GCSE

Mathematics

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Report on the Examination in

MATHEMATICS

Syllabus Codes 1660 & 1661

SUMMER 1994

MATHEMATICS

(Syllabus Codes: 1660 and 1661)

General Introduction

The percentage of candidates awarded each grade was as follows:

Without Coursework (Syllabus 1660)

	A*	A	B	C	D	E	F	G	U
Percentage in Grade	2.4	6.6	12.9	29.3	13.8	13.9	12.5	5.5	3.1
Cumulative % in Grade	2.4	9.0	21.9	51.2	65.0	78.9	91.4	96.9	100

These statistics are correct at the time of publication.

The total entry for the examination was 36 140 candidates of which 8 394 were entered for the Basic Tier, 21 232 for the Central Tier and 6 514 for the Further Tier.

With Coursework (Syllabus 1661)

	A*	A	B	C	D	E	F	G	U
Percentage in Grade	2.7	6.9	14.8	28.4	13.9	14.1	10.9	5.9	2.4
Cumulative % in Grade	2.7	9.6	24.4	52.8	66.7	80.8	91.7	97.6	100

These statistics are correct at the time of publication.

The total entry for the examination was 29 091 candidates of which 7 761 were entered for the Basic Tier, 15 957 for the Central Tier and 5 373 for the Further Tier.

Paper 1660/1 and 1661/1

General Comments

In setting the paper, equal marks were given to each of the Attainment Targets, and also to each of levels 4, 5 and 6. This meant that the paper assessed some topics not assessed in previous years' Foundation level papers. Examiners felt that the paper tested the ability range well – there was enough for the weaker candidates yet some fairly challenging work for the more able.

Though a long paper, candidates had sufficient time in which to complete the paper. Some marks were lost due to the absence of working shown. Some candidates had a poor standard of English which caused problems in answering questions which required explanations.

Answers and Comments on Individual Questions

Section A

Q.1 (a) 5007; (b) 4497.

Answers were usually correct, though some candidates attempted 510–5007 in (b).

Q.2 (a) $\times 2$; (b) $\times \frac{3}{2}$.

The pattern was spotted by most in (a) but there was a poor response to (b).

Q.3 (a) 26.

(a) About half obtained the required answer, the majority of the remainder giving the area.

(b) Accurate rectangles were much in evidence, even from the weaker candidates.

Q.4 (a) 0 to 0.25; (b) Arrow/explanation consistent.

(a) Some misread 'show' for 'snow' and wrote about moving house. Most, though, were able to match their arrow to their reason.

(b) Most comments matched the position of the arrow.

Q.5 (a) 25, 18; (b) Either Kim or Pat with valid reason.

(a) The mean was usually correct but few could calculate the range, or show any method for obtaining it.

(b) Many candidates were unable to express their reason for choosing either Kim or Pat. There was a lack of understanding of the significance of the range.

Q.6 (a) 0.8 ± 0.01; (b) Correct ($\pm 2°$).

This question was very well answered.

Q.7 170.

Few candidates showed any working – leading to candidates obtaining full marks or no marks. About half of the candidates scored full marks. The most common error was to divide 850 by 20.

Q.8 (a) Lightoaks; (b) 021 (or 022) 416 (or 417); (c) Church.

Most candidates scored all six marks. There were a few errors in (b), such as 026 412 seen, but these were rare.

Q.9 £6.75.

This question was usually well done, with all but a small minority achieving full marks. The commonest error occurred through assuming the purchase of just one stamp of each denomination. A few calculated the change from £5.

Q.10 17.4 ± 0.7.

This question was poorly answered by nearly all candidates. The majority measured the three sides and gave the perimeter as their answer.

Q.11 (a) 900; (b) 300 or (a) ÷ 3.

This question proved difficult for candidates to interpret and it was poorly answered. Common errors were answers of £468 and £456, or £25 and £75.

Q.12 12.

Answers were usually correct, though some candidates wrote 21 in the answer space following 12 seen in the working.

Q.13 (a)(i) 20 22 24 26 28; (ii) 21 24 27; (iii) 20 25; (b) Prime.

There was a good response to (a), but many failed to use the word 'prime' in (b). Some gave 'odd' as the answer, while others simply wrote 23, 29.

Q.14 (a) 23; (b) Would expect more 'normal' distribution.

(a) This was well answered, though '7' was frequently seen as an incorrect answer.

(b) Many answers were too vague to score. A noticeable number thought that the bar chart was reasonable.

Q.15 £15 000.

The correct answer was often seen. The common error by weaker candidates was to add 1000 before multiplication, leading to 54 000.

Q.16 (a) 29; (b) 1001.

(a) Answers were almost all correct, with clear explanation.

(b) 00 or 400 was often seen. The explanation was rarely seen.

Q.17 (b) More rainfall – Less sunshine.

(a) Misread of scale and hence misplot was very common. 'Glasgow' was plotted correctly more often than 'Plymouth'.

(b) Common errors included trying to find a connection between North and South, describing the rainfall in two cities, or referring to October in general.

Q.18 Rectangle 3×6, correct position.

There was good understanding of change of size but very little understanding of change of position.

Q.19 (a) 9; (b)(i) 160, (ii) 150.

(a) This was not well done, with many making an incorrect attempt to write $\frac{3}{4}$ as a decimal.

(b) Many candidates introduced errors by rounding off their intermediate answers in both parts.

Q.20 – 3.

There was a good response to this question and awareness of negative numbers was shown.

Q.21 (a) 50°; (b) 110°; (c) 213.5 to 214.

(a) There was a good response on the size of the angle but many candidates were unable to give the reasons. 'Isosceles triangle' or '$BC = BA$' was rarely stated.

(b) There were many answers of 110° but few were able to give clear reasons.

(c) Candidates showed very poor knowledge of $C = 2\pi r$. The majority gave the answer as '68' or used the formula for area.

Q.22 (a)10, 24; (b) 35.

(a) Many gained the mark for '10', but added 6 to 15 to give 21 as the second answer.

(b) Common errors were $7 \div 100 \times 20$ or 0.35.

Q.23 (a) 66 $\pm$ 2; (b) 56 $\pm$ 2; (c) Correct comparisons; (d) $\frac{3}{100}$ or 0.03 or 3%.

(a), (b) were well answered.

(c) There were many sketchy comments, with candidates often not making a comparison.

(d) This was not well answered, with '$\frac{3}{97}$' or an equivalent seen.

Q.24 (a) 13 15 17 19 Sum = $64 = 4^3$; (b) 10; (c) 8000; (d) $x + 2$.

(a) Many gave '13 15 17' followed by '$45 = 4^3$'. Pattern recognition does not seem to be a strength of the majority of candidates.

(b) Most candidates did not use the pattern and hence failed to calculate '10'.

(c) Very few could answer this part.

(d) Hardly any correct solutions were seen. Answers of y, z, xx, $2x$ were seen.

Q.25 Most candidates were unable to draw lines correctly representing the bearings. Some with wrong bearings did have intersecting lines with *S* marked to score 1 follow through mark.

Q.26 (b) 3.6 to 3.8; (c) 3.74.

(a) A misread of scale often led to incorrect plotting. Points were often not joined up or were joined with straight lines.

(b) Very few answers were in the required range.

(c) It was very rare to see an attempt at this part. There was little knowledge of the trial and improvement method.

Q.27 (b) $\frac{4}{9}$.

Many tables were correct, but there were few correct answers to (b).

Section B (1660 only)

Q.28 Bar chart, pie chart or pictogram.

Most candidates scored well on this question, with the bar chart being the most popular answer. A few poor diagrams were seen, with rulers not used or bars of unequal width. A small number of candidates either did not attempt the question or simply rewrote the information.

Q.29 (a) 3, 2; 11; 9, 7, 12; 14.

(a) Candidates appeared familiar with magic squares and scored highly in part (a).

(b) Many gained the mark for correctly copying the square four times, but few correctly shaded groups of squares. Many merely shaded in rows and columns, while others repeated shadings that had earned marks.

Q.30 (a) Example, with amount; (b) Critical analysis of presentation.

(a) Nearly all candidates gave an example with a reasonable approximation of the amount. Those who gave 'swimming pool' as a use often gave too small an amount, while a few copied one of the examples given.

(b) Many candidates described the graph instead of commenting on the presentation. Some gave reasons such as 'hot summers' or 'water wastage'. A few, however, did notice that the axes were not labelled, there was a poor choice of scale or that there was a general lack of information.

Paper 1660/2 and 1661/2

General Comments

The standard of the paper seemed appropriate for the range of candidates MEG advised should be entered for the Central Tier. The requirement to adhere to the National Curriculum weightings resulted in some topics being given a greater emphasis than in previous years while the wider range of candidates taking the paper makes direct comparison with previous years difficult to assess directly.

Many candidates have not yet learned to express their thoughts with sufficient clarity when attempting to answer those questions requiring some explanation; for example, is 'the four squares in each corner of the large square' one set of four squares or four sets of four squares?; 'In 1961 100% of households had black and white televisions' is actually not correct in the context of Q.5. Examiners' work was made difficult by the poor quality of much of the setting out of work. Candidates do not help either themselves, or those whom they are seeking to impress, when they seem so disinterested in the quality of their presentation or in their casual approach to premature approximation, which resulted in so many numerically incorrect answers. In spite of these disappointments, there were many positive examples of good work in this new style of paper. In particular, the response to Section B by 1660 candidates was generally very pleasing.

Answers and Comments on Individual Questions

Section A

Q.1 (a) 9; (b)(i) 160, (ii) 150.

Most of the problems occurred in (b)(i), where $100 \times \frac{24}{15}$ was often carelessly evaluated in separate stages which led to 6.6 or 6.7×24.

Q.2 $-3°C$.

There were correct answers from all but a tiny minority of candidates here.

Q.3 (a) Angle BAC = angle $BCA = 65°$ (isosceles triangle)
$\therefore$ angle $ABC = 180° - (65° + 65°)$ (sum of angles of a triangle)
$\therefore$ angle $ABC = 50°$.

(b) angle $CDE = 180° - 70°$ (co-interior angles)
$\therefore$ angle $CDE = 110°$.

(c) 214 cm.

Too many candidates were casual in their approach to parts (a) and (b) of this question. Expressions such as 'angle *AB*', coupled with unstructured solutions and lack of pride in setting out work, made it very difficult for Examiners to award part marks.

A surprising number of candidates confused the formulae for circumference and area of a circle.

Q.4 (a) 10, 24; (b) 35.

Part (a) caused many more problems than part (b).

Q.5 (a) 66; (b) 56;

(c) The percentage of households with licences for black and white television rose from 50% in 1961 to a peak of 70% in 1971 before falling to 20% in 1981. Colour television licences started in 1971 at 10% of households and increased to 75% in 1981.

(d) $\frac{3}{100}$.

Many candidates read the scale to the accepted tolerance of $\pm$ 2 in parts (a) and (b) and most scored at least 1 of the available 2 marks in each part. Some introduced irrelevant points about cost or technology into their response to (c), but most earned at least 1 mark for a recognisably correct statement. In part (d) there were some answers of the form '3 in 100', which is not an acceptable way of expressing a probability.

Q.6 (a) 13 15 17 19 Sum $= 64 = 4^3$; (b) 10; (c) 8000; (d) $x + 2$.

Examiners often had to search for the complete answer to (a), but in general the response to this question was good.

Q.7 Drawing.

The most common errors were bearings of 020° and/or 310°, but the majority scored full marks. Those who failed to measure either bearing correctly were still able to earn a follow through mark provided they clearly showed the position of *S* at the intersection of their straight line bearings.

Q.8 (a) Graph; (b) 3.6 to 3.8; (c) Trials, 3.74.

Many candidates needlessly forfeited a mark through taking insufficient care over drawing their curve after usually accurate plotting. The mark for (b) was allowed as a follow through and presented few problems. Trial and improvement is new to the syllabus and many candidates have yet to come to terms with the technique.

Q.9 (a) RB RB RY (b) $\frac{4}{9}$.

BB BB BY

YB YB YY

On the few occasions when marks were lost in (a), the reason was carelessness rather than any lack of understanding. The response to (b) was particularly pleasing, with almost 100% success.

Q.10 £40.15.

Again, a lackadaisical approach was the primary cause when marks were lost, with answers of £40.14 or £40 or even £40.1. However, the majority earned full marks.

Q.11 (a) x^9; (b) 1.

Part (a) presented few problems. The majority of answers to (b) were correct, the most common errors were 9 or 1 000 000 000.

Q.12 78.3 km/h.

Only the most able candidates earned full marks here. The work of the majority was very poorly set out, making it hard for Examiners to follow when looking for reasons to award part marks.

Q.13 8.54×10^8.

There has been a slight improvement in work with this topic, but too many who insist on using their calculator are unable to translate '8.54^8' into standard form.

Q.14 (a) 7.62; (b) 31°.

Only the weaker candidates failed with (a), but there were many examples of failure to reach the correct result in (b) after '$\tan DCB = \frac{3}{5}$'. A surprising number calculated '3/(tan5°)' or 'arctan 5'.

Q.15 (a) – 1, 0, 1, 2, 3; (b) 17, 18, 19, 20, 21.

The omission of '0' or the inclusion of '– 2' were the most frequently seen errors in (a) from those who had the right idea. Weaker candidates showed more understanding of what was required in (b).

Q.16 (a) 11.5; (b)(i) 5.613636 (...), (ii) 6;

(c) A weight between 11.5 and 12.1 pounds corrects to 5 kg, a weight between 12.1 and 12.5 pounds corrects to 6 kg.

Only a small minority failed to score the mark for (a), while rather more were satisfied with '5.61' as their answer to (b)(i). These, together with the few who used '12.35 × 2.2' were still eligible for the follow through mark in (ii).

There was an imaginative variety of answers to (c), some of which were mathematically relevant. Since the fact that some of the weights converted to 6 kg had been established in part (b), Examiners were content to allow full marks if candidates showed that some weights converted to 5 kg.

Q.17 (a)(i) $\frac{32}{200}$, (ii) $\frac{106}{200}$; (b) Polygon.

There were more correct answers to (a)(i) than to (ii), but only the more able candidates were comfortable with this topic. Again, otherwise good answers were marred by the use of expressions such as '16 in 100'. Correct frequency polygons were very rare. Most candidates plotted points 1 cm to the right of the correct position and many drew histograms or freehand polygons.

Q.18 (a) $3pq(4p - 5q)$; (b) $2x^2 + 7x - 15$; (c) $n = (C - 120)/40$.

The failure of the great majority to cope with simple algebra is a continuing source of disappointment and concern. Again, untidy presentation of work suggests that some candidates have the wrong attitude.

Q.19 (a) 117.8; (b) $34\frac{5}{8}$ or 34.9.

Many candidates used formulae such as '$2\pi rh$' or 'πr^2' in part (a), while a few were unable to evaluate '$\pi \times 2.5^2 \times 6$' correctly on their calculator. Part (b) posed many more difficulties than anticipated. A significant number of candidates failed to change '$1\frac{3}{4}$' to '1.75' for use with their calculator.

Q.20 $\pi h(a + b)$ because this is the only one with dimensions of length × length (or dimensions of area).

Only a tiny minority showed any understanding of this topic.

Q.21 (a) Anticlockwise; (b)(i) 4, (ii) 2.

Most found this question a welcome oasis in this more difficult part of the paper.

Q.22 (a)

A ✓ *B* ✗ *C* ✓
A ✓ *B* ✗ *C* ✗
A ✗ *B* ✓ *C* ✓
A ✗ *B* ✓ *C* ✗
A ✗ *B* ✗ *C* ✓
A ✗ *B* ✗ *C* ✗

(b)(i) 0.18, (ii) 0.915.

There was a lot of success with part (a), but (b)(i) was beyond the reach of most candidates and only a few made any real attempt at (ii). Most of those who showed some understanding in (ii) used '$0.8 \times 0.9 + 0.8 \times 0.75 + 0.9 \times 0.75$'. Some successfully found the probability of just two catching the bus but failed to add the probability that all three caught the bus.

Q.23 – 22.

There were many more difficulties than expected from even the more able candidates, who might have been wiser to reach '$5 \times -\frac{39}{9}$' before attempting to use their calculator.

Q.24 2×10^{11}.

Untidy work often made it almost impossible for Examiners to see what was going on. Only a few reached either the correct answer or '1.845×10^{11}'. Candidates were unwilling or unable to manipulate the powers of 10 without either trying to use a calculator or attempting to write out all the zeros.

Section B (1660 only)

Q.25 (a)

16	3	2	13
5	10	11	6
9	6	7	12
4	15	14	1

(b) Any four correct groups.

This was generally well done. Candidates who had difficulty in expressing verbally what they meant would have been well advised to draw sketches.

Q.26 (a) M_3 is (5, 2), M_4 is (4, $5\frac{1}{2}$); (b) $((x_1 + x_2)/2, (y_1 + y_2)/2)$;

(c) Diagonals cross at midpoint of line joining opposite vertices.

This proved a hard question for many candidates. The coordinates of M_3 were often found correctly from the grid on the question paper, but most were unable to progress any further.

Q.27 (a)(i) 0.4242 (. . .); (ii) 4, because each odd digit in the recurring decimal is a 4.

(b)

$$x = 0.51515151 \ldots$$
$$100x = 51.51515151 \ldots$$
$$\therefore \; 99x = 51$$
$$\therefore \; x = \frac{51}{99} = \frac{17}{33}.$$

(c) It would be necessary to multiply by 1000 instead of 100 at step 1.
Steps 2 and 3 could stay as 'subtract x' and 'solve the equation'.

Marks were thrown away in many cases by a casual approach to parts of this question. For example '0.42', with no attempt to indicate recurrence, was unacceptable in (a); '$99x = 51 = \frac{51}{99}$' was not worth full marks in (b), where an exemplar solution was provided, together with an instruction to 'follow the same steps'. A pleasing number saw the need to modify the first step in part (c) and received full credit.

Q.28 (a) $x = 5$ and $y = 6$;

(b)(i) $3^4 + 4^4 + 5^4 + 6^4 = 7^4$; (ii) lhs = 2258, rhs = 2401 $\therefore$ not correct.

(c) (i) Any power of an odd number is odd;
(ii) 3^5, 5^5 and 7^5 are odd, 4^5 and 6^5 are even,
$\therefore$lhs = odd + even + odd + even + odd = odd,
8^5 is even, so the sum total cannot equal 8^5.

Although completely correct answers were rare, there was a lot of good work in the responses to this question, marred at times by answers such as 'because 3 and 5 are odd' for (c)(i). Examiners had to labour to interpret the meaning of some of the phrases used by candidates.

Paper 1660/3 and 1661/3

General Comments

This paper allowed candidates to demonstrate their ability and even weaker candidates made good attempts at many of the questions, particularly the overlap questions with paper 2. The paper did, however, prove very long for many of the candidates and there was some evidence that work was being rushed and that 1660 candidates were running short of time on Section B. A few questions proved inaccessible to many candidates. There was some evidence that some of the weaker candidates were not familiar with level 9 and 10 work and may have been entered at the wrong tier.

The standard of presentation was generally good and most candidates gave sufficient working to make their methods clear. There are still, however, some candidates who penalise themselves through omitting working.

The calculation and much of the algebra was quite pleasing as was some of the work on probability. Work on errors and effect of rounding which forms the major part of AT2 at levels 9 and 10 was rather disappointing. Since an equal number of marks are allocated to each AT attention should be paid to this. Many candidates fail to express themselves concisely and precisely in explanation questions. Often a simple example and a few words are better than a whole paragraph of words.

Answers and Comments on Individual Questions

Section A

Q.1 (a) – 1, 0, 1, 2, 3; (b) 17, 18, 19, 20, 21.

Generally this was well done though in part (a) some candidates omitted 0 and a few – 1 also. In part (b) the most common error was to subtract 2 instead of add, leading to 15, 16, 17, 18, 19, 20. Occasionally answers were left as inequalities.

Q.2 (a) 11.5 pounds; (b)(i) 5.613636...kg, (ii) 6 kg;
(c) Showing case in range $11.5 \leqslant w < 12.1$ pounds rounding to 5 kg.

Many candidates scored full marks on this question though some did not show the full calculator display and there were many candidates giving very vague non-specific explanations in part (c).

Q.3 (a) $\frac{53}{200}$; (b) Plotting.

Part (a) was usually done well with most candidates picking out the right intervals. There are now very few candidates who do not give probabilities in acceptable forms. The most common error was 90 + 16 = 116. Part (b) was rarely completely correct. Most commonly the points were plotted at the end of the interval not the middle. Histograms were also common as was joining the points with a curve.

Q.4 (a) $3pq(4p-5q)$; (b) $2x^2 + 7x - 15$; (c) $n = \frac{C-120}{40}$

Though many candidates did this question very well, it was surprising to see Further Tier candidates finding difficulty with part (a). Many were trying a trinomial approach rather than looking for a common factor. The algebra in parts (b) and (c) was very encouraging.

Q.5 (a) 117.7 to 118 cm^3; (b) 34.87 to 34.89 cm.

This question was well done with most candidates using the correct method and calculating accurately. In part (a) a small, but significant, number used wrong formulae such as cylinder area or sphere volume. In (b) some candidates simply gave the height of the cylinder *C*.

Q.6 $\pi h(a + b)$ since it was the only formula with units of area.

Most candidates chose the wrong formula and many of those that did choose the correct formula were unable to explain why it was the only possible one.

Q.7 (a) Anticlockwise; (b) 4; (c) 2.

Nearly all candidates gained full marks on this question.

Q.8 (a) Table; (b) 0.915.

The table was usually correct. The probability was only done well by the better candidates. Most candidates were able to calculate P(3 catching) but P(2 catching) was often written as $0.8 \times 0.9 + 0.9 \times 0.75 + 0.8 \times 0.75$. Many only attempted P(2 catching). Many candidates were unperturbed by an answer greater than 1.

Q.9 – 21.66 to – 21.7 or – 22°C.

This was generally well done though there were occasional rounding errors.

Q.10 200 000 000 000 or 2×10^{11} tonnes.

There were many good solutions though it was common to leave the answer to 4 significant figures. Most of the errors were in converting the units. 100 g = 1 kg was common as was dividing by 1000 only.

Q.11 (a) $72^{1/2}$, $18^{1/2}$; (b)(i) 24 cm, (ii) irrational since side = $\sqrt{18}$ cm (which is irrational).

Part (a) was usually answered correctly, though some picked out the rational ones and others thought they were all rational, possibly due to misunderstanding the power half. The perimeter was usually correct though 6 was often left as the answer. The answer was usually given as irrational but some candidates were very vague in their reasons, often giving a general description of an irrational number rather than looking at the specific case. Some better candidates, however, gave good concise explanations.

Q.12 93.7 to 93.8 m.

This question was done very well or very badly. There were some excellent solutions based on ratio or time of crossing methods, very few using trigonometry. Many weaker candidates used $(\frac{50}{3}) \times 1.6$. It was very common to see $AC = 93.75$ and then Pythagoras used to find *BC*.

Q.13 $T = 0.2\sqrt{L}$.

Many candidates succeeded completely with this question, often with no working. Implicit answers were often seen. The main criticism is probably the lack of formal setting out. This did not affect the candidates who got the correct answer but it often made it difficult to award part marks. Sometimes it was suspected that the candidate knew the constant was 0.2 but the formula given was e.g. $L = 5T$.

Q.14 3 clear criticisms of method or question asked.

There were many good answers, though often badly or lengthily expressed, appreciating the limitations of such a survey. The errors came where candidates were trying to explain the low percentage rather than criticising the method.

Q.15 (a) Tree Diagram; (b) 0.15.

Most candidates drew the correct tree diagram with the correct probabilities. Some reversed the order of events. Part (b) was done well sometimes after an incorrect part (a). Despite this being a level 9 conditional probability question candidates found it easier than question 8 (level 8 independent probability).

Q.16 (a) Darren 2.25 to 2.35 and Fiona 2.295 to 2.305; (b) 2.8 years.

Though most candidates realised that Fiona's answer was more accurate than Darren's, only the best candidates appreciated the limits of accuracy. In part (b) the fact that 1, 2 etc. years old means 1 to 2, 2 to 3 etc. was only appreciated by a very few exceptional candidates.

Q.17 (a) $2\mathbf{p} + 8\mathbf{q}$; (b) proof based on $\overrightarrow{CD} = \mathbf{p} + 4\mathbf{q}$ or $\overrightarrow{AD} = 3\mathbf{p} + 12\mathbf{q}$.

Most candidates found this question very difficult. Part (a) was quite well done by the better candidates but good solutions to part (b) were very rare. The most common mistakes in (a) were to use $\overrightarrow{AC} = \overrightarrow{OA} + \overrightarrow{OC}$ or to use Pythagoras. Many candidates left part (b) blank or gave very vague explanations.

Q.18 (a)(i) Tangent drawn, (ii) 1.6 to 2; (b) acceleration; (c) 84 to 86 m.

The tangent was usually drawn well but the gradient often failed to take into account the scales. Acceleration was usually correct. There were many excellent solutions to part (c). Success was usually due to clear splitting up into trapeziums or rectangles and triangles. Those using the Trapezium Rule usually were either totally successful or remembered the rule incorrectly. There were some misreads of the scale and arithmetic slips.

Q.19 (a)(i) 90°, (ii) $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$, (iii) $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$, (b) (2, − 2); (c) Reflection in $y = -x$.

Part (a)(i) was often correct but 270, 180, − 90 were common. Part (ii) was rarely correct. Candidates seem not to know the base vector method and were often using trial and error. Part (iii) was often incorrect with many not using a column vector. This question did discriminate well as the better candidates were much more successful. Part (b) was done better but still proved a problem for many candidates. Many candidates recovered on part (c) and gained full marks. There were very few double transformations seen.

Q.20 (a)(i) 3, (ii) £8, (iii) £5.50, (iv) 15; (b) 3, 4.

The whole of part (a) was well done by nearly all the candidates. The commonest wrong answers were 9 in (i) and 14 in (ii). The presence of the £ sign in the answer space was dealt with by accepting £8 providing it did not come from totally incorrect working. Examiners report that once this decision had been made candidates did not appear to suffer. In part (b) many candidates gave only one answer. Candidates who drew the $x = 2y$ line were more likely to give both solutions.

Q.21 (a) Graph stretched from $y = 0$ with scale factor 2; (b) Graph translated by $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$.

Very few candidates got both parts correct but many of the better candidates could do one or the other. Weaker candidates found this question very difficult and often left it blank. Translation in the negative x direction was common in part (b).

Q.22 (a) 17 m 15 cm; (b)(i) 3.25 km, (ii) 0.3 km^2.

This question produced a wide range of marks. The better candidates often coped well but the weaker ones often did not appreciate the limits of accuracy. Many however did obtain part marks through either getting the correct maximum/minimum or using the correct method. In part (a) many used 6.35 but used it with 23. In part (b)(i) many either used 16.25 or got the unit conversion right but only strong candidates did both. Similarly in (ii) many used 7.5 or multiplied by the figures 2^2 but only the best did both and changed the units successfully. In this question 23.499... etc. was accepted where the upper limit was required.

Section B (1660 only)

Q.23 (a) $100x = 51.5151...$, $99x = 51$, $x = \frac{17}{33}$ or $\frac{51}{99}$;

(b) Step 1 multiply by 1000, rest the same; or complete revision of calculation.

This question was done very well with many candidates obtaining full marks. Some candidates did not follow the set pattern and a very few thought that × 100 would still work.

Q.24 (a) $3^4 + 4^4 + 5^4 + 6^4 = 7^4$, answers 2258, 2401 so incorrect;

(b) (i) Argument based on odd × odd = odd or all powers of 3 are odd,
(ii) Argument based on addition of three odds plus two evens was odd and conclusion that LHS was odd but RHS was even.

Many candidates did well on this question. In part (a) there were very few incorrect patterns but the correct evaluations were often left without a conclusion. In part (b) there were some very good explanations but often candidates who had the right basic idea failed to express themselves clearly. Often the fact that the power 5 was odd was thought to be relevant. The argument that there were more odd than even was also seen frequently. Here too candidates often failed to make conclusions from their arguments.

Q.25 Diagrams showing the four basic categories of information. Statements making comparisons of the information.

There were many excellent statistical diagrams showing the information. There was a certain amount of unclear labelling and confusion between 'adults' and 'all ages' but generally this work was encouraging. The further comparisons of the figures were often long and tortuous with much repetition. It must be emphasised that a few concise sentences is better than paragraphs and paragraphs of comment. Too often candidates fell in to the trap of looking for reasons, or giving their own views, rather than sticking to analysis of the data. This, in itself, was not penalised if the analysis was there as well, but was self-penalising in terms of time. Despite this candidates often scored highly on this question with 7 and above being common.

Q.26 (a)(i) 3, (ii) 4;
(b)(i) $c = 2$ and 3 assume $c^2 = c \times c$, (ii) 4 or $\frac{1}{4}$ assume $\frac{p}{q}$ means $p \div q$ or ÷ is the opposite of ×.

This question was sometimes not attempted though whether through lack of time or difficulty was not always evident. Part (a)(i) was usually correct and many also were successful with (ii), though $\frac{3}{2}$ etc. was common. Many only gave one solution to (b)(i); surprisingly it was often 3. Very few assumptions were attempted. Many did not get as far as (b)(ii) and those that did found it difficult. There were, however, a few good solutions though rarely any assumptions.

Paper 1660/4 and 1661/4

General Comments

The paper reflected the demands of setting questions on National Curriculum levels 4, 5 and 6. The range of performance on the paper reflected the range of ability among the candidates entered. At the upper end there were many very good and carefully answered scripts, showing sustained application and sound mathematical ability. At the lower end there were many scripts in which page after page had been left blank. The 1660 candidates divided quite sharply between those who put considerable effort into the two Section B questions and hence scored high marks, and those who tried perfunctorily or not at all.

Answers and Comments on Individual Questions

Section A

Q.1 (a) 7; (b) 5.

A simple starting question, which was nearly always answered correctly.

Q.2 (a)(i) 5, 4, 3, 2, 1, (ii) 4, 5, 6, 7, 8.

This was the first of the questions requiring a verbal response. Most candidates realised that the two sequences were the same, but reversed; comparatively few noticed that the digits of each number in the right-hand column added up to 9.

Q.3 (a) 6.09, 6.10 or 6.11 m; (c) 608 cm; (d) 18 to 22 feet; (e) 80%.

Parts (a), (b) and (c) were very well answered; wrong answers were usually a result of misreading the question or of slips. Only one in five answered part (d) correctly. Not many more gave the correct answer to part (e), and it was noticeable that few of those showed any working.

Q.4 (a) 3.82 m; (c) 4.52 cm^2.

Few candidates knew the formulae – a new requirement this year – and fewer still achieved correct answers.

Q.5 (a) (8, 60°); (c)(ii) Equilateral.

Another new topic, but most candidates managed to score most of the marks available. The standard of drawing accuracy was usually good. The explanations in part (c)(iii) were usually verbose but variable in merit.

Q.6 (a) IN 8; OUT 8, 11.

This question was very well answered with most candidates scoring full marks. A few calculations in part (a) finished with 5 and 4 in the OUT column; errors in part (b) were due to carelessness rather than lack of knowledge.

Q.7 (a) 61 mm; (b)(i) 352 mm, (ii) 55 mm; (e) 55 to 65 mm.

Three-quarters of the candidates calculated the mean successfully, but only half could write down the ranges. A majority of sensible and well thought-out answers to part (d) were seen, though these did not always relate to both means and both ranges, as required.

Q.8 (a) $C = 24n$; (b) $y = x + 3$.

Inevitably, this question yet again revealed the congenital weakness in algebra at this level. $24 \times n$ and $n24$ were accepted in part (a); the success rate in part (b) was somewhat higher, but just '$y = + 3$' was a common answer.

Q.9 (a) A (– 5, 2), B (1, – 4); (b) – 4, 0, 1; (d) (– 0.5, – 2.5).

Part (a) was usually well answered. Only occasional candidates now want to put *x*s and *y*s in their coordinates. The second two answers in part (b) were usually correct; – 2 – 2 caused rather more errors. Surprisingly few drew the line in part (c), and even fewer drew both lines, so the success rate on part (d) was very low.

Q.10 (a) 0.35 or $\frac{7}{20}$.

Very few correct answers were seen to part (a) – indeed, most candidates did not attempt it. Part (b) produced many vague responses. The weaker candidates thought that the shape of the spinner was significant. Part (c) was usually completely correct or completely wrong.

Q.11 (a) 34 cm; (b) 44 cm^2; (d) 4 cm, 3 cm, 2 cm; (e) 24 cm^3.

A significant minority of candidates betrayed their lack of ability here by mixing up the concepts of perimeter and area. The majority, however, scored more than half of the available marks on this question. The least well answered part was (f), where many did not understand what isometric shapes are.

Q.12 (c) 5538p.

Part (a) was usually correct, but parts (b) and (c) revealed widespread weakness in basic arithmetic. Only about half of the entry were prepared to approximate to the numbers in part (b), and produce an estimate; and only about one in five performed a 'classic' long multiplication in part (c). The others mostly covered the page in figures, with 5538 suddenly emerging at the end like a rabbit out of a hat. Some, however, produced clear and ingenious substitutes for multiplication.

Q.13 (a) 1536 cm^2; (b)(i) 104 cm^2.

Only just over half the candidates succeeded on part (a) (a level 4 question). Only a few could cope with the area of the triangular part of the design in part (b)(i). Part (b)(ii) sorted out the careful ones from those less so – and many errors and repeats were seen in the lists presented.

Q.14 (a)(i) 81 litres, (ii) $\frac{3}{20}$.

Far fewer than expected found the correct answer in (a)(i). The presence of 'litres' in the answer space in (a)(ii) was dealt with by accepting 48.6 litres. Despite this, very few correct answers were seen. Part (b) was much better answered, with most candidates earning either 2 or 3 marks out of 3. The common error was making the 'washing pots' angle 40° instead of 36°.

Q.15 (a)(i) £52.15, (ii) £350.15; (b)(i) £7.50, (ii) Berries.

Not everyone knew how to find a percentage, and those who did sometimes found 17% or $7\frac{1}{2}$% of £298. A large majority then subtracted the VAT! Further weakness was revealed in the inability to find one sixth of £423, or to handle the given information correctly.

Q.16 (a)(i) × 10; – 1, (ii) $L = 10n - 1$; (b)(i) 75, 125, 175, 225, (ii) Row 18.

Part (a), being algebraic, proved to be too difficult for most candidates. Part (b)(i) was usually correct, though a sizeable minority continued with 50, 75, 100, 125. The answer to (b)(ii), from those who got (b)(i) correct, was usually either 17 or 18; most of them explained that they did it the long way, by adding and counting.

Section B (1660 only)

Q.17 (a)(ii) 6 90° angles, 2 270° angles; (b)(i) 360°, (ii) 720°, (iii) 1080°.

Part (a) was usually answered successfully. Quite a lot of candidates appeared to see the connection between parts (a), (b) and (c), and the pattern in parts (b) and (c), and hence scored high marks. Some, after errors in part (b), produced a perfect table in part (c).

Q.18 A lot of thought and experimentation was evident in this question, and many good solutions were seen.

Part (a), the lead-in, was usually correct.

Part (b) yielded every possible mark between 0 and 8 inclusive, revealing the level of understanding of the idea of a Factor Diagram, and the amount of care being taken.

Part (c), the open-ended part, produced many and varied solutions. Those who kept it simple with just the four factors of 20 did the best; those who went further usually missed one or two arrows.

Paper 1660/5 and 1661/5

General Comments

Most candidates were able to make a confident start to the paper and performed well on the first five questions. Candidates demonstrated a firm grasp of area, percentage work and pie charts and a facility with number patterns. Later questions were found very difficult in parts by all but the more able candidates although some 1660 candidates decided to allocate more time to the Section B questions and left out some of the later Section A questions. Since questions were constrained to be based on the Statements of Attainment of The National Curriculum, candidates were expected to explain or comment on their answers rather more than in previous examinations. There were some good responses but many were incomplete or irrelevant and would benefit from more practice. Some topics were new to this syllabus and there was evidence that, for example, 3-D coordinates had not been understood by some candidates. On a more positive note, the response to the bearing question was excellent and Examiners were impressed by the investigation work produced by 1660 candidates in Section B.

Answers and Comments on Individual Questions

Section A

Q.1 (a) 104.

This was a very successful question for almost all candidates. The area was nearly always correct while the listing of colour combinations was usually correct apart from the inclusion of red/red and blue/blue after the first line of instructions was overlooked.

Q.2 (a)(i) 81 litres, (ii) $\frac{54}{360}$; (b) Pie chart, angles 72°, 180°, 72°, 36°.

Most candidates were happy to interpret the given pie chart and to draw the second one accurately. In part (a), however, some were not prepared to handle simple fractions by finding a quarter of 324 so started by working out the number of degrees per litre (1.11111), rounding the decimal and, sometimes, multiplying the result by 90. Similar decimal methods were employed to write down the fraction of water given to animals when a simple fraction (not necessarily in lowest terms) would have been acceptable.

Q.3 (a) Estimation using 140 × 40 or 142 × 40 or 145 × 40 or 150 × 40; (b) 5538p.

Some candidates did not appreciate the difference between an estimate and an accurate answer. It was expected that candidates should round the given figures (particularly the 39) to figures which could be used comfortably in mental arithmetic (in the supermarket, say) and to show the units of their answer if changing to pounds.

In part (b) many employed long methods involving decomposition instead of long multiplication. All non-calculator methods were acceptable though there were clear attempts to invent 'carry' figures after calculator use!

Q.4 (a)(i) £52.15, (ii) £350.15; (b)(i) £7.50, (ii) Berries.

This was well answered by the majority with a pleasing improvement reported in the handling of percentages. A significant number, however, thought that £52.15 should be subtracted from £298 to find the usual price of the television set. In (b) there were some inaccuracies after the fraction was converted to a rounded decimal or percentage instead of merely dividing Berries' price by six. Very weak candidates subtracted 0.1666 from £423 to find Berries' sale price.

Q.5 (a)(i) $\boxed{\times 10}$ — $\boxed{-1}$, (ii) $L = 10n - 1$; (b)(i) 75, 125, 175, 225, (ii) 18, (iii) Clear explanation in words or figures, (iv) $S = 50n - 25$.

A large majority gained full marks in (a) by following the clear example of the formula for *F*. Most started (b) by correctly completing the table of values though a small but significant number generated their own values of 25, 50, 75, 100, 125. Those candidates were awarded follow-through marks, if appropriate, later in the question. Row 18 was usually found correctly, either by adding on 50s or by using the information given in (a). Candidates were expected to explain their method in slightly more detail than merely 'I added on 50', but a complete table of values was acceptable. The more able candidates found no difficulty in producing the formula in (iv) though some formulae were spoiled by an absence of brackets e.g. $S = n + n - 1 \times 25$.

Q.6 (a) Cuboid; (b)(i) (300, 0, 250), (ii) (0, 400, 100); (c) Locus indicated.

Many candidates produced very good drawings of the cupboard though some had difficulty in drawing the far end of the cuboid. This error was penalised by one mark. The use of 3-D coordinates is new to this syllabus and it was clear that many candidates were unfamiliar with the concept. Many quoted two numbers to define each point, often decorated by *x*, *y* or *z*. Conventional form was expected though the omission of brackets was condoned this year. The locus in part (c) was well attempted though only the minority gained full marks with the inclusion of the quarter circle based on the corner.

Q.7 (a)(i) Graph, (ii) ($x =$) 1.5 to 1.6, ($y =$) 3 to 3.1; (b) ($x =$) $\frac{20}{13}$, ($y =$) $\frac{40}{13}$.

Almost all candidates drew straight line graphs but only about half drew the correct straight line. Many drew $2y = x$, lines with negative gradients or lines parallel to the axes. Those who realised that the point of intersection was required in order to find the solution of the simultaneous equations were usually accurate in reading the values of the coordinates. It was disturbing to note, however, that very many candidates omitted this part or supplied x and y values when their straight line did not cross the given line. The algebraic solution of simultaneous equations is a new topic for Central Tier candidates. Some otherwise good candidates did not appear to have met the topic since they did not attempt a solution. Those who adopted the correct method to eliminate either variable did not usually appreciate the significance of **exact** solutions but were penalised by one mark for decimal answers.

Q.8 (a) 0.35; (b)(i) 0.45, (ii) 0.06.

Many candidates scored well on this question despite the pitfalls of the waterjump! Most answered (a) correctly and were able to make a good attempt on (b)(i) though some multiplied 0.3 by 0.15 instead of adding. Only the better candidates gained the full 3 marks for (b)(ii). Those who correctly multiplied P(score 1) by P(score 3) often forgot the water jump so added on the probabilities of other combinations. Those who understood the game often added P(score 1) and P(score 3). Some weak candidates ignored the bias of the spinner in (b) so gave answers of $\frac{2}{4}$, $\frac{1}{4}$.

Q.9 (a) 250° to 252°; (b)(i) (Greatest) 3560.5 or 3560.49(9.), (Least) 3559.5, (ii) 1084 to 1085 m; (c) 6 to 10 miles; (d) 5 to 7 hours.

The bearing was correct in almost all cases. Since a reflex angle was involved, candidates are to be congratulated on the excellent use of the protractor as well as on a marked improvement from last year in the understanding of bearings. In (b)(i) many good candidates were able to appreciate the least possible value of 3559.5 but gave 3560.4 as the greatest. Weaker candidates used 3555 and 3564 or gave answers of a different order of magnitude. Most candidates used two steps to answer (b)(ii). Many good methods were spoiled, however, by premature approximation at the intermediate stage. For example, $3560 \div 5280 = 0.67$ so $0.67 \times 1609 = 1078$. This was penalised by one mark. Although some Centres expressed concern about the methods required to estimate the length of the walk, the markscheme allowed for any use of the given scale to be rewarded. Some counted the dots, some marked distances on the diagram while some applied the scale to the straight line distance. The use of the formula in (d) was often incorrect since the majority substituted 1171 or 3560 for V instead of the vertical height climbed.

Q.10 (a)(i) 50°, (ii) Angles of a triangle, base angles of isosceles triangle;

(b)(i) 59.2 cm, (ii) 44.2 cm, (iii) 52.2°; (c) 60.8 cm.

Part (a) including the explanation was generally answered well. Candidates found (b) and (c) very difficult. Many good candidates failed to appreciate that adjusting the ironing board meant that the angle at O was no longer 80° – perhaps the context was unfamiliar. Those successful in (b) usually earned marks for the use of Pythagoras' theorem in (b)(i) and for correct trigonometry in (b)(iii) where many correctly used their answer for (b)(i) instead of the more direct cosine. The instruction to 'Use similar triangles' in (b)(ii) was ignored by the large majority who thought that triangle AOC was right-angled so calculated $\sqrt{36^2 + 36^2}$. Some candidates were successful using a ratio method directly or by a trigonometric ratio method. Part (c) defeated almost all.

Q.11 (a)(i) 50.1 seconds, (ii) 40–50 seconds; (b) Mean or Median which takes into account the high frequency in 60–70 class for Pricewell; (c)(i) Ogive, (ii) 41.5 – 42.5, 61 to 63, 19.5 to 21.5, (iii) Times at Pricewell more dispersed at upper end.

Although almost all were able to select the modal class and there were many good answers for the mean, some candidates appeared to be unfamiliar with the mean of a grouped frequency distribution whilst others started correctly by finding the mid-interval values but did not multiply by the frequencies. The better candidates were also able to draw the cumulative frequency curve although there were many merely plotting frequencies. Some were able to read quartile values and most of these could also deduce the interquartile range. The comments in (b) and (c), however, were poor. Many selected the modal class (since it was the same for both stores) while few appreciated the need to comment on the difference in the **cumulative** frequencies rather than on the relative efficiency of the two stores.

Q.12 (a) 365 to 366 or equivalent in standard form; (b) 3.74×10^7 or equivalent; (c) 4.05×10^{-3}.

In (a) and (b) most better candidates were able to select the correct pair of figures from the table and to divide or add as appropriate. Candidates able to use a calculator confidently to handle standard form had few problems in reaching a correct answer though there was evidence of misuse of the EXP button. Part (c) was rarely correct since almost all found the reciprocal value.

Q.13 (a)(i) 40 pence, (ii) £7; (b) $\frac{x}{100}\left(135 - \frac{3x}{2}\right) - 20$.

This was a very unsuccessful and difficult question for all. Many candidates did not attempt any part. It was anticipated that candidates could apply similar triangle techniques (linear interpolation) to answer (a). Although readings are not to be encouraged from a **sketch** graph, credit was given to the few who obtained accurate values after careful measurement. Answers to (a)(ii) usually involved 120 (not the correct 90) hot dogs at 30p. Although the algebra in (b) is difficult, almost all attempts involved finding x in terms of y, rather than the profit in terms of x.

Section B (1660 only)

Q.14 (a)(i) Octagon, (ii) 2; (b)(i) 720°, (ii) 1080°; (c)(i) A triangle cannot have all angles of 90° or 270° since the sum of the three angles is only 180°, (ii) $n = 5$ or greater odd number; (d) Investigation with conclusions that, if n is odd no right polygon exists, if n is even the number of 270° angles is given by $(n - 4) \div 2$.

Many candidates were able to achieve more than half marks on this question. Parts (a) and (b) provided easy 'leads-in' to the investigation. Many misconceptions surfaced in (c) since some stated that angles of 270° were essential for right polygons or that polygons must have more than 4 sides thus destroying the reasoning for (c)(i). It was expected that candidates should investigate polygons with more than 8 sides before drawing conclusions. There was evidence of clear, well-organised work resulting, in many cases, in tables of values. The absence of odd values of n was taken as an indication that 'right polygons do not exist if n is odd' but a formula was expected for full marks to be earned rather than the statement that 'as the number of sides goes up by two the number of 270s goes up by one'.

Q.15 (a)(i) 4.625, 4.6875, 4.65625, (ii) graphical representation, (iii) Investigation with conclusions that, if starting terms are equal all terms will be the same, or, if starting terms are different, terms go up and down and tend to a limit (or equivalent statements); (b) Counter example using successive terms of a mean sequence e.g. $5 > 1 \times 3$, $2 > -2 \times 0$.

Time factors may have made this investigation less successful than Q.14 but **many** candidates were led astray by the misuse of their calculators in evaluating $(a + b) \div 2$.

Sequences starting 1, 4, 3 . . (after $\frac{1+4}{2} = 3$ seen) were common and regrettable since conclusions of oscillation and convergence would not be possible after error. Graphical representations in an unfamiliar situation were very good, however, and were rewarded whatever valid interpretation was adopted. A very small number of candidates started sequences with other than two different positive integers; negative numbers, fractions or equal numbers were welcomed. When asked to comment on the behaviour of the sequences, most were content with 'behaves in the same way' rather than in identifying the way – perhaps more guidance should have been given. The counter-example, when attempted, was rarely correct since many started with consecutive integers rather than consecutive terms of a mean sequence. It was disturbing to note the number who could not demonstrate that '*bc*' means *b* multiplied by *c*, since arguments of '10 is greater than 4 and 7' implied that candidates were not considering the product of 4 and 7.

Paper 1660/6 and 1661/6

General Comments

The overall performance of candidates on this paper was quite encouraging with many high scoring scripts. The standard of work and presentation was generally good. It was evident, however, that some candidates were not totally prepared either for the new style of the paper or for some of the new topics being tested. Candidates found the paper long and there was some evidence of work being rushed towards the end of the allotted time. Most 1660 candidates attempted both investigation questions in Section B though some spent too long on Q.17 leaving little time to tackle Q.18 adequately.

There were some surprises in the paper. A complicated formula in Q.9 was handled exceptionally well yet what was thought of as a straightforward quadratic formula question, Q.14(b)(i), was done badly. A few candidates went through the paper with their calculator set in RAD or GRA mode.

Answers and Comments on Individual Questions

Section A

Q.1 (a) Tape measure. Used fewer times so less chance of error; (b)(i) 50.5 cm; (ii) 14.5 cm; (iii) 36. Greatest length remaining.

Generally this question was done well. Common errors were giving 50.4 in b(i), and in b(ii) not answering the question but discussing the range of values that the remaining length could be.

Q.2 (a) 6, 6, 8, 5, 5; (b) $55\frac{1}{3}$; (c) Histogram.

Though there were a few problems in (a) and (b), these parts of the question were often correct. The histogram in (c) however was not done well. Some candidates just drew a bar chart, often not even with different widths.

Q.3 (a) 2 m; (b)(i) Verifying equations, (ii) $a = -5$, $b = 40$, (c) 20.75 m.

Surprisingly part (a) was very often incorrect. Using $t = 0$ was overlooked and commonly a difference method was applied to the values in the table, resulting in an answer of 12. There were many correct answers to the rest of the question. Setting up and solving simultaneous equations was handled confidently by many.

Q.4 (a)(i) 10.5 m, (ii) 20 m; (b) 43.6°; (c) 55 m^2.

On the whole the first three answers were obtained correctly. There was some confusion in (c) where a number of candidates failed to subtract the area of triangle *AOB*. Weaker candidates assumed that angle *AOB* was 90°.

Q.5 (a) 31250; (b) 7812; (c) $\sqrt{\frac{k}{N}}$; (d) 3.95 cm.

Very often this question was completely correct. The most common mistake was to give 7812.5 in (b).

Q.6 1.76 m.

There appeared to be little knowledge of similar triangles. This question was answered by many badly, if at all.

Q.7 (a)(i) for example $0.333... = \frac{1}{3}$, (ii) Without repetition; (b) Irrational, $\frac{5}{2}$, Irrational, $\frac{1}{3}$.

This was generally answered quite well. In (a)(ii) 'cannot be written as a fraction' was a common statement, however the majority understood that a discussion about the decimal part of the number was needed here. A few did not state that $\sqrt{4\frac{1}{4}}$ and $\frac{1}{3} + \sqrt{3}$ were irrational.

Q.8 (a)(i) Cumulative frequency curve, (ii) Median = 63, IQR = 22, (iii) Maths had higher average but results were more spread; (b) 0.88.

The curve was usually correct though some plotted at mid-interval values. In a(ii) it was evident that the **semi**-interquartile range was sometimes being found. Good answers in (a)(iii) were rare. Part (b) was mostly done well but it was disappointing all too often to see 0.6 + 0.7 = 1.3.

Q.9 (a) 14, – 2, – 10, – 14, – 16; (b) Curve; (c) Straight line; (d) 2.7 minutes.

It was pleasing to see a good number of totally correct answers. Problems that did arise came from the misuse of the formula which was transformed into $32 \times 2 \times 10^{-t} - 18$ and through the mis-plotting of points on the graph. The most common of these were (1, – 2) being plotted at (1, – 1.5) or (1, – 1) and (2, – 6) plotted at (2, – 4).

Q.10 (a) 0.61:1 or 1.63:1; (b) 0.48:1 or 2.08:1; (c) Yes.

There was a mixed response to this question. Though candidates appeared to know about ratios and scale factors there was much confusion about when to square, cube or whatever. Good candidates found no problem with this question but there was some loss of marks through premature approximation of the linear scale factor.

Q.11 (a) Horizontal line 3 cm above *AB*; (b) Semi-circle, *AB* as diameter; (c) 4 triangles shown.

A score of 6 marks was not uncommon for this question but very few scored all 7, failing to identify the two triangles lying outside the semi-circle. Of all parts of the question, (a) was the most successful. A common diagram for the weaker candidates consisted of two isosceles triangles with *AB* as base.

Q.12 303°.

Very often found correctly. There were those, however, who found the wrong angle, measured the angle or did not attempt it at all.

Q.13 (a) Value rounding to 2 460 000 cm^3; (b) 5325.

Many candidates did not appreciate what the question was asking. Incorrect values used in (a) for the radius and height were 3.7 and 11.1 or 3.74 and 11.14. There was more of an idea in (b) where 3.65 and 11.05 were often correctly used.

Q.14 (a)(i) Re-arrangement, (ii) – 1.5; (b)(i) – 1.46, 5.46, (ii) both give the negative solution to the equation.

There were many disappointing attempts at this question, and only good candidates appeared to be able to cope with it. The algebra required in (a)(i) was lacking, many solutions contained errors like $(x - 1)\ (x - 3) = x^2 - 4x - 3$ and $x(x - 3) = 1 + 11$. In part (a)(ii) answers such as – 1.4, + 1.4, + 1.5, – 1.46 etc. were common. Most disappointing of all were the poor attempts at using the quadratic formula in (b)(ii). At this level these should have been three easy marks, but not so. Some candidates tried to factorise the equation and several were using $a = 0$!

Q.15 45.12°.

Many were able to score some marks in this question but very few scored all 5. Using 12.55 was the most common error though there were some glaring mistakes such as incorrectly substituting into or rearranging the given formula and missing out the 'sin' from the formula completely.

Q.16 (a) Mean = 4.5, Standard deviation = 1.86; (b) It does satisfy the property.

Many candidates used their calculator efficiently and obtained the correct answers, showing no working at all. Others used their calculator, showed no working, gave the wrong answers and scored zero. Those who did not use a calculator often obtained the mean correctly though the mis-quoting and the misuse of the standard deviation formula was widespread. In general candidates were unsure of how to tackle part (b).

Section B (1660 only)

Q.17 This question was approached sensibly and methodically with proper reference to its context.

Reasonable values of x were chosen and used to calculate R though occasionally there were more values than were strictly necessary. In general graphs were well presented and comments were appropriate. In part (b) nearly all used 45° with the new speed to calculate one way of beating the record. Only a few thought to consider a speed smaller than the new maximum.

Q.18 It was felt that many candidates did not have enough time to make a reasonable attempt at this question. Often triangle numbers were quoted from memory, not always correctly, but invariably these were reproduced using the formula. Candidates found various ways of proving 171 to be a triangle number. The verification in (b)(i) was usually shown correctly. Though some made a correct start to (b)(ii) very few completed an adequate proof.

Paper 1661/7 (Coursework)

General Comments

The moderating team went into this year's exercise with some trepidation. However, this was ill-founded and it is pleasing to report that the general comments of the team were very positive. The vast majority of Centres required no adjustment to the awarded marks and Moderators were able to confirm the judgements of teachers. However, there are some specific areas where comments are appropriate.

Specific Comments

Administration

This was almost universally good but the following suggestions should be noted.

* Please include the Coursework Assessment forms **with** the MS1 to the Moderator.
* Please write candidate names in alphabetical order within sets on the Coursework Assessment forms.
* Please indicate clearly the candidate's name, number and task title on each piece of work.

Attention to these small points makes moderation much more straightforward and enables the Moderator to concentrate on the essential business of considering Centres' judgements.

Moderators were pleased to report that Centres responded to requests on time, with prompt return of coursework. Most Centres also provided helpful information about the tasks and the way in which they were set. It is pleasing to report that there were generally few clerical errors and Moderators did not need to correct many marks.

Tasks

The majority of Centres set tasks in such a way as to allow candidates to demonstrate their abilities in an 'open' situation. Very few Centres set very structured tasks which limited candidates' ability to score in strand (i), Applications (although this fact was not always reflected in the assessment).

The best Centres clearly considered the tasks that would be used and differentiated according to the abilities of their candidates. Thus they avoided the trap of setting closed or trivial tasks to able students and preventing achievement at the highest level.

Investigations

Many Centres used T shapes and did so successfully. However, there were plenty of other examples of good investigations. Some Centres had prepared their own performance indicators and included them with the sample. Where this happened Moderators generally agreed with judgements. Certainly the order of merit was reliable.

Practical Tasks

This category presented most difficulties, usually **due to the poor choice of task** by a Centre. Strand (iii), Reasoning, Logic and Proof, requires generalisations to be made at levels 4, 5 and 6, also at 8 and possibly at 10. Tasks must be chosen to allow exemplification of this skill. Hence, planning bedrooms, holidays, design a garden etc. are generally unsuitable for candidates expecting to go beyond level 3 in strand (iii). **The best practical tasks allowed for generalisation** in the form of 'hypothesis' with genuine statistical research – not just data presentation through varieties of graphs – or probability or practical applications of mathematics where non-specific statements may be made.

By far the most popular choices of task were 'Anyone for Tennis' or 'Constraints'. Both these worked well but there are many other examples of good practical tasks.

Most Centres **provided helpful front covers** to tasks which showed how marks had been awarded. This is very good practice and should be adopted by all Centres both for Moderator information and feedback for candidates.

Assessment

Annotation

This was patchy. Some Centres wrote helpful comments on front covers to indicate how marks had been awarded. Some wrote comments on the work and some indicated by codes in the margins where Statements of Attainment had been achieved.

Too many Centres gave no indication of how judgements had been made. Annotation is for the benefit of candidates, in order that teachers' judgements may be supported by Moderators.

Ephemeral Evidence

There were very few examples of Centres awarding a level above that indicated in the work **and** supporting this with comments relating to 'interviews' with candidates. There were some examples of the former without the latter!

Internal Moderation

Many Centres had devoted a lot of time to this through the media of agreed indicators, exchanging and cross marking tasks, INSET days, one teacher marking whole tasks and then being cross checked and other devices. This was a marked improvement on previous years.

Marking

Many examples were seen of good marking of work, calculations clearly checked and logic followed. Comments in the margin helped Moderators to follow the candidate's reasoning in the work, as understood by the teacher. However, too many examples were seen where incorrect work was 'ticked', graphs that should have been broken were solid lines, inappropriate statistical graphs were used to represent data without comment.

Coursework is a learning situation as well as an assessment exercise. These shortcomings should be fed back to candidates in order that they may learn by their errors. They should also be reflected in the assessment.

Accuracy

The accuracy of work must affect the assessments given. For example it would be wrong to use incorrect results to justify a false generalisation (6c).

Recognising Structure

When a Centre has set a very structured task it is extremely difficult to justify awarding above level 4 in strand (i), Applications. Centres who have done this should refer to the latest training material.

Some Specific Statements of Attainment

Comments on all these Statements of Attainment are contained in the training material. However, it is worth emphasising that

5a requires **the candidate** to structure the task so that it is reduced to smaller, logical stages.

6a requires **the candidate** to question their findings in such a way as to direct the course of the 'solution'.

7a requires the candidate to move into **a new area of investigation** where **mathematics of a more complex nature is involved** or the **degree of difficulty** of the task is **significantly raised**.

8b **is NOT a stepping stone linking 7b to 9b**. It is a skill of its own and requires a thorough and constructive search for an example to disprove a generalisation or solution OR candidates to carefully construct a proof.

10a requires candidates to study, constructively, mathematics new to themselves and of a degree of difficulty at or around level 9 or 10. This should be indicated to the Moderator.

Where adjustments to marks were made it was often at level 7 or above. In some cases, Centres made very generous interpretations of the Statements of Attainment.

However, as already stated, the vast majority of Centres correctly interpreted the Statements of Attainment and had clearly benefitted from the training provided by MEG. It is felt that the first year of National Curriculum Key Stage 4 coursework has been a success with Centres making good use of tasks within their schemes of work. The moderating team looks to the future with considerable optimism and hopes that the number of Centres entering candidates for coursework will expand once more in 1995.

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. Each overall mark is shown below as a percentage.

Mathematics 1660 (Without Coursework)

Component Threshold Marks									
Component	Max. Mark	A	B	C	D	E	F	G	U
1 Paper 1	150				107	83	59	35	00
2 Paper 2	150		109	74	59	44	29		00
3 Paper 3	150	89	68	48	28				00
4 Paper 4	150				106	82	59	36	00
5 Paper 5	150		92	58	46	34	22		00
6 Paper 6	150	89	64	39	14				00

Overall Threshold Marks					Basic Tier					
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100					71	55	39	24	00

Percentage of Candidates Awarded each Grade	Total Candidature: 8394								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade				0.04	7.5	25.6	36.5	23.7	6.7
Cumulative % in Grade				0.04	7.5	33.1	69.6	93.3	100

Overall Threshold Marks					Central Tier					
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100			67	44	35	26	17		00

Percentage of Candidates Awarded each Grade	Total Candidature: 21 232								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade		0.0	11.8	45.6	19.6	13.5	6.9		2.6
Cumulative % in Grade		0.0	11.9	57.5	77.0	90.5	97.5		100

Overall Threshold Marks					Further Tier					
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100	75	59	44	29	14				00

Percentage of Candidates Awarded each Grade	Total Candidature: 6514								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade	13.2	36.8	32.9	14.0	3.0				0.2
Cumulative % in Grade	13.2	50.0	82.9	96.9	99.8				100

Mathematics 1661 (With Coursework)

Component Threshold Marks									
Component	Max. Mark	A	B	C	D	E	F	G	U
1 Paper 1	120				85	66	48	31	00
2 Paper 2	120		92	65	51	38	25		00
3 Paper 3	120	72	56	39	22				00
4 Paper 4	120				84	65	47	31	00
5 Paper 5	120		80	51	41	30	19		00
6 Paper 6	120	74	53	33	13				00
7 Coursework	60	48	42	36	32	28	24	20	00

Overall Threshold Marks					Basic Tier					
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100					65	52	40	27	00

Percentage of Candidates Awarded each Grade	Total Candidature: 7761								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade				0.01	10.5	28.8	31.6	22.0	7.1
Cumulative % in Grade				0.01	10.5	39.3	70.9	92.9	100

Overall Threshold Marks						Central Tier				
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100			70	51	41	32	23		00

Percentage of Candidates Awarded each Grade	Total Candidature: 15 957								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade		0.0	15.3	47.7	19.7	11.7	4.6		1.0
Cumulative % in Grade		0.0	15.3	63.0	82.7	94.5	99.0		100

Overall Threshold Marks						Further Tier				
	Max. Mark	A*	A	B	C	D	E	F	G	U
	100	78	64	50	36	22				00

Percentage of Candidates Awarded each Grade	Total Candidature: 5373								
	A*	A	B	C	D	E	F	G	U
Percentage in Grade	14.7	37.3	34.4	11.9	1.7				0.02
Cumulative % in Grade	14.7	51.9	86.4	98.3	100				100

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