CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

# GCSE

## Mathematics

Session: 2000 June
Type: Report
Code: 1662

Oxford Cambridge and RSA Examinations

OCR

RECOGNISING ACHIEVEMENT

## GENERAL CERTIFICATE OF SECONDARY EDUCATION

(former Midland Examining Group syllabus) GCSE 1662

# MATHEMATICS: SYLLABUS A



## REPORT ON COMPONENTS

TAKEN IN JUNE 2000

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## Paper 1

### General Comments

For the first time this year, calculators were not allowed on this paper. It appeared to have an effect in three ways. (i) Questions involving basic arithmetic proved to be more difficult; (ii) the better candidates, who often solved algebraic equations by number crunching were unable to do this, and, (iii) for the first time in several years a proportion of candidates did not complete all the questions, often due to doing pages of long winded calculations earlier in the paper.

It appeared from parts of their answers, that some of the candidates did not have access to the necessary equipment.

### Comments on Individual Questions

Q.1 (a) 8209; (b) 473; (c) 179; (d) 2360; (e) 2400.

This question was answered well on the whole, but 8029 was a common wrong answer. Some candidates rounded 2360 to 2300 when trying to round to the nearest 100.

Q.2 (a) Tangent; (b) Arc; (c) Diameter; (d) Chord.

Due to possible doubt within the diagram, radius was allowed as the answer to (c). It was obvious that candidates generally did not know the names of the parts of a circle. This is an example of candidates not <u>learning</u> mathematical language. Candidates cannot hope to do well on questions on circles if they do not know the basic language needed. Seldom more than one mark scored here.

Q.3 (a) {(1), 2, 4, 5, 10 (20)}; (b)(i) 49, (ii) (±) 9; (c)(i) Even no, (ii) 12 or 18, (iii) 11, 13 or 17, (iv) 8.

(a) Was generally well answered, although occasionally some of the factors were missing.

(b) Demonstrated the effect of not having a calculator. Many candidates wrote down that $7^2 = 7 \times 7$, and were then unable to evaluate it correctly; 14, 42 and 59 were all frequently seen. The $\sqrt{81}$ or equivalent, was usually done correctly in previous years; this year however a correct answer was very rarely seen, with 40.5 and $81^2$ being commonly seen answers.

(c)(i) and (ii) Were well answered, but not (c)(iii) or (iv).

Q.4 11 carnations and 65 pence change.

A fair proportion of correct answers here, and many who failed to get the correct answer still knew <u>how</u> to do it, and scored method marks. (Lack of calculator again causing a loss of marks).

Q.5 (a) The Rolling Stones; (b) 80; (c) Sample size/sites or non-uniform cross section.

A well answered question, with parts (a) and (b) usually correct. Often at least one mark was scored in part (c), but some candidates seemed to concentrate on people refusing to answer questions.

Q.6 £1150.

Despite the lack of structure, this question was possibly the best done on the whole paper. Careless addition errors sometimes lost one mark.

Q.7 18 to 20 $cm^2$.

This question was done well by the better candidates, but the poorer ones had problems. Correct units were surprisingly rarely seen.

Q.8 (a)(i) 240,000 or 237,600 or 232,000 or 237,000; (ii) more – we used overestimates; (b) 22,968.

(a)(i) Poorly done, the majority attempted to find the exact answer. Those who did start the question correctly often made errors in computation.

(a)(ii) There were many inappropriate responses to this part of the question.

(b) Generally correct methods were seen but most candidates made more than two errors evaluating their product. Many also sought to multiply by an additional factor of 10.

Q.9 (a) 7; (b) 6.

(a) Those who attempted to find the median in this part of the question knew to rank the numbers. Many however used only eight of the numbers. The method of finding the median from their ranked data was usually correct. Some found the mean instead of the median.

(b) Part of the method was known to those who attempted to find the mean, namely to add the data. However many did not add correctly or did not add all their numbers. Few encountered problems in knowing the number to divide by but did not manage to correctly evaluate the quotient, some also gave the mean as the sum of their numbers or multiplied their sum by the number of data items.

Q.10 (a) $\frac{1}{5}$oe; (b) $\frac{49}{100}$; (c) $\frac{31}{100}$.

This question was answered well by the better candidates.

(a) Was well answered.

(b) Was often correct, but some did not combine Mr and Mrs Green's probabilities.

(c) Marks were often lost here because of poor arithmetic.

Some candidates persist in using other methods of writing probabilities, some of which were penalised.

Q.11 (a) Correct reflection; (b) Correct rotation; (c) Correct enlargement.

(a) Generally well done.

(b) Many candidates attempted to reflect about the diagonal line perpendicular to the longest side of the given triangle. A few did rotate but gave three images at 90° intervals. However many did obtain the correct response.

(c) Generally poorly done with many candidates drawing the image using the centre B for the vertex between the shorter sides of the given triangle. In most cases the triangle was an incorrect size. Other candidates drew an image in the correct area of the graph paper but were unable to locate all three vertices correctly.

Q.12 (a) $\frac{12}{25}$; (b) 35(%); (c)(i) 0.375; (ii) 0.0375.

This question was common with the Intermediate Tier.

(a) Poorly done with 48% a frequent incorrect response.

(b) Only done correctly by the best candidates.

(c)(i) Only a handful of candidates knew to divide 3 by 8; 0.38 was a common, incorrect, response.

Q.13 Suitable observation sheet. For full marks data must be instantly available e.g. 2 way table. Most candidates scored on this question; usually at least 2 marks. Only a few two way tables were seen.

Q.14 (a) 24; (b) 110; (c)(i) g; (ii) k; (iii) d.

Parts (a) and (b) were reasonably well attempted with most candidates scoring some marks. Part (c) was very poorly done, candidates either did not understand the necessary vocabulary, or were unprepared to answer this part of the question.

Questions 15 to 18 were common with the Intermediate Paper.

Q.15 (a) 31; (b) 1, 6, 11, 2; (c) 281 to 290; (d) Correct pie chart.

(a) Few scored the mark for 31. Some gave a response close to 31 whilst others gave the largest and smallest numbers in the given data.

(b) The vast majority scored one of the two available marks. A few left their answers as tallies whilst some others used another method to count the data items.

(c) Generally correct.

(d) Poorly done, with little or no working seen in the majority of cases. Of those who did show working, few knew the correct method for calculating angles/percentages and even these were spoilt by poor computational skills.

Q.16 (a)(i) 3.5; (ii) 6; (iii) 7; (b)(i) $16q$; (ii) $8n + 4p$.

(a)(i) More able candidates were able to answer this part without difficulty.

(a)(ii) Poorly done by most; there was a lack of knowledge of equation solving skills in both this and the next part of the question.

(a)(iii) Very few marks scored here.

(c)(i) and (ii) These were the best attempted parts of the question.

Q.17 (a) $3n$; (b) $4n + 1$.

Very few correct answers seen. This topic is on the foundation syllabus, but would appear to be beyond all but the few very best candidates. The usual response was to continue the sequences.

Q.18 (a) Accurate drawing; (b) 20 cm oe.

(a) was generally well done, with some marks earned by nearly all those who used a ruler to draw their straight lines. The horizontal and vertical lines were the most frequently correct.

Q.19 (a)(i) −1, 2, 5, 8, 11; (ii) correct ruled line; (b)(i) −1, 3, 15; (ii) correct smooth line.

Most candidates could not do this question, although a few centres produced candidates who scored highly.

## Paper 2

### General Comments

Candidates usually performed reasonably well at the start of the paper, but tailed away badly towards the end. The vast majority earned between 25 and 65 marks out of 100. In general visual questions were answered well; but the arithmetic questions showed that many candidates were distressingly weak in the basics - fractions, percentages, bills, use of metric units, etc. One-stage calculations presented few problems to most, but two-stage problems drastically reduced the success rate. Algebra was usually a no-go area; and work on angles, both measuring and calculating, was often poor. A few candidates evidently did not take a ruler into the examination, and probably no protractor either.

About 10% of the candidates were unsuitably entered, earning only 20 marks or less. Many of these simply made little progress, leaving several pages completely blank or writing arbitrary answers to selected parts of questions. It is fair to say that almost all of those who continued to try throughout the examination managed to answer sufficient parts of questions to be awarded a grade.

### Comments on Individual Questions

Q.1 (a) 20 minutes; (b) Britain Today; (c) off the shelf, World News.

A nice easy starting question which was generally well answered. Quite commonly, however, only one answer was given in part (c).

Q.2 (a) (i) 1/4, (ii) 3/8; (b) South; (c) 90°.

(a)(i) Usually correct; (ii) Not well done. 1/3 was often seen, as was an answer in degrees.

(b) Usually correct, although North was seen fairly often.

(c) Again usually correct. 45° was the most common wrong answer.

Q.3 (a)(i) Odd; (ii) 17, 19; (b)(i) 1 + 3 + 5 + 7 + 9 = 25, 1 + 3 + 5 + 7 + 9 + 1 1 = 36; (ii) square numbers.

The candidates did well with the number patterns in both parts. The names of the numbers were not as good, with answers like 'plus two', 'results', 'answers' seen.

Q.4 8, 11, 7.

Almost always correct.

Q.5 (a) (i) 40cm$^3$, (ii) 20cm$^2$; (b) (i) (square) pyramid; (ii) 53°, (iii) 4 correct lines drawn; (iv) 4.

(a) Again usually correct, though there were some errors in part (i). It seemed that many counted the squares rather that multiplying.

(b)(i) Common wrong answers were 'prism' and 'triangle'. Spelling errors were condoned.

(ii) Many blanks here; also 45° and 60° were often seen.

(iii) Mostly correct, although one of the two pairs of axes of symmetry was sometimes missing.

(iv) Largely correct.

Q.6 (a) 3 points plotted correctly; (b)(i) 39°C, (ii) −14°C; (c) ±53°C; (d) 5°C; (e) 7 hours.

(a) The plotted points were usually accurate to within 1mm.

(b) Usually correct.

(c) Mostly correct, although 25 came up at regular intervals.

(d) Little difficulty was experienced here.

(e) Very mixed responses. It was difficult to see how they arrived at some of the answers.

Q.7 (a) $2 \leqslant h \leqslant 3$; (b)(i) 9500cm, (ii) 5m, (iii) 104 yards; (c)(i) 2 000 000, (ii) 2 500 000.

(a) The majority correctly gave 2m, 3m or something in between. The remainder mostly gave answers between 6 and 10 - probably confusing metres with feet.

(b)(i) 950 was very common. (ii) Some correct answers but a variety of wrong answers were seen.

(iii) $95 \times 0.9144$ was much more common than the correct method.

(c) Discriminated at the Grade F level. The careful candidates were usually correct.

Q.8 (a) Impossible, unlikely, evens, likely, certain; (b)(i) 6, (ii) 5, (iii) 5/40 oe.

(a) Almost always correct.

(b) Poorly answered. A range of 3 to 8 was often seen. 6 was the favourite mode; and a fraction was rarely seen in part (iii), least of all the correct fraction.

Q.9 (a) £3.04; (b) £58.80; (c) £3.68; (d) $3.6 \times 10^{11}$.

This arithmetic question was generally poorly answered. Most candidates did no better than to answer one of the four parts correctly, with basic errors in the other parts.

(a) All sorts of misconceptions were seen.

(b) 490 - 12 = 478 was often seen. Those who could find 12% often gave the discounted cost as the answer, rather than the discount itself.

(c) £11.04 was the most popular answer, suggesting that many candidates do not read the question properly.

(d) Many just wrote down 3.6", or whatever their calculator display showed.

Q.10 (a) 20 km/h.

The question as a whole was usually well answered. Some errors were seen in locating B and C, but it was pleasing that very few said that the car was going downhill between B and C.

Q.11 (b)(i) 1/25 oe, (ii) 0 oe, (iii) 5/25 oe.

The table in part (a) was usually correct, but the responses to part (b) were many and varied. Most of these candidates avoid fractions at all costs.

Q.12 (a) 41.28 francs; (b) £2.68.

There was a poor response to this question. Quite often no working was shown, with totally wrong answers evident.

(a) Few found 160%. Some found 60% and then stopped. Many found 50%, then 25% and then lost the thread. Others divided by 60.

(b) Many tried to do this by trial and error, resulting - at best - in an inaccurate answer. There seemed to be a general reluctance to divide.

Q.13 (a)(i) 52°, (ii) 32°; (b) Rhombus.

A widespread lack of knowledge of basic geometry at this level was revealed by this question. Some tried to measure the angles in the diagram; some just guessed. Working was seen only rarely. In part (b) 'kite' or 'diamond' were more frequently seen than 'rhombus'.

Q.14 (a) 714 to 714.2 $cm^2$; (b) 105.8 to 106 cm.

Only very occasionally candidates remember $\pi r^2$ or $2\pi r$, so very few marks were earned on this question. Even the mark for $cm^2$ was not earned very often.

Q.15 (a) $y+5$; (b) $4y+5$; (c) $4y+5=61$, 14.

Algebra! A poor response guaranteed. Part (a) was sometimes correct but 3y + 5 was common in part (b). Almost no-one wrote down the correct equation (or any equation) in part (c). Instead, some managed to find the cost of one apple by trial and error.

Q.16 £91.40 or £91.39.

Most candidates managed to pick up the first two marks here, for the two multiplications. The third mark, for finding 5% of the total and adding it on, discriminated at the grade E level. Then the biggest hurdle of all – remembering to change pence into pounds! Electricity bills for several thousands of pounds were common. Would they pay without question if they actually received such a bill?

Q.17 (b) 0.95.

(a) Many candidates seemed to be quite happy to propose going through a complete English dictionary, showing little appreciation of sampling. They often wanted to pick out the words containing vowels, blissfully unaware, apparently, of just how few do not contain vowels. The standard of written English here was remarkably low. Some of the best answers, however, were written in just two or three lines.

(b) Examiners reported that they saw just one or two correct answers amongst several hundred marked. Too advanced a concept for these candidates.

## Paper 3

## General Comments

The national introduction of a non-calculator paper has been a demanding challenge to all candidates.

Many students, particularly those in the middle and lower bands of this ability range, were ill-prepared in all aspects of arithmetic which now form an essential part of this assessment. Urgent attention to improve the standard of the four rules of number, fractions, decimals and percentages is essential if otherwise good candidates, who understand and can apply the mathematical principles involved, are to achieve the grades they deserve.

Now that candidates have more need to show working, it is pleasing to report that most do so in a clear and logical way. Practice is still required, however, with presentation of answers to the longer, unstructured questions. These, at the moment, can sometimes be rather randomly set out.

There has been a noticeable improvement in the standard of Algebra, something that has been of concern in the past. Data Handling questions continue to be answered well. Drawing and graphical work is generally of a good standard - when the appropriate equipment, including a sharp pencil, is available.

Candidates appeared to have enough time to complete the paper. Few seemed to have been entered at the wrong tier.

## Answers and Comments on Individual Questions

Q.1 (a) 12/25; (b) 35%; (c)(i) 0.375, (ii) 0.0375.

What was intended as a gentle introduction proved difficult for many. Though there was some success with parts (a) and (b), answers were often spoilt by poor cancelling. In part (c) (i) 3/8 often turned into $8 \div 3$ and many of those that divided the right way round were unable to do so accurately. For their answer to part (c) (ii) some multiplied by 10 rather than dividing and others just added a zero to the end of their answer to part (c) (i).

Q.2 (a) 31; (b) 1, 6, 11, 2; (c) 281 to 290; (d) pie chart.

This question was generally well done by all; many candidates scored full or nearly full marks. Common errors were the range given as 264 to 295 instead of a single number and poor arithmetic leading to the wrong angles being calculated. Those who chose to work in percentages were often not accurate enough in the drawing of the pie chart.

Q.3 (a)(i) 3.5, (ii), 6, (iii) 7; (b)(i) $16q$, (ii) $8n + 4p$; (c) $x^2 + 5x + 4$.

Pleasingly, there were a significant number of correct answers to all parts of this question. Some candidates did not take enough care though and $3x = 8$, $7x = 35$, $5x = 17$, $16q^3$, $8n - 4p$ and in part (c) $4 \times 1 = 5$ were all common errors.

Q.4 (a) Diagram; (b) 20.

There were few problems encountered by candidates in part (a); the accuracy of drawing was good. Only those without the necessary equipment had difficulty. In part (b), it was clear that the idea of scale was well known. 5 was the common wrong answer.

Q.5 (a) $3n$; (b) $4n + 1$.

A large number of candidates still do not understand what is required in questions of this type. The next term in the sequences or the term-to-term rule for the sequences were the predominant answers given. Some candidates know and could use the formula $a + (n\text{-}1)d$, but others had trouble remembering it accurately and/or simplifying their result.

Q.6 0.3.

The underlying method required was understood by all. There were many correct answers. Some, however, made the error of adding 0.02 instead of 0.2, giving a final answer of 0.48.

Q.7 (a)(i) 2400, (ii) 2.4; (b) 5.

Though most knew how to find the volume of water, many were let down by an incorrect calculation. $40 \times 30 = 120$ or 700 were common errors. Division by 1000 to convert from $cm^3$ to litres was rarely seen; dividing by 100 was the more popular, incorrect method. The poor arithmetic stretched into part (b) also where $20 \times 20 = 40$ was seen regularly. Whether this calculation was correct or not, most candidates then followed a Trial and Error method to get to 2000. A good number did this successfully.

Q.8 (a) Tight oval of positive gradient points; (b) Scattered points.

More often than not, answers to this question earned full marks. Correlation is well understood.

Q.9 (a) 20; (b) 8000.

Better candidates scored well in part (a) with clearly set out working. Others, however, seemed to be trying all possible combinations of the given figures with no clear idea of what was required. Most wrong methods involved dividing by the wrong value, usually 480. Answers to part (b) were much more successful. Most followed a correct method and there were many correct answers. Arithmetic problems again meant the loss of some marks for a number of candidates.

Q.10 (a)(i) (6, -5), (ii) $\begin{bmatrix} 4 \\ -6 \end{bmatrix}$; (b)(i) $(11, -1)$, (ii) $y = 3$.

The majority of candidates made little or no real use of the grid provided and consequently had limited success with this question. Better candidates used the grid sensibly and scored full marks. Often the question was treated as a number exercise rather than a test of spatial awareness.

Q.11 4.5 to 5.5

The idea of rounding to estimate a calculation was well know. $\sqrt{27}$ was a popular final answer when candidates were unable to go further, Others could and did make the final step to a correct response. Those not seeing or understanding the instruction to 'estimate' wasted valuable time with long multiplication.

Q.12 (a) 60; (b) 80; (c) $\frac{f-32}{0.6}$.

A good proportion of candidates managed to answer parts (a) and (c) correctly. Very few could cope with the demands of part (b). Many candidates got as far as $36 = 0.6d$ in part (a); the next step was more problematical. Of those who knew to divide by 0.6, many failed with the arithmetic. Candidates did not link part (b) with the original formula. 68, the value of $f$ given in part (a), was a common wrong answer to part (b). A pleasing, high number of candidates were able to transpose the given formula correctly in part (c).

Q.13 6.

Though there were a good number of correct solutions to this question, many faltered on one element of the calculation. Incorrect mid-points, dividing by 4 instead of 30, $13 \times 0 = 13$ and incorrect arithmetic were all seen. Of those with little or no idea of what was being asked, common incorrect methods were $\sum f \div 4$ and $\sum \text{mid-points} \div 4$ or 30.

Q.14 (a) 720, 480; (b) 1/8.

Many candidates scored full marks in part (a); this time the arithmetic did not stand in the way of them obtaining correct answers. A common error made by the less able was to divide 1200 by 3 and by 2. In part (b), many established the correct fraction but not all could cancel this successfully to its simplest form. Some found the women and children as a fraction of the men.

Q.15 (a) Volume; (b) Area; (c) Length.

Very few candidates showed any working here. Most obviously guessed and usually guessed incorrectly.

Q.16 68.

For the better, careful candidates this was an easy two marks. Of those who recognised the need to choose the lower bound of the two values, some found the area instead of the perimeter. Many, just spotting the word 'perimeter' worked out $2 \times (22+13)$. Some of these however, looking back at the question, decided to knock off 0.5 as their contribution to finding the smallest value of the perimeter.

Q.17 (a) Tree diagram; (b) 1/400; (c) 5; (d) 12/400.

It was pleasing to see very few candidates using inappropriate ways of expressing probabilities. Invariably fractions and decimals were used.

In many cases the tree diagram was completed correctly in part (a). Though candidates knew the methods required for the rest of the question, their inadequate arithmetic skills often led to incorrect answers. $\frac{1}{20} \times \frac{1}{20} = \frac{1}{40}$ or $\frac{2}{40}$ etc were all too common. Those with less secure knowledge tried to add instead of multiply probabilities. The distinction between 'and' meaning multiply and 'or' meaning add is still unclear for some.

Q.18 (a) 12, 8, 6, 4, 3, (2.4), 2; (b) Graph; (c) 3.1 to 3.4; (d) 26 to 28.

The table of values was often completed correctly. Invariably, if there was an incorrect $y$ value, it was that from $x = 15$. Though there were many good graphs with accurate plotting of points and a smooth curve, some candidates still do not take enough care. The point (50, 2.4) was often plotted incorrectly due to the mis-reading of the scale of the graph. Candidates successfully used the graph to find the answer to part (c) but were equally unsuccessful in part (d). Again, the misreading of the scales led to many incorrect answers.

Q.19 (a) 1/9; (b) $2^{-6}$; (c)(i) $1.8 \times 10^{10}$, (ii) $4 \times 10^{3}$.

Most candidates found this question beyond their capabilities. Correct answers to any part of it were few and far between. The work on indices in parts (a) and (b) caused most trouble. -6, -9 or 0.03 were common wrong answers in part (a) and only the best candidates could make any headway in combining the powers in part (b). The questions on standard form caused less confusion though most failed to reach a correct answer. $18 \times 10^{9}$ and 4000 were the best attempts in parts (c) (i) and (c) (ii). Have candidates relied on the calculator for these questions too much in the past?

## Paper 4

### General Comments

Candidates appear to have found this paper a little more difficult than last year. Two factors may have influenced this. The reduced formula sheet meant that candidates had to rely on recall of the circle and trigonometric formulae, which affected performance on questions 5, 14 and 16. The division of topics between the non-calculator Paper 3 and the calculator- allowed Paper 4 meant that many of the topics perceived difficult by candidates (Compound Interest, reverse percentages, trigonometry and similarity, for example) occurred on Paper 4.

There was encouraging evidence of improved performance on some topics (trial and improvement and approximations, for example) and many gained high marks for the first eight questions of the paper. The questions on manipulative algebra, which formed a significant proportion of the paper, were mostly of a straightforward nature but the response from many centres was disappointing. Many candidates lacked the facility to factorise simple quadratics.

The unstructured questions 5 and 8 produced some excellent solutions that were very pleasing. Some weaker candidates did not complete the last four questions but unfamiliarity with the topics rather than shortage of time may have been the cause. Most candidates showed working so that method marks could be awarded. All candidates appeared to have scientific calculators.

### Answers and Comments on Individual Questions

Q.1 Costsave better since 1500g for £1.82 compared with Pricewell 1500g for £1.85. The candidates who realised that both offers led to a total weight of 1500 g had no difficulty in gaining 3 marks. Some otherwise very good candidates started by working out g/pence or pence/g for the original boxes so made little worthwhile progress.

Q.2 (a)Table completed; (b)(i) $\frac{1}{25}$, (ii) 0, (iii) $\frac{5}{25}$.

The majority of candidates scored very well on this question. While probabilities written as fractions, decimals or percentages are acceptable, marks were not given for answers of, for example, 1 in 25, 1 to 25 or 1 : 25.

Q.3 (a) 41.28 francs; (b) £2.68.

Part (a) was well done with most finding 60% then adding. Some weak candidates divided by 60. Some candidates wasted time in part (b) by attempting to find the answer using trial and error rather than dividing 25.80 by 9.63. No marks were awarded for trial and error unless the correct answer was reached so this approach is not to be encouraged. An appropriate degree of accuracy for small amounts of British money is deemed to be correct to the nearest penny.

Q.4 (a)(i) 52°, (ii) 32°; (b) Rhombus.

Most candidates found the value of $x$ correctly but fewer reached 32° for $y$. Many gained a consolation mark for writing angle $ABE$ as 116°. Answers of kite, diamond or parallelogram appeared as frequently as rhombus. Some weak candidates gave trapezium, equilateral or symmetrical polygon.

Q.5 (a) 714 to 714.2 $cm^2$; (b) 105.8 to 106 cm.

Most candidates were able to structure their answers correctly but many were hampered by poor recall of the circle formulae, which are no longer supplied on the formula sheet. It was not always possible to deduce which formulae had been used. Good practice is to quote the formula, show substitution (e.g. $A = \pi \times 10^2$) then use a calculator to evaluate the numerical expression. Candidates sometimes failed to differentiate between radius and diameter or multiplied 20 by 10 to find the area of the square. Most supplied the correct units for part (a). Part (b) was less successful than part (a). Some forgot the 3 cm overlap or added the 3 twice.

Q.6 (a) $y + 5$; (b) $4y + 5$; (c) $4y + 5 = 61$, $(y =)$ 14.

Most made a correct start but very many candidates gave 3y + 5 rather than 3y + $y$ + 5 in part (b). Some candidates formed a correct equation from the working but many were able to reach the answer of 14 by reasoning or by trial and error. Marks were available and were often awarded for the formation and manipulation of an equation from a wrong answer to (b) provided the variable $y$ (and only $y$) was used.

Q.7 (a)(i) $n^3$, (ii) $6ab$; (b) $12x - 18$.

Candidates had more difficulties in part (a) where $3n$ and $5ab$ were common wrong answers. Most reached $12x - 18$ for (b) and were not tempted to over-simplify the expression.

Q.8 £91.39 or £91.40.

Mostly correct, clear working was shown so that part marks could be awarded even if the correct answer was not reached. Most selected and multiplied the correct pairs of figures then added before working out the VAT. Many candidates, however, had difficulty in appreciating that electricity bills of £9139 were excessively high.

Q.9 (a) Two-way table with boys/girls and columns for word-processing, spreadsheets, both and neither;
(b) 0.95.

Very few scored full marks on this question. Full marks were awarded in part (a) for a two-way table which allowed for the response 'neither' so that a simple tally could display the data with no further sorting required. Many candidates produced a one-way table with a column headed boys/girls or a questionnaire. Both gained some marks. Part (b) was very badly answered. Very few recognised that $\frac{\Sigma fx}{\Sigma f}$ was required. Most added the digits on the top row, the digits on the bottom row then divided - often reaching the answer of 2.

Q.10 (a) 8.04; (b)(i) 7.6149(0.), (ii) 7.61, (iii) e.g. $\frac{4^2+0.5}{4\times0.5}$, 8 to 8.3.

It is disappointing to report the large number of wrong answers for part (b) since candidates should be expecting questions of this type on paper 4. Many did not treat the numerator as bracketed by implication so reached an answer of 15.282... after keying $3.9^2 + 0.53 \div 3.9 \times 0.53$. The remainder of the question was fairly well attempted although some rounded to $\frac{4^2+1}{4\times1}$, which was acceptable but led to a significant under-estimation compared with the more usual rounding to one significant figure.

Q.11 4.2.

There was a very pleasing improvement to the solution of this trial and improvement question. The majority of candidates knew the method involved and evaluated their trials correctly. The final mark for 4.2 was awarded to about 25% of the candidates but answers of 4.3, 4.245 and 4.25 were common. Some candidates continue to aim for 68 to one decimal place rather than $x$ to one decimal place.

Q.12 (a) £535.95 or £535.96; (b) £376.

The response to this question was most disappointing. Compound Interest is not new to this paper yet very few gained full marks. There was little sign of the more efficient method of $450\times1.06^3$ but some followed the correct step-by-step method. Some earning method marks failed to gain the answer mark because they gave a 4 decimal place answer or corrected to £536. The majority evaluated, in effect, the Simple Interest. Part (b) was very poorly done. The vast majority evaluated 115% of £319.60 instead of the reverse percentage.

Q.13 $x = 3, y = -0.5$.

Better candidates used the correct approach to eliminate one of the variables. Those who reached $7x = 21$ found $x$ correctly but had difficulties in finding $y$ by substitution. Many followed $4y = -2$ by $y = -2$. Weaker candidates attempted solutions by trial and error without success.

Q14 (a) 8.9 to 8.94 km; (b) 7.7 to 7.75 km.

The best candidates had few problems in gaining full marks for this question. As in question 5, however, the reduced formula sheet caused problems for the majority. Some average candidates realised that Pythagoras' theorem was required in part (a) but added the squares of the sides. In part (b) there was evidence that most realised that trigonometric ratios were involved since many quoted SOHCAHTOA but the angle with the vertical made the question more difficult. Those applying the trigonometry usually selected the correct tangent ratio.

Q15 (a) $10x - 22$; (b) 1, 2, 3, 4; (c) $3x(2x - 3y)$; (d)(i) $(x-2)(x-6)$, (ii) 2, 6.

Algebra continues to defeat many candidates so few marks were gained on this question. In part (a) most gained one mark for reaching $4x - 20 + 6x - 2$ but often collected terms wrongly to $10x - 18$. Few noticed the word 'integer' in part (b) so attempted to simplify the inequality without selecting integer values. The remainder of the question was often omitted by weaker candidates whilst even those correctly factorising the quadratic rarely followed it by quoting both values of $x$.

Q16 (a) 83.6 to 84°; (b) 1.125 m.

This was frequently not attempted. Some candidates did not recognise that trigonometry was required and gave the answer as 90°. Those who did start correctly by finding half of the required angle often failed to gain full marks because of premature approximation of $\frac{0.8}{1.2}$ as 0.6 or 0.66. Some used their calculator incorrectly by evaluating $(\sin^{-1}0.8)\div1.2$. In part (b), a small minority used similarity to find PS. There was no evidence of long methods which involved trigonometry.

Q17 (a)(i) 0.72, (ii) 0.02; (b) Plots at (10, 4), (30,19), (50,30), (70,18), (90,9) with ruled joins; (c)(i) 4, 23, 53, 71, 80, (ii) Plots at (20, 4), (40,23), (60,53), (80,71), (100,80) with ruled joins or smooth curve; (d)(i) 50 to 54 minutes, (ii) 27 to 32 minutes.

Very few candidates got both probabilities correct. Those who correctly multiplied 0.9 by 0.8 often followed by 1 - 0.72 for part (ii). The majority added the probabilities (then divided by 2 when the answer was more than 1). Many realised that 0.1 and 0.2 were the probabilities to use in part (ii) but then added.

This was the first time that candidates have been asked to draw a frequency polygon without the help of scaled axes. Many failed to get the mark for the scaling of the axes since they labelled the horizontal axis $0 < t \leq 20$, etc instead of 0, 20, 40 etc. Others plotted points at 20, 40 etc rather than at 10, 30 etc. To gain full marks the correctly plotted points had to be joined by ruled lines rather than freehand. Weaker candidates often did not attempt the cumulative frequency or repeated the values from the first table. Those who obtained the correct cumulative frequencies often went on to draw a correct diagram and to find the median and interquartile range.

# Paper 5

## General Comments

The paper produced a wide range of response with marks ranging from a few low scores of single figures to a number in the mid nineties. It was therefore able to discriminate well between the different levels of candidates' abilities. Fortunately there were relatively few very low scores indicating that most of the candidates were entered at the correct level. It is still worrying, however, that there is still a minority of students who clearly should be entered at intermediate level. For them the experience of sitting such a demanding paper cannot have been a rewarding one.

In terms of the Mathematics involved many candidates performed very well. Algebra, if anything, was improved probably reflecting the greater emphasis that has been placed on it in recent years.

The most worrying aspect was the inability to cope with the arithmetic on this first non-calculator paper. Very little demanding arithmetic was set with no questions, with the possible exception of 10(b), requiring long multiplication or division. Most candidates, however, found the calculations very difficult. The sort of calculations which illustrate this include 40 x 30 x 20 which was often given as 240 or 2400, the inability to calculate $20 \div 8$, the inability to cope with $30^3$, errors in multiplication of fractions such as 7/20 x 6/19 (or even 7/20 x 7/20 when that error was made) and errors in calculating 50.5 - 14.95. "Cancelling" fractions, which would have made calculations such as 7/20 x 6/19 or 4/3 x 30 x 30 x 30, so much easier was just never seen.

## Comments on Individual Questions

Q.1 Locus of line parallel to rear of house distance 2 cm, circular ends radius 2 cm, circle centre tree radius 2.5 cm. Correct shading.

This proved a successful start for most candidates. The most common mistakes were to omit the circular ends or the parallel line. When a reasonable locus was drawn, the shading was almost invariably correct. A few candidates appeared not to have compasses.

Q.2 (a) 24 000 $cm^3$; (b) 22098.1 $cm^3$; (c) 15.5 kg, 14.5 kg.

Most candidates rounded the numbers to 40, 30 and 20 but some only rounded to 2s.f. and a few used the given numbers. Many candidates gave the wrong number of zeros in the final answer. Part (b) was usually correct, even sometimes after an incorrect (a). Part (c) was generally well done with very few of the 15.4 etc that were often previously seen. This area of work has definitely improved.

Q.3 (a) Possibility Space followed by 5/36; (b) 25/36 or equiv.; (c) 6/36 or equiv.

Many candidates do not know what a possibility space is despite it being clearly on the syllabus. Many achieved the 5/36 without a possibility space. Some only found 21 outcomes. Parts (b) and (c) were usually well done although 1/6 was a fairly common error in (b). Generally this question was done very well or very badly.

Q.4 (a) $t^6$; (b)(i) $x = 3.5$, (ii) $x > 2.5$; (c) $(2x + 5)(2x - 5)$; (d)(i) $(x + 1)(x + 6)$, (ii) $-1$ and $-6$.

Whilst in general it is pleasing to note the improvement in algebra, there are still some worrying aspects. Part (a) and (b)(i) were usually correct. In (b)(ii) it was disappointing to see the number of candidates working with equations and either leaving = or inserting the inequality (sometimes wrongly) at the end. Perhaps more worrying was the number who could not cope with $20 \div 8$, either not attempting it or giving wrong answers such as 2.4. In (c) the "difference of two squares factorisation" was not known by many candidates. Most candidates were able to do the factorising in part (d). Slightly disappointing was the significant number who did not see the connection between parts (i) and (ii), often using the formula. Candidates should realise that words like "hence" are intended as hints as to the method.

Q.5 (a) (3), 20, 21, 49, 73, 90, 98, 100; (b) plots joined by curve or line segments; (c) 78 to 82; (d) 1.7 to 2.2 cm.

It is very pleasing to note how much the standard of cumulative frequency work has improved. All parts were done well with many candidates gaining full marks. A very few weaker candidates plotted frequencies. Occasionally median was given instead of inter-quartile range. It is pleasing to note how very few candidates gave a range of values for the inter-quartile range.

Q.6 Ruled line, through (0,0) and (2,6), ruled line through (0,6) and (4,0), correct region shaded.

This was fairly well done. Sometimes $y = 3x$ was drawn as $y = 3$ or $x = 3$ (or both). In fact the more difficult line was sometimes done better. Candidates who made a table of values for $3x + 2y = 12$ were less successful than those using the intercept method. Quite a large number of candidates shaded the wrong region even after correct lines.

Q.7 Correct argument based on ratios of 2 lengths and 2 widths or length & width and length & width.

This was done well by many candidates despite the many possible methods. Some tried vague descriptive arguments and many erroneously used areas. Quite a number produced, what would otherwise have been a perfect response, apart from the fact that they only used one border.

Q.8 (a) 8; (b) 2; (c) 6.

Better candidates achieved all three and most got one or two correct. There were no particularly frequent wrong answers.

Q.9 (a) $x > -3$; (b)(i) $-1\frac{1}{2}$ and 1, (ii) Parabola crossing $x$-axis at $-1\frac{1}{2}$ and 1.

As with question 4(b) far too many candidates treated part (a) as an equation and then either left = or guessed the inequality. Many made the expected error after $- 3x < 9$, with those collecting $x$ terms on the right faring somewhat better. In part (b) the very good candidates did well but the factors were not well done by average candidates. Even those with correct factors sometime went on to answers of -3 and 1. The candidates using formula, if anything, fared worse, with 1 - 24 being the most common error. In (b)(ii) many gave straight lines or cubic graphs. There were also many parabolas but few saw the significance of their answers to part (i) to the intercepts with the $x$-axis.

Q.10 (a)(i) $18\,000\pi$, (ii) 45; (b) 24.

This proved a difficult question for many candidates. Even those who appreciated what was required, often found the arithmetic beyond them. $30^3$ was often seen as 2700, 270, 900 etc. 4/3 was often changed to 3/4. Some forgot to divide by 2. It was almost never simplified by cancelling the 2 with the 4 and one of the 30s with 3. Despite the instruction many substituted for $\pi$. In part (b) most candidates put

$\pi \times 20^2 \times h$ = their (i) but many could proceed no further. Some very good candidates however did very well on these two parts.

Part (c) was only done well by the very best candidates. The vast majority did not spot the right angled triangle and hence the need for Pythagoras. Even then some could not cope with the arithmetic, not spotting that it was a "3, 4, 5" triangle. It was very pleasing to note, however, the response of the very best candidates to this testing spatial awareness question.

Q.11 (a) 42/380 or equiv; (b) 226/380 or equiv.

Most candidates knew all or some of the methods required but could not cope with the arithmetic. The use of unconditional probabilities instead of conditional was more common than in similar questions of previous years. Addition instead of multiplication was also fairly common. Lack of knowledge of fraction rules led to many wrong answers. 20 x 19 defeated many, but by far the biggest problem was that candidates did not know that it was necessary to multiply 7 x 6 and 20 x 19 even after they had written 7/20 x 6/19. These problems were exacerbated in part (b) when it was required to both multiply and add fractions. The main method error in (b) was not to deal with reversals and hence stop at a method which would lead to 113/380. Despite having found P( both fair) in (a), very few did it as 1- P(both fair or both dark or both red).

Q.12 35.55 m.

Although most candidates realised that it was necessary to subtract "small" from "big" many, either used 14.5 etc instead of 14.95, or could not cope with the subtraction. A few did 50 - 15 and then ± 0.5.

Q.13 (a)(i) $6\sqrt{2}$, (ii) $10\sqrt{3}$, (iii) $5\sqrt{3}$; (b) a = 32, b = 10.

Some candidates did this question extremely well but many did it very badly. By far the most common error was to say $\sqrt{72} = 2\sqrt{6}$ and $\sqrt{18} = 2\sqrt{3}$ etc, apparently by guess work. Perhaps, if students were encouraged to write $\sqrt{72} = \sqrt{36} \times \sqrt{2}$, $\sqrt{18} = \sqrt{9} \times \sqrt{2}$. etc first, it would help. Surprisingly parts (ii) and/or (iii) were correct when (i) was wrong. In part (b), even those who knew how to expand the brackets, often did not realise that, by definition, $\sqrt{7} \times \sqrt{7} = 7$ or that $5\sqrt{7} + 5\sqrt{7} = 10\sqrt{7}$. The definition of a and b was intended to make it absolutely clear what was required but it is admitted that it did confuse some candidates. Again surprisingly, this part was sometimes correct when (a) was totally incorrect.

Q.14 (a) Strata identified e.g. areas, streets, council tax bands, random selection within strata, 10% clear;
(b) ensures all areas, streets etc represented;
(c) people not in directory, not on phone, includes businesses etc.

Most candidates do not fully understand sampling in general and stratified sampling in particular. Most simply stated lots of different types of strata instead of deciding which they would choose as stated in the question. Many stated that they would use, as strata, things that could only be found out by calling at the house first e.g. numbers and ages of inhabitants, thus defeating the whole object of sampling, which is to save you the time and expense of calling at every house. In (b) and (c) many candidates made general statements like "more accurate" or "wider range" rather than looking at the specific case of the question and their strata.

Q.15 (a) $\frac{540}{x} + \frac{300}{x+1} = 90$ followed by ÷ 30; (b) $x = -2/3$ or 9 followed by answer 9.

This was, of course, a difficult question, and proved to be beyond many of the less strong candidates. It did, however, enable many of the better candidates to show good algebraic techniques and the results were pleasing. In the first part stronger candidates often wrote down the unsimplified equation and many of them showed the division by 30. One common error was to have 840 as the numerator of the second fraction. In part (b) those who multiplied through by $x(x + 1)$ were often more successful than those using a common denominator approach. There were often mistakes after a correct initial step. A common mistake was to work out $3x(x + 1)$ as $3x^2 + 3$. Those using factorisation were generally more successful than those using a formula. The question asked candidates to solve the equation and so the negative solution should have been found, before rejecting to answer the final bit of the question.

Q.16 (a) 2a; (b)(i) b – a, (ii) $\overrightarrow{CD} = 2\mathbf{b} - 2\mathbf{a}$ with conclusion; (c) Proof that $\overrightarrow{AE} = \mathbf{b}$ or equiv.

Only the weaker candidates failed to gain some marks on this question. Parts (a) and (b)(i) were usually correct. In (b)(ii) many candidates reached 2**b** – 2**a** but some failed to complete the proof with a valid conclusion or statement that this implied $\overrightarrow{CD} = 2\overrightarrow{AB}$. Most were successful with part (iii). In part (c) better candidates usually found $\overrightarrow{AE} = \mathbf{b}$ and/or $\overrightarrow{BE} = \mathbf{a}$ by a valid method but here too correct conclusions were rare. Many candidates simply stated $\overrightarrow{AE} = \mathbf{b}$ and/or $\overrightarrow{BE} = \mathbf{a}$ without proof.

## Paper 6

### General Comments

Fewer candidates were entered at the wrong level this year, but there were still a significant number of very low scoring scripts.

There has been a slight improvement in basic algebraic manipulation and efficiency in solving simple equations.

Many candidates seem unaware of the angle properties of circles and few demonstrated that they knew a tangent was perpendicular to the radius through the point of contact.

Rather than use a concise and efficient form of the trapezium rule, the majority of candidates preferred to find the area of separate trapezia and this often resulted in inaccurate and poorly presented work.

Candidates used the formulae for standard deviation from the formula sheet without adapting them when considering a frequency distribution and consequently the frequencies were often ignored.

More candidates used incorrect trigonometric ratios, perhaps because they were no longer given on the formula sheet.

### Comments on Individual Questions

Q.1 (a) Negative; (b) Ruled line; (c)(i) 9.9 to 10.1; (ii) Time does not continue to decrease with age.

In part (a) a significant number of candidates described the relationship between age and time rather than the correlation. The line of best fit and the resulting estimate for 20 year olds were well done, with only a few falling out of the acceptable range. The reasons in (c)(ii) were, as expected, rather variable. Many referred to averages or the points not being on the line of best fit instead of explaining why the extrapolation for this particular example was inappropriate.

Q.2 (a)(i) 7.6149; (ii) 7.61; (b) 8 to 8.3.

This was generally well answered with the only errors being $3.9^2$ as 3.9 EXP 2 on the calculator or failure to use = after evaluation of the numerator.

Q.3 4.2.

Many correct and concise solutions were seen. The most common error after correct working was to choose 4.3 rather than 4.2. Some candidates did waste time evaluating unnecessary trials which often resulted in answers given to a greater degree of accuracy than required.

Q.4 (a) 8.9 to 8.94; (b) 7.7 to 7.75.

The majority of candidates scored full marks here but in (a) $BC^2 = 12.4^2 + 8.6^2$ was occasionally seen. In part (b) the omission of basic trigonometric ratios from the formula sheet did result in a few candidates using an incorrect ratio. Long methods often included premature approximation, giving a final answer which was out of range.

Q.5 (a)(i) 0.72; (ii) 0.02; (b)(i) 52.25, 20.97; (c)(i) 4, 23, 53, 71, 80; (ii) Curve or polygon; (iii) $\frac{13}{80}$.

Whilst the majority of answers were correct in part (a), the common errors were $(0.8 + 0.9) \div 2$ in (i) and $1 - 0.72$ in (ii). In part (b) the mean was often found but it was not uncommon to see $(10 + 30 + 50 + 70 + 90) \div 5$. The method for standard deviation was often incorrect as candidates did not appreciate that the given formulae needed adaptation when considering a frequency table. Of those who did attempt to include the frequencies, the errors were to evaluate $\Sigma(fx)^2$ or $\Sigma[f(x-\bar{x})]^2$ instead of $\Sigma fx^2$ or $\Sigma f(x-\bar{x})^2$. It was surprising how many used 5 here for $\Sigma f$, even when they had used 80 in the calculation of the mean.

(c)(i) and (ii) were very well answered with the only error being to plot the points at mid-intervals when blocks were also drawn. In (iii) the majority of candidates did not interpret the question correctly and consequently gave the answer as $\frac{67}{80}$.

Q.6 (a) $n^2 + 1$; (b) $4n^2$.

Many candidates found the next terms of 50 and 196 and made no attempt to give a general expression in terms of $n$. The common error in the formula in (b) was $2n^2$ instead of $(2n)^2$. Some candidates did appreciate that quadratic expressions were required after they had found the second differences to be constant in each case.

Q.7 (a) 83.6° to 84°; (b) 1.125.

Part (a) was usually correct but a few candidates failed to double angle ABD and some used an incorrect trigonometric ratio. Occasionally Pythagoras was followed by the use of tan or cos but premature approximation invariably led to an out of range answer. Part (b) was often correctly answered but the common error was to forget to double 0.8.

Q.8 (a) $3x(2x - 3y)$; (b) 0.44 and $-1.69$.

Although part (a) was generally well done, some candidates only partially factorised the expression and a few assumed that factorisation means 'double brackets'. $3x(x - 3y)$ was surprisingly common. In part (b) a remarkably high number did not recognise the standard hint of 'give your answers correct to two decimal places' as being suitable for solution by the formula. Consequently there were attempts to solve by factorisation or incorrect algebra of $9y^2 - 3 = 0$ or $9y^3 - 3 = 0$.

Q.9 (a) 376; (b) 5.

Many candidates earned full marks for this question. The usual error of £319.60 × 1.15 occurred in (a) and 100/15 or 20/1.5 in (b).

Q.10 (a) $x = 3$, $y = -0.5$; (b) $y = -6x + 2$.

Part (a) was extremely well answered with most candidates using the efficient method of subtracting $3x + 8y = 5$ from $10x + 8y = 26$. Part (b) was found to be difficult with many candidates making no attempt or trying to spot the answer. Of those who did try to write down simultaneous equations, many confused $x$ and $y$ with $a$ and $b$. The gradient and $y$ intercept method was often spoiled by inaccurate diagrams or the gradient evaluated as 6.

Q.11 (a)(i) 55, (ii) 35, (iii) 80; (b)(i) 54, (ii) 22.

Many parts of this question were often not attempted. Few candidates seem to be aware of the angle properties in circles or the tangent being perpendicular to the radius through the point of contact.

Q.12 (a) $\frac{(4y-3x)}{4x}$; (b) $\frac{4y}{(4a+3)}$.

There has been some improvement in basic manipulative algebra with far more candidates gaining some credit here. Many candidates reached $a=\frac{(4y-3x)}{4x}$ in (a) but often this was then incorrectly cancelled to $\frac{(y-3x)}{x}$ or $\frac{(4y-3)}{4}$ or $y-3$. Part (b) proved to be more problematical as few candidates appreciated the necessity to 'collect' the terms in $x$ and even fewer could then factorise to $x(4x+3)$. There were far too many who correctly reached $4ax+3x=4y$ and then proceeded to $4x+3x=\frac{4y}{a}$ and hence to $x=\frac{4y}{7a}$.

Q.13 (a) $\frac{35}{99}$; (b) Any correct pair of irrationals.

In part (a) a large number of candidates were unaware of the method required. Many gave an answer of $\frac{35}{100}$. It was encouraging to see the variety of correct answers in part (b), some of which were $\sqrt{5}, 2\sqrt{5}$; $\sqrt{5}+1, \sqrt{5}-1$; $\pi, \frac{6}{\pi}$; $\sqrt{2.5}, \sqrt{3.6}$..

Q.14 (a) $\frac{3}{10}$; (b) $\frac{1}{20}$; (c) $\frac{1}{10}$.

Parts (a) and (b) were well answered with many candidates demonstrating a good knowledge of probability theory but inevitably some thought there was a choice of five on each day. In part (c) many did not realise that $\frac{3}{5}\times\frac{1}{4}\times\frac{2}{3}\times\frac{1}{2}$ did not give the complete solution.

Q.15 39.

Only a very small number of candidates realised that the maximum number one is certain of getting is the minimum possible number achievable and consequently this question was very badly answered. In nearly all cases, the length of each piece was considered to be in the range 14.5 to 15.5 instead of 14.75 to 15.25.

Q.16 91.

There were some excellent responses to this difficult question. Two basic methods were seen, the first of which was to use $0.5bc\sin A = 2300$ to calculate angle $A$, followed by the cosine rule which was sometimes spoiled by reaching $BC^2 = 225\cos A$. The other method of $h=\frac{2300}{0.5}\times 76$ followed by Pythagoras was marred by those who assumed that the perpendicular height bisected $AC$. Very few candidates gave their final answer to an appropriate degree of accuracy.

Q.17 (a) 18.8 to 19.6; (b) 55 to 95 km/h$^2$ or 0.9 to 1.6 km/h/min.

In part (a), very few candidates used a concise and efficient formula from the trapezium rule. The majority attempted to find the area of six separate trapezia whose parallel sides often were not the same as the ordinates to the curve. The heights were not accurately interpreted and far too many reduced the shapes to smaller rectangles. In part (b), only the very best candidates were able to progress. Often the tangent was not attempted or drawn at the wrong point. Those who did have a correct line usually made a good attempt at its gradient but some had difficulty with the scale on the time axis.

## OCR Marked Tasks
## 1662/07

### General Matters

Administration was effectively conducted by almost all centres and the vast majority of scripts arrived promptly with the correct documentation. Examiners appreciate the correct use of treasury tags and putting the solutions together in the correct order, **Task A and then Task B.**

Front sheets rarely contained information that aided the assessment of the candidate, such as comments supporting the **personal** development of a formula, where the evidence for this might have been omitted by the candidate. The intention of the reverse of the cover sheet is to enable teachers to provide ephemeral evidence that might aid the examiner's judgement when awarding strand marks. Use of this facility is, of course, entirely optional.

**An appendix** was not always appropriately used by centres. An appendix, notes made on non OCR paper, should be used to save time in copying up already drawn tables, computer printout or diagrams. Work seen on this paper is **not marked** but is used to substantiate claims made in the solution. Thus, pages of "redundant" notes should not be sent to the examiner as they have no effect upon the assessment. Also, candidates who say "Development 1 ... see appendix" score nothing for this. Examiners would appreciate centres retaining non essential notes in future.

## Specific Comments on Strand Marks

S5 Having proposed a change to the original task , work must be done on this development which is at least sufficient to allow further conclusions to be drawn. A "wish list" of developments scores no further marks.

C5 Candidates who score C4 through the medium of a well organised solution, drawing together at least two means of mathematical presentation by an appropriate commentary, and then generalise their findings and use their generalisation may score this mark.

R4 Candidates who have made a generalisation must test this on **new** data. For example, in the Bakers Dozen the conclusion is that the Triangle Numbers predict the number of moves required. If this has been decided on arrangements of up to 5 of each type of bun, then the number of moves for 6 of each must be predicted by this means **and** this must be tested by moving the buns. A prediction of the number of moves for 200 of each bun is, reasonably, untestable.

S7 and R7 "Features" and "Variables" are interchangeable and may be regarded as algebraic or as aspects of the task that make it a complex task appropriate to the award of Grade A.

Mathematics appropriate to the award of Grade F, C, A must be seen in the solution to the task for the award of marks 4, 6, 8 on any given strand. *(Refer to the Grade Descriptors in the Syllabus)*

## Task Specific Comments

## Task A
## Millennium Parties (Foundation / Intermediate Tiers)

The appearance of the solutions to this task would suggest that candidates who were more Foundation than Intermediate were entered for it.

Few candidates scored less than 8 marks, since the task allowed them the opportunity to begin and make early development through the medium of drawing. However, this approach hindered some in their progress beyond the lower marks. Where they continued to draw more and more tables and did not collect and organise results, they were unable to make suitable progress.

Many candidates scored 12 marks, with ease, if they adopted a systematic approach to any part of the task beyond question 2. *(1 and 2 were "warm up" questions to facilitate the achievement of marks of 1 and 2 and to begin the thinking process.)* Thus, if the candidate decided to follow a line of enquiry in question 3 of exploring how further tables could be added in a particular way, eg. adding to the side of a square arrangement without increasing the seating capacity, this opened the door to scores of S4 and S5. Unfortunately, most candidates wasted this opportunity and drew apparently random arrangements of tables to seat 16.

Most of the candidates who scored S4 did so by discovering that the linear arrangement of tables produced the maximum seating capacity and producing the generalisation $2n + 2 = p$ with appropriately defined variables. In the best examples, this generalisation was accompanied by a set of diagrams, systematically drawn and with tabulated results and a commentary to explain their thinking. **The generalisation was also tested on a new table arrangement by substitution into the formula and also by drawing the arrangement and counting of the number of seats.**

Those candidates who scored above 12 usually went on to research arrangements of different shaped, regular shaped tables. They most often chose the maximum case to explore. These candidates also explained **why** their generalisations applied, referring to the table shape and the number of lost seats when tables were joined, or the available edges. Thus they scored R5.

In a relaxation, nationally agreed, of the criteria for C5 candidates were able to score C5 if they had achieved C4 (with an appropriate commentary and organised representation of data, using at least two means of representation) and gone on to state results in algebraic form **and use this generalisation.**

Few candidates scored above 15 marks, where they might have gone on to research an over-arching formula that applied to "s" sided tables with clearly defined conditions.

Some candidates failed to score well because they interpreted the task as a "practical" one in which people needed to talk to each other and pass food. Pages of description took up the time that should have been used to develop mathematical ideas. In such circumstances centres should have provided suitable guidance and noted this on the Cover Sheet.

## Bakers Dozen

This task provided an appropriate vehicle for candidates to score marks of 5 and more in each strand.

In the best organised cases, time spent drawing coloured diagrams was minimised, data was presented in organised tables and the origin of this data was referred to in the text. *In this task it was understood that many of the results would be derived from the moving of counters.*

Candidates "spotted" the Triangular Numbers, although few provided a satisfactory explanation as to **why** these numbers occurred through the examination of the moves of the individual counters (R5).

Most candidates went on to research arrangements of 3, 4, 5, .... different types of bun and sorting these into separate types. Thus they achieved an aver-arching formula for "n" number of buns of "t" types as the product of pairs of triangular numbers. This was deemed worthy of 7 marks and in suitable cases, depending on the level of algebraic argument, beyond. This was because the solution involved two algebraic variables and the features of the task rendered the degree of difficulty appropriate.

Interesting developments included the grouping of buns, arranging in rings, having different numbers of each type of bun, and having 2D arrangements. All were worthy of reward although, in the 2D examples, some extensions were trivial.

Candidates scored S6 and beyond if they employed, and annotated a suitable algebraic method (usually difference) to a **development** of the original problem. They also, frequently scored C6 by the same means.

Candidates who did score low marks often did not develop the task beyond the original, except for trivial ideas, and they failed to test their generalisations on new arrangements or failed to provide evidence for new testing.

## Task B
## Grazing

Candidates in all Tiers were able to score well in this task.

Foundation / Intermediate candidates were, generally, able to employ the area of a circle formula. They correctly described the effect of moving the tether towards the fence and often described the limiting condition as a semi circle or quarter circle with radius *m*. The majority of drawings were well executed. However, some diagrams were very poor with freehand drawing. This did not aid the lowest achievers where words were scarce and understanding was often judged by communication through drawing.

The usual line of development was to explore the effect of increasing the rope length and utilise a Trial and Improvement method to approach the required area. This method, correctly explained and using non integer values for the radius usually scored 12 marks.

The candidates were judged to be introducing new questions when they extended the rope around the corner of the barn and began to correctly combine semi and quarter circles. They could also earn the S5 mark for any new question that was followed up with appropriate working. For example, having a running tether that slipped along the side of the barn or a post that was away from the barn but which allowed the barn to impede the rope or tethering the horse **inside** the barn etc.

A purely computational approach did not allow the candidate to progress much beyond this point unless it required the injection of more complex, **relevant**, mathematics. This was usually achieved by considering the case of the overlap when the horse approached the back of the barn from both directions. Scores of 21 were often seen for a well explained, specific solution to this case. When candidates generalised this situation the candidates then scored 22 and above. However, these scores were also seen for development into 3D by tethering a bird and for overlaps of circles from different tethers etc. Calculating a series of areas, looking at the differences and obtaining a multiple of $\pi$ and thus returning to the circle or semi circle formula, was not relevant to the task.

Examiners reported that candidates who appeared able to use the circle formula with confidence stuck to T & I in some cases when they could have solved equations to find circle radii. They also restricted themselves to numerical methods when they should have generalised their situations. There was some poor algebra employed, for example by stating that the component areas were $\frac{1}{2}\pi r^2 + \frac{1}{2}\pi r^2 + \frac{1}{2}\pi r^2$ with no distinction between variables. Despite this, examiners saw some very efficient work, exploring sets of semi and quarter circles in which results were stated in entirely general terms. If these introduced variables for the length and width of the barn, scores of 21 were readily available, provided that the whole solution had been appropriately explained.

Some other profitable extensions were; exploring tethers around regular polygons, exploring areas created by "running" tethers and work in 3D.

A mark that was less often awarded was R6, which required the candidate to examine their earlier work and make progress. This examination rarely took place and candidates should be encouraged to undertake this reflection. For example, the tether point might be moved to different points along the side of the barn and the sets of results considered to draw further conclusions eg. that the corner is the most efficient tether point.

The overwhelming feeling of the examiners was that the component was appropriately differentiated and provided a means of assessment in which candidates were able to achieve.

## Grade Threshold Marks

Candidates' performances were assessed on each component. The minimum level of performance (the threshold mark) was determined for each grade. These thresholds are given below as unscaled marks (i.e. the scale of marks used by the Examiners).

The relevant component thresholds were then related to each other in accordance with the component weightings to fix the overall threshold marks for each option.

| Component Threshold Marks | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Component | Max mark | A | B | C | D | E | F | G | U |
| 1 | 100 | | | | 60 | 46 | 33 | 20 | |
| 2 | 100 | | | | 61 | 48 | 36 | 24 | |
| 3 | 100 | | 68 | 44 | 32 | 20 | | | |
| 4 | 100 | | 73 | 45 | 32 | 19 | | | |
| 5 | 100 | 51 | 34 | 18 | | | | | |
| 6 | 100 | 57 | 37 | 18 | | | | | |
| Coursework 7 | 24 | 19 | 16 | 13 | 11 | 9 | 7 | 5 | |

| Overall Threshold Marks | | | | | | Option 1 + 2 + 7(Foundation) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max Mark | A* | A | B | C | D | E | F | G | U |
| | 250 | | | | | 156 | 122 | 89 | 56 | |
| Percentage of Candidates Awarded each Grade | | | | | | Total Candidature: 13741 | | | | |
| | | A* | A | B | C | D | E | F | G | U |
| Percentage in Grade | | | | | | 13.6 | 36.1 | 33.2 | 14.7 | |
| Cumulative % in Grade | | | | | | 13.6 | 49.7 | 82.9 | 97.6 | |

| Overall Threshold Marks | | | | | | Option 3 + 4 + 7 (Intermediate) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max Mark | A* | A | B | C | D | E | F | G | U |
| | 250 | | | 167 | 109 | 77 | 45 | | | |
| Percentage of Candidates Awarded each Grade | | | | | | Total Candidature: | | | | |
| | | A* | A | B | C | D | E | F | G | U |
| Percentage in Grade | | | | 17.6 | 45.6 | 24.3 | 11.3 | | | |
| Cumulative % in Grade | | | | 17.6 | 63.2 | 87.5 | 98.8 | | | |

| Overall Threshold Marks | | | | | | Option 5 + 6 + 7 (Higher) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max Mark | A* | A | B | C | D | E | F | G | U |
| | 250 | 194 | 143 | 95 | 49 | | | | | |
| Percentage of Candidates Awarded each Grade | | | | | | Total Candidature: | | | | |
| | | A* | A | B | C | D | E | F | G | U |
| Percentage in Grade | | 15.3 | 42.3 | 34.6 | 7.6 | | | | | |
| Cumulative % in Grade | | 15.3 | 57.6 | 92.2 | 99.8 | | | | | |