	78	57	34	20	6	2	1	7	16		D
29	105	74	42	37	25	9	5	3	10	27		C
30	106	54	63	25	15	6	3	2	3	14	5	
31	106	45	72	23	9	4	2	2	3	11	U	
32	106	60	68	26	19	6	2	3	5	16	Ab	
33	106	58	Ab	Ab	Ab	Ab	Ab	Ab	Ab	Ab	4	
34	107	80	66	28	18	7	6	1	9	23	3	
35	107	65	26	49	24	5	2	3	7	17	4	
36	107	80	34	40	30	6	5	2	8	21		D
37	109	68	66	19	10	8	4	6	7	25	4	
38	109	71	56	33	15	8	4	4	9	25		E
39	109	93	49	32	18	8	6	4	14	32		C

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
40	110	101	63	33	15	10	5	3	12	30	2	
41	110	64	55	27	21	5	3	2	5	15	4	
42	110	84	67	37	24	8	5	3	9	25	2	
43	110	81	57	32	18	Ab	Ab	Ab	Ab	Ab		C
44	110	55	56	27	21	5	2	1	4	12	4	
45	110	75	77	25	14	5	4	2	7	18	4	
46	110	70	60	32	15	6	3	3	6	18		D
47	111	62	78	21	16	7	5	2	12	26	Ab	
48	112	69	48	37	19	6	2	1	3	12	4	
49	112	69	48	34	22	7	4	2	7	20	Ab	
50	112	89	71	30	15	7	7	4	11	29		B
51	114	72	54	22	16	6	4	3	9	22	4	
52	114	70	46	32	19	6	2	2	7	17		D
53	114	67	52	36	18	6	2	4	6	18	4	
54	114	75	54	29	20	6	5	4	8	23		C
55	115	96	64	40	23	11	6	5	14	36		B
56	115	74	65	36	19	8	5	4	7	24		
57	116	74	61	27	13	5	6	4	9	24	5	
58	116	56	58	22	14	8	3	2	8	21	4	
59	117	85	49	40	26	8	7	6	13	34		C
60	117	81	48	26	28	10	7	5	9	31		E
61	118	100	69	33	14	11	7	6	14	38		B

GIRL No.	NON-VERBAL TEST DH	TAMESIDE NUMERACY TEST	ATTITUDE QUESTIONNAIRE			FOUR SHORT TESTS					MATHEMATICS EXTERNAL EXAMINATIONS	
			DIFFICULTY	UTILITY	ENJOYMENT	No. 1	No. 2	No. 3	No. 4	TOTAL	CSE	GCE 'O'
62	120	97	37	38	28	10	5	6	13	34		B
63	121	99	38	30	18	10	6	8	13	37		A
64	122	85	71	29	16	10	3	4	11	28		C
65	126	94	37	35	19	10	5	5	14	34		B

Ab = Absent

APPENDIX C

Tameside Numeracy Test

Test Paper and Item Analysis

Tameside Numeracy Test

Test for Students of Third-Year Secondary School Age

Name of pupil _____

Today's date _____

Date of birth _____

Name of school _____

Instructions

1 Attempt every question. If you cannot do one, leave it and go on to the next.

2 Do all your working in the spaces provided and make your answers clear.

3 Do not underline your answers.

You will be allowed ample time in which to finish.

Schofield & Sims Ltd Huddersfield

	blank
n the number 345, which has the largest alue, the three, the four or the five? _____	
se figures to write the number: hree thousand, four hundred and seven. _____	
ral question	
'rite down the next two numbers. 06, 207, 208, 209, ____, ____.	
ral question	
dd the numbers in each part. fifty and thirty _____ 2 hundreds and 7 hundreds _____ 6000 and 1000 _____	
3241 526 1037	
9 take away 4 is _____ 14 is 5 more than _____	
2074 382	
+ 7 + 7 + 7 + 7 an be written as 7 + 5 b 7 × 5 c 7 − 5 d 7 ÷ 5 Vhich? _____	
)ral question	

	blank
12 634 × 6	
13 175 × 100 = _____	
14 1523 × 32	
15 a _____ × 4 = 36 b How many 5s in 40? _____	
16 $6\overline{)4218}$	
17 5330 ÷ 13 =	
18 a 5 + 4 = b 9 − 3 = c 12 × 3 = d 18 ÷ 6 =	
19 7 + (2 × 5) =	
20 Oral question	
21 Oral question	
22 Oral question	
23 Find the value of a 2^3 _____ b $\sqrt{16}$ _____	

Give the next two terms in each line.

a 3, 7, 11, 15, 19, ____, ____.

b 5, 10, 20, 40, 80, ____, ____.

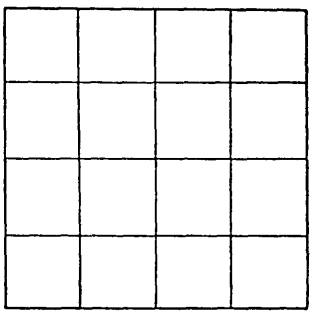
Complete using >, < or =.

a 2 + 3 ☐ 4 − 1

b 5 − 1 ☐ 5 + 1

a Write nine sixteenths in numbers. ____

b Shade in this fraction on the diagram.



Write down which of the following numbers are greater than 1.

, $\frac{9}{3}$, $\frac{2}{4}$, $\frac{5}{9}$, $\frac{3}{2}$, $\frac{4}{7}$ _____

Write

$+\frac{1}{5}+\frac{1}{5}+\frac{1}{5}$

s a single fraction. _____

/hat is a fifth of two as a single fraction?

_____

/hich of these fractions are equal to $\frac{2}{5}$?

$\frac{7}{2}$, $\frac{4}{10}$, $\frac{3}{15}$, $\frac{10}{25}$, $\frac{12}{26}$

There could be more than ne answer.) _____

$+\frac{1}{5}=$

$\frac{2}{5}+3\frac{1}{5}=$

$\frac{8}{9}-\frac{1}{9}=$ b $\frac{4}{7}-\frac{2}{5}=$

34 How many fifths are there in $3\frac{4}{5}$?

_____

35 $2\frac{2}{3}-\frac{1}{4}=$

36 $\frac{5}{8}\times 48=$

37 $\frac{3}{4}\times\frac{3}{4}=$

38 $1\frac{1}{2}\times 2\frac{3}{4}=$

39 $\frac{2}{5}$ of $70=$

40 $\frac{3}{4}\div 5=$

41 $\frac{3}{4}\div\frac{2}{5}=$

42 Complete

☐ $+\frac{5}{9}=1$

43 Complete

$\frac{7}{5}\times$ ☐ $=1$

44 Express 20 as a fraction of 25.

_____

45 Ring the fraction part of

23 . 52

46 In the number 21.98

the 2 stands for 2 tens

the 9 stands for 9 _____

the 8 stands for 8 _____

47 Oral question

$31.72 + 14.9 =$

$5.375 - 2.481 =$

$1.236 \times 10 =$

$$\begin{array}{r} 46.23 \\ \times \quad 8 \\ \hline \end{array}$$

$$\begin{array}{r} 2.1 \\ \times 1.3 \\ \hline \end{array}$$

$127.4 \div 100 =$

$6\overline{)452.4}$

$4\overline{)4.872}$

omplete

$\frac{.6}{.2} = \frac{}{12}$

ive 23.756 to 2 decimal places.

_____

ive 24.72 to 3 significant figures.

_____

onvert $\frac{5}{8}$ to a decimal.

_____

60 Write 0.61 as a fraction.

_____

61 Oral question

62 Express 32% as a fraction.
(You need not express the fraction in its lowest terms.) _____

63 Express $\frac{9}{20}$ as a percentage.

_____

64 Express 0.36 as a percentage.

_____

65 Write 84 per cent as a decimal.

_____

66 Calculate 35% of 700.

_____

67 Express 15 as a percentage of 75.

_____

68 Complete
1500 is increased by 20% to _____

69 15 is increased by 300%.
How large is this increase?

_____

70 Three flasks contain 255 cm^3, 485 cm^3 and 543 cm^3 of water respectively. They are all poured into one container. How much water will there be in the container?

_____

An oil tank on a farm contained 243 litres one night, but next morning only contained 154 litres. How much had gone?

Each householder uses about 35 gallons of water a day, for washing etc. How much water will be used in a week by each householder?

A bottle of medicine contains 750 mℓ of liquid and is used in 15 mℓ doses. How many doses are there in the bottle?

A large, rectangular tank measures 5 m high, 7 m long and 3 m wide. What is its capacity?

/rite 2.043 litres, in litres and millilitres.

leasure this line.

spring 37 cm long, stretches by 25 cm /hen pulled by a weight of 2 kg. /hat is its new length?

roll of cloth is 150 m long. From it length of 79 m is cut. What length emains?

79 A dress designer needs $2\frac{1}{2}$ m of material to make a particular style of dress. She is having 300 of them made up by a factory. How much material will they need at the factory for this order?

80 A car travels 288 km on a tankful of petrol. How many full tanks will be needed for a journey of 4032 km?

81 How many complete centimetres are there in 1.325 metres?

82 5.2 tonnes of hay are put onto a lorry which weighs 7.3 tonnes when empty. What will the loaded lorry weigh?

83 Together a goldfish, water and bowl weigh 2142 g. The water and the bowl weigh 2123 g. What does the goldfish weigh?

84 Find the total mass of 9 crates, each of mass 17 kg.

85 The total mass of 8 equal metal bars is 1400 g. Find the mass of one bar.

86 How many kg in 1.731 tonnes?

A table costs £57·95. A set of chairs cost £62·85. What is the total cost?

How much profit is made if something that is bought for £37 is sold for £86?

A square metre of carpet costs £6·95. How much will 20 m² of the same carpet cost?

At 75p a week, how long will it take to save £16·50?

What is the sum of the following: two 50p coins, twelve 10p coins, one 5p coin, three 2p coins and four pennies?

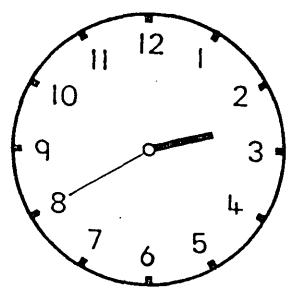
recipe takes 25 min to prepare and hours 15 min to cook. How long does t take from start to finish?

n aeroplane takes off at 2.15 p.m. and ands at 5.35 p.m. How long was it in light?

94 A girl takes 18 min to walk a mile. At the same pace, how long would it take her to walk 9 miles?

95 A typist can type at 50 words per minute. How long will it take to type 3000 words?

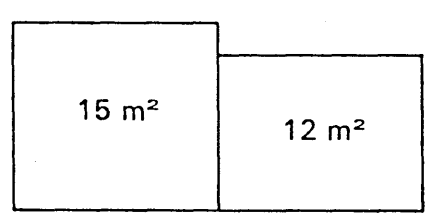
96 What time does this clock show?



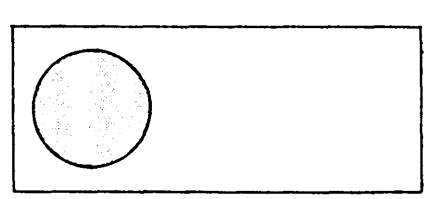
97 Write 4.30 p.m. in 24-hour clock time.

98 Split 7 hours 35 min into 5 equal parts.

99 What is the total area of these two rectangles?



100 A circular piece measuring 15 cm² is removed from a rectangle measuring 84 cm². What area is left?



A carpet tile is 0.64 m^2. What area will 50 of them cover?

_____

How many square tiles each measuring 100 cm^2 will be needed to cover the floor of a room measuring 90 000 cm^2?

_____

A rectangle measures 5 cm by 9 cm. What is its area?

_____

How many mm^2 are there in 1 cm^2?

_____

Write $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$ in index notation.

_____

At two football matches there were 48 250 and 51 470 spectators respectively. How many spectators watched the two games?

_____

In an election, a candidate gets 5423 votes and his opponent gets 3284 votes. By how many votes did the first candidate win the election?

_____

A bakery has 80 trays of loaves with 40 loaves on each tray. How many loaves is this?

_____

109 126 eggs are put into boxes of six eggs. How many boxes are needed?

_____

110 This table shows the number of bad melons contained in 36 boxes examined at a fruit wholesaler's warehouse.

number of bad melons	0	1	2	3	4	5	6	7	8
number of boxes	29	3	2	1	0	0	0	0	1

How many boxes contained only 1 bad melon?

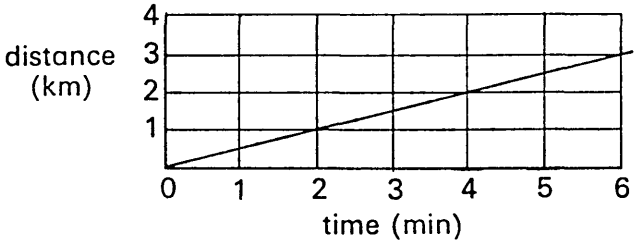
_____

111 38, 42, 39, 40, 41, 39, 40, 41, 39, 40, 39, 38, 41, 42

These are the marks for an exam. Count each of the numbers and enter them in the following table. The first has been done for you.

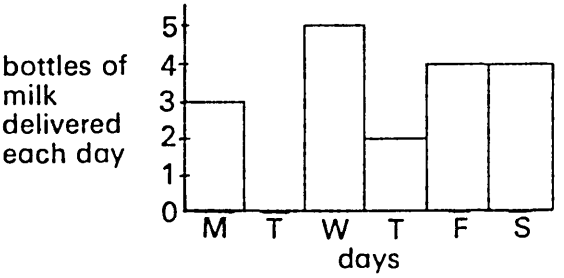
exam mark	38				
number of people gaining the mark	2				

112 A car is travelling along a road. Its distance from a certain bridge is given on the graph.



How far has the car gone in 3 minutes? _____

113 The graph shows the number of bottles of milk delivered each day to a house. 4 bottles were delivered on Tuesday. Put this information on the graph.



This chart shows the distances, in miles, between 7 cities.

What is the distance between Bristol and Newcastle?

London	77					
Birmingham	128	111				
Bristol	74	114	88			
Manchester	208	184	81	162		
Leeds	229	191	110	196	41	
Newcastle	319	274	204	288	131	94
	Southampton	London	Birmingham	Bristol	Manchester	Leeds

_____

A fireworks manufacturer makes 3 separate boxes of fireworks.

The 'De Luxe' contains 3 bangers, 2 roman candles and 4 rockets.

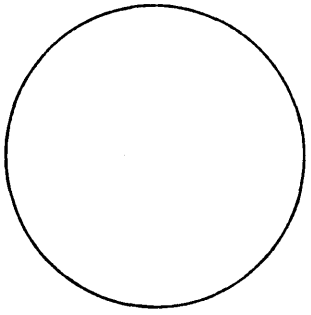
The 'Super' contains 4 roman candles, 3 pin-wheels, 5 rockets and 2 bangers.

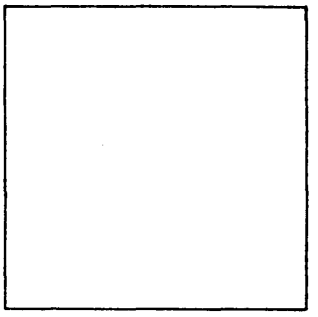
The 'Super Plus' contains 7 rockets, 5 roman candles and 4 pin-wheels.

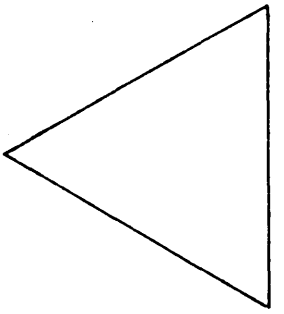
Put this information into the table. Two have already been done for you.

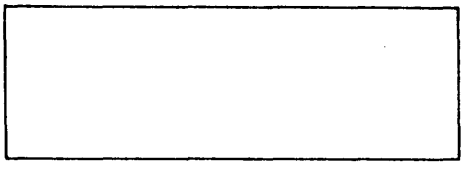
	bangers	rockets	roman candles	pin-wheels
De Luxe				
Super		5		
Super Plus	0			

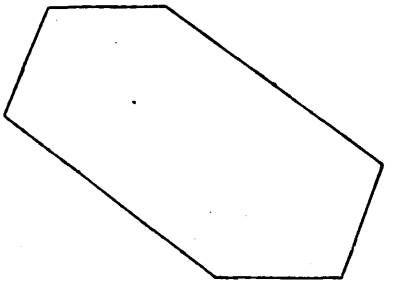
Name these shapes.



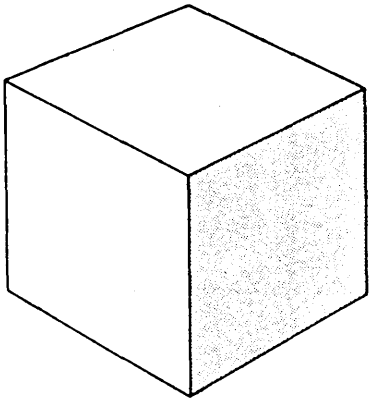


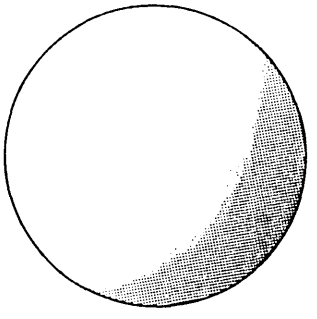


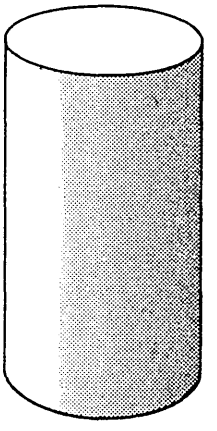


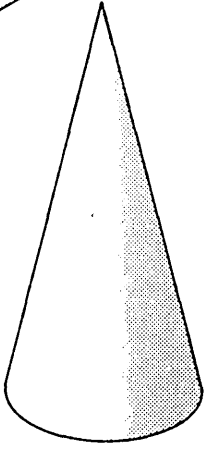


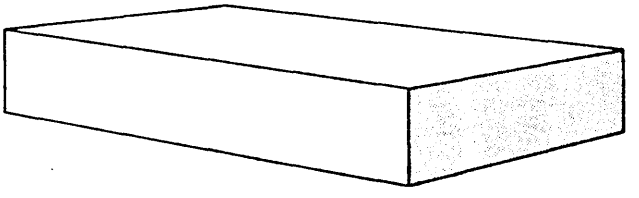
Name these shapes.











Draw a circle with radius 4 cm inside a circle with radius 5 cm.

Draw an angle of 60° accurately.

	Blank
Sketch the net of a cube.	

TAMESIDE NUMERACY TEST

PERCENTAGE IN EACH GROUP ANSWERING ITEM CORRECTLY

A. INTEGERS

ITEM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO-EDUCATED GIRLS	90•6	90•6	ORAL	87•5	ORAL	92•2	92•2	87•5	68•7	84•4	ORAL	82•8	60•9	64•1
SEGREGATED GIRLS	87•7	83•1	ORAL	75•4	ORAL	90•8	92•3	93•8	73•8	95•4	ORAL	95•4	63•1	66•2

ITEM NO.	15	16	17	18	19	20	21	22	23	24	25
CO-EDUCATED GIRLS	90•6	59•4	57•8	82•8	70•3	ORAL	ORAL	ORAL	40•6	64•1	43•7
SEGREGATED GIRLS	89•2	66•2	58•5	90•8	80•0	ORAL	ORAL	ORAL	32•3	56•9	55•4

B. FRACTIONS

ITEM NO.	26	27	28	29	30	31	32	33	34	35	36	37	38
CO-EDUCATED GIRLS	85•9	54•7	39•1	23•4	59•4	15•6	43•7	15•6	53•1	18•7	21•9	54•7	18•7
SEGREGATED GIRLS	89•2	58•5	49•2	16•9	53•8	13•8	56•9	9•2	63•1	13•8	23•1	70•8	13•8

ITEM NO.	39	40	41	42	43	44
CO-EDUCATED GIRLS	29•7	15•6	20•3	53•1	12•5	60•9
SEGREGATED GIRLS	41•5	6•2	12•3	64•6	18•5	76•9

C. DECIMALS

ITEM NO.	45	46	47	48	49	50	51	52	53	54	55	56	57	58
CO-EDUCATED GIRLS	42•2	29•7	ORAL	56•2	54•7	57•8	50•0	46•9	34•4	54•7	37•5	70•3	6•2	7•8
SEGREGATED GIRLS	52•3	23•1	ORAL	60•0	56•9	67•7	61•5	43•1	32•3	61•5	35•4	83•1	13•8	24•6

ITEM NO.	59	60	61
CO-EDUCATED GIRLS	9•4	32•8	ORAL
SEGREGATED GIRLS	3•1	41•5	ORAL

D. PERCENTAGES

ITEM NO.	62	63	64	65	66	67	68	69
CO-EDUCATED GIRLS	53•1	37•5	57•8	40•6	23•4	6•2	15•6	14•1
SEGREGATED GIRLS	72•3	36•9	49•2	40•0	16•9	12•3	16•9	15•4

E. VOLUME AND CAPACITY

ITEM NO.	70	71	72	73	74	75
CO-EDUCATED GIRLS	64•1	81•2	81•2	62•5	29•7	59•4
SEGREGATED GIRLS	83•1	92•3	83•1	80•0	36•9	67•7

F. LENGTH

ITEM NO.	76	77	78	79	80	81
CO-EDUCATED GIRLS	81•2	65•6	87•5	40•6	31•2	9•4
SEGREGATED GIRLS	70•8	72•3	89•2	55•4	47•7	12•3

G. MASS

ITEM NO.	82	83	84	85	86
CO-EDUCATED GIRLS	70•3	75•0	78•1	53•1	23•4
SEGREGATED GIRLS	63•1	90•8	86•2	66•2	20•0

H. MONEY

ITEM NO.	87	88	89	90	91
CO-EDUCATED GIRLS	89•1	84•4	68•7	54•7	73•4
SEGREGATED GIRLS	95•4	90•8	75•4	61•5	76•9

I. TIME

ITEM NO.	92	93	94	95	96	97	98
CO-EDUCATED GIRLS	85•9	79•7	62•5	59•4	92•2	87•5	21•9
SEGREGATED GIRLS	92•3	83•1	75•4	55•4	93•8	95•4	26•2

J. AREA

ITEM NO.	99	100	101	102	103	104
CO-EDUCATED GIRLS	64•1	70•3	40•6	53•1	79•7	15•6
SEGREGATED GIRLS	63•1	73•8	43•1	44•6	78•5	16•9

K. NUMBER

ITEM NO.	105	106	107	108	109
CO-EDUCATED GIRLS	48•4	87•5	73•4	65•6	73•4
SEGREGATED GIRLS	49•2	90•8	81•5	75•4	90•8

L. TABLES, GRAPHS AND CHARTS

ITEM NO.	110	111	112	113	114	115
CO-EDUCATED GIRLS	79•7	62•5	87•5	93•7	62•5	92•2
SEGREGATED GIRLS	73•8	55•4	92•3	96•9	55•4	92•3

M. SPATIAL RELATIONSHIPS

ITEM NO.	116	117	118	119	120
CO-EDUCATED GIRLS	54•7	12•5	73•4	79•7	34•4
SEGREGATED GIRLS	60•0	20•0	86•2	81•5	36•9

APPENDIX D

Four Short Mathematics Tests

Test Papers and Item Analysis

TEST NO 1

NAME _____ FORM _____

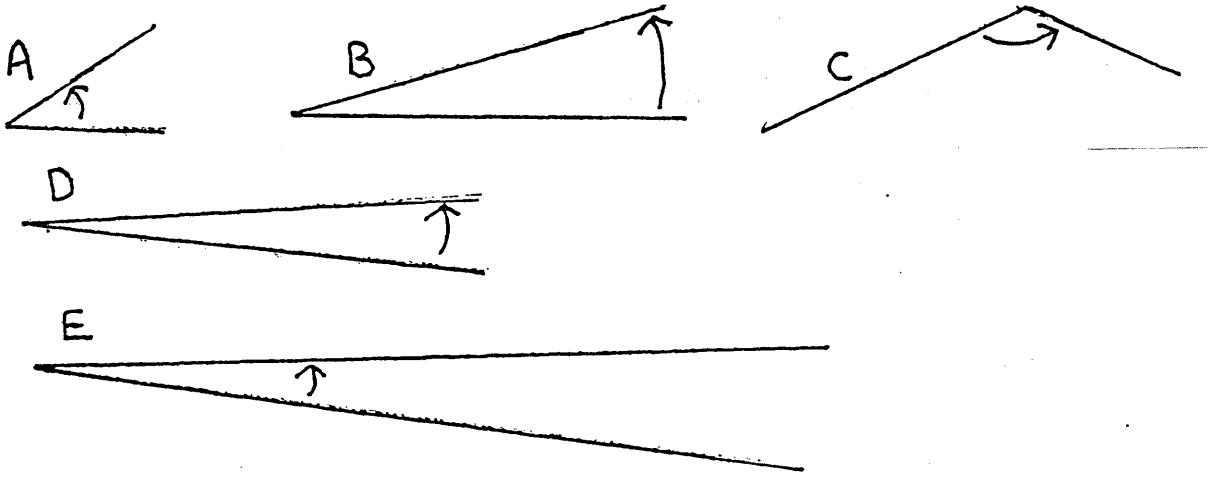
This test should take about 15 minutes, but you can take longer if you need the time.

Do try to give an answer to each question.

Any working out can be done in the blank spaces, or on the back of the test paper.

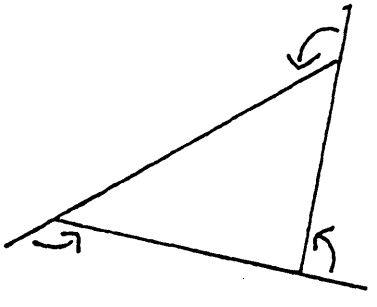
You do not require a protractor or compasses.

1. a) Which of these angles is the largest?



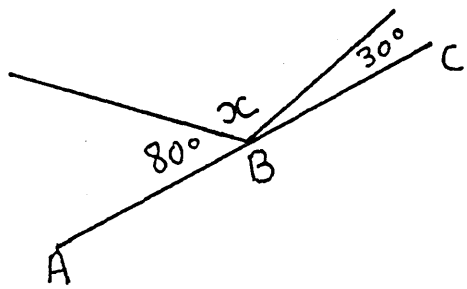
ANSWER _____

b) What is the sum of all the angles?



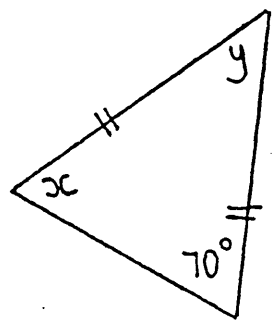
ANSWER _____

2. a) ABC is a straight line. What is the value of $\hat{x}$?



ANSWER _____

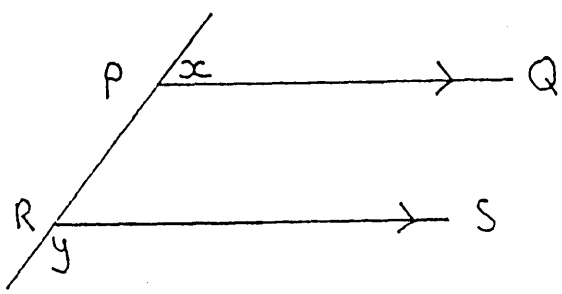
b) Calculate angles x and y for this isoceles triangle.



ANSWER x = _____

y = _____

c)

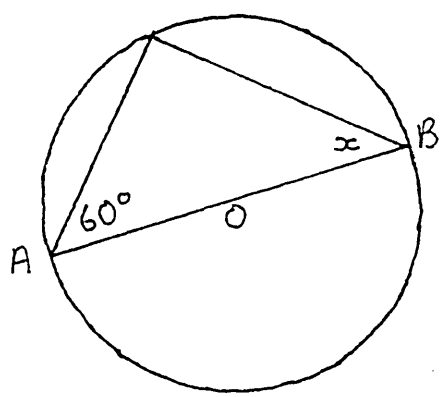


PQ is parallel to RS and $y = 2x$.

What is the value of angle x?

ANSWER _____

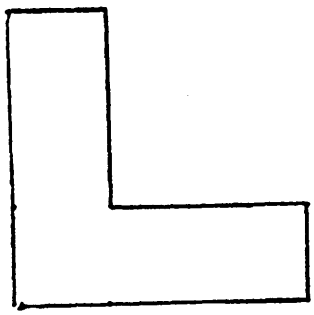
d)



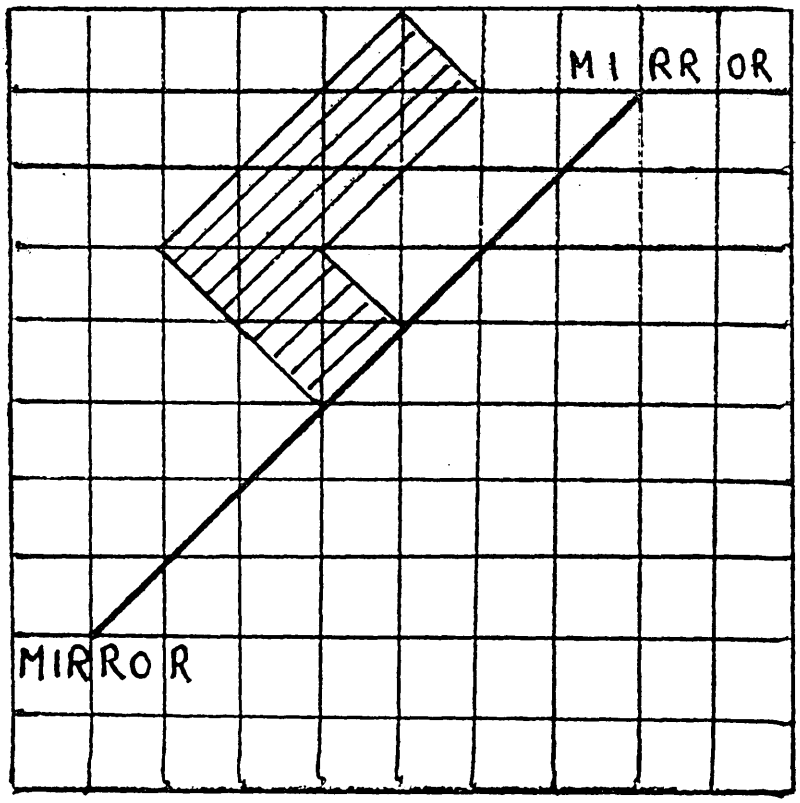
AOB is a diameter.
What is the value of angle x?

ANSWER _____

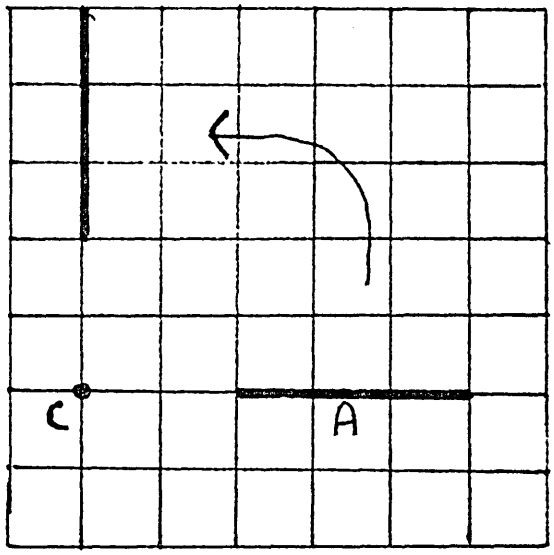
3. a) Draw in a line of symmetry on the shape below.



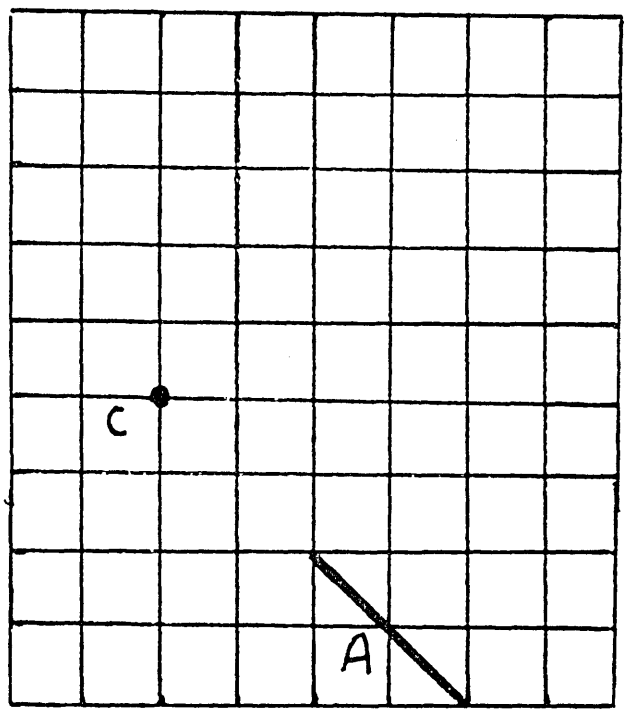
b) Draw the reflection of this shape in the mirror.

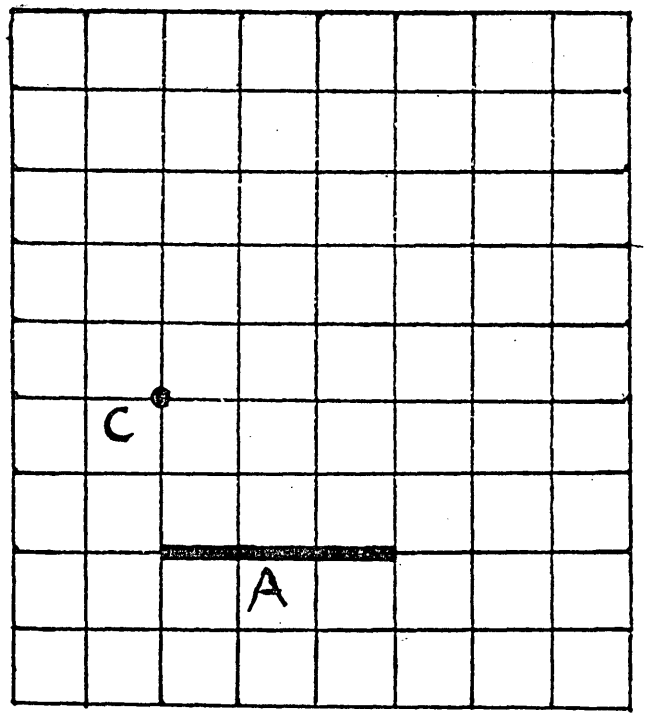


c) In this diagram, line A has been rotated through 90° at C.

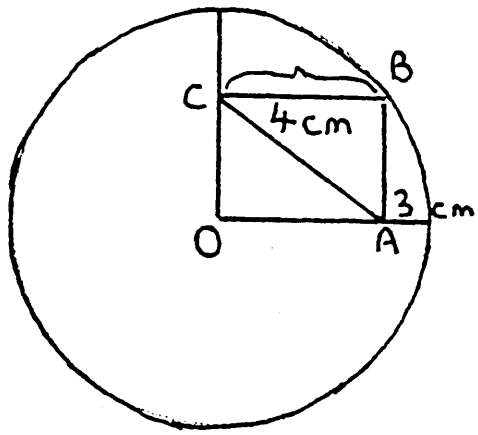


Rotate and re-draw line A through 90° in the two diagrams below.





4. O is the centre of the circle.
OABC is a rectangle.
What is the length of AC?



ANSWER _____

5. PT and PQ are both tangents to the same circle, and T and Q are their points of contact. What kind of triangle is PTQ? (Draw a freehand diagram if it will help you).

ANSWER _____

TEST NO 2

NAME _____ FORM _____

This test should take about 15 minutes, but you can take longer if you need the time.

Do try to give an answer to each question.

Any working out can be done in the blank spaces, or on the back of the test paper.

1. If a distance of 100 km is shown on a map by a line 4 cm long, then 1 cm represents:-

   A 20 km
   B 25 km
   C 40 km
   D 45 km
   E 50 km

   ANSWER _____

2. Water pours into a pool at a constant rate of 15 gallons every three minutes. What is the rate in gallons per hour?

   A 75
   B 150
   C 180
   D 240
   E 300

   ANSWER _____

3. If you can buy 8.55 French francs for £1, how much is a franc worth in English money to the nearest 1p?

   A 9
   B 10
   C 12
   D 14
   E 17

   ANSWER _____

4. A plane flies 1,056 miles in three hours.

   a) What is its average speed (miles per hour)?
   b) How far will the plane fly in $5\frac{1}{2}$ hours?

ANSWER a) _____

b) _____

5. A basic mix for pastry before adding water is flour, margarine and lard in the ratio of 4:1:1.

   a) What weight of flour should be used with 30 g of lard?
   b) If the basic mix weighs 450 g, what weight of lard is used?

ANSWER a) _____

b) _____

6. A woman walks 4 km at 4 kmph, and then travels by train for 80 km at 40 kmph. What is the average speed for the whole journey?

ANSWER _____

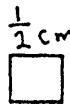
TEST NO 3

NAME _____ FORM _____

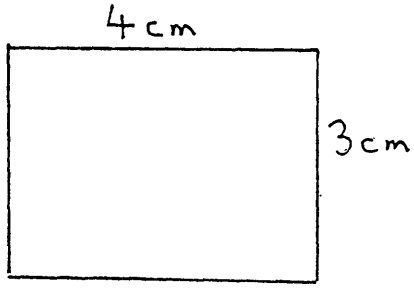
This test should take about 20 minutes, but you can take longer if you need the time.

Do try to give an answer to each question.

Any working out can be done in the blank spaces, or on the back of the test paper.

1. How many squares like this 

will fit into this rectangle?

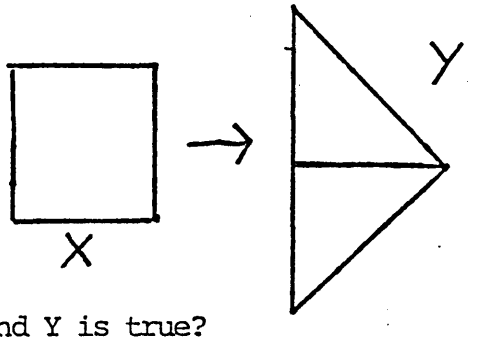


ANSWER _____

2. A gardener has enough grass seed to seed a rectangular lawn 8 m x 3 m. If instead he uses it to seed a lawn 6 m long, how wide will it be?

ANSWER _____

3. I cut square X into 2 pieces and arranged the pieces to make a new shape Y like this:-



Which statement about X and Y is true?

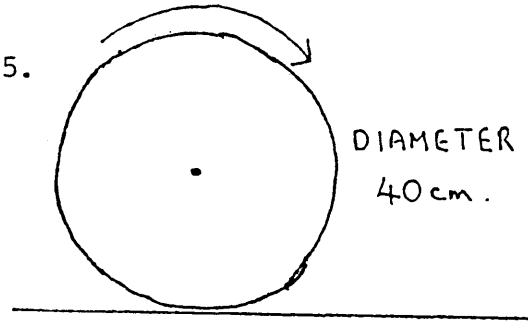
A X has a bigger perimeter.
B Y has a bigger perimeter.
C Y has a larger area.
D X and Y have the same perimeter.
E You cannot tell if one perimeter is bigger or not.

ANSWER _____

4. The height of an average man is about:-

A 85 cm
B 1 m
C 1 m 75 cm
D 2 m 50 cm
E 3 m 50 cm

ANSWER _____

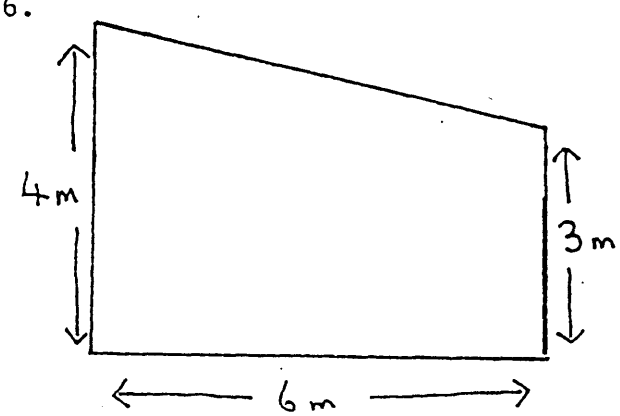
5. 

A wheel of diameter 40 cm is rolled through 5 whole turns without slipping along a level floor. If $\pi = 3.14$, which of the following answers gives the distance moved by the wheel?

A 728 cm
B 628 cm
C 528 cm
D 428 cm
E 1,256 cm

ANSWER _____

6.

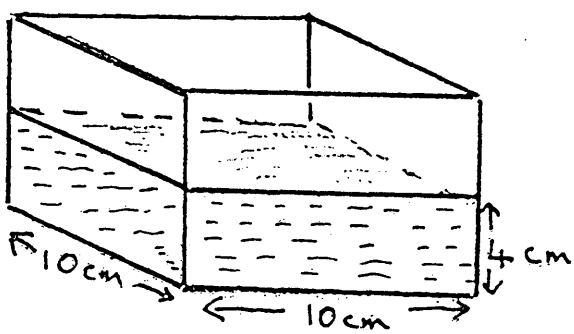


The diagram shows the end view of a lean-to shed.

Calculate the area of the end of the shed.

ANSWER _____

7.

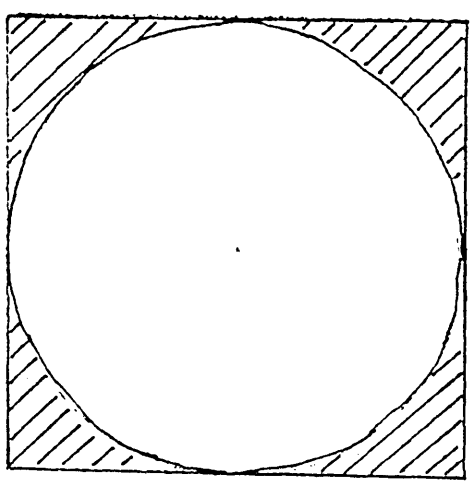


The diagram shows a tank containing water to a depth of 4 cm. An object is dropped in the water where it sinks and is completely covered. The water level in the tank rises 2 cm.

What is the volume of the object in cubic centimetres?

ANSWER _____

8.



The perimeter of the square is 56 cm. If $\pi = 3\frac{1}{7}$ calculate the shaded area.

ANSWER _____

TEST NO 4

NAME _____ FORM _____

This test should take about 15 minutes, but you can take longer if you need the time.

Do try to give an answer to each question.

Any working out can be done in the blank spaces, or on the back of the test paper.

1. If $a = 2$, $b = 3$ and $c = 1$, find the value of:-

   (i) $3a - 4c$ ANSWER _____

   (ii) a^3 ANSWER _____

   (iii) $a(b + c)$ ANSWER _____

2. Write your answers in their shortest form using p.

   (i) $p + p + p + p$ ANSWER _____

   (ii) $p \times p \times p \times p$ ANSWER _____

3. Remove the brackets $3a(a + 2b)$. ANSWER _____

4. Find the value of a in each of the following equations:-

   (i) $3a - 1 = 11$ ANSWER _____

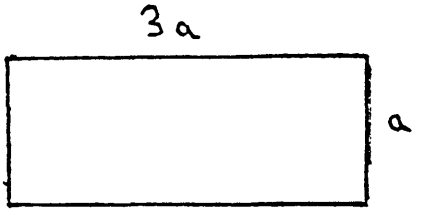
   (ii) $4a - 3 = 3a + 7$ ANSWER _____

5. What do we write for a number which is one more than the number p? ANSWER _____

6. A bar of chocolate costs x pence and a packet of crisps costs y pence. Using x and y in your answer, what is the cost of 3 bars of chocolate and one packet of crisps?

ANSWER _____

7.



(i) Write the shortest answer for the perimeter of this rectangle in terms of 'a'.

ANSWER _____

(ii) Write the shortest answer for the area of the rectangle in terms of 'a'.

ANSWER _____

8. On a bus, there are (8m + 6w) people. At a bus stop, 5m people get off and 4w people get on.

Write the number of people now on the bus, using the letters m and w.

ANSWER _____

9. The cost of x packets of crisps is 90 pence.

Write down the cost of a single packet of crisps using x and 90.

ANSWER _____

FOUR SHORT TESTS

PERCENTAGE IN EACH GROUP ANSWERING EACH ITEM CORRECTLY

TEST No. 1 GEOMETRY

ITEM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13
CO-EDUCATED GIRLS	87•3	36•5	88•9	85•7	74•6	9•5	27•0	57•1	76•2	27•0	3•2	12•7	20•6
SEGREGATED GIRLS	84•1	31•7	92•1	87•3	82•5	7•9	30•2	47•6	84•1	25•4	4•8	9•5	42•9

TEST No. 2 PROPORTION, RATES AND RATIO

ITEM NO.	1	2	3	4	5	6	7	8
CO-EDUCATED GIRLS	92•2	79•7	31•2	59•4	32•8	51•5	37•5	9•4
SEGREGATED GIRLS	87•3	74•6	23•8	60•3	30•2	47•6	22•2	7•9

TEST No. 3 MENSURATION

ITEM NO.	1	2	3	4	5	6	7	8
CO-EDUCATED GIRLS	46•9	37•5	28•1	60•9	29•7	21•9	9•4	9•4
SEGREGATED GIRLS	66•7	49•2	15•9	66•7	28•6	14•3	19•0	12•7

TEST No. 4 ALGEBRA

ITEM NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CO-EDUCATED GIRLS	90•6	53•1	48•4	45•3	65•6	20•3	85•9	32•8	32•8	53•1	32•8	20•3	75•0	43•7
SEGREGATED GIRLS	87•1	67•7	53•2	40•3	64•5	35•5	82•3	35•5	24•2	53•2	24•2	25•8	88•7	40•3

APPENDIX E

The APU Mathematics Attitude Questionnaire

Instructions and Questionnaire (relevant parts only)

Analysis of Statements

Assessment of Performance Unit

SECONDARY ATTITUDE QUESTIONNAIRE

ADMINISTRATION INSTRUCTIONS

AND SCORING KEY

This manual has been written as a guide for those wishing to use the APU Secondary Attitude Questionnaires to gather material for their own research. Details of the APU scoring methods are presented so that users may adopt the same marking schemes.

It must be stressed that, although this questionnaire has been used on large national samples of 15 year olds, no normative or standardisation data are supplied, so no direct score comparisons can be made with APU results.

A few major findings from APU surveys are discussed to give some indication of national findings but, at this level, no account is taken of variables that may be influential in smaller localised studies. Some of these variables might include: type and size of school, geographical locality and teacher influence, to name but a few.

The Questionnaire

The questionnaire is divided into 4 sections as follows :-

Part A

The purpose of Part A is to gauge reactions to mathematics on a very general level.
It is composed of statements expressing feelings about how useful, enjoyable and difficult mathematics is, as a school subject. Pupils are asked to rate the degree to which they agree with each statement.

Part B

Part B is designed to indicate opinions about particular aspects of the mathematics curriculum when just a topic name is given.
Pupils are asked to use separate 3 point scales to rate how useful and difficult they find the given topics.

Part C

Part C attempts to elicit more specific information about how pupils view a particular topic, having just completed a representative item.
Pupils are asked to work through examples drawn from the APU written test bank. After each one, they are asked to say how difficult they found that item and how useful they consider it might be, both now and in the future.

There are also spaces available for pupils to comment on the specific examples or the topics they represent, or to express any other feelings about them.

Part D

Part D was included for the first time in 1982.
It was designed to gain information about:

a) how pupils see mathematics in relation to other school subjects;

b) whether pupils regard the mathematical performance of girls and boys respectively as similar or different;

c) any other issues that pupils regard as relevant to their views of mathematics.

ADMINISTRATION INSTRUCTIONS

1. The attitude questionnaire may be administered in groups, but pupils should not be allowed to confer.

2. Pupils should be seated so that they can write comfortably without disturbing their neighbours.

3. Each pupil will require a pen or pencil. No other apparatus is necessary.

4. Once settled, ask pupils to enter the following on the front cover (as required by the researcher):-

   a) date of birth
   b) today's date
   c) a tick next to Female/Male as appropriate.

   Pupils are not asked to give their names in APU surveys, however, if names are required, they should be entered above Date of birth on the cover.

5. Tell pupils to :-

   a) read through the instructions and ask if there is anything they do not understand or cannot read. The teacher is permitted to clarify misunderstandings at this point;

   b) work through the questionnaire at their own pace. There is no time limit;

   c) ask for help if they are unable to read the instructions or questions. These may be read to pupils, though no translation or alternative wording should be given.

SCORING

Part A - Statements

Previously run factor analyses have revealed that, by and large, each statement contributes to one or more of 3 scales; a Difficulty Scale, a Utility Scale and an Enjoyment Scale. While it is of note that the statements are not mutually exclusive, for the purposes of this exercise, statements have been allocated to the scale with which there is the strongest association.

Statements are scored 5 → 1 or 1 → 5 depending on whether a positively or negatively loaded statement is being rated.

The following statements are scored 5 → 1:

12	18	24	30	38	45
14	20	25	32	40	46
15	21	27	36	41	48
16	22	28	37	44	

For these statements, a tick in each box is scored as follows:

Example:

I'm surprised if I get a lot of maths right.

Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure
5	4	2	1	3
	✓			

A score of 4 would be recorded for a tick in the "agree" column.

The following statements are scored 1 → 5:

13	31	39
17	33	43
23	34	47
26	35	

In the above cases, a tick in each box is scored as follows:

Example:

Maths is easy for me.

Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure
1	2	4	5	3

A tick in the "Strongly Disagree" column would be given a score of 5.

"Unsure" is designated a middle range score, falling somewhere between agreement and disagreement, and given a value of 3 in all cases.

Statements that are omitted are given a score of zero (0).

Statements 19, 29 and 42 are not included in the scoring of the scales.

The Scales

The computation of a total score for the statements should be resisted because that implies that the feelings being measured in the statements constitute a single trait and statistical analysis has revealed that this is not so.

However, separate scores can be computed for the 3 previously mentioned scales, by summing the points awarded for the statements as follows :-

Difficulty The following statements contribute to the difficulty scale. To yield a "difficulty" score, sum the pupils' scores over these statements :-

12	26	32	39
15	27	34	41
16	28	36	44
24	30	38	46
			47

Utility The following statements contribute to the utility scale :-

13	31	45
17	33	48
21	35	
23	43	

Enjoyment The following statements contribute to the enjoyment scale :-

14	25
18	37
20	40
22	

Part B - Topics

Both "Usefulness" and "Difficulty" are scored 1 → 3, as follows :-

Example: -

Finding areas of shapes

USEFULNESS			DIFFICULTY			
Not Useful	Fairly Useful	Very Useful	Not Difficult	Fairly Difficult	Very Difficult	Not Done
1	2	3	1	2	3	0
		✓		✓		

In the above example, the score for utility (usefulness) will be 3 and the score for difficulty 2.

"Not done" is given a score of zero (0).

Total scores are not calculated for each of these scales.

Pupil Number

APU Assessment of Performance Unit

Department of Education and Science
Welsh Office Education Department
Department of Education for Northern Ireland

Mathematics Attitude Questionnaire

SECONDARY

Apparatus permitted: pen/pencil ONLY

Date of birth ..... Female .....

Today's date ..... Male .....

ABOUT THIS BOOKLET:

In this booklet are some questions asking you how you feel about maths and some of the things you might do in maths, like multiplying or using graphs.

THIS IS NOT A TEST. We just want to know how interesting or boring, easy or difficult, useful or useless you find maths.

You don't have to put your name on this booklet so no one you know will see what answers you give.

Please tell us what you really feel - it will help us to understand more about what pupils of your age really think about maths.

There are 4 parts to this booklet and each part has separate instructions.
Please turn to page 2 for the instructions to Part A.

PART A

Pages 3 and 4 contain a list of statements that pupils of your age group have made about maths.

We want to know how much you agree or disagree with these statements.

FIRST, read each statement carefully.

NEXT, tick the column that best describes your feelings about that statement.

Here are two examples that show you what to do:

STATEMENTS	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided
I would like to do well in maths.	✓				
I feel proud of the work I do in maths.			✓		

The pupil strongly agrees with the statement in the first row, but disagrees with the statement in the second row.

NOTICE there is only one tick in each row.
Please put one tick in each row and don't miss any rows.

IF YOU DON'T UNDERSTAND, put up your hand and tell the teacher in charge.

NOW do Part A.

STATEMENTS	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided	
en it comes to doing a problem in maths, I get ll the formulas mixed up.						12
en I leave school, I won't think again about st of the maths I've done.						13
e more you study maths, the more interesting t becomes.						14
en I do well on a maths test, I consider self lucky.						15
go on to new work in maths far too quickly r me.						16
don't find much use for maths outside of hool.						17
find maths lessons interesting, whatever we e doing.						18
t's hard to find a good job unless you've passed ur maths exam.						19
like maths because I have to think things t.						20
u won't be able to get on in life without a od knowledge of maths.						21
enjoy working on maths problems.						22
st people only need to learn enough maths take care of their money.						23
can't remember half the things we study maths						24
enjoy the fact that there's always mething new to learn in maths						25
usually get most of my maths right.						26
'm not interested in anything in maths but imple everyday arithmetic.						27
find maths difficult to understand even nen it's explained.						28
aths is more relevant for boys han girls.						29

STATEMENTS	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided	
I can do the work in class but I don't know how to apply it.						30
I only want to learn useful things in maths like measuring and keeping accounts.						31
I have more trouble understanding maths than any other subject.						32
Most maths problems seem pointless.						33
I usually understand a new idea in maths quickly.						34
I don't need maths much outside of school.						35
A lot of topics we study in maths make no sense to me.						36
Sometimes I work out maths problems for fun.						37
Each year maths becomes more difficult to understand.						38
Maths is easy for me.						39
I can get so interested in a maths problem that I don't know what's going on around me.						40
In lots of maths it's hard to know what's being asked of you.						41
When you're thinking of a career, maths is more important for boys than for girls.						42
I don't see the value of most of the maths we do.						43
I'm surprised if I get a lot of maths right.						44
Knowing maths is helpful in understanding today's world.						45
Most of maths is a monotonous repetition of the same thing.						46
Maths is one of my better subjects.						47
I can use maths to solve some everyday problems.						48

Now that you have finished Part A, check that there is only one tick in each row and that you have not missed any rows.

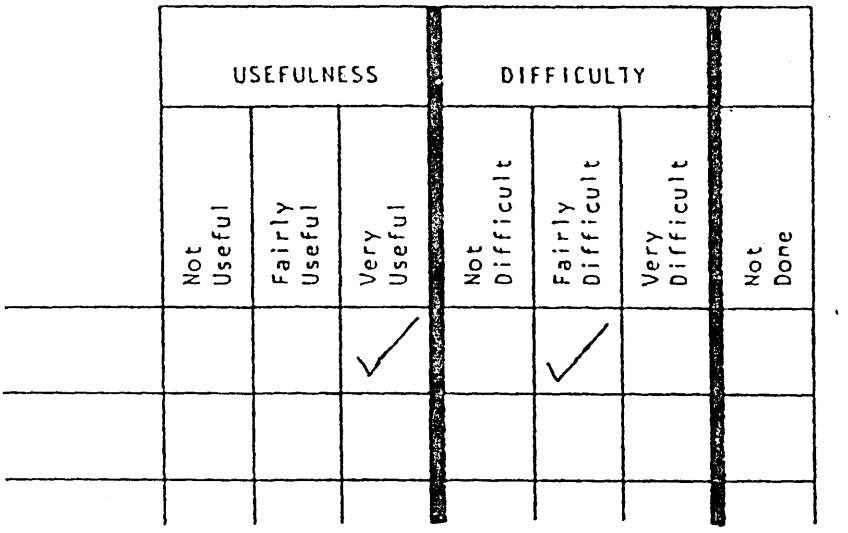
When you have done that, turn to the next page where you will find the instructions for Part B.

PART B

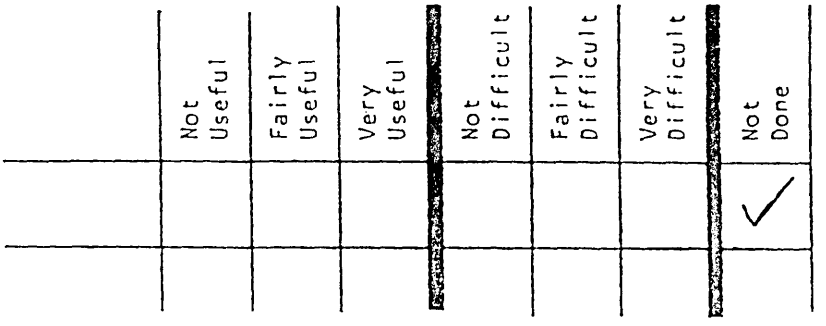
On the next two pages is a list of maths topics. We would like to know how useful and how difficult you find these topics and activities <u>in school</u>.

Next to each topic on the list are 2 sets of columns. One set refers to the <u>usefulness</u> of the topic. The other set refers to its <u>difficulty</u>. For each set, place a tick under the word that comes closest to your opinion.

For example, if you think that a topic is <u>very useful</u> and <u>fairly difficult</u>, you would place your ticks liks this:



But, if there are any topics that you have <u>not done</u> at school, place one tick in the Not Done column like this:



IF THERE IS ANYTHING YOU DO NOT UNDERSTAND, put up your hand and tell the teacher in charge.

	USEFULNESS			DIFFICULTY				
	Not Useful	Fairly Useful	Very Useful	Not Difficult	Fairly Difficult	Very Difficult	Not Done	
Using graphs or charts								..12..13
dding or subtracting fractions								..14..15
Problems in trigonometry (using sines, cosines, tangents, etc.)								..16..17
Finding volume								..18..19
Using negative numbers								..20..21
Multiplying or dividing decimals								..22..23
Finding areas of shapes								..24..25
Sets and Venn Diagrams								..26..27
ectors								..28..29
Calculating with percentages								..30..31
Using formulas								..32..33
Geometrical constructions (using compasses, set squares, etc.)								..34..35
Estimating lengths								..36..37

	USEFULNESS			DIFFICULTY				
	Not Useful	Fairly Useful	Very Useful	Not Difficult	Fairly Difficult	Very Difficult	Not Done	
Matrices								..38..39
Solving equations in algebra								..40..41
Adding or subtracting decimals								..42..43
Problems about scale (scale models, scale of maps, scale drawings, etc.)								..44..45
Finding perimeters (distance all round a shape)								..46..47
Multiplying or dividing fractions								..48..49
Averages (average speeds or scores)								..50..51
Measuring angles								..52..53
Reflections or rotations								..54..55
Number patterns								..56..57
Everyday problems (about money or recipes or "do-it-yourself" costs)								..58..59
Using flow charts								..60..61
Reading timetables								..62..63
Using calculators								..64..65

ANALYSIS OF STATEMENTS ON MATHEMATICS ATTITUDE QUESTIONNAIRE

		Strongly Agree and Agree	Disagree and Strongly Disagree	Undecided	Adjusted where necessary: Strongly Agree and Agree	Adjusted where necessary: Disagree and Strongly Disagree	CHI Square: df	CHI Square: Value
When it comes to doing a problem in maths, I get all the formulas mixed up	CG	40	16	5			2	3.55
	SG	33	16	12				
When I leave school, I won't think again about most of the maths I've done	CG	24	30	7	27	34	1	0.13
	SG	28	30	3	29	32		
The more you study maths, the more interesting it becomes	CG	26	30	5			2	7.00 *
	SG	26	20	15				
When I do well on a maths test, I consider myself lucky	CG	35	23	3	37	24	1	0.03
	SG	35	25	1	36	25		
We go on to new work in maths far too quickly for me	CG	26	29	6			2	1.77
	SG	28	23	10				
I don't find much use for maths outside of school	CG	16	45	0	16	45	1	5.12 *
	SG	27	31	3	28	33		
I find maths lessons interesting, whatever we are doing	CG	16	39	6			2	2.62
	SG	12	37	12				
I like maths because I have to think things out	CG	32	24	5			2	7.34 *
	SG	19	29	13				

		Strongly Agree and Agree	Disagree and Strongly Disagree	Undecided	Adjusted where necessary: Strongly Agree and Agree	Adjusted where necessary: Disagree and Strongly Disagree	CHI Square: df	CHI Square: Value
You won't be able to get on in life without a good knowledge of maths	CG	36	17	8			2	0·37
	SG	34	20	7				
I enjoy working on maths problems	CG	27	28	6			2	2·40
	SG	19	33	9				
Most people only need to learn enough maths to take care of their money	CG	18	39	4	20	41	1	6·51 *
	SG	32	25	4	34	27		
I can't remember half the things we study in maths	CG	36	23	2	37	24	1	0·32
	SG	39	21	1	40	21		
I enjoy the fact that there's always something new to learn in maths	CG	38	18	5			2	1·15
	SG	33	20	8				
I usually get most of my maths right	CG	32	23	6			2	1·11
	SG	27	25	9				
I'm not interested in anything in maths, but simple everyday arithmetic	CG	18	35	8			2	0·39
	SG	20	35	6				
I find maths difficult to understand even when it's explained	CG	19	31	11			2	1·71
	SG	21	34	6				
I can do the work in class, but I don't know how to apply it	CG	39	13	9			2	8·49 *
	SG	23	24	14				

		Strongly Agree and Agree	Disagree and Strongly Disagree	Undecided	Adjusted where necessary: Strongly Agree and Agree	Adjusted where necessary: Disagree and Strongly Disagree	CHI Square: df	CHI Square: Value
I only want to learn useful things in maths like measuring and keeping accounts	CG	17	36	8	20	41	1	1·26
	SG	25	34	2	26	35		
I have more trouble understanding maths than any other subject	CG	22	35	4	24	37	1	0·14
	SG	21	37	3	22	39		
Most maths problems seem pointless	CG	28	31	2	29	32	1	2·11
	SG	35	23	3	37	24		
I usually understand a new idea in maths quickly	CG	17	32	12			2	1·37
	SG	23	27	11				
I don't need maths much outside of school	CG	17	37	7	19	42	1	1·72
	SG	26	34	1	26	35		
A lot of topics we study in maths make no sense to me	CG	25	33	3	26	35	1	0·13
	SG	28	32	1	28	33		
Sometimes I work out maths problems for fun	CG	21	35	5	23	38	1	0·32
	SG	18	38	5	20	41		
Each year maths becomes more difficult to understand	CG	50	10	1	51	10	1	1·26
	SG	42	14	5	46	15		
Maths is easy for me	CG	3	49	9			2	-
	SG	6	49	6				
I can get so interested in a maths problem that I don't know what's going on around me	CG	15	38	8	17	44	1	0·35
	SG	20	40	1	20	41		

Adjusted where necessary

		Strongly Agree and Agree	Disagree and Strongly Disagree	Undecided	Strongly Agree and Agree	Disagree and Strongly Disagree	CHI Square df	CHI Square Value
In lots of maths it's hard to know what's being asked of you	CG	40	8	13			2	6·81 *
	SG	39	17	5				
I don't see the value of most of the maths we do	CG	33	26	2	34	27	1	0·13
	SG	34	24	3	36	25		
I'm surprised if I get a lot of maths right	CG	33	23	5	36	25	1	0·03
	SG	33	24	4	35	26		
Knowing maths is helpful in understanding today's world	CG	46	6	9			2	4·09
	SG	41	14	6				
Most of maths is a monotonous repetition of the same thing	CG	26	30	5			2	1·88
	SG	28	24	9				
Maths is one of my better subjects	CG	15	41	5			2	0·93
	SG	18	36	7				
I can use maths to solve some everyday problems	CG	50	8	3	53	8	1	1·44
	SG	46	13	2	48	13		

CG = Co-educated Girls
SG = Segregated Girls

*The difference is significant

APPENDIX F

Interviews with Girls

Supplementary Attitude Questionnaire and Transcripts

Some girls of 15 and 16 regard maths as one of the most difficult subjects on the curriculum. Your answers to the Mathematics Attitude Questionnaire last summer suggested that some of you find maths difficult.

I am particularly interested in two points:-
a) When do girls begin to find maths difficult?
b) Why does maths seem to be so difficult?

This short questionnaire is anonymous and completely confidential. No-one at school will ever see the completed forms.

Please complete this form as carefully and as honestly as you can. There are no right and wrong answers. I am interested in your individual opinions.

Remember that your responses should reflect as far as possible your own experience of maths.

1. When did you first come to regard maths as a difficult subject?

Place a tick in the appropriate box.

In primary school?	
In the first year of secondary school?	
In the second or third year of secondary school?	
In the fourth or fifth year of secondary school?	
Not sure	
Never	

2. This section contains 18 statements. I want to know whether you agree or disagree with these statements.

First, read each statement carefully. Next, tick the appropriate column to show whether you strongly agree, agree, disagree or strongly disagree with the statement. If you are not sure, or think that the statement does not apply to you, tick the undecided column.

You must only place <u>one</u> tick in each row.

If you are not clear about these instructions, put up your hand and ask for an explanation.

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	UNDECIDED
I find maths quite easy when the teacher explains carefully.					
If I worked hard in maths lessons, my friends would tease me.					
My parents are interested in how I am getting on with my maths.					
I think I would do better if there were no boys in my maths class.					
Students who take physics and chemistry find maths easier than those who don't.					
I always try to do my maths homework properly.					
Many teachers believe that maths is really a boys' subject.					
Maths will be very useful to me after I leave school.					
Girls are unable to concentrate as well as boys in maths lessons.					
Many boys do well at maths because they also take technical drawing.					
When you're thinking of a career, maths is more important for boys than for girls.					
Boys are naturally better than girls at maths.					
Most maths teachers give girls and boys equal attention in class.					
My parents think that maths is more important for boys than for girls.					
My friends encourage me to take no interest in maths.					
Boys demand most of the teacher's attention in maths lessons. They don't give the girls a fair chance.					
We go on to new work in maths far too quickly for me.					
Doing my maths homework helps me to understand the lessons.					

3. This section contains a list of suggestions which may have contributed to the difficulties you face in maths.

Read the list carefully.

Now try to pick out from the list the factor which has caused you the most difficulty. Mark 1 in the box alongside this factor. If you can, pick out the second most important factor and mark 2 in the box alongside it. Try to do the same for the third most important factor, marking it with a 3.

Do not go beyond this. I only want you to mark the three main factors.

If you are not clear about these instructions, put up your hand and ask for an explanation.

Not using maths in my leisure time activities.	
The hostile attitude of some of my friends towards maths.	
The behaviour of boys in maths lessons.	
Not being able to understand much of the work in maths lessons.	
Lack of support and help with maths at home.	
Not taking subjects like physics and technical drawing in the fourth and fifth years.	
Maths teachers who devote more attention to the boys rather than the girls.	

4. This questionnaire does not cover all the reasons why many girls seem to find maths such a difficult subject.

If you can think of any additional reasons which apply to yourself, please list them below.

Thank you for your help.

S.W. Smith

S = Interviewer (Stuart Smith).

INTERVIEW WITH J.

22.3.84

S. First of all, how would you rate Maths in terms of difficulty with other subjects?

J. It's very difficult to say, it depends what we're doing in Maths.

S. What about in general?

J. In general, I find it hard compared to many subjects.

S. Now, imagine it's a Maths lesson. Mr. T.A. has set you an exercise. You come to a question you can't do. What do you generally do when that happens?

J. Well, I'll always struggle hard to do it first, but if I can't - then I'll ask the teacher.

S. I see. Have you any alternative to asking Mr. T.A. ?

J. Not really.

S. Do you normally sit with a friend?

J. Yes.

S. Would you try and work it out together?

J. Yes, sometimes (giggle).

S. Yes, fair enough. Now a slightly different situation. Mr. T.A. is explaining something at the blackboard. You can't understand. What do you do?

J. Ask him to repeat it.

S. You don't mind asking for help in class. You're not shy?

J. No definitely. I will ask if I'm stuck.

S. Right, the next one. You're doing your Maths homework. You're struggling. You're stuck. What do you do next?

J. I'd try and have a word with Mr. T. A. before the work's due in. I try to sort it out. Very rarely do I hand it in saying I couldn't finish.

S. What about with your friends in registration time - do you ever try to sort it out then?

J. Yes sometimes.

S. What about help at home?

J. Me dad can help a little, but he often gets stuck. (giggle)

S. What does he get stuck with?

J. Quite a lot. He says Maths has changed such a lot since he was at school.

S. Right. Now I'd like to have a look at the questionnaire you did for me last week. Would you have a look at the first question. Can you remember how you answered? You remember I asked you when you came to regard Maths as a difficult subject. What did you answer?

J. From the fourth year.

S. That's interesting isn't it? You're telling me that up to the third year, you had little difficulty?

J. I found it fairly easy, but then in the fourth year we began to do sines and trig ratio and stuff like that and I began to get lost.

S. It's a lot to do with topics then?

J. Yes. I think, (pause) I think for me we began to move too fast. I just begin to grasp something, then we have to move on. Last year, it was very hard. We were pushed and pushed, we moved so fast, I couldn't really

grasp anything.

S. That's interesting. You know on the questionnaire I asked you if you felt you moved on in Maths too quickly and all the girls agreed.

J. Yes, there's an awful lot to learn.

S. How did you find it up to the third year though?

J. I found it fairly easy. I'm not saying it came to me. I had to work to understand.

S. Yes.

J. But in the 4th and 5th year it's been very hard.

S. Now you've mentioned trig which is an obvious one.

J. Yes (giggle), we're doing that now.

S. Any other difficult topics particularly?

J. I find trying to remember (pause) theories - I find them hard. I find remembering factorisation hard.

S. You're talking about algebra now.

J. Yes. I find algebra very difficult and fractions, I can't do fractions. (giggle)

S. Now. You say you've had Mr. T.A. for Maths the last two years - now I'm not trying to get at him, but is there possibly anything in the teaching techniques, say, which have given you problems? You've mentioned moving too quickly - is there anything else about the teaching you want to mention?

J. I think it's just me, for if I can't grasp something, I just switch off. You know, I'll struggle with it so

far, and if I can't cope I just lose interest. I think Mr. T.A. tries his hardest. He's got a hard set, but he does struggle along trying to make them work.

S. Yes, it's not an easy situation.

J. But despite the situation I do try to work things out.

S. But at a certain stage you switch off?

J. Yes. You know there are times when I realise I can't work it out. And I've sat there and sat there and I've thought I'm not trying anymore -I just can't do it.

S. You remember one of the statements I put on the questionnaire asked did you think the boys could concentrate better in Maths?

J. I think the girls can concentrate better.

S. Better?

J. Yes. In our set there are four or five of them who try. The rest just copy or want to lark about.

S. You're talking about the boys?

J. Yes.

S. I'll come back to the boys in a moment. Now you've said your problems began in the 4th year. I find that interesting. Did you find you began to have difficulties in other subjects at the time?

J. My French and my German. I find them both very difficult. I don't mean the first and second year. I liked it then. And even the third year.

S. That's why you opted for them?

J. Yes. I like languages. I think it's interesting.

S. But from the 4th year things changed?

J. Yes, it's gone a lot harder. There's a lot more grammar and verbs to learn.

S. So, it's not just Maths you've struggled with?

J. No, the three subjects I'm really struggling with are Maths, French and German.

S. I think we've covered that fairly well, J , now, another point - have you missed much time through absence?

J. A lot in the fourth year. I had about eight weeks off with appendicitis.

S. Did that affect you much in work?

J. I think it did last year. I missed out on an awful lot of Maths.

S. What time of year was this absence?

J. Around February.

S. About halfway through the fourth year?

J. Yes.

S. Right, can you turn on a page, J . Let's go back to this question about boys. There's a statement there about boys in Maths lessons. What does it say?

J. (pause) I think I'd do better if there were no boys in my Maths class.

S. Can you remember how you answered that one?

J. I think I put I disagree because lads don't bother me much.

S. No?

J. I can switch off from them no trouble.

S. Yes. (pause) You're in fact saying you prefer mixed sets to all girls sets.

J. Well, it just doesn't bother me. I pay no attention to them. I just get on with my work. The only people I talk to are the people around me.

S. All girls?

J. Yes, all girls.

S. Do the boys sit in a separate part of the class?

J. More or less, yes. There are two boys who sit over on our side.

S. Can we turn to the last question on the next page, J ? If you remember, I asked you to pick three factors.

J. I only picked two.

S. Two. Now, I know you picked number four, because all the girls did, and it's hardly surprising. But what was the other factor?

J. I think it was the first one. (not using Maths in leisure time).

S. Can you explain what you meant by that?

J. Well, out of school, I just don't use Maths at all. I use, you know, on Saturdays, where I work, but it's just simple addition and subtraction.

S. Well, where do you work?

J. I work at a butcher's on the market.

S. Don't you find it useful?

J. Mm, perhaps, I'm keeping in touch with figures.

S. But apart from that, you just switch Maths off?

J. Yes.

S. Not much else, J . And the last one's a hard one. You're just coming to the end of five years at Stamford. If you were given the chance to reorganise the way Maths is set up and taught (pause) what would you do?

S. (pause) Any ideas to improve Maths?

J. Well, I don't think Maths should be taught to any sort of advanced level except to those who want to take it.

S. Yes.

J. Just those who need it as a profession. But the rest of us should just learn certain topics - you know useful bits.

S. You would not force those who struggle with Maths to do more advanced work?

J. No.

S. When would you introduce this choice?

J. What year?

S. Yes.

J. I think I'd start sort of the third year, because I think that's when it starts to get complicated. Late in the third year.

S. From the end of the third year say?

J. Yes.

INTERVIEW WITH D.

29•3•84

S. Can you tell me how you rate Maths in terms of difficulty in comparison with your other subjects?

D. I think it's one of the hardest. I find it the most difficult alongside French.

S. French is equally difficult?

D. Yes.

S. Let's come on to classwork now. Who do you generally sit with in Maths lessons?

D. EA

S. Apart from EA , who you obviously discuss things with, are there any other pupils you regularly communicate with during Maths lessons?

D. Sometimes with the girls who sit in front and behind us.

S. Whereabouts in class do you sit?

D. At the side, near the back.

S. Near the back corner?

D. Yes.

S. In the normal run of events, would you speak to any boys during the lesson?

D. Oh yes - but - none regularly.

S. Now then, imagine Mrs. has set you an exercise in class - you come to a problem you can't do. What do you generally do in that situation?

D. If EA can do it, she tells me what to do. If not, we go and see Mrs. .

S. Am I to understand that - the two of you work closely together?

D. Yes.

S. If she is stuck, would she ask you?

D. Yes - we always work together and help each other.

S. Now, the two of you can't work it out, you go and see Mrs. . Did you say then, or at the end of the lesson?

D. We go at the time we're stuck.

S. Do you find it fairly easy to get Mrs. attention when you need her?

D. Oh yes.

S. Now another situation. Mrs. is explaining something on the blackboard - a new topic - you don't understand - what would you do in that situation?

D. I'd just leave it, and ask for an explanation when she'd finished explaining.

S. You do not put up your hand in the middle of her explanation?

D. No.

S. Is that because you're shy?

D. A bit yes, but I find I can follow better when she shows me on my own.

S. Coming on to homework now. First of all, where do you generally do your homework?

D. Sometimes, at home in my bedroom, sometimes in Central Block.

S. What during the lunch hour?

D. Yes.

S. If you do it at school, do you generally work with someone else?

D. I sit with EA - we work on it together, and check one another's answers.

S. If you are doing your homework at home, and you are stuck you can't finish. What do you do?

D. I look through my books - to see if I can find some example - if I can and understand it, I finish off. Otherwise, I just leave it.

S. And you hand it in unfinished?

D. Yes, I'll explain why to Mrs. N if I see her.

S. Now, I'd like to look at some of the questions on the questionnaire I gave you a couple of weeks ago. Remember? Let's look at the first question - <u>when</u> did you come

to regard Maths as a difficult subject. Can you remember what you put?

D. Yes - I put 4th and 5th years.

S. Very recently in fact?

D. Yes.

S. Your problem began with the start of the CSE course?

D. Yes. It started getting harder. We began doing lots of things, lots of different things every week.

S. So one problem is new topics?

D. Yes.

S. And you talked of every week?

D. Yes, we do a lot. We move too fast.

S. Which new things in fact did bother you?

D. I don't really - pause - Equations - pause.

S. Think for a minute. Think of the different topics.

D. Pause - Area and Perimeter, I got stuck with them. And Trigonometry, that's the worst.

S. You say you also find French difficult? Was that about the same time?

D. Yes, it's the exam course. We started doing tenses and that.

S. Now, I don't want to be rude at all, D but do you think the problems you have in Maths perhaps is something

to do with yourself?

D. Sometimes, yes sometimes, I just switch off, and I don't follow what's going on.

S. You mean you don't always concentrate?

D. Yes.

S. Let me put it another way. Do you think over the last year or two your attitude to Maths has changed?

D. Yes, I can't be bothered with it at times. I've just got fed up with it now.

S. Are you looking forward to leaving?

D. Not really. I like school - but I'll be glad to see the back of Maths.

S. Do you remember the statement 'I think I would do better if there were no boys in my Maths class' How did you answer that? Did you agree or disagree with that statement?

D. I agreed with it.

S. Can you explain that a little bit to me?

D. Well, they muck about and mess about. They always want to talk. And they're all on top of the girls. So we have to change about. The topics and that.

S. Can you explain that a little bit to me?

D. Well, when they've finished theirs, we move on to something new, whether we've finished or not.

S. What you're saying is, the boys are better at Maths, they finished their work more quickly than the girls, so you all move on to something fresh?

D. Yes.

S. What about the boys' behaviour? How does this affect you?

D. Well sometimes you muck about with them. Or they just get on your nerves and you can't concentrate on what you're doing.

S. And if there were just girls in the set together?

D. It would be quieter. And more friendly.

S. You remember the last question I gave you? I asked you to pick three factors that had caused you most difficulty. Now I know you picked the fourth one, because every girl did. Which others did you pick?

D. I picked 'lack of support at home'.

S. And the other?

D. 'Maths teachers devote more attention to boys than girls.'

S. Can you explain what you mean about lack of support at home?

D. Well, the things we do at school now, me mum didn't do when she was at school. She doesn't understand the Maths.

S. Does she ever check whether you've done your homework?

D. No, (giggle). She wouldn't know if it were right or wrong.

S. One last question. You've just finished five years at Stamford. You know the Maths department well. If you were given the power to make any changes in Maths, what would you do? (Other than separate the girls).

D. No - because most of the teachers are all right. And I think the groups are equal. It's quite fair. Pause - and I wish we could go slower.

INTERVIEW WITH B.

9•4•84

S. If I asked you to place all the subjects you are taking in order of difficulty, where would Maths come?

B. The most difficult.

S. No doubt about that?

B. No, much the most difficult.

S. Is that perhaps because you're in the top set for Maths?

B. No, I don't think so.

S. You remember that questionnaire you did for me two weeks ago? I'd like to go through one or two questions with you. Now, the first question - how did you answer that one?

B. Yes, in the second or third year.

S. Well, let's take it from there. First of all, what about Maths in primary school?

B. No. I enjoyed that.

S. Then, in the first year at Stamford, you had Mrs. G ?

B. Yes, I liked Maths then. No problems.

S. But somewhere in the second or third year things changed. Can you tell me what happened?

B. Well it got harder. I got put in the very top set in the second year and it was harder.

S. Who was the teacher then?

B. Mr. T.B.

S. In what way did Maths become harder?

B. I don't know. The teacher wasn't explaining enough. Mind you, Mr. T.B. went through it again and again, but with Mr. T.A. (B s present Maths teacher) he just explains once, then tells you to do it. I need to be told over and over again before I get it.

S. You're talking about your present problems?

B. Yes.

S. You did find it clearer with Mr. T.B. ?

B. Yes.

S. Nevertheless, you first began to find Maths difficult in the second year.

B. Yes, but in the fourth and fifth years it gets harder and harder.

S. And what were you saying about Mr. T.A. ?

B. He says it once, then he puts a few questions on the board, and I get a bit of it, but by the time he gets to the end, I've lost it. So I ask him to explain it again, he explains it and comes and writes it down in my book, and I still don't understand it.

S. Let's talk about your present Maths class. Whereabouts in the class do you sit?

B. At the side near the window.

S. Do you normally sit with the same person?

B. Yes, with CA

S. Is she good at Maths?

B. Yes, she's just a bit higher than me.

S. Now, when Mr. T.A. sets you an exercise to do in class, do you work separately from CA , or work things out together?

B. Separately.

S. Now, if you were stuck with a particular problem?

B. I'd ask Mr. T.A. first. Then, if I couldn't follow him, I'd ask CA . She sometimes explains in an easier way.

S. Is Mr. T.A. generally available when you need him?

B. Oh yes. I don't have to talk much to CA .

S. Do you talk much to the other pupils around you?

B. Yes, the girls behind me, when I've finished my work.

S. Would you ever ask them to help?

B. Sometimes - not often.

S. Who sits in front - more girls?

B. Yes - only girls in my row.

S. Do you ever talk to any of the boys in Maths?

B. Not really.

S. If Mr. T.A. was explaining something to the class, and you didn't understand....

B. I'd put my hand up and ask him.

S. You're not shy about doing that?

B. No. I'd keep on asking him, until I'd got it.

S. Can we talk about homework now? First of all, where do you do your homework?

B. In my bedroom.

S. Do you spend much time on your homework?

B. Yes, I have to. My dad makes me do it properly.

S. Does your dad help if you're stuck?

B. If I ask him, he will. He can do some of the Maths, but not all of it.

S. Would it be normal to ask him when you're stuck?

B. Yes, I do.

S. Do you ever ask anyone at school?

B. No - I do my homework away from school.

S. What grade of pass are you hoping for in Maths?

B. Well, Mr. T.A. says he hopes I'll make grade C 'O' level, but I don't think I'll get it.

S. I find it quite interesting, B , that although you find Maths the most difficult subject, it also seems your best subject.

B. Yes - when I can understand it - I really enjoy Maths.

S. Now, can we look at some of those statements on the questionnaire. I put down 'I think I would do better if there were no boys in my Maths class'. Did you agree or disagree with that?

B. I agreed with it. It would be better with no boys.

S. Can you tell me why?

B. Well (pause) most girls you know, they wont tell Sir if they haven't understood. They wont tell him. I dont care whether lads laugh or not.

S. But the other girls?

B. They easy get upset. They wont ask. They stay quiet.

S. Does the boys' behaviour affect you?

B. No.

S. The other girls?

B. Not really. It's just they don't like asking.

S. Does this happen only in Maths?

B. No, in other subjects as well.

S. So, generally, girls would do better being taught alone?

B. Yes.

S. Do you think girls get a fair amount of attention?

B. No.

S. Can you explain?

B. Well, in Maths, if we put up our hands to have something repeated, he wont come to us first, he'll always go to the boys. So, we have to keep asking him to come over. And finally he'll come to us.

S. Do you think you would have preferred a girls' school?

B. Not really, no.

S. Have you discussed this at home?

B. No, not really.

S. With your friends?

B. Yes, a lot. We think girls would do better in exams if there were no boys in class. We all say there should be just sets of girls.

S. Now, can we look at the last question on the questionnaire. Now, every girl selected the fourth item as a factor causing difficulty in Maths. Can you remember the other ones you picked?

B. I picked the one about teachers giving boys the attention.

S. Yes, we've talked about that already.

B. (Long pause) I can't think of any other.

S. Never mind, Can you think of any other teachers or lessons where the boys are favoured?

B. No, I don't think so.

S. Now just one final question. You've been at Stamford five years now. You know how the Maths is organised. Now, if I could give you the power to re-organise the way Maths is set up at Stamford, have you any ideas?

B. Well, I'd split the lads from the girls, and I'd put a woman teacher with the lads and a man teacher with the girls to make it stronger to them. Yes (giggle) it would be all right that.

S. You prefer men teachers?

B. Yes.

S. Just individual teachers or generally?

B. No, generally. They're much better.

S. Would your friends agree with you?

B. (giggle) Not really.

S. Any other thoughts about Maths?

B. No.

INTERVIEW WITH W.

9•4•84

S. If I were to ask you to place the seven or eight subjects you are taking in order of difficulty, what would you pick as the most difficult?

W. Maths.

S. Quite sure about that?

W. Absolutely positive.

S. Any others that you find very difficult?

W. Well, English, sometimes, it depends what we're doing.

S. I'd like to go through some of these questions from the questionnaire you did. Remember?

W. Yes.

S. The very first question was <u>when</u> did you come to regard Maths as difficult. Do you remember how you answered?

W. The second or third year of secondary school, I put down.

S. Now, let's look at that for a bit. Can you remember who was teaching you at the time? Who took you in the 1st year?

W. Mr. T.B.

S. Were there no problems then?

W. No, because it was just going over what we'd done at previous schools.

S. Primary school?

W. Yes. And then in the Second Year we started having Mr. H. and it started getting difficult. At first, we did similar stuff what we had with Mr. T.B. . Then we started moving on. You go over things too quick. We'd no sooner start one thing than we'd move to another thing. And then those that are dragging behind, he sort of leaves them dragging behind, and he wont pick them up with the rest of the class, so it becomes a sort of two way class - the highest set and the lowest set.

S. You found it was quite clearly in the second year that your problems began?

W. Yes.

S. You said you started moving around quickly from one topic to another - more quickly than in the first year?

W. (Pause) Yes, much quicker.

S. Now I know it's a long time ago, but can you remember some of the topics you began having difficulty with?

W. Area and, you know, Volume. We just seemed to move on too quick.

S. Any other topics?

W. Mainly Area (pause) and triangles.

S. Geometry?

W. Yes.

S. Let's look at working in class now in the fifth year. Whereabouts in class do you sit?

W. Right at the front, by the door.

S. Do you sit on your own?

W. No - I sit with XA

S. And who sits behind you?

W. No-one.

S. Apart from XA and Mr. P. , is there anyone in the class you would speak to regularly in the lesson?

W. Well, I suppose, well, in the lessons, girls just talk to girls don't they? I talk quite a bit to the four girls who sit behind the desk that's empty. I sometimes talk to them, but mostly I just talk to XA

S. Now, let's take a normal lesson situation. Mr. P. has set you some work to do, an exercise in lesson time. First of all, would you try to solve the problems on your own, or would you work with XA from the start?

W. We'd work on it together.

S. Now, at some time, you're going to come to a problem that neither of you can answer. What do you do at that stage?

W. (Pause) I'd either talk it over with the girls behind me, because I'd rather talk to the girls behind me, you know when you go up to Sir he either shouts at you for not understanding, or as though you haven't been listening.

S. But you wouldn't go to Mr. P. in the first instance?

W. No.

S. Are you nervous of him then?

W. Yes.

S. Were you nervous of your other Maths teacher?

W. Mr. H. , I was, but not Mr. T.B .

S. Have you had anyone else for Maths?

W. No.

S. That's interesting. Was it just that you weren't nervous of Mr. T.B. , or was it you that changed when you went in the second year?

W. I think it were me that changed actually. I just (pause) didn't like Maths from the second year. So, I got scared of going to the lessons, you know, and (pause) I never dodged lessons -

S. But it would be true to say you didn't enjoy Maths?

W. Yes.

S. Is it still true to-day?

W. Yes (pause). It all depends on what we're doing. If I know it's something I can do - I enjoy Maths then. Then, there's weeks when I can't do it, so I don't enjoy it. (giggle).

S. Would you ask Mr. P. for help if you were desperate?

W. (Pause) Yes. I'd go up to him - but if he was in a mood, like he normally is, I think I'd just leave it.

S. What if Mr. P. was explaining something on the blackboard, and you didn't understand, would you put up your hand?

W. (Pause) I think I'd just sit there and look puzzled. Like, some days he'll bother with you, and some days he wont. And if you look puzzled, he'll just ignore you some days - and then I'll just shout out 'I don't understand' - because if you put up your hand, most days, he'll just ignore you.

S. Does he ever ask the whole class 'Do you understand that'?

W. It all depends what mood he's in. If he's niggly, he'll just sort of say 'Right, get on with it.' Then there's some days he'll say 'Do you understand?' And if there's just one or two of us, he'll say 'Right come to my desk and I'll explain.' And some days, he'll just blow his top. (giggle)

S. What about homework? Do you do homework?

W. No. (pause). Hardly ever.

S. Why is that?

W. I can't sit down and do Maths. I can't do it with English neither. There's only (pause) say if it's Commerce and I know I can do it, I'll sit down and do it. If I can't, I wont.

S. How long has this been going on with your Maths?

W. I used to do it before. But I've always been like that. If I can't just see how to do it - I'll slam it down and give up (pause) especially with Maths, but I think it began about (pause) fourth year, I gave up trying with Maths homework. I think I've only done two pieces of Maths homework in the fifth year.

S. What does Mr. P. think about this?

W. Well, in the fourth year, he said do your homework - if it isn't done, you go to Mr. T.C. (Mr. T.C. - a senior teacher). And then in fifth year he said, 'Right, I can't be bothered if you don't do your homework, it's up to you.'

S. He just marks homework from those who hand it in?

W. Yes.

S. Now, I know it's easy for us to criticise the teachers, and also the difficult topics, and the speed at which

you move from topic to topic, but do you think any fault lies with yourself and your attitude to Maths?

W. Yes, sometimes, yes (long pause).

S. If you were given the choice, would you give up Maths altogether?

W. I think I would, yes.

S. You do dislike it that much?

W. Yes (giggle)

S. Can I go through some more of the questionnaire? I asked you 'I think it would be better if there were no boys in my Maths class' can you remember whether you agreed or disagreed with that?

W. I don't mind.

S. That means?

W. I'm not bothered if there are lads there.

S. Can I ask you then, what advantages there are to having boys in class?

W. I suppose you've got to get used to mixing haven't you? If you're with girls all the time, then you're in a situation where you're with boys, you'd sort of be shy with them being there. It all depends on what sort of boys they are. If they're loud and noisy, I just ignore them or tell them to shut up, you know? But most of them in our set are quiet, so it's all right, there's just a couple in the back corner that lark about. I think there's more girls in our set, so it's quiet.

S. Now let's look at the last one on the questionnaire. I asked you to pick out some of the factors that had caused you difficulty in Maths. Now, I know you picked the one

about not being able to understand some of the Maths lessons, because all the girls did. Can you remember the others you picked?

W. (Long pause) I think it was the hostile attitude of some of my friends towards Maths. (Pause) And lack of support and help with Maths at home.

S. Let's talk about these two then. What about your friends and being hostile to Maths?

W. Like some days you're in the mood for Maths and you walk in and there's XB , she sits in the corner like, and she's always going on about this Austria trip and she's on about who she met there and what she did and where she went and I just get fed up of hearing it, then there's other girls talking of where they're going to-night, what they're doing, who they are going out with and I just get that fed up of it, cos me and XA sit right on the front desk and XB sits behind us and I said to Sir 'if I hear this once more, I'm just getting up and moving,' so one day me and XA decided and XB started, so I picked up all my books and my bag and I walked across the class and dumped my things on an empty desk. So she starts being bitchy with us then and saying 'Why are you moving?' and I said 'Because I'm fed up of hearing about your stupid trip' So Mr. P. wouldn't speak to us for a couple of lessons. And we wouldn't speak to him, because he kept encouraging XB , asking her about Austria. He knew it got right up us nose. And all we could hear was her, she kept coming up to the front to talk to Mr. P. . It just got on me nerves.

S. Does XB like Maths?

W. She doesn't like any lessons, XB .

S. So one problem is getting on with other girls?

W. Yes.

S. Has it happened in other Maths lessons?

W. Well, XB : is the worst (pause) I did once fall out with another couple of girls. But it's mainly XB . No-one likes her.

S. Right, W Now this other one - 'lack of support and help with Maths at home.' Now you don't do Maths homework, so can you explain that a little.

W. Well, when I was in juniors, me dad left us when I was eight, so that confused me a bit. I didn't know whether I was coming or going, and I began to drift away from school. When I came to Stamford I was determined to do well, and I put more into my work and (pause) I don't know me mum just sort of tied up with everything else, and I was sort of scared of going home and asking for help, because she were that frustrated with everything else.

S. Were you facing these problems at the same time as Maths became more difficult?

W. Yes.

S. I did notice, incidentally, that you moved down a set in Maths at the end of the second year. Can you tell me about that?

W. I started getting right to the bottom of the class and my mum thought if she were in a set lower she would be at the top. And I didn't get on with the people in the top set. It were XC , he used to sit behind me, poking me, calling me names and everything.

S. So you spoke to your mum about it?

W. Yes. I just asked her could I be moved down a set.

S. Do you think now, looking back, it was a sensible thing to do?

W. Oh yes, I was right out of my depth.

S. Interesting what you say about XC though. Yet you say you don't mind boys in class.

W. Oh, it's just XC , he picks on anybody. He still does. I don't think he'll ever grow up. He doesn't bother me now.

S. One final thing. You've been through five years of Maths at Stamford. If you had the power, how would you change the way Maths is organised, and taught before you leave?

W. (Long pause) I don't think I'd increase the number of lessons. (Pause) I think they should start the harder things earlier. Like my sister, she's doing the same things that we're doing, yet she's only second year. They should start in the first year with harder stuff, then you'd do better when you start in the exam Maths courses in fourth and fifth year. They just started jumping the hard stuff on us much later, and we had it all to do. Our Mandy's covered Area already. We didn't start that till third or fourth year. And Pythagoras - that's difficult. (giggle)

INTERVIEW WITH Q .

15•5•84

S. First of all, Q , can you tell me of all the subjects you are taking in these exams, where does Maths rank in order of difficulty?

Q About the same really.

S. What does that mean, you find them all equally difficult?

Q Yes, much the same.

S. What about in terms of liking. Do you like Maths?

Q No. (giggle) I hate it.

S. Have you always disliked Maths?

Q No, I used to like it in junior school and the first year here.

S. I was going to come on to that. Do you remember the questionnaire you did for me some weeks ago? The first question I asked was, when did you first regard Maths as difficult. Can you remember how you answered? (Show Q the question).

Q (Pause) It was in the second and third year.

S. Who did you have as Maths teacher in the first year?

Q We had Mrs. F. .

S. And it was OK then?

Q Yes.

S. Can you remember some of the topics you did then?

Q Not really. (giggle)

S. It was from the second year things began to change?

Q Yes.

S. Who did you have for Maths?

Q Mr. H .

S. And things began to get more difficult, and you began to dislike Maths? Can you tell me what happened?

Q Well in the first year, I were dead quiet, then in the second year, I started messing about, and I lost concentration and I started getting in trouble.

S. Was this just in Maths or in all your subjects?

Q No, it were the same in most lessons.

S. Do you think the fault was with yourself or with the lessons?

Q Oh no, it was me. I just stopped trying. I used to be good at Maths at primary school. The headmaster used to say I had a mathematical brain (giggle) and I loved Maths.

S. And it carried on in the first year here?

Q Yes, and then in the second year, I started mucking about. There were a few of us.

S. Your friends?

Q Yes.

S. Which friends were they?

Q There was RA , RB and RC and RD , and we all used to muck about together.

S. Are you talking about the Maths lessons?

Q No, just generally. Me and RA were in the same form, but we mainly messed about in the lunch hour and after school and that.

S. Let's come back to the Maths for a minutes. Did you start to mess around in Mr. H's class?

Q Not particularly. It's just that when you start mucking about with a crowd you lose interest in lessons and I didn't bother with Maths anymore.

S. Did it affect all your subjects, or just Maths?

Q No, it was worse in Maths.

S. Why was that?

Q (Pause) Because you need Maths more than any other subject.

S. Do you regret the way you mucked about?

Q Yes, I thought I could always get by in Maths by common sense - but I've fallen too far behind.

S. Do you still have the same friends?

Q Yes.

S. Did you get in trouble with the teachers in the second year?

Q Yes.

S. Who with?

Q Miss T.O. , Mrs T.E., Mrs. T.F. .

S. So you got shouted at?

Q Yes. There was a load of trouble over the tuck shop.

S. Now, can you think of any other reasons why you began to lose ground in Maths in the second year?

Q Well, Mr. H. who took us in the second year didn't explain it proper. He didn't go into things deeply enough. Mrs. N. explains it better.

S. And did you find the work in Maths became harder?

Q Yes. (giggle)

S. In the second year?

Q No. More in the fourth year. I used to be in the top set for Maths up to the third year, then I got put in a C.S.E. set for Maths.

S. Which set?

Q Set 3 with Mrs. N .

S. So you had Mrs. N. again?

Q Yes.

S. And she makes you behave yourself?

Q Yes (giggle)

S. I did notice from your reports that you have had a lot of time off school. Did this affect your Maths?

Q I had a lot of time off, particularly in the fourth year, and it's hard to see what's been happening.

S. Why did you have so much time off?

Q I did play truant a lot of the time. Then in the fifth year, I had a lot of time off because I were poorly.

S. Did your truancy begin in the second year?

Q No, from the fourth year.

S. Was it with the same crowd you mucked about with?

Q No (pause) well a bit near the end of the fourth year.

S. Now let's talk about your present Maths lessons. Tell me first, where do you normally sit?

Q At the front, in the middle.

S. In the best place?

Q Yes. (giggle)

S. Who do you sit with?

Q RE

S. Apart from RE and Mrs. N. , are there any other members of the Maths class who you regularly speak to?

Q I talk to RF and RG.

S. Where do they sit?

Q At the side of us, by RE.

S. Any others you would talk to regularly?

Q No.

S. Now, imagine Mrs. N. has set you some work to do in class. Would you try to do the problems on your own?

Q No, RE and I normally work together.

S. Which of you is the better?

Q We're about the same.

S. Suppose RE and yourself get stuck, and can't sort out a problem, what do you normally do?

Q We ask Mrs. N .

S. Would you ask any other people in class first?

Q No.

S. And is Mrs. N. always available to help?

Q Yes. (pause) Sometimes, we have to wait a bit, we try some of the others, then she comes over.

S. Now then, imagine Mrs. N. is explaining something new to you all. She's working on the blackboard. You don't understand her explanation. What do you do?

Q I'd ask RE when Mrs. N. finished.

S. And if RE didn't understand?

Q We'd go and ask Mrs. N .

S. You wouldn't put up your hand and ask Mrs. N. while she was explaining?

Q No.

S. Why not?

Q Because it's ignorant.

S. To put up your hand?

Q Oh, I don't know - I wouldn't put up my hand anyway.

S. Is it that you're shy?

Q I don't like putting my hand up.

S. Why is it?

Q I don't know (giggle) I go all red.

S. You're embarassed?

Q Yes (giggle)

S. Is it just in Maths?

Q No, with everyone.

S. Now, homework, Q . Do you do your Maths homework?

Q No. It's ages since I did any.

S. Did you bother with Maths homework in the fourth year?

Q No.

S. Did you get chased up by your teachers?

Q No, not really.

S. When was the last Maths homework you can remember?

Q I don't really know. I have done it very occasionally.

S. Can we have another look at the questionnaire? Remember that list of statements? One I asked was 'I think I would do better if there were no boys in my Maths class.' Can you remember how you answered?

Q Disagreed.

S. What do you mean?

Q I don't agree with that. It's just the same whether boys are there or not.

S. Do you think boys and girls behave differently in class?

Q No, not really.

S. Do the boys embarass you at all?

Q No. I don't mind (giggle). It's usually the girls that put me off.

S. Can we now look at the last question. A list of statements causing difficulty with Maths. Now, all the girls picked the fourth one, quite naturally. I'm interested in the others you picked. Can you remember?

Q (pause) I picked the last one - about teachers giving more time to boys (pause) and the one about friends.

S. Tell me about Maths teachers devoting more attention to the boys. In what way?

Q Well (pause). I can't really explain it.

S. Well, try. Take your time.

Q Well, if a girl puts a hand up and a boy, the teacher always goes to the boy first. And when there's trouble, they always go to the boys first.

S. Are you talking just about Maths?

Q No, most subjects, but it always happens in Maths.

S. Mrs. N and Mr. H just the same?

Q I can't remember with Mr. H . It does with Mrs. N .

S. Are there any other ways that teachers favour boys?

Q They always go to them first. They get more attention. Especially the women teachers prefer boys. They give them more attention.

S. Now the other one. The hostile attitude of some of my friends. Are you talking about your friends generally, or just in Maths?

Q No. I mean the friends I muck about with, RC and RB and that. None of them like Maths (giggle).

S. Does RE put you off Maths?

Q No. She's all right. She works hard.

S. She's keener than you are?

Q Yes (giggle)

S. Just one final question, Q You're just finishing five years at Stamford. Looking back, can you think of any changes you would make to improve the Maths?

Q (pause) No. I can't think of any.

S. Do you blame the school at all, because you haven't done all that well in Maths?

Q No. I quite like the teachers, they do their best.

INTERVIEW WITH R.

22•5•84

S. If I asked you to place Maths in order of difficulty with your other school subjects, how would it rate?

R. The most difficult.

S. Sure?

R. Oh, yes.

S. Any equally difficult?

R. Commerce (pause). Sometimes.

S. When you were lower down the school, was Maths then the most difficult subject?

R. Well, Maths weren't so difficult lower down the school. I understood it better then. It's just as I've come up through the school. It's got harder.

S. That brings me on to my next question. You remember the questionnaire we did a few weeks ago? The first thing I asked you was when did you first find Maths difficult. (pause) Here's the question. Can you remember your answer?

R. I think it was (pause). I think it was 4th and 5th.

S. OK. Let's go through the early years at Stamford first. Now in the first year you had Mr. H. . Can you remember much about it?

R. Yes, I enjoyed it then. He went through it dead good. Thorough like. I could understand it then.

S. Now, take me on to the second year, you had Mrs. F. ? You were in set 1?

R. Yes (giggle) but I got thrown out at the end of the year.

S. So there were problems in the second year? Tell me about it

R. It were too difficult. She never went through it. I asked her to, but she just thought I were being awkward. And I couldn't understand what she were going on about.

S. Now, you say 'being awkward'. Were there problems between yourself and Mrs. F ?

R. No, not really. But I never seemed to grasp what she were doing so I asked so many questions, she thought I was just wasting time.

S. Was it partly to do with the speed of the work.

R. Yes, she was fast. She just went through it once and then said 'do it'.

S. Why do you think she was so quick?

R. Because it was the top set. Most of the others could do it.

S. Right. The third year you went in Mr. L's set. Which set was that?

R. Set 3. And I went to the top of Mr. L's set.

S. Was it too easy?

R. I found it easy. I could understand it.

S. Were you still enjoying Maths at this stage?

R. Not in the second year, but it was OK with Mr. L .

S. And the 4th year? C.S.E., how was that?

R. We had Mrs. F again. It was still too fast with her. Even though I weren't in the top set.

S. Do you think the problem is mainly the speed with which you cover topics in Maths?

R. Yes. Whenever we do something slowly, I can grasp it and do it properly. I need time for it to go through my head. I just need time to grasp it.

S. Does this not apply in other subjects?

R. No. I can understand nearly everything else. It's just Maths. I can't understand it.

S. Is it anything to do with the different topics in Maths?

R. I don't know (pause). There's a lot of things I can't do.

S. Can you tell me some of them?

R. Percentage (giggle). All Maths in Society. Most other topics are OK.

S. What about Trig?

R. We've never done much of that. I don't remember.

S. Algebra?

R. Oh. I can't do that (giggle), hopeless.

S. Let's talk about Maths now - in the 5th year. You have Mrs. G . Do you normally sit with somebody?

R. Yes, with SA

S. Where do you normally sit?

R. At the front. By the window.

S. You obviously talk to SA in lessons. Are there any other boys or girls you regularly talk to?

R. In the third year, I sat with SB.

S. I'm not talking of the third year just now. What about the fifth year. Apart from SA, do you talk to anyone regularly?

R. No one really. Not every lesson.

S. But in the third year you sat with SB. Did you work with him?

R. Well, he never did much, but it didn't stop me working.

S. Can you tell me whether you chose to sit with SB or were you placed there?

R. No, we just sat together because we were friends. I knew him outside school for many years. We were always friends.

S. Coming back to the 5th year. You sit with SA When Mrs. G sets you some problems to do in class. Do you work on your own until you're stuck, or do you work together all the time?

R. Well, at the start we tried to work on our own, but now we work together most of the time.

S. What about Mrs. F last year. Who did you sit with then? Was it SA?

R. No. I sat with SC.

S. And did you work on your own then, or with SC?

R. No. I couldn't do the work at all with Mrs. F . I had to work with SC.

S. Was SC better than you?

R. Not really. It's just that we could sort it out better when we worked together.

S. What happens nowadays when SA and yourself get stuck in Maths?

R. We call Mrs. G over.

S. Is she generally available or do you have to wait?

R. No, she comes straight away.

S. If you don't understand something Mrs. G is explaining on the board. What do you do?

R. I put my hand up and ask.

S. You're not shy?

R. Not with Mrs. G . I didn't like asking with Mrs. F last year.

S. Why were you shy with Mrs. F ?

R. I don't know. She scared me.

S. Mrs. F scared you, rather than the boys and girls around you?

R. Yes, it were Mrs. F . Although the others sometimes laughed, but I always expected Mrs. F to shout.

S. And you're more confident with Mrs. G ?

R. Yes. I feel we're more or less all the same with Mrs. G .

S. Can we go back to the questionnaire? One statement I gave you was 'I think I would do better if there were no boys in my Maths class'. Can you remember if you agreed or not?

R. I don't mind the lads at all.

S. Do you think boys behave differently to girls in Maths?

R. No, not really (pause). Some act a bit stupid like SD . Some mess a lot. But they don't bother me.

S. Do you think boys have more attention from the teacher?

R. No. (pause) I think in our set, the girls get more attention (pause). I'm not sure really.

S. Do you think you gain anything being taught with boys?

R. No (pause) No, it's just they don't bother me at all.

S. Do you remember that table of factors that might have caused you difficulty in Maths? Now, all the girls listed the fourth one - about not understanding the work in Maths. I'm interested in the other two factors you picked. Can you remember?

R. (pause) I picked lack of support and help at home. (pause) I can't remember the other.

S. Let's come back to lack of support at home. Can you explain what you mean by that?

R. Well, when I bring Maths homework home, my mum doesn't come up and ask how I'm going on, or offer to give me a lift. She just doesn't say anything. I'm left to get on with it.

S. Have you never had much help with your Maths?

R. I did from my sisters when they lived at home, but they've gone now.

S. Do you not ask your mum and dad for help?

R. I do ask her, but (giggle) she says she can't help and it's up to me.

S. What you really mean is that your mum and dad can't really help?

R. Yes.

S. Are they interested in you doing well in Maths?

R. Oh yes. They just want me to get on with it. They like me to do homework.

S. Do they help at all with other subjects?

R. No. I don't need any help. The only subject she's really interested in is my typing. She's always asking me about that. She thinks my typing will get me a job.

S. Have you done much Maths homework this year?

R. (pause) It's been revision mostly.

S. All year? Surely there's been some homework.

R. Yes.

S. Did you do it or not?

R. (pause) Sometimes.

S. But not always?

R. (giggle) No, sometimes I didn't bother. Sometimes I did it in morning registration with the others.

S. Did you get in trouble with Mrs. G ?

R. Yes. But sometimes she'd forget I hadn't handed it in.

S. Last question now. Thinking back over your five years at Stamford, can you think of any ways that the Maths department and Maths teaching could have been better organised? Or does any lack of progress lie with yourself?

R. (pause) I think it's me, not the school. I know I didn't do well with Mrs. F , but the others got along with her and did OK.

S. Was it a personality problem with you and Mrs. F ?

R. (pause) I think it was just me.

INTERVIEW WITH A.

24•5•84

S. If I asked you to place Maths in order of difficulty with your other school subjects, where does it rank?

A. I think about in the middle.

S. So you do find others more difficult?

A. Oh yes, particularly French (pause) English - it's not so bad- then comes the Maths.

S. So French is most difficult and then Maths with English?

A. Yes, that's about it.

S. Now do you remember the questionnaire I gave you some weeks ago? I'm very interested in the first question (when did you first find Maths difficult). Can we look at it together and perhaps you'd tell me what you put?

A. Third year. Second or third year I put.

S. O.K. Now, let's go back to the first year. You had Mr. L then. You didn't find Maths difficult then?

A. No, it was all right.

S. What do you remember about it?

A. I think it was the fact that there weren't many boys in our set. And we got on a lot better with it being a woman teacher. There was a good relationship. She's always been like that. Nice. If I get on with the teacher, I'll do it. And there weren't many boys. Only three or four. I find if there aren't many boys about I work a lot better.

S. So you've happy memories of first year Maths?

A. Yes. I enjoyed it then.

S. Now you said the problems began in second and third year. Can you remember how it began? You had Mrs. TG in year 2.

A. I think it was to do with the change of teacher. Because you're taught things different. So it became complicated when it came to working things out because she did it different.

S. Did Mrs. TG show you different ways for solving problems?

A. Yes. That was partly it.

S. Anything else?

A. No, except we began doing more difficult things. Equations and things like that.

S. So you moved on to new topics?

A. Yes.

S. Can you remember some of these topics - other than equations?

A. (pause) Well multiplication. It took me ages to master long multiplications. Oh, and percentage. (pause) and averages.

S. Have you done much geometry?

A. No. I can't remember. I think we did a bit last year.

S. Now to go back. Did Maths suddenly become more difficult in the second year, or was it a gradual change?

A. No, it was gradual.

S. Did the same apply to French? Was this difficult in the second year? Or was that later?

A. That was in the fifth year. We got a new teacher. We'd had Mr. L to the end of the fourth year and she was great. Then we changed to Mr. H . and he teaches different. So it went down from then.

S. So a lot of the problems depend on the teacher?

A. I think it does. Yes, I know it does.

S. But Maths was the subject you first found difficult?

A. Yes.

S. Can we talk about your fifth year Maths classes? Do you generally sit on your own or with someone?

A. No. I sit with BA and BB.

S. In a block of three? Three desks together?

A. Yes.

S. Are you in the middle?

A. No. On one side with BA in the middle.

S. Now, Mr. L sets you some problems to do in class. Would you work on your own to begin with, or as a team?

A. I try on my own at first, then when I'm stuck, I'll ask the teacher or BA .

S. Which would you generally ask first?

A. (giggle) BA , I think.

S. And if you were all struggling?

A. We'd go as a group to Mr. L .

S. Suppose Mr. L is explaining something on the blackboard, and you don't understand, would you put your hand up?

A. No, actually, I don't know whether to tell you this or not - I feel a bit silly - if she's explained something that seems easy to someone else - I wont ask because I'd feel stupid.

S. I'm glad you mentioned it. Believe me, there are many other boys and girls who feel the same. Are you in fact a bit self conscious?

A. Yes. I wont ask on my own - I will if someone else asks with me. If she asks for people to put their hand up and I can't do it I keep my hand down. Then if someone else puts their hand up, I don't mind. If someone else doesn't understand, I'm not embarassed.

S. What is it you fear? Is it something Mr. L might say or someone in the class?

A. Someone in the class.

S. Anyone in particular. I promise that anything you say will never get out in school.

A. Yes, well, BC (giggle). He's worst.

S. BC . He's a bit sarcastic?

A. Yes. Everything you say, he says something back.

S. Have you had him in your set for long?

A. Just this year.

S. Obviously, we have to discuss boys in Maths lessons. Do you remember one statement on the questionnaire? I asked if you thought you would do better with no boys in the Maths lessons. What did you say?

A. No boys. Definitely.

S. You became conscious of this when? You said in the first year there were few boys in the Maths set and that helped.

A. I think (pause) late third year, early fourth year. (pause) Because they started opening their mouths then. If they got something wrong, they'd say something. And they behaved worse. And I stopped asking questions because they always had something to say.

S. What sort of things might they say?

A. Oh, 'can't you do it?' 'anyone can do that' 'you must be right thick' and I felt right embarassed.

S. Was it just yourself, A ı? What about the other girls?

A. Some went quieter. Some never bother.

S. Have you discussed it with your friends?

A. Oh no. I'd feel embarassed really.

S. Well believe me, you're not on your own. Many other girls feel the same. Do you think generally boys do behave differently in class to girls?

A. Yes.

S. In what way?

A. Well, they don't buckle down to their work as well as girls do. The girls try to do it. And the boys often just mess about. And talk and that.

S. And yet in Maths, boys often do better?

A. Yes, I know. We were talking about that the other day in class, and why boys do better. But we really can't understand it. It's stupid really.

S. Do you think that perhaps they respond to the teacher more, answer more questions in Maths?

A. Yes, and of course she's always having to tell them off.

S. When Mr. L asks questions, who is more likely to answer?

A. I think it's the boys actually. Generally they just shout it out (giggle).

S. Does Mr. L go round the class marking the books and generally helping?

A. No, not much. She generally reads out the answers at the end. If you want help, you generally go up, but sometimes she'll come over. She doesn't walk round the class all the time.

S. Who asks for help the most - boys or girls?

A. About equal.

S. Do you remember this question, A[illegible]? I asked you which factors caused you most difficulty. Now all the girls chose the one about not understanding much of the work in the Maths lessons, but I'm more interested in the other two factors you picked. Can you remember?

A. I picked the behaviour of the boys and then (pause) I'm not sure (pause). I think it was the second one. The hostile attitude of my friends.

S. Are these the friends you sit with or others?

A. Others.

S. Can you name names. I promise you it wont get out.

A. BD.

S. Is she in your Maths set?

A. No. She's my best mate. And some are other mates from outside school. They go to Copley. BE particularly.

S. What do they say?

A. Well if I'm revising for the Maths exam and they come round they say 'Oh, you swot'.

S. So there's a stigma. Is it particularly in Maths?

A. Oh, any subject really.

S. Now. A final point. You're at the end of five years at Stamford. If I now made you Head of Maths at Stamford what changes would you make? What improvements? I suppose you'd separate boys and girls for a start.

A. Oh yes (pause). And I'd make it more interesting. Not just shove a book in front of you. I'd insist on more explaining. And try and make it more interesting. Go round the class and make sure everyone understands it. And if they didn't understand, I'd try and explain it a different way. To make it easier.

S. But how can you make it more interesting?

A. More variety. And more useful Maths. But I'd spend longer on each bit. We always move on before I've grasped it properly.

INTERVIEW WITH E..

29th January 1985

S: I notice in your last report that Mrs. N expects you to get a good 'O' level in Maths.

E: Yes.

S: Do you still regard it as a difficult subject?

E: Yes, (pause) but I think I find it easier than I used to. I did Mock, and I got a good result and it sort of gave me confidence.

S: That's great. Now if we look back, perhaps to primary school, or your early years at Stamford, can you think of a particular time when Maths seemed more difficult?

E: The Third Year, yes. It was the topics, and Mr. TA It was the time with FA, FB and FC and it was just - they were so far in front, and we were so far behind that I just sort of packed up.

S: Yes, those bright girls joined another group. Did that help you?

E: Yes. It was better without them. It's all to do with us being comprehensive.

S: Do you find any topics very difficult?

E: Some algebra. And I'm doing stats on the options paper. That's much better.

S: Now let's talk about not having boys in Maths lessons. You're used to them in other subjects. What do you feel about this?

E: I think it's better. We act daft with boys around. I think I've done better in Maths than I would have done.

S: Why?

E: I think they demand more attention. You just have to sit there and say nothing.

S: Are you self-conscious with boys around?

E: Not now. I used to be.

S: Do you think a class of girls on their own behaves differently?

E: Yes. (pause) I think girls on their own. It gets more serious.

S: Would you like all subjects separate from boys?

E: No, not really. It wouldn't be a mixed school then.

S: What about girls' schools?

E: I've nothing against them. But it would be stupid to split boys and girls all the time in a mixed school.

INTERVIEW WITH T.

29th January 1985

S: If I asked you to put Maths in order of difficulty with your other subjects, where would it come?

T. It's the hardest. Quite definitely.

S: You remember I wanted to ask from what period Maths became a difficult subject for you. Does it date back to Junior School?

T. No. It wasn't till the Second Year at Stamford.

S: Now, you were in Mr. T.B.'s set in the First Year. That was OK?

T. It were all right. I remember some parts were easy.

S: You had Mr. H. in the Second Year. Now thinking back to those times - what happened?

T. It just got harder. (giggle) He started introducing things like simultaneous equations.

S: So your problem was concerned with topics?

T. Some I just can't understand. Sines, cosines and tangents. Number bases. Some work with angles.

S: Algebra?

T. I can sort of get that.

S: What exam are you doing in Maths?

T. 16+.

S: What sort of Mock result did you have?

T. It wasn't that good (pause), but not that bad either.

S: What sort of grade are you expecting?

T. Quite a good one. I'm looking for a pass.

S: Let's talk about Maths lessons a little. Suppose Mr. T.H. is explaining something to the class, and you don't understand. What would you do?

T. He tells us to have a go at it first. Then, if you can't manage, come up to the front.

S: Suppose you have tried and you can't manage. Would you ask the girl you sit with?

T. If I were stuck, she'd be stuck as well (giggle). I'd just go up and ask Mr. T.H.

S: Are you shy at doing that?

T A bit. Especially when people say, "Oh we get it." Than I feel daft.

S: Now, what about boys. You've had five years without boys in Maths. Yet you are with them in other subjects. What do you think about that? Has there been any benefit?

T. Yes, it's better. Because the lads, they put you down. If you get anything wrong they laugh and say, "You should have got that." And with all girls, you sort of get on better.

S: Are you bothered about lads in other subjects?

T They just sit there as though they're the best. It puts you off. But I don't really mind in the other subjects. I just keep my concentration.

S: Would you prefer just girls in all subjects?

T. No (giggle). That would be terrible.

S: Do you get much Maths homework? Do you do it?

T. Yes. A lot. I try and do it. If I can't do it, I leave it to the lesson. Sometimes I ask in morning registration.

S: What about at home? Would your brother help - or your mother or father?

T. My brother wouldn't help me! He just says, "Try it yourself." (NB Brother got grade 'A' O level Maths last year!) My mum couldn't help me - and my dad wouldn't.

S: Do you get in trouble for not finishing your Maths homework?

T. No.

INTERVIEW WITH M.

31st January 1985

S: If I asked you to put Maths in order of difficulty, with all the other subjects you take, where would it come?

M: I found German very difficult, and European Studies at times, (pause) but Maths would come second to German.

S: When did you first come to regard Maths as a difficult subject? Was it junior school? Or when you first came to Stamford? Or later?

M: I always enjoyed it at junior school (pause), and in the First and Second years at Stamford. (pause) Well, in the Second Year I found it a bit difficult (pause), that's why I moved down. But in the Third Year I found it too easy, because I was in set 2, but I still find set 1 difficult now I'm back again.

S: You think to some extent it's the problem of keeping up in set 1? And it first showed itself in the Second Year?

M: Yes, that's right.

S: How come you moved down at the end of the Second Year?

M: Well, mainly because my results weren't very good, and she said it would be better if I moved to set 2, to understand the work properly.

S: This was Mrs. F?

M: Yes.

S: And did you talk it over with mum and dad?

M: Yes. They thought it best.

S: But in Mrs. T.G.'s set it was the other way round?

M: Well, I liked it, because I came top, but I could do it without pushing myself.

S: You did come top?

M: Yes.

S: Who suggested you go back in set 1?

M: Well, Mrs. T.G. could tell I was doing well. We talked over moving back earlier in the year, but Mrs. T.G. said I should wait till summer.

S: And now you're with Mrs. N. , and you're struggling again!

M: Yes.

S: But are you able to cope?

M: Well, some of the topics I can do right away, but others are real tough.

S: Which topics are like that?

M: Algebra. And we've just started calculus. I can't do that. I like the geometry side.

S: Have you got to do calculus in the exam?

M: No, we can do statistics instead. I'm better there. Mrs. N. told me to go straight to statistics and ignore the calculus.

S: What about trig?

M: Yes, that's hard.

S: Percentages?

M: Yes, that's OK.

S: What sort of grade are you hoping for, M

M: Well, I hope to scrape an 'O' level grade. Originally, Mrs. N wanted me to do just C.S.E., but I've improved a bit, and mum and dad wanted me to try 16+.

S: Obviously you do need help with your Maths. Now imagine Mrs. N is explaining something to the class, and you don't understand. What would you do?

M: Well, she always asks us whether we've understood it or if we want her to go through it again. And I'd ask her. And then if I don't get it, she'll come, and I seem to understand it better when she's just telling me, than with the whole class.

S: You're not shy about putting your hand up?

M: Well, I were at first, and she put on my report that I must ask if I didn't understand, and I started asking her more.

S: You don't find others in the class take advantage? Tease you at all?

M: No.

S: Now, homework. Do you get it regularly?

M: Twice a week.

S: And you always attempt it? At home?

M: Always.

S: Suppose you find you're stuck with your homework?

M: I usually ask me dad (pause) or me mum. And then (pause) if they can't do it, 'cos a lot of the modern maths, they don't understand, I usually tell Mrs. N /, and she'll go through it again. And then she'll give it me again to do for homework.

S: And you don't feel you're out of touch with the rest of the set?

M: No. I just about manage. (laugh)

S: Now, you've had Maths in an all girls' set for five years. Yet you're used to having boys in other subjects. On reflection, do you think it would have been better to have had boys in your Maths sets?

M: I think it's better just with girls. I think you get girls trying to impress the lads, and the lads teasing the girls. I think really it's better just girls. For Maths anyway.

S: It's a different atmosphere?

M: Yes.

S: How is it different?

M: (pause) Well, you sort of settle down quicker, no boys messing about, and you can talk more freely with the teacher without having boys about, and when you answer, the girls are OK, but the boys laugh at you.

S: Do you think you would have preferred a girls' school?

M: (pause) No, not really, no. Well, they don't bother me, but I think it would bother me in Maths.

S: Maths is different?

M: Yes. And probably Science as well. I'd prefer to have Science just with girls.

S: But why Maths and Science rather than, say, English?

M: I don't really know. (pause) Well, I suppose in English, I seem to get on better. I'm more sure of myself.

INTERVIEW WITH K.

7th February 1985

S: You know I'm interested in Maths, and how difficult you find it. Can you tell me first of all how difficult you find it compared to all your other subjects?

K: Well, I find Physics difficult, but there are parts I do understand. But in Maths, I understand the basic stuff, but I don't see the point of much of it. I do see the point of some of the stuff in Physics, and this makes it better.

S: Are you telling me you don't find Maths of much use?

K: Yes, I think it's of use but not to the extent you have to do it.

S: Is it because it seems not relevant that you find it difficult?

K: Could be. Because like some of the things just don't make sense. Like calculus. (pause) What's the point of finding the gradient of a line? Where will I need that?

S: Do you have to do calculus for the exam?

K: No. We can do statistics instead. Now I can do that. I see what it's about. I enjoy it.

S: Let's go on to a second point. I'm interested in when you came to consider Maths a difficult subject. Was it in junior school? When you first came to Stamford? Or later?

K: I struggled a bit with fractions in junior school. But I liked it there, and then it was OK in First and Second Year. (pause). No. (pause) It was hard with Mrs. F. - in the Second Year. I enjoyed the First Year, but I did struggle with Mrs. F.

S: What about Third Year?

K: I can't remember really - I don't think it was so bad - but once we started Fourth Year exam work, it's been hard all the time.

S: Let's talk about topics a little. I know you can't really cope with calculus. What other areas do you find difficult?

K: Equations, particularly factorisation. I can never work out if it should be plus or minus.

S: What about simultaneous equations?

K: Yes, they're difficult. (pause) When we practise them for a long time, I'm OK, but I forget how to do them and then we have to start all over again. When we practise something, and I see them on an old exam paper, I think, "Great - I can do these." But then when the actual exam comes, I've forgotten again!

S: What about another topic? What about trig? Sines and cosines?

K: I can do that most of the time. Sometimes I can't tell which one I'm supposed to be using. I can always tell a tangent. But I can't always tell between sines and cosines.

S: What about percentages?

K: I can do percentages. (pause) I don't find it difficult, percentages and other work that's useful. It's when we go on to stuff that seems useless that I get lost.

S: Let's talk about Maths lessons now. Do you normally sit with the same girl?

K: Yes. LA.

S: Is she better at Maths?

K: A bit. But we're both struggling.

S: Do you generally work on your own? Or together?

K: Together. I don't think we'd manage without helping each other.

S: I know that your set has changed in recent months. Some very bright girls have been taken out. Has that made any difference?

K: Yes, it's a bit better, but there's still some dead brainy ones. I'm still struggling.

S: Let's suppose Mrs. N is explaining something to the class, and you didn't understand. Would you put your hand up?

K: No, I wouldn't try to stop her.

S: What would you do then?

K: Well, when Mrs. N finished, I'd ask LA And if she didn't know, we'd ask the girls round us. Particularly LB She's good. She often comes over and shows us.

S: Is she one of the best in the set?

K: Yes. She doesn't do the problems. She shows us how to go about it, then we try. And then we might check our answers against hers.

S: So you work a lot with the other members of the class.

K: Yes.

S: But what about Mrs. N ?

K: I don't like going up to her desk. She comes round a lot and helps us. The trouble is, she'll show us and then move on, and sometimes we still can't do it. We daren't call her over again. We'd feel stupid. I can't help it. Sometimes when she's doing something on the board she says, "K , what's this?" And if I can't answer, I feel terrible.

S: I have seen your reports, and some of your teachers say you won't ask for help. Is that right, K: ?

K: Yes. (giggle) Well in some places. (pause) Yes. But I don't mind asking in a lot of lessons, because I feel more sure of myself.

S: Is Maths different?

K: Yes. (pause) Mrs. N 's very nice, but I'm always conscious of making a fool of myself. She'll show us how to do a problem, and we can manage, but then we get stuck on the next. We can't ask her again.

S: I'd like to ask about your homework. Do you try to do it in Maths?

K: When I can, yes.

S: At home?

K: It depends. If I can do it, I do it at home. If not, I do it at school, in registration or lunch time - I get someone to show me. But I always try at home first.

S: Do you get any help at home?

K: No. (giggle) They don't understand it.

S: Now what about boys and Maths. You've now had five years of girls' Maths sets, yet you are with boys in other subjects. What do you think? Is it better or not?

K: I prefer it as it is.

S: Why?

K: Well, if we were mixed I'd be in a lower set. And I'd be <u>really</u> embarrassed with boys around. When the test marks are read out, I'd be petrified in case I was near the bottom.

S: Would the boys say anything?

K: It's just they'd be there. Not what they'd say. They'd know.

S: How does the atmosphere differ between a girls' set and a mixed set?

K: It's freer. You can speak more freely. I'd always be wondering what I looked like, or if my hair were sticking up. (giggle) I'm much more relaxed with girls.

S: Is the working atmosphere any different?

K: I don't think so. (pause) That depends much more on the teacher.

INTERVIEW WITH U.

7th February 1985

Painfully shy.

1. Finds Maths and Commerce equally difficult - more than the rest of the subjects.

2. Has always found Maths difficult - even junior school. Although she was OK in First Year with Mrs. T.J. (5/5).

3. Can't do fractions or algebra. OK with rules of number and money problems. (Works in shop)

4. Homework: rarely bothers to do it now - has lost interest and finds it hard anyway. Lower down the school she attempted homework - and was helped by her mother.

5. Considers Maths the most boring of her subjects.

6. She is generally very shy - doesn't like speaking to teachers at all - nervous of teachers and the response of her classmates. She agrees she is worse in Maths than other subjects.

7.

S: You are used to boys in other subjects, but not in Maths. Do you think it would have made any difference with boys in Maths sets?

U. No, not really.

S: Would it have been better or worse in any way?

U. Worse.

S: In what way?

U. If the teacher asks questions and you don't know.

S: What would happen then?

U. They put you off. Laugh and that.

S: Do you think you would have been happier in a girls' school?

U. No, not really.

INTERVIEW WITH C.

24th January 1985

S: If I asked you to put all the subjects you are taking in order of difficulty, where would you place Maths?

C: The hardest. (pause) No matter how hard you try, things just get me down. I can't really cope in the set I'm in now (set 2). That's why I'm only doing C.S.E. The rest are on 16+.

S: Has Maths always been hard?

C: No. Like... (pause) some of the work I can do.

S: Now you've been in more or less the same Maths set for a long time.

C: From the Third Year, when we had Mrs. T.G.

S: It's from then you began to struggle?

C: Yes. With Mrs. T.G. I prefer men teachers.

S: But from the Fourth Year you've had Mr. T.H. and your Maths hasn't really recovered.

C: In some areas I have. But in new topics, it's still very difficult. When I've got to understand it, we go on to another topic. You're just starting to understand things, then you move on.

S: Is that just recently?

C: Yes, in the exam set. Because you've got to get through it. And some people in each set, they catch on quicker than others. And it's a hard set I'm in anyway. And it's hard to put people in just the right set for their ability. There must be some that struggle in every set.

S: Which topics do you find hard?

C: I like graph work. I can't do algebra and cosines and tangents and that. And some fractions. Trig is worst.

S: Home work. Do you try to do Maths homework?

C: Well, yes. I have a go. Usually I just do say the first two and see if it's right. Because I always find it's a waste of time because I always seem, it always seems to be wrong.

S: Do you do it at home?

C: If I do it at all it's at home. Sometimes I ask someone in class next morning.

S: Registration?

C: Yes.

S: Where do you sit in Maths lessons?

C: At the back. With DA.

S: Suppose Mr. T.H. explains something and you don't understand. You and DA. What do you do?

C: Just put your hand up and he comes straight over. He's dead good.

S: You don't mind asking?

C: No. (pause) I used to at first, but we're all used to him and no-one minds asking now.

S: Do you talk to other girls apart from DA ?

C: Yes. All of them - it's a very easy going group. They're OK.

S: Now what about boys? You've not had them in Maths at all, but you're used to them in other lessons. Has not having boys had much effect, do you think?

C: Yes, I think it does. I prefer mixed because you find lads, they sort of break the ice, the girls can be dead bitchy with each other, can't they? You know, about exams and homework. And I've got to do this and I've got to do that, but lads, they soon break the ice. They take everything in their stride.

S: Has it been particularly bitchy in Maths?

C: Yes, especially with homework and revising and exam marks. But it's been better with Mr. T.H. . When we start squabbling, he just sits there laughing. He always laughs at us. He's real cheerful. (pause) I can get on better with lads. That's the big advantage.

S: Do you think perhaps that boys are more suited than girls to Maths?

C: No. Not always. My sister's dead good at Maths. She got her 'A' level.

S: Does she help you with homework?

C: No, not really. She loses her temper when I don't get it. She says, "I've explained it once. I'm not doing it again."

S: Does it put you off?

C: Yes. I shout back, "I'm not doing it then."

INTERVIEW WITH V.

24th January 1985

S: Let's talk about Maths compared with your other subjects. How difficult is it compared with the rest?

V. Well, now I find it easier, because I'm doing it at a lower level than I did before, but I think it's quite easy compared to the other ones I'm doing.

S: So you find C.S.E. Maths easy, but you couldn't handle 'O' level Maths?

V. Yes, that's it.

S: Another thing I wanted to ask you was when you found Maths difficult. Was it in junior school? Or when you came to Stamford? Or later?

V. Well, it was easy at junior school. And the First Year here it started getting a bit hard. Towards the end of it, I was struggling. Then I moved in set 2 for Second Year. In set 2 I got good marks. Then I moved back up in Third Year. And I found it difficult again.

S: So it's set 1 work that's been the problem?

V. Yes.

S: What did you find hard in First Year?

V. Something to do with algebra. Simultaneous equations. And some sort of graphs. I can't remember what they were. A lot of us found it hard, and a few of us went to set 2 in Second Year.

S: And then you came to set 1 in Third Year?

V. Yes.

S: Nowadays, what topics do you find hard?

V Well, I find graphs difficult. (pause) Those with algebra. And trig. I never grasped that at all.

S: Tell me about Maths lessons now, with Mrs. N . Who do you sit with?

V Me and WA sit on our own. We're the only ones doing C.S.E. We do separate work.

S: Do you work as a pair?

V Sometimes. But she's generally away. It's better when she's not there. She distracts me.

S: Does Mrs. N set you separate work?

V Well, she's given me a revision book, that I can work through when I'm told. And when I don't know what to do in class, I start doing that, until she's finished with the rest of the class, then she might give me some C.S.E. questions.

S: How long have you been doing this?

V Since about three weeks ago. Just after Christmas.

S: Homework. Do you get homework set?

V Yes.

S: Do you do it?

V Well. (pause) She's told me if I can't do it, to see her next day at school, but to do as much as I can first.

S: If you're stuck at home, can you get any help?

V No. They take one look at it and tell me to leave it!

S: Now there's only one more area I want to mention. This business of not having boys in Maths. You've had that for five years, yet you're

used to having boys in other subjects. Do you think not having boys in Maths has made much difference?

V I think if there'd been boys in the group all the time, it would have made the girls work harder. There'd have been more competition. Definitely.

S: So you regret not having boys in Maths?

V Well, I do, yes, because I think it's had some effect on me, because now when I'm talking to lads in my year, I don't seem to be able to talk to them as well as to girls.

S: You get on easier with girls?

V Yes.

S: Are there any advantages in Maths without boys?

V Only that (pause) when I was in Third Year a lot of the girls felt it was better. Some teachers, they look at lads rather than girls and if it's a male teacher, he'll concentrate on the boys and (pause) female teachers aren't like that.

S: This is what you've heard?

V Yes. And the thing is. A lot of lads take the mickey out of the girls. Because they're supposed to be members of the weaker sex, they're thicker as well. If you get an answer right, you're a swot, and if you get it wrong, you're a dunce. You can't win with lads.

S: This is what you've seen in other lessons?

V Yes.

S: Do you think most of the girls agree with you about having boys in Maths?

V No, not all girls. Some like to be away from boys. There's a girl in my year, and she's got a boy friend, now in Science lessons she's with him, together, that's a distraction.

INTERVIEW WITH X

31st January 1985

S: If I asked you to put Maths in order of difficulty with all the other subjects you are taking exams in, where would it come?

X The hardest (pause) with Physics. I can't do Physics at all.

S: Now let's look back to when you began to regard Maths as difficult. Let's think back to junior schooldays, to when you first came to Stamford, right up to now in the Fifth Year. When did you first find Maths a struggle?

X The Third Year.

S: What happened then?

X I just couldn't understand it.

S: You had Mr. P then. Was it the topics?

X I found it more confusing. The work got harder.

S: Did you just lose interest in the Third Year?

X No. Maths used to be my best subject, at junior school particularly. And somehow I suddenly got nothing out of it. But I was struggling, and couldn't get anywhere.

S: Tell me about junior school Maths.

X We seemed to specialise in Maths. One morning we would do English, the next Maths, and so on. We did Basic, all those Alpha and Beta books. I used to get stuck into it all morning, and I loved it. A lot of the things we did at junior school, we did again in the First and Second Year. I got a good start at junior school. Then we moved beyond it in the Third Year. That was different.

S: Can I ask you which topics were hard in Third Year?

X Pie charts. I could never sort those out. And equations and algebra. Oh, and I can't do trig.

S: What about other geometry?

X We've been doing that in Extra Maths.

S: Can I ask what Extra Maths is?

X It's when we go back after school to go over things we found hard.

S: Do you go to these often?

X Yes, nearly always.

S: Do most of the other girls?

X No, about six of us. There's about six or seven of us who are struggling in Maths. Most of them don't bother.

S: So you've not given up?

X No! I still want a decent grade in the exam.

S: Let's talk about Maths lessons for a bit. Suppose Mrs. N is explaining something to the class, and you don't understand, what do you do?

X I'd ask her to go over it again. She normally asks us if any of us don't understand and she shows us again.

S: But will <u>you</u> ask her?

X Yes.

S: You're not shy? You don't worry that you might be, say, teased or kidded by the others for not understanding?

X No. I always ask her. We all do. She's good like that, Mrs. N.

S: What about Maths homework? Do you do it?

X Well, I do it when I can follow it.

S: Where do you do it?

X At home. Nowadays, as soon as I get in, whilst I can still remember some of it from the lesson.

S: Suppose you struggle with it. Can anyone help?

X Yes. My mum and my sister. They help a lot.

S: Now let's talk a little about having Maths just with girls. You've had that for five years, yet in other subjects like English and Physics, you have mixed sets. Looking back, do you think it would have been any different with boys in Maths lessons?

X Yes. There would have been more competition.

S: How does the atmosphere differ, from girls' sets to mixed sets?

X Well, it's quieter, there's no joking like with the boys. It's livelier somehow. The girls are competing with the lads. They mess about a bit, the lads, but it breaks up the lesson, and things go better somehow.

INTERVIEW WITH Y.
14·5·85

S. I noticed that at the end of the second year, you were moved from a middle Maths set to Mrs. T.J.'s (remedial) set in the 3rd Year. Yet your Maths grades in the 2nd Year were average. Why were you moved?

Y It's just that I don't ask. You know, when I can't do it, when I'm stuck I don't do anything. I just sit and struggle by myself.

S. Let's come back to that later. I see you joined a CSE Maths set at the start of the 4th Year, and you're still in a CSE set, and I know you're doing CSEs in your other subjects. Now can you tell me, where would you place Maths in order of difficulty with the other subjects you take? Is it relatively easy? Or hard? Where does it come?

Y (pause) I'd say it's quite difficult. (pause)

S. Are there any subjects more difficult?

Y (pause) General Science sometimes - particularly when we do Chemistry. That's very hard (pause). But after that comes Maths.

S. Have you any idea when you began to think that Maths was difficult? Wasit in junior school? Or after you came to Stamford?

Y Well (pause) in junior school I could do most things, but when it comes to fractions, I didn't like Maths then, because I couldn't do those. I struggled on fractions.

S. Then you came to Stamford, what about first year Maths? Can you remember?

Y (pause) I used to just sit there, I think, and not do anything. Try to struggle on my own without help, (pause)

and I didn't like Maths from then. I could never do it.

S. Did you ever ask for help?

Y I just sat there and tried to work it out for myself. And if I couldn't do it, I left it.

S. Did Mrs F. ever get cross with you?

Y She used to ask me questions, but I didn't know the answers. (pause) I knew some of the answers, sometimes. She'd ask me to come out when I was stuck, but it was embarassment. If I got anything wrong, I'd feel stupid, getting the answer wrong.

S. Do you feel the same with other Maths teachers, or was it just with Mrs. F. ?

Y I got quite used to it by the 3rd Year, then (pause) I'll go up and ask now. I'm all right now.

S. How did you go on with Mrs. T.J. ?

Y I could do most things (pause). It were just fractions (giggle) and long division.

S. Any other topics cause you difficulty?

Y (pause) Angles, (pause) I can do algebra (pause) It's just fractions.

S. Are you feeling any happier with your Maths now, in the 5th Year?

Y Yes, I can cope with most questions now.

S. It seems to me you've done well to have come from Mrs. set in year three, to take CSE. Did it help being with Mrs T.J. in the 3rd Year?

Y Yes (pause) Because I could talk to her and most of the other people were thick anyway, so I felt comfortable. In asking questions, like. And I was moved up because I'd done so well in Mrs T.J. 's class.

S. That's interesting.

Y It were like that in English as well. Because I feel self conscious there as well (pause). Because of the lads. They mess about. And now we have to sit next to the lads, and it's not so bad.

S. Now you've mentioned boys, perhaps we could discuss this business of having Maths in all girls sets. You are used to boys in other subjects. Has it made any difference not having boys in Maths lessons?

Y I think I would have been even worse with lads. (pause).

S. Can you say why?

Y It's just that they embarass me. Because lads, they put you off.

S. In other subjects?

Y Yes. They're idiots. Always messing about.

S. And in Maths?

Y It's better. I don't feel so bad.

INTERVIEW WITH Z
14•5•85

S. I notice that although you've always been in the top set for Maths and you're taking the 16+ Maths exam, you still regard Maths as a difficult subject. Can I ask you when did you first consider Maths difficult? Can you remember? Can you put a time on it?

Z (pause) It was about the beginning of the 4th Year.

S. And before then?

Z I enjoyed it. It were when we started exam work.

S. And you went in Mrs N 's set at the start of the 4th Year. How did things change?

Z I think, Mrs. N , sometimes she goes a bit fast. And we sort of tell her to slow down. She doesn't realise how fast she is going. She whips through it. And we say will you go through it again.

S. She has a lot of ground to cover.

Z We used to find it a lot harder at the beginning. But it was because of all the others, the ones that were moved out of the set to take 'O' Level in the 4th Year. (pause) They thought they were over us and it brought us down. Because they answered all the questions. And we felt daft in case we got it wrong.

S. What about now? Say Mrs. N 's explaining something, and you don't understand. What do you do?

Z Ask her about it (pause). If she's part way through I'd wait till she finished, then ask her. I'd probably go up to her when she's finished.

S. One thing that's different in Maths to your other subjects is being taught in an all girls set. You're used to having

boys in other lessons. Has it made any difference in Maths?

Z. It doesn't really bother me. I think we'd get on anyway.

S. You're telling me that boys wouldn't make any difference?

Z Not really (pause). Sometimes I suppose. When lads are messing about and that. They can put you off a bit. They think they know it all.

S. So on balance, has the absence of boys helped or hindered you in Maths?

Z. Helped, I suppose.

INTERVIEW WITH Mr.F. 15.1.85

Female
20 years teaching experience - all Maths
a) 2 years - mixed secondary
b) 3 years - girls secondary (became head of Maths)
c) Since 1970 at Stamford
i.e. Has a very wide experience of teaching:-
Mixed sets)
Girls sets) of all secondary ages
Boys sets)

'There are points on both sides. Single sex setting suits particular children. Some are better in single sex groups, others in mixed groups. There's no doubt about that. It's absolutely clear - you've watched and you've seen it - I think to the majority of children single sex sets are better (surprisingly) early on than farther up the school. I think the 1st Year children - particularly the girls - appreciate not having to put up with boys who, at that point, can be an annoyance, and I think they appreciate being able to get on with it without them prodding and poking and making rude comments etc. which they do in the 1st Year. I think girls in the 1st and 2nd Years appreciate having no boys in Maths.'

'One clear disadvantage is with the very bright pupils. The very top end feel they would have been happier with the opposite sex because there would have been closer setting - there would not have been such a wide ability range. They say quite a lot - at times, the brighter girls and boys have been very bored because the teacher has had to go over particular points again - and again. At that ability level there is no question of them being bothered by the presence of the opposite sex, they would revel in the competition.

Even the shyest girl in the top set - who is very capable - would have preferred mixing for Maths.'

'I think we have created discipline problems at the top end of the school - the older pupils. There isn't the flexibility to separate Bill Bloggs from Joe Soap as you would have been able to with mixed sets. It's not only the boys' sets, some of the girls' sets are very, very difficult, in the upper age bracket,and I think this is because they're separated.'

'The 4th Year boys' set that I had last year are very hard to teach. I do feel that if they had been leavened with some of the girls, they wouldn't have been quite so difficult and some of the behaviour would never have taken place, because they wouldn't have done the sorts of things they were doing in front of girls. They would have lost face.'

'On the whole, girls probably gain more from single sex setting than boys - particularly the younger end. Some of them will not ask if boys are present. They will go all coy about it and cover it up. I have a mixed 1st Year set now, and I'm concerned that four of the girls in that group will not ask questions because they don't want to look silly in front of the boys. The boys aren't so inhibited. I do feel there are four girls there who don't ask and don't get on as they should because they won't ask. I've now become aware of it, of course, and I check them all the time, but they were inhibited in the first term, and I wasn't aware of the problem at first.'

'So many girls made a mess of Maths and have sort of fed into their daughters that Maths is hard. I think they have given this impression. Then the girls feel silly when they don't understand it.'

'I don't think it's wrong to separate the girls just for Maths. It's only for a short time. If we separated boys and girls for every subject it would be dreadful. I think it's all right to separate them for Maths if we feel the pupils will do better.. Whatever we have done, we have tried to put the interests of the pupils first. Both boys and girls.'

'In a lot more cases than I expected, there has been some benefit. I didn't expect much benefit to come out of it. For a minority of children, there is a definite benefit. Not just girls. When I think of my 2nd Year boys' group last year, I think some of those boys benefitted being on their own. They were just becoming aware of themselves as fellas, and I think they were better that they couldn't show off, so they got on with what they were supposed to be doing, and not trying to make eyes at Jemima Jane at the back of the room.'

'Summing up; it isn't simple to judge single sex setting. It's not black and white. It's a beautiful collection of shades of grey.'

INTERVIEW WITH Ms. G 15.1.85

Female
6 years teaching experience - all at Stamford
Has taught all ages of mixed Maths sets and
all ages of both boys and girls sets.

'I find that in certain situations, single sex setting works very well. It depends on the type of children. I think in a lot of cases it works well. I would only have doubts about it where it interferes with ability setting. You get this overlap where children would be better with others of their own ability than putting them in boys and girls sets. There's such a wide range of ability in single sex sets. You cannot set very finely, and this is a problem, particularly with able pupils. I think that's the main drawback.'

'Most of the children like to work in single sex sets. It's very popular, Even the 5th Year. I have a boys' set this year. They're happier as a boys' set. They like it very much. They don't want to be mixed with the girls for Maths. They see the present 4th Year are now mixed for Maths and they're thankful it hasn't happened to them.'

'I think that girls on the whole benefit more from single sex setting. Just thinking back to the classes I've had, I would say yes, the girls. I have at the moment a 3rd Year set who need, despite the fact they're set 1, they need a couple of explanations of most points. And on the third explanation perhaps most of them will have understood it! And I don't think they mind. I feel there's more contact between me as a teacher and them as pupils because they're not afraid to say

'I don't know what you're talking about' or 'I don't understand that.' And I feel they're more inclined to say that than if there are boys present. And I know for a fact that some of the boys in the parallel set are very sharp and they'll be whizzing away getting on with it and I think girls might feel silly, inferior or embarassed. So I think for them, single sex sets work and I think with just girls they are less inhibited, and all girls together don't bother if anything is said that's rather silly. Obviously, the girls together have a bit of a giggle. So I do feel girls benefit more from these sets.'

'I also have a boys' set; set 3. Now, they might feel conscious of girls. I don't know whether it's this male superiority or not, but boys don't like to feel that girls can beat them. So, I think that many boys can also benefit from being away from girls.'

'I think that bright boys and girls will survive wherever you put them. So in a sense there's no contest there. But I think it works well for average and below average children.'

'I don't think either boys or girls miss out by single sex setting. There are more advantages than disadvantages. The fact that you may not get this competition between boys and girls - I don't really regard that as important. Girls like to do well, to achieve a certain amount, but there's no hassle about it in a girls' set - it's all part of the day's work, they like to get their heads down and get on with it and do as well as they can. I don't feel the competition side of it is strong, despite the fact that they want to do well.'

'I personally think that discipline is better in single sex sets - they're far too easily distracted, sort of not by the amount of work they're doing or the type of work they're doing, but by distractions that have nothing to do with the work. When they get to that age. The 5th Year group I took last year - a mixed group - I'd had some of those boys and girls for three years and I felt that some of the girls would have benefitted in the last two years by not being with boys. They would have settled and concentrated more on their own. I think that once they get in the class, they're settled down and the work's going on - it seems to work much better.'

'I feel generally that single sex sets work well, but there are occasions when it doesn't.'

'I suppose some people would argue that boys and girls have to compete when they leave school, so they should be mixed for Maths. But all we're trying to do is enable them to cope and gain more confidence. It's like anything else. There's no point in sticking to a rigid system if it isn't working well. We had to do something about it to help the girls.'

'Now that the current 4th Year Maths set have been placed in mixed sets, my present 3rd Year girls are living in fear and dread of being put in mixed Maths sets next year. They don't want that at all.'

INTERVIEW WITH Mr. H. 17.1.85

Male
12 years teaching experience - all at Stamford
A wide experience of mixed Maths sets.
Girls' sets - Years 1 and 2 only
Boys' sets - All five years, but in years 3,4 and 5, experience is limited to average and below average sets.

'I find particularly if you're teaching a low ability set of boys and remember that these are quite sizeable groups, that they tend to become a bit over confident. Boys feel they must behave as boys within that particular group. There's a tendency for them to show off. I should imagine that more able boys are more self-motivated and behave better, but I've no experience of teaching able boys' sets in Upper School. Lower ability boys' sets are difficult to motivate and I do feel that when they are mixed, the boys and girls tend to calm each other down. Boys and girls on their own, each of them tend to show off.'

'As far as I can see, it is the only disadvantage. The advantages come from mainly having taught the girls in the1st and 2nd years, going off that experience, generally speaking, their work was excellent, better than girls normally produce in mixed sets. Of course, this may have been a peculiarity of the particular girls' sets I taught. I could not fault the system for these sets.'

Basically, I think the system has been of more benefit to girls than to boys. In the 4th and 5th Years, I don't think it has benefitted the boys. My own experience is that the girls' sets have settled down and participate and respond well. There's a wider response

from girls than there would have been had they been mixed. I do know the boys tend to dominate in mixed sets.'

'I feel a bit uncomfortable teaching an all girls' set. I can't give a particular reason for it. When I'm teaching them, although I'm getting something from them, I don't know whether it's because I'm the only male in the room. It can be an uncomfortable feeling, and I feel it would come even more to the fore if I were teaching older girls. I feel much more confident teaching a set of boys. The boys can be boisterous, but at the same time, I feel more in common with them somehow. And I've always felt like that. Being a male I can joke with the boys, and I can't have the same sort of repartee with the girls.'

'Obviously, we are mainly concerned with the pupils, but we should also think about how the teachers feel regarding the setting arrangements. How the teacher feels will obviously affect the quality of his teaching. And I do worry whether my performance as a teacher is not as good with girls' sets.'

'Overall I am happier with a mixed class than single sex groups, but if we were to stay with single sex sets, I would prefer to take the boys.'

'In 1980 I was very much against the idea (of single sex setting), but I was largely looking at it from my point of view, but for reasons I've mentioned before, I do think the girls have benefitted from it, certainly the two sets I've taught, there's been a very broad cross-section of response, there's been greater participation from the girls than had boys been present. Boys do tend to dominate and submerge the girls to a certain extent. I must admit in 1980 I was a little

bit dubious, having been used to mixed sets. Since then, my feelings have mellowed and I don't worry really what sort of set it is.'

INTERVIEW WITH Mo.L. 17.1.85

Female
8 years teaching experience - all at Stamford
Has generally taught a 2/3 Maths 1/3 Science timetable
A broad experience of mixed Maths sets over all five years.
Girls Maths sets - years 2,3,4 & 5
Boys Maths sets - has taught only one 2nd Year set (1984/85)

'I've got mixed feelings about single sex setting. Until this year, I'd rather have had them separate; the girls. Up until then, I'd just had girls' sets. Now this year I have a 4th Year mixed set, and they work very well together. Now many of these girls I had in my 3rd Year girls' set last year, and they were saying, 'Oh, why do we have to go with the lads next year.' And yet they're fine now. I've not asked them about their feelings now, but they do work well with the boys.'

'The girls I've got this 5th Year, that's an all girls' set, they're lower ability and I think they ought to stay as a girls set. Lower ability need to be separate. They benefit from being on their own. They're not as frightened at asking, being all girls together, you know. They're not frightened of other girls knowing when they're stuck with a particular problem. Some of them are very shy to begin with, but they do come round when they're just with other girls.'

'My 2nd Year boys' set, they're the bottom set and I have a real job just getting them to sit still. I was dreading taking a boys' set for the first time, but I don't find it bad at all. There's not much difference between taking an all boys and an all girls set.'

'Now I wouldn't like to take a set of older boys, I would find a set like that difficult.'

'For behaviour, all the girls' sets have been all right. Now this 4th Year set, when they came together, I thought, they might be difficult, but it was all right.'

'I like the way it's set up at the moment, with the first three years in single sex sets, then mixed after.'

INTERVIEW WITH Mo.N 26•2•85

Female 2 1/c Maths Department
10 years teaching experience (one year at junior school, and at Stamford since 1976)
Has taught all ages of mixed Maths sets.
Girls sets - all five years
Boys sets - years 1,2 and 3

'There are pros and cons I think with single sex setting. I think the girls are in favour of being on their own. There's certainly more confidence when they're on their own. I think it's shown in the group I had last year in the 3rd Year, all girls, the second ability group. They're now many of them in my mixed set in the 4th Year and now they definitely lack confidence. They were much better on their own. They've told me they'd prefer being on their own. Cathy (MC's daughter) she's in the top set, she's told me she would have preferred staying in a girls set.

'Against it (pause) I think being in a school which really only has one top set, then the ability range has spread so much, that it causes an awful lot of problems. It did last year. Girls I started out with in the 4th Year last year were almost unteachable, some of them. Where to pitch the work was a tremendous problem. Now I'm only talking at the top of the ability range that you get this problem. So much so that we had to take out the very top boys and girls; and it's paid off.

'As soon as those top girls moved out to work separately, the atmosphere improved enormously. There was an awful feeling between them. There really was. And having said that, there's probably 20 of the rest should now get their 'O' level.

'My present 4th Year set, they're set 3 and mixed, have now settled down. Some of the girls are plodders. They like to be taught slowly. Once they understand it, they're OK. A lot of the boys are quick. They latch on very quickly, they seem to have more ability. So I think the girls, they're being pressured a little bit. Having said that, taking the group I had in the 3rd Year up to the 4th Year, the ability range would have been terrific again. I'd have had a terrific

stretch if they'd stayed an all girls set. I don't think we'd have got the best out of each set (pause). There are pros and cons.

'I think last year was unfortunate. There were discipline problems. The top set of boys were super, but the top set of girls were a nightmare, till we separated the very bright ones. And they're a smashing set now. Beryl's boys were atrocious. Arthur has them now. They're better, but it's still difficult. I think if you do separate a set like that and create mixed sets, it's easier.

'Girls benefit most from single setting. It gives them confidence. The boys don't seem to miss out. Hopefully, the results will show the girls doing better. When I think a few years ago, there were only four girls in the top Maths set. We've come a long way since then. The gap between boys and girls has dropped enormously.

'I like single setting in Lower School. I really do. I think it's smashing there. Both girls on their own and boys on their own. You can really get to grips with a class, you can develop a relationship which works. I wouldn't want to go back to mixed sets lower down the school. I enjoy the children in the lower school, and I enjoy the spread of ability there. But my main concern in the 4th and 5th Years is the ability. Not the discipline. To me, it's more important where I'm teaching and who I'm teaching to, what level the work's at. When you've got a great spread of ability in a 4th or 5th Year set, there's a lot of stress in that situation.

'It doesn't really worry me whether I take girls sets or boys sets. Having said that, last year I took the top 3rd Year boys and the second set of girls, and I much preferred the boys, because the girls were chatter, chatter, chatter, but on the whole it doesn't bother me. I like the boys though. Now the boys I had in the 2nd Year, I would like to have taken through. We developed a super relationship. They're nice and very hard working. Boys in general are quicker to understand.

They're much livelier. They always have something to offer. Girls tend to be more reticent at coming forward. You do get the ones who will put their hands up, but I don't think they think like the boys do, quite honestly, the boys will always give you something, the girls tend to be a problem. You have to prod them. Especially in the 5th Year. I find their minds are often occupied with other things away from school.

'I think most of the maths staff like the present set-up.

INTERVIEW WITH Mr. P. 8•7•85

Male Has taught Maths at Stamford since September, 1978.
Stamford is his only school.
Has taught mixed Maths sets in all five years, and single sex sets in years 1,2,3 and 4.
Experienced in teaching both boys and girls sets - including a 4th Year girls CSE set.

'When I first took a single sex set, I was very inexperienced and when I took them at first, I think they ran amok with me a little bit. I certainly had problems with the first group - a second year girls set - and I looked on it from a discipline point of view. It was very difficult being a young teacher to control them, and I found that was the major problem at first. This experience put me off single sex setting at first. Now that I have a wider experience of single sex setting, I see there are pros and cons to it.

'I think that with low ability boys, the discipline problems are immense. One third year boys set I had were particularly bad, there were many discipline problems and motivation was very, very difficult. They didn't have the concentration and nothing seemed to settle them.

'Mixing the sets does have a settling effect, because even the girls when they're all together (pause) they tend to set each other off, they tend to stir each other up a little bit. When they're mixed, they wouldn't say some of the things they say in a single sex group. They give more lip in that situation whereas they wouldn't if the boys were there, because they'd look silly.

'I think the girls do benefit from it in that they tend to get more confident, mainly the fact that they are all together, they're more confident as a social group and therefore it comes through in their work. They do tend to be more confident and they will ask questions, whereas when they're in a mixed class they tend not to ask questions unless you push them. I know we try to involve everyone, but you find that girls will not offer comments or answers when the boys are there. When girls

are on their own, they do become more involved in the lesson. There are obviously still shy ones, but those that are not so shy come out more and they certainly do better. Even the shy ones feel more secure with just other girls.

'I've never noticed any great advantages for the boys. I think they can cope. I think possibly the boys suffer a little bit because of the discipline problems it creates. Although the more able boys groups are highly motivated. There's no problem there.

'I think the early years, years 1 and 2, gain most from single sex setting. 1st Year girls do need more encouragement, more help, and they do benefit. I don't know how they come from junior school, but their attitude towards Maths, they seem to be very flippant towards it, it doesn't seem to them to be as important as it is to the boys. And I think boys in 1st Year have a willingness to do well in Maths. To the girls, Maths is just another subject, and as far as they're concerned, it's just the numeracy which is important, not the mathematics. The boys seem more interested in the mathematics rather than just the numeracy.

'When I first started teaching, I was totally against girls sets. Being young, I found difficulty in coping with girls groups. As I've grown older and gained experience, I find now I don't really mind whether I take boys or girls sets. Every lesson you approach differently, even when you're dealing with the same topic, and I don't really mind at all.

'It comes back to the flippant attitude of the girls. The example was when we did practical work with a first year all boys set and then an all girls set. Same ability. It was practical work on measuring. We did the estimations in class, we talked about estimating, and the attitude then was the boys were really, really keen and wanted to get out and measure and when they went out to measure, they were very, very accurate

and worked extremely hard. They wanted to make sure their results were right. They did the exercise, and then checked their work. The estimations and measurements of the two sets were similar, but the way the girls worked when they had to go out, they did not have the same attitude. They weren't enthusiastic, and their approach was very haphazard, they would put the tape measure down and then squabble as to who should hold it. Then someone would walk off with it. They didn't seem to be able to organise themselves. A rough guide or estimate was good enough. Most of them were not prepared to measure carefully and check their answers. They lacked the willingness to ensure the work was right and accurate.