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Mathematics 3301

Specification A

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Registered address AQA, Devas Street, Manchester. M15 6EX. *Dr Michael Cresswell Director General*

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Specification A

Paper 1: Foundation Tier

General

The standard of work showed a significant improvement this year, with candidates being better prepared for the examination. The majority of candidates found enough straightforward questions at the start of the paper and Questions 1 to 10 were a good source of marks for nearly all candidates. More candidates attempted nearly all of the questions on the paper and appeared to complete as much as they could in the time available. There were fewer very poor scripts, with most candidates scoring between 30 and 70 marks. Again, it was encouraging to see more candidates gaining marks in the questions towards the end of the paper.

There was a noticeable improvement in the candidates' presentation this year, with more candidates giving their answers on the answer line and with only a few candidates writing in pencil. As reported in previous years, centres should discourage candidates from writing answers only, as a considerable number of method marks could well be lost. It was pleasing to see that there were not so many candidates without the necessary mathematical equipment required for the examination, especially in Question 13, where candidates were expected to use a ruler and a protractor.

As in previous years, it was surprising how many candidates found difficulty with manipulative number work, such as long multiplication, addition of decimals and multiplying numbers by powers of 10. Once again, there was the usual confusion between perimeter and area in Questions 4 and 16.

The standard of written English continued to cause concern for examiners, especially when an explanation was required and the spelling of mathematical words was particularly weak, especially in Question 6, where a considerable number of ways for the spelling of *parallelogram* and *trapezium* were seen.

Topics that were done well included:

- Number patterns;
- Interpreting bar charts;
- Problems involving money;
- Probability;
- Coordinates;
- Two-way tables

Topics which candidates found difficult included:

- Converting a percentage and a fraction to a decimal;
- Metric equivalents of Imperial measures;
- Manipulation of decimals;
- Construction of a triangle;
- Substitution into a formula;
- Solving equations;
- Angle properties of quadrilaterals;
- Solving problems involving ratio and proportion;
- Estimation

Question 1 *(a) 8721* *(b) Any even number using all the cards*

The correct answer was given in part (a) in nearly all cases. However, in part (b) many candidates gave an odd number or an even number which did not use all the digits or a list of even two-digit numbers.

Question 2 *(a) 2 correct patterns drawn* *(b) 7, 9, 11* *(c) Add on 2 or equivalent*

Most candidates scored well on this question, with many gaining full marks. A few candidates only drew one pattern in part (a) or drew acceptable circular patterns. Those who drew incorrect patterns were, nevertheless, often able to recover marks in parts (b) and (c). In part (c), it was pleasing to see the answer 'double the Pattern number and add one'.

Question 3 *(a)* 6 4 1 *(b)* 5 3 2

Quite a number of candidates did not appear to appreciate what was being asked of them. In part (a), some candidates treated the columns as three separate additions and so, for example, obtained the answer 11 in the bottom right hand box. A few candidates started the addition in the hundreds column rather than in the units column. There was, however, more success with part (b), where no 'carrying' was required.

Question 4 *(a) 26 cm* *(b)* $12\,cm^2$

There was still a good deal of confusion between perimeter and area for some candidates, evidenced by the answers being given the wrong way round. There was much miscounting in part (a), with 30 and 22 being quite common incorrect answers, but there was a greater success in achieving the answer 12 in part (b).

Question 5 *(a) £1080 + £750 + £200 = £2030*
(b) Two thousand and thirty pounds, £2030.00

This question was a good source of marks for the majority of candidates. While there were some arithmetical errors, for example, 2×540 being given as 1800 instead of 1080, many candidates scored 2 or 3 marks in part (a) and were then able to successfully transfer their answer to part (b), where there were some innovative spellings for 'thousands' and 'thirty'. There was some misinterpretation in part (b), where some candidates added on the £240 from the cheque shown, while others wrote out a cheque not including the car hire. A few candidates simply copied the cheque in the question.

Question 6 *(a) Parallelogram, Kite, Trapezium* *(b)(i) Different quadrilateral drawn*
(b)(ii) Correct name for part (i)

In part (a), the majority of candidates knew that shape B was a kite, but there was less success in naming shapes A and C. In part (b), squares and rectangles were the most common shapes drawn and identified, but there was a number of attempts at a rhombus, but drawing these on the grid usually resulted in a parallelogram. Some candidates misunderstood what was being asked for and chose instead to draw and name triangles or other polygons.

Question 7 *(a) 12%* *(b) Education* *(c) Bar drawn at height of 5*

The vast majority of candidates correctly answered parts (a) and (b). In part (c), some candidates knew how to find the remaining percentage, but wrong calculations often prevented the arrival at the correct answer. Some candidates appeared to pick a number, often 1%, from the decreasing pattern of the bars. Quite a number of candidates gave the answer 0% because there was no bar drawn.

Question 8 *(a) £14.40 (b) 4 gallons (c) Multiple by 9, divide by 2 (in either order)*

Nearly all candidates knew that 18 × 80 was the correct calculation for part (a), but there were varying degrees of success in achieving the correct answer. Those candidates who wrote down 80, 18 times, often made a mistake in their addition. Quite a number of candidates chose to multiply 18 by 8 first, but were often unable to multiply their answer by 10. There were many correct answers for part (b), but equally surprising was the number of candidates who gave an answer of 3 having written down 36 ÷ 9. A few candidates thought that the starting number was 80 or their answer to part (a). In part (c), quite a large number of candidates wrote down the same operations given in part (b) but in the reverse order. Another fairly common error was to think that 'subtract 2' was the inverse of 'multiply by 2'.

Question 9 *(a) 60 (b) 42*

Many candidates simply subtracted the numbers and wrote down answers of 6 for part (a) and 4.2 for part (b). It was then quite common for candidates to add 10, instead of multiplying by 10.

A common error was to give 4.2 × 10 as 4.20 or 40.2

Question 10 *(a)(i)* $\frac{1}{6}$ *(a)(ii)* $\frac{4}{6}$ *(b) Yes, each number lands about the same number of times*

In part (a), many candidates identified $\frac{1}{6}$ as the answer for (i) but quite a number of candidates gave $\frac{2}{6}$ as the answer for (ii). Some candidates marred their answers by using incorrect notation for probability and a few wrote descriptions such as 'unlikely'. In part (b), most candidates referred to the numbers on the spinner rather than to the frequencies in the table.

Question 11 *(a)(i)* $\begin{matrix} & 50 \\ 24 & 26 \end{matrix}$ *(a)(ii)* $\begin{matrix} & -1 \\ 2 & -3 \end{matrix}$ *(a)(iii)* $\begin{matrix} & 8a \\ 3a & 5a \end{matrix}$

This question was done well by a good proportion of the candidates and there were many fully correct solutions. The negative numbers in part (a)(ii) caused some problems; sometimes the sum of −8 and 5 was given as 3, or the two additions given as −18 and −13. In part (b), a large number of candidates obtained 2*a* rather than 3*a* in the first box, while others introduced powers of *a*.

Question 12 *(a) True (b) False (c) True*

There were many fully correct answers to this question, with part (a) appearing to be the least well-known and part (c) the best well-known. It was surprising to see the number of candidates who got all parts wrong.

Question 13 *Correct triangle drawn*

Candidates produced some good accurate drawings, with more than usual gaining full marks on this type of question. Even so, it was evident that many candidates did not have either a ruler or a protractor, or did not know how to use them correctly.

Question 14 $\frac{3}{20}$, *19%, 0.22*

Many candidates did not produce the required working out, despite the question saying that they must show their working. Instead they merely repeated the numbers in the working space and then again, in a different order, on the answer line. Some candidates were able to convert 0.22 and 19% to a common form, but $\frac{3}{20}$ proved the difficult one. Often this was stated to be 60%. Fully correct solutions, with working shown, were very rare.

Question 15 *5×10^3, 10 000, 7×10^4*

Many candidates correctly wrote down 10 000 to accompany the 7, although some wrote 70 000 or 0000, but the other two answers proved to be too difficult, except for the most able candidates.

Common incorrect answers were 5×100^2 and 7×1000^2

Question 16 *(a) Q(5, 4), R(4, 0), S(0, 1)* *(b) 17cm^2*

Many candidates correctly obtained the coordinates in part (a), with only a few writing them in reverse order. In part (b), some candidates were clearly attempting to find the perimeter, while others tried to find the length of a side, which was often taken to be 4, and then proceeded to find 4×4, which led to the very common incorrect answer of 16 cm^2. Those candidates who tried to count squares often had difficulty in coping with the 'part squares' but some were able to arrive at the correct answer using this method. It was surprising to see a good number of candidates attempting to find the area by adding all the numbers in the coordinates. Fully correct answers, including the units, were not seen very often.

Question 17 *30*

This question produced some confusing responses. Some candidates got as far as dividing 500 by 5 and gave 100 as their answer; others attempted to find $\frac{3}{10}$ of 500, often correctly; while others seemed to combine 3, 5, 10 and 500 with various operations to obtain an answer. The few who obtained the correct answer 30, often went on to do more working and arrive at a different answer.

Question 18 *(a) 0.7* *(b) 0.2*

Some candidates wrote the answer to part (a) in the table, but gave 0.2 on the working line in part (b). 0.8 and $\frac{3}{5}$ were common incorrect answers for part (a).

Question 19 *Regular jar*

Many candidates found the difference in the price between the two jars but did not then go on to compare this with anything. The most common method was to find the price of 100g for both jars. £1.50 was usually correctly found for the regular jar, but dividing £4.80 by 3 proved too difficult for many candidates. Those candidates who added £1.50 to £3 or compared £1.50 with the £1.80 difference inevitably had more success.

Question 20 *135°*

The majority of candidates who attempted this question often knew they first had to subtract the sum of the three angles from 360°, although some subtracted the sum from 380° or even 365°. However, they did not then subtract their answer from 180°. Some candidates simply subtracted 60° or 115° from 180° and a few candidates appeared to have measured the angle.

Question 21 *(a)*

	Walk	*Other*
Boy		*2*
Girl	*3*	*3*

(b) No and explanation eg, $\frac{3}{6}$ is the same as $\frac{2}{4}$ ***or*** *same proportion of boys and girls*

The completion of the two-way table in part (a) produced a very large number of correct responses, but in part (b) the majority of candidates focused on the fact that the number of boys and girls in the sample was not the same or simply looked at the numbers of boys and girls walking rather than the proportions.

Question 22 *(a) E* *(b) C* *(c) 65°*

While there were a large number of correct responses to part (a), correct answers to parts (b) and (c) were rarely seen, with 55° being a very common incorrect answer for part (c).

Question 23 *(a) $6x + 5$* *(b)(i) 15* *(b)(ii) 5*

This question proved to be difficult for the majority of candidates. In part (a), those candidates who correctly obtained $6x$, sometimes left their answer as $6x + 8 – 5$. Other candidates proceeded to collect all terms to arrive at the incorrect answer of $11x$. In part (b)(i), the division line was often interpreted as a subtraction and in part (b)(ii) many candidates used trial and improvement methods with varying degrees of success.

Question 24 *150 or other suitable estimates*

Very few candidates gained any marks in this question. Many candidates did not attempt to approximate the numbers, but proceeded to use long multiplication and division. Of those candidates who rounded the numerator to 100×30, the denominator was then often rounded to 18 which made further progress difficult. Of the few candidates who got as far as $3000 \div 20$, many could not cope with the division, so that answers of 15 or 1500 were all too common.

Question 25 *108°*

Many candidates measured the five angles and then added them, often arriving at 540° for which no credit was given. A good number of candidates divided 360° by 5 and gave this as their answer. The correct answer of 108° was rarely seen.

Question 26 *(a) $x + 2$* *(b) $x – 2$*

This question proved too demanding for the majority of candidates. Only in a handful of cases were the correct answers seen. 'y' and 'w' or other letters were often given, or a value substituted for x.

Paper 1: Intermediate Tier

General

The paper was fairly accessible and the majority of candidates attempted questions throughout the paper. As expected, most candidates scored well in the questions in the first half of the paper but only more able candidates were able to tackle later questions with any degree of success.

There were a number of straightforward and routine questions that enabled well-prepared candidates to demonstrate their mathematical knowledge and basic skills. However, a significant proportion of candidates made elementary errors in these questions. As usual, many displayed weaknesses in algebraic topics and many candidates were let down by poor numerical ability. Many candidates found it difficult to deal accurately with negative numbers, basic decimal calculations and the use of short division to convert a fraction to a decimal.

Overall, presentation was good with most candidates showing their method. This resulted in marks being scored even when slips produced incorrect final answers. Nearly all candidates attempted to follow the instructions given in questions although some might have benefited from reading questions more thoroughly; for example, in Question 21 many candidates ignored the instruction to convert answers to standard form. The instructions, "estimate" and "show" continue to cause problems.

Relatively few candidates scored either very low or very high marks. However, it is likely that a proportion of candidates would have been more appropriately entered at the Foundation tier or at the Higher tier.

Topics that were well done included:

- Using powers of 10
- Inverse operations
- Probability
- Best buy problem
- Completing a 2-way table
- Simplifying a simple algebraic expression
- Substituting into expressions with and without brackets
- Using the rules of indices

Topics which candidates found difficult included:

- Converting a fraction to a decimal or percentage
- Writing an algebraic expression involving a bracket
- Generalising an algebraic expression from a sequence of diagrams
- **Single** transformations
- Fraction subtraction
- Estimating the value of a numerical expression involving a square root
- Recurring decimals
- Interpreting a frequency polygon and comparing two frequency polygons
- Solving a multi-step angle problem involving two triangles
- Converting to standard form
- The perimeter of a semi-circle in terms of π

Question 1 $\frac{3}{20}$, *19%, 0.22*

Fewer than half of candidates scored full marks on this question and a significant minority scored zero.

The conversion of $\frac{3}{20}$ caused most problems with a large number unable to convert this either to a decimal or a percentage with many not making an attempt. There was more success for those who tried to change to a percentage. A minority made correct conversions but failed to give the correct order.

Question 2 *(a) 5×10^3, 10 000, 7×10^4*

This was well done with about three-quarters of candidates scoring full marks and all but a very small minority scoring at least one. Errors occurred mainly with the powers with some candidates not using powers of 10 as instructed

Question 3 *(a) 0.59* *(b) 6.32*

In part (a) only about two-thirds of the candidates managed to answer this routine calculation correctly. In part (b) about half the candidates scored the mark for this question. Most errors were with the place values but some candidates failed to realise that the answer involved the digits 632 and attempted long division.

Question 4 *$17cm^2$*

Most candidates measured the length of the side as 4 cm and ended up with the answer of 16. Those who counted squares generally obtained the correct solution. Very few candidates added the area of the triangles to the area of the 3 by 3 square or subtracted the area of the triangles from the 5 by 5 square. The majority of candidates gave the correct units.

Question 5 *(a) 6* *(b) 5(x + 2)*

Part (a) was usually answered correctly. Some candidates worked out $6 \times 5 - 3$ and failed to score both marks because they either left their answer embedded in this form or wrote 27 on the answer line. In part (b) about 30% of the candidates gave fully correct solutions. Most scored one mark because they omitted the brackets and gave either $5x + 2$ or $x + 2 \times 5$.

Question 6 *30*

Slightly less than half of the candidates worked out what was required in this multi-step question and scored full marks. It was fairly common for candidates to stop after correctly calculating $\frac{3}{20}$ of 500. Arithmetical slips were fairly common, the most notable being the inability to work out $150 \div 5$ correctly. A number of candidates attempted to calculate $\frac{3}{20}$ of 500 but used an invalid method.

Question 7 *(a) 0* *(b) 0.7* *(c) 0.2*

Part (a) was particularly well done and the majority of candidates gave correct answers to all three parts of the question. Part (b) caused the most problems with 0.5 being a common incorrect answer.

Question 8 *Regular jar*

Most candidates scored at least one mark for this question as they were able to use a correct method to find one comparable value; about 60% of candidates gave a completely correct answer. Successful candidates generally found 1.5 and then compared this to 1.6 or multiplied it by 3 and compared £4.50 with £4.80; a popular alternative was to compare the costs for 600 g of coffee. Less successful candidates confused grams per penny with pence per gram and attempted calculations like $300 \div 480$ unsuccessfully; many candidates lost marks because they were unable to divide by 3.

Question 9 *(a) 135°* *(b) Explanation based on $360 - 3 \times 90 = 90$* ***or*** *Attempt at drawing a quadrilateral with 3 right angles & conclusion that 4th angle would also be 90* ***or*** *five (or more) sides would be need for three right angles*

In part (a) a large majority of candidates scored at least one mark with between 60% and 70% giving the correct answer. A large number of candidates successfully worked out the value 45° but were unable to take this away from 180° correctly. A number of misconceptions were exposed in this question; for example, subtracting 315° from a value other than 360°, assuming that the missing angle was supplementary with 115° or 60° or that the opposite angles of the quadrilateral were supplementary. Simple arithmetical errors were fairly common.

In part (b) about 60% of candidates scored at least 1 mark for this Using and Applying mathematics question with about half of these providing a full and valid argument. Some seemed to think that as only 3 angles were given that a triangle was being drawn. Those who drew diagrams usually did better

Question 10 *(a)*

	Walk	*Other*
Boy		*2*
Girl	*3*	*3*

(b) No and explanation eg, $\frac{3}{6}$ *is the same as* $\frac{2}{4}$ ***or*** *same proportion of boys and girls*

For part (a) nearly all candidates completed the table correctly. In part (b) about 70% of candidates gained at least one mark for this Using and Applying mathematics question with just less than half of these giving a fully correct explanation usually based on equal proportions. Many answers were based on the different number of boys and girls; very few considered that the numbers in the sample were too small.

Question 11 *(a) E* *(b) C* *(c) 65°*

For part (a) about 80% of candidates were able to choose the correct piece to match rectangle A. In part (b) fewer candidates found the piece that matched rectangle B. In part (c) less than half of candidates matched the correct piece to rectangle D. Nearly all of these went on to attempt to subtract 65° from 180°, but some made an arithmetic slip in doing this and failed to score both marks.

Question 12 *(a) $6x + 5$* *(b) 15* *(c)(i) 7 (with methods)*

(c)(ii) $a(b + c) = ab + ac$ (must see ***both*** *methods and answers)*

Part (a) was well answered with over 90% of candidates scoring at least one mark with most of these getting full marks. Some candidates lost a mark usually for $6x - 5$ or $6x + 8 - 3$ and some for showing incorrect work after obtaining $6x + 5$, for example, $11x$. In part (b) over 80% of candidates answered this question correctly. A common incorrect answer was 2. For part (c)(i) nearly all candidates found this question easy and the majority scored all three marks although some lost marks by not showing enough working. A common misunderstanding resulted in $1 + 3 + 4 = 8$ and $3 + 4 + 1 = 8$; some calculated $1(3 + 4)$ as 17. In part (c)(ii) many candidates found this Using and Applying mathematics question demanding with only about 30% of candidates scoring any marks. The most common correct answer resulted from substituting other values for a, b and c with $a \neq 1$; a few candidates gave $a(b + c) = ab + ac$

Question 13 *(a)(i) $x + 2$* *(a)(ii) $x - 2$* *(b)(i) $n^2 + n$* ***or*** *$n(n + 1$* *(b)(ii) 42cm*

For part (a) approximately 65% scored both marks for this question. In part (b)(i) very few candidates had any idea of how to approach this question with some trying to use inappropriate formulae; many gave a numerical answer. About 30% of candidates scored 1 or 2 marks; of those who scored 1 mark, some just gave n^2, whereas others simply omitted the brackets from the correct expression. Candidates were slightly more successful with part (b)(ii) with many finding 10 and 11 using trial and improvement, although some did not know how to find the perimeter from this. A common incorrect answer was 55 from $110 \div 2$.

Question 14 *(a) Rotation, 90° clockwise about (1, 1)*

(b) Trapezium with verticles at (2, 1), (2, 3), (4, 5) and (4, 1)

In part (a) few candidates scored more than one or two marks. The most common error was to give a combined transformation of a rotation followed by a translation, which contributed to the relatively large number of candidates who scored zero. Many of those candidates who did give a single transformation only gave two of the three required parts with the centre of rotation often not given or given incorrectly. A significant number of candidates gave the wrong direction of rotation. For part (b) most candidates knew how to enlarge the trapezium with scale factor 2 but many did not know how to use the centre of enlargement to draw it in the correct position.

Question 15 $2\frac{8}{15}$

The relatively few completely successful solutions nearly always used a method involving improper fractions. Those who subtracted the whole numbers and then dealt with the proper fractions were less successful as they struggled with the negative sign with answers like $2\frac{7}{15}$ or $3\frac{7}{15}$ being common. About 40% of candidates showed little or no knowledge of how to subtract a fraction.

Question 16 *7 or 7.1*

Many candidates showed little or no awareness of the concept of calculating an estimate and some made incorrect attempts at approximating such as 10 ÷ 0 and 10 ÷ 0.5. The majority of the remaining candidates could not progress beyond calculating 10 ÷ 0.2 with 5 being a common answer to this. Many candidates who got to √50 failed to give 7 or 7.1.

Question 17 *(a)* $\frac{5}{6}$ *(b) 0.2727(27…)* ***or*** $0.\dot{2}\dot{7}$

Both of these questions proved beyond all but about 10% of candidates. A large number of candidates attempted to find the reciprocal of the given fractions. Many of those who used the correct method could not do so accurately.

Question 18 *(a)* $\frac{9}{30}$

(b) Frequency Polygon drawn at correct points and joined by straight lines.

(c) Correct comparison of 'average' and 'spread' ***or***
Comparision of one of these together with one vaild observation

In part (a) only about 40% of candidates managed to score a mark; some of these gained one mark for 9 but failed to convert this to the required probability. The most common incorrect answer was $\frac{10}{30}$.

For part (b) approximately 80% of candidates gained at least 1 mark for this question with the majority of these scoring both marks. Many candidates lost a mark for plotting at the upper class boundary rather than the mid-point. In part (c) both marks were scored on this question only by candidates who gave a correct statement using either average or range plus one other valid statement. Despite the influence of coursework very few candidates managed to do this. However, a relatively large proportion scored one mark for any valid statement. Candidates who scored zero invariably did not use the frequency polygons to **compare** teachers and students.

Question 19 *(a) 30°* *(b)(i) 100°* *(b)(ii) 110°*

In part (a) about three quarters of candidates gained one or more marks for this multi-step question with about one third giving a correct solution. Many candidates failed to use the fact that triangle *ABC* was isosceles and gave an answer by working out angle *DAB* and then halving it to give 25°. Some candidates obtained 40° from triangle *ABC* but failed to halve it and gave 50 – 40 as their answer. For part (b) approximately half of the candidates knew one or both of the appropriate angle facts and scored one or two of the marks. Part (b)(ii) was answered slightly more successfully.

Question 20 *(a) $x - 11y$ (b(i) w^8 (b)(ii) w^6 (b)(iii) w^{12} (c)(i) $(y - 2(y - 3)$*
(c)(ii) 2 ***and*** *3*

For part (a) just over half of the candidates gained marks with the majority of these failing to take account of the minus sign before the second bracket and scoring only one mark. A number of candidates gave the correct answer by making an error both in the expansion and in the subsequent collection of terms, for example:
$7(x - 2y) - 3(2x - y) \equiv 7x - 14y) - 6x - 3y) \equiv x - 11y$. This scored one mark for the expansion with one error. The answers given in part (b) showed that the index laws were fairly well known and a good source of marks for many candidates; approximate proportions of correct answers were (i) 70%, (ii) 60% and (iii) 50%. Part (c) was beyond the majority with only about 20% of candidates showing any idea of the concepts involved and only about half of these being able to find the correct factorisation; relatively few candidates could translate their factorisation into an attempted solution of the quadratic equation.

Question 21 *(a) 7×10^5 (b) 3.5×10^{-3}*

In part (a) many candidates realised that they had to simplify the given ratio by dividing by 50 but relatively few could do this accurately; for example, many forgot to calculate 35 000 000 divided by 50 after dividing 50 by 50. About one-third of those who managed to find 700 000 failed to convert it to standard form. Part (b) was poorly attempted with less than 5% finding the correct answer; very few candidates gained the method mark for showing that they needed to divide
3.5×10^3 by 10^6. About 12% did obtain 0.0035 generally with little method shown but then failed to convert this to standard form.

Question 22 *Factorising $10\pi + 20$* ***or*** *Expanding $10(\pi + 2)$*

Most candidates did not know how to approach this Using and Applying mathematics question. Those who gained marks generally did so by displaying 3.14×20 and then halving it and some of these then added 20 to work out the perimeter. A minority then went on to show that this was equal to $10 \times (3.14 + 2)$ to gain full marks. Some impressive solutions were seen from better candidates involving logical argument and the use of π rather than 3.14.

Question 23 *$1 \rightarrow D$, $2 \rightarrow C$, $3 \rightarrow E$, $4 \rightarrow A$*

This was rarely fully correct with just under 10% of candidates scoring 3 or 4 marks and indicating that they had knowledge of the concepts involved; the majority of candidates scored one or zero probably by guesswork.

Paper 1: Higher Tier

General

The paper was felt to be a fair test of candidates' ability. However, in general candidates performed less well than in previous years. It was relatively easy to accumulate marks in the first part of the paper but there were some fairly challenging questions in the latter half, making really high marks (85%+) less easy to attain. One concern was the significant increase in the number of candidates who scored below 20%; many of whom seemed to be incorrectly entered for the Higher tier.

There was no evidence that the paper was too long, all candidates seemed able to do as much as they were capable of. Clear presentation of solutions is important at this tier and many candidates find this difficult. It was not uncommon to find working all over the page. This made it difficult for examiners to pick out work which might be creditworthy.

One area which candidates found difficult was in answering questions which ask for explanations or formal proofs. Proofs need to be set out in 'bullet point' style, using clear and correct mathematical language, correct notation (particularly in identifying angles) and logical reasoning. Far too often attempts were wordy and salient points were difficult to pick out.

There are still some issues regarding numeracy skills. Poor manipulation of intergers, decimals and fractions was evident in many scripts, leading to an unnecessary loss of marks.

Topics that were done well included:

- Sequences
- Basic Algebra
- Fractions calculation
- Transformation Geometry
- Drawing a frequency polygon
- Tree diagram probability
- Laws of indices

Topics which candidates found difficult included:

- Finding a reciprocal
- Changing fractions to decimals
- Changing the subject of a formula
- Congruent triangles proof
- Proportion
- Surds problem
- Sphere/cone problem

Question 1 *(a)* $n^2 + n$ ***or*** $n(n + 1)$ *(b) 42cm*

Part (a) was well done by the majority of candidates although there was the occasional omission of brackets. In part (b), an answer of 42 was sometimes evident even when part (a) had not been done successfully. 38 was seen quite often and there were instances of some alarming arithmetic such as 10 + 10 + 11 + 11 = 44

Question 2 *(a)* $x - 11y$ *(b)* 9 *(c)(i)* $(y - 2)(y - 3)$ *(c)(ii)* 2 ***and*** 3 *(d)* $\frac{x+3}{4}$ *(e)* $16m^{12}p^4$

In part (a) there were many fully correct solutions although the correct answer often followed from incorrect working, typically a sign error on the $+3y$ term (incurring a 1 mark penalty).

Part (b) was extremely well done.

Part (c)(i) was well done by the majority and, with follow through marks available, most scored on part (ii).

Part (d) caused problems; many candidates tried to expand the brackets. Frustratingly common were answers of $\frac{2(x+3)}{8}$ and $\frac{2x+6}{8}$ whilst there was a lot of illegal cancelling.

In part (e) the most common mistake was to forget to work out 2^4.

Question 3 *(a)* $\frac{2}{3}$ *(b)* 7 *(c)* $2\frac{8}{15}$

Reciprocal is a term that ought to be familiar to candidates but this part was not at all well done. Many candidates scored zero.

Approximations of 10 and 0.2 were common but not all candidates then worked out 50 for their division. Of those who did, many scored all 3 marks, although there were some inappropriate answers of $5\sqrt{2}$.

The fractions calculation was well done; almost all candidates scoring 2 or 3 marks.

Question 4 *(a)Reflection in* $y = x$ *(b) Rotation,* 90^o *anticlockwise, centre (1,1)*
(c) Enlargement, scale factor -2*, centre (0, 0)*

Part (b) was the most successful of the three parts and although there was sometimes an element missing the majority scored 2 or 3 marks.

In part (c) there were too many combinations of transformations given … the question clearly stated that a single transformation was required. Even so, a significant number of candidates scored 2 or 3 marks.

Question 5 *(a)* $\frac{5}{6}$ *(b)* 0.2727**…** ***or*** $0.\dot{2}\dot{7}$

In part (a) candidates either knew exactly how to approach this question or could make no progress at all. Those who set off correctly, trying to do the division the correct way round, usually identified the correct answer (a small degree of error was tolerated). Too many attempted division but did 10 ÷ 9, 8 ÷ 7 and 6 ÷ 5 … reaching the conclusion that $\frac{9}{10}$ was the recurring decimal. Similar mistakes occurred in part (b) where even fewer candidates were successful. In this part some decided to equate $\frac{3}{11}$ with $\frac{27}{99}$ but couldn't proceed further, scoring no marks.

Question 6 *(a) Frequency Polygon drawn at correct points and joined by straight lines.*
(b) Correct comparison of 'average' and 'spread' ***or***
Comparision of one of these together with one vaild observation

The frequency polygon was accurately drawn by very many candidates. There were a few plotted at the upper bound of the intervals but these were very much the exception.

'Average' and 'spread' reasons are always what a question such as this requires but there were far more 'other valid observations' given for the two comparisons … remarks such as, 'both had a frequency of 7 for 10 – 15 hours of TV' or 'more teachers than students watched a smaller amount of TV'. Such comments could not gain full marks unless accompanied by a comparison relating to 'average' or 'spread'.

Question 7 *(a)* 7×10^5 *(b)* 3.5×10^{-3}

In part (a) there were some errors on the number of zeros that should come after the figure 7 but the question allowed for some follow through when writing the answer in standard form and a large number scored at least 1 of the 2 marks. Some answers were numerically correct but not written in standard form, scoring 1 mark.

In part (b) many tried to divide by 10^6 but made errors in positioning the decimal point. Embedded answers were seen occasionally.

Standard form notation was correctly used by many … there were very few instances of, for example, 7^5 instead of 7×10^5

Question 8 $1 \rightarrow D,\ 2 \rightarrow C,\ 3 \rightarrow E,\ 4 \rightarrow A$

Many candidates scored at least 2 of the 4 marks. The most common mistake was in transposing the answers for D and E.

Question 9 $u = \dfrac{2s}{t} - v$ ***or*** $u = \dfrac{2s - vt}{t}$

The first step in rearranging the formula was crucial and there were many candidates who could not handle the correct order of operations hierarchy.

Common incorrect first steps were $2s = (u + v)2t$ or $\frac{1}{2}s = (u + v)t$ or $s - t = \frac{1}{2}(u + v)$

The bracket was frequently expanded incorrectly, for example as $\frac{1}{2}u + vt$

This was a question where the layout of the solution was often unclear making it difficult to see where credit could be given.

Although a third of all candidates scored full marks, nearly a half scored zero.

Question 10 *24cm*

Some candidates spotted the 2 : 3 ratio but were unable to use it correctly … answers of $\frac{2}{3}$ of 40 = 26.66…

resulting. Pleasingly, a good number did use the ratio correctly and scored full marks.

Question 11 *Men: 4 5 4 2* *Women: 6 4 7 3*

Although a third of all candidates scored full marks on this question, just as many scored zero. This was due to a number of factors: poor arithmetic, very untidy working (which made it difficult to find work that could earn part-marks) and, not least, an inability to read the question carefully (answers of the correct proportions of men and women but with no 10% calculation attempted).

Question 12 *1 YZ is common*

2 angle MYZ = angle NZY (given)

3 angle MZY = angle NYZ (base angle isosceles ΔXYZ) Congruent (ASA)

It was quite disconcerting to see the number of candidates who thought that triangles with three equal angles were, therefore, congruent. There were a huge number of wrong assumptions made such as *MZ = NY* or *NM* and *YZ* are parallel, and many candidates worked in the wrong pair of triangles (*NMY* and *MNZ*).

Perhaps the most disappointing thing of all, however, was that very few candidates appreciated the need to set out a formal proof for congruent triangles in 'bullet point' style. The majority just wrote down everything they could think of relating to the two triangles (and other parts of the whole diagram too), in no particular order and mixing up correct observations with incorrect ones. To 'pick out' correct facts from the confusion was not an easy task although it did result in 1 or 2 marks for at least half of the candidates.

Better presentation is essential for 'formal proof' questions such as this one.

Question 13 $-2.6 \leq x \leq -2.5$ ***and*** $1.5 \leq x \leq 1.6$

Some candidates misinterpreted the scale on the *y*-axis and drew the line $y = x - 1$ with the wrong gradient. The mark scheme allowed for this (and for correct gradient but wrong intercept) and follow through marks were available. It was disappointing to see that far too many candidates thought that the 'appropriate' straight line was either $y = -1$ or $x = -1$

Question 14 *(a) 13 cm (b) angle y*

Although part (a) was reasonably well done there were many examples of poor arithmetic, poor presentation and sloppy notation. Not all realised that they had to apply Pythagoras' theorem twice and stopped after just one application.

Some used the same length twice, for example, $12^2 + 4^2 = 160$ followed by $160 + 4^2 = \ldots$ and lost marks. Having successfully applied the correct method, some candidates failed to give an answer of 13 and left their length for *BH* as $\sqrt{169}$ (squares of integers up to 15 need to be known).

Part (b) proved too difficult for many. The ability to pick out the two relevant right-angled triangles and sketch them (even allowing for lengths wrongly calculated in part (a)) was the simplest way to proceed. Candidates could then offer a 'non-trig.' explanation, describing the relationship between the sides and deducing the largest angle … and a significant number did just that. Comparing 'like' trig. ratios was a popular and valid method but all too often careless mistakes were made … the trig ratio was be inverted or a wrong value was used, some tried comparing a sine with a cosine … all of which meant a likely score of only 1 mark out of the 3 available.

Question 15 *(a) 2nd game probabilities of 0.7, 0.3, 0.4, 0.6, in that order.*
3rd game probabilities 0.4, 0.6, 0.7, 0.3 in that order.

(b 0.55

The majority of candidates performed well on part (a), although there were instances of probabilities being transposed (particularly the 0.4 and 0.6 values). Some candidates were guilty of not reading the question carefully enough and simply repeated the 2nd game probabilities in the 3rd game column. A small number took no notice of the 0.7 and 0.6 values and wrote probabilities of 0.5 on every branch of the tree.

Part (b) was less well done but a significant number of candidates scored either 3 or 4 marks. Some loss of marks was due to poor arithmetical skills ($0.5 \times 0.3 \times 0.4 = 0.6$, instead of 0.06 was probably the most common mistake) and some was due to candidates multiplying (correctly) 0.5×0.7 but then following it up with 0.5×0.4 and 0.4×0.7 … in other words, just the 'Ian wins' probabilities from each of the three correct routes through the tree.

This last example gives an answer of 0.83 when the probabilities are added … an answer surely much too high given the similarity of 'Ian wins' and 'Simon wins' in the first place?

Thinking whether or not an answer is reasonable seems not to occur to many candidates; nor does it seem to worry them when answers such as 1.09 result from careless arithmetic!

A simple check of their working would eliminate some of these mistakes.

Question 16 *(a)(i)* w^8 *(a)(ii)* w^6 *(a)(iii)* w^{12} *(b)(i)* $\frac{x}{y}$ *(b)(ii)* x^2 *(b)(iii)* $9y$

Almost all candidates scored full marks on part (a).

Part (b) was a rather different story. Candidates were being asked to apply the same laws as in part (a) of the question but 'working backwards' from an answer given in index form.

The only part done with any degree of success was part (ii) where nearly half managed the answer of x^2. There were only a few correct solutions to the other two parts of (b).

Question 17 *Rule C*

It was apparent that many candidates did not understand the proportion notation and had no idea how to proceed (by attempting to calculate a constant of proportionality). Those who did try to use a correct method were blighted by some poor arithmetic.

$2 = 6k \rightarrow k = 3$, $2 = \frac{k}{36} \rightarrow k = 64$ being examples of the sort of mistakes that were made.

The $t = 2.4$, $m = 25$ pairing was largely ignored during any form of testing of the rules. Testing the rules was often incomplete, either because only two of the three pairs of values were used (which would have been enough if errors had not been made) or because the values used for the test were exactly the same ones used to find k in the first place!

Some candidates did explain why the relationship was an inverse one, thus ruling out A, and gained credit for this but others just wrote 'not A' giving no explanation (and receiving no marks!).

It was a challenging question … as one would expect at this stage of the paper … and although well over half of the candidates scored zero, almost a fifth scored full marks.

Question 18 *(a) Correct expansion and verification of result*
(b)(i) Correct use of Pythagoras' theorm to verify result *(b)(ii)* $6\sqrt{2}cm^2$

In part (a) there were a pleasing number of completely correct expansions, scoring 2 marks, and a lesser number who could not quite tidy up the surds convincingly, scored 1 mark. Many candidates (even those who could expand correctly) assumed the result and ended with a statement of 27 = 27, which although not liked was condoned. Starting with the expression on the left-hand side and working through to 27 is much tidier and, mathematically, more sound. $\sqrt{12} + \sqrt{3} = \sqrt{15}$ did occur, although, thankfully, not too often.

Those unable to successfully sort out part (a) were destined to come to grief in a similar way in part (b), although they could still pick up 1 mark for applying Pythagoras' theorem correctly and, possibly, 1 mark for an attempt at the expansion of $(\sqrt{8} + \sqrt{2})^2$, as long as there was no more than one error in it.

Almost a third of all candidates scored full marks on part (b)(i), which was encouraging, and approximately another fifth scored at least 1 mark.

When an answer is given, as in this case, candidates need to appreciate that their work needs to be set out very clearly, showing all the steps in the calculation so as to convince the examiner that they have arrived at the result by legitimate means. There is still room for improvement in this respect.

Finding the area in part (b)(ii) was significantly less well done. In too many cases the factor of $\frac{1}{2}$ was missing and there was some poor handling of surds addition ($\sqrt{8} + \sqrt{2} + \sqrt{2} = \sqrt{12}$).

Using a length of 18 for the base of triangle *PQS* was quite common … presumably coming from the value of $(\sqrt{8} + \sqrt{2})^2$… and some tried to use $(\sqrt{12} + \sqrt{3})$ for the perpendicular height.

Answers of $6\sqrt{2}$ (the correct answer) often clearly came from wrong working and as such were penalised accordingly.

Question 19 *(a) Correct equating of volumes to verify the result* *(b) 4*: *√5*

Part (a) was not done well and this was a big disappointment because a huge number of candidates failed to read the question carefully enough and so put the factor of '2' on the wrong side of their equation
ie, 2 × sphere volume = cone volume.

For correctly writing $\frac{4}{3}\pi r^3 = 2 \times \frac{1}{3}\pi r^2 x$ there was 1 mark (before any simplification) … there was no penalty for using *h* instead of *x*.

There were some unconvincing attempts at cancelling terms even from those who did earn the first mark but some candidates did manage the steps successfully and scored 2 marks.

There were too many instances of candidates incorrectly copying the formulae for the sphere and cone volumes from the information at the front of the question paper. $\frac{4}{3}\pi r^2$ was all too common a sight.

Cone problems frequently need to incorporate Pythagoras' theorem since the calculation needed for surface area depends on knowing the value of the slant height, *l*. It was, therefore, extremely disappointing to see that this thought never occurred to most candidates when attempting part (b), even those who had been successful in part (a).

Of the very few who did attempt to use Pythagoras' theorem, squaring the term for the perpendicular height ($2r$) often resulted in $2r^2$ rather than $4r^2$.

This question, as well as testing the geometry of the sphere and the cone, was algebraic in nature. It was a combination that proved to be too difficult for all but the very best candidates.

Paper 2: Foundation Tier

General

Nearly all of the candidates were entered for the appropriate tier and scored between 15 and 75 marks. There were many straightforward questions for all candidates to display their knowledge and skill and time constraint was not a problem. It was pleasing to see so many candidates correctly answering the interpretation and explanation questions: stating that the line could not be straight because the angles did not add up to 180^o (question13b) and that 16 year olds prefer texting whereas adults prefer making calls (or equivalent, question10c). The construction (question 24) was the only question that seemed beyond nearly all of the candidates.

The presentation of work was good but still too many candidates just write down answers without working even with the more involved multi-step questions. If working is shown then marks may well be gained even with incorrect answers. The writing of money notation regressed this year with many candidates writing £103.2, £151.2, and £97p (in questions 9(b), 19(a) and 11(b)). It seems that as soon as a calculator is used the context is ignored. Many candidates can use inverse operations to solve simple equations but have poor techniques and understanding when the variable occurs more than once.

Topics that were done well included:

- Simple application of number and money
- Reflection of a shape
- Coordinate points
- Sequences of numbers
- Interpreting diagrams and explanations
- Formula in words
- Calculation of average speed
- 2-stage operations

Topics which candidates found difficult included:

- Vocabulary: of diameter and tangent
- Percentages
- Rounding
- Symmetries of 4-sided shapes
- Naming 3-D solids from their nets (including poor spelling)
- Bearings
- Correct use of a calculator
- Ratio
- Circumference of a circle
- Construction

Question 1 *(a) 24, 32 (b) 3, 15 (c) 36*

Most candidates could identify at least one multiple of 8 and one factor of 45 from the given list but less than 50% could identify a square number.

Question 2 *(a) Mid-point indicated at (4, 2) (b) (4, 2) (c) Correct line through P*

The mid-point was usually marked and coordinates written correctly, but many did not know the meaning of parallel.

Question 3 *(a) 39 (b) subract 3 each time*

Over 80% of candidates scored full marks on this question

Question 4 *(a)(i) Correct diameter* *(a)(ii) Tangent at A* *(b) Cuboid*
(square based) pyramid

The terminology used in this question is still not familiar to many candidates with even the more able only scoring 2 of the 4 marks. Rectangle was the most common answer for part (b)(i).

Question 5 $\frac{3}{15}$, $\frac{6}{30}$

The majority of candidates knew one equivalent fraction but many do not understand the concept.

Question 6 *(a) 6.4 cm* *(b) Mark in the middle third 260 - 280*

This question was very well answered.

Question 7 *(a) 93000 000* *(b) 6000* *(c) 276500*

This was again well done but 93 followed by 4, 5 or 9 noughts was often seen.

Question 8 *(a) Correct reflection* *(b) Rectangle **and** / **or** rhombus, 0, 2*

The reflection was very well done by nearly everyone but few had any idea about the symmetries of these 4-sided shapes.

Question 9 *(a) L,F; S,G; S,F; P,G; P,F* *(b) £103.20*

Part (a) was very well done by most candidates but weaker ones just repeated the list given in the question rather than list all of the possible combinations. Again there were many correct answers in part (b) but the context did prove confusing to some candidates. Weaker candidates thought that the meal actually cost £1.50.

Question 10 *(a)(i) 60* *(a)(ii) 25* *(a)(iii) Correct diagram drawn* *(b) 60, 30*

*(c) 16s text a lot more than adults **or** 16s make a lot less phone calls than adults or equivalent*

It was pleasing to note that over 90% of candidates scored 4 or more marks out of 6 in this question. However, a significant number thought the word comparison synonymous with similar and commented on the 'other' sectors.

Question 11 *(a) 7* *(b) £0.97*

This question was well answered by many candidates, the only real problem occurring with not deleting the £ sign when writing the answer in pence.

Question 12 *(a) £2.90* *(b) 5 miles*

Over half of the candidates scored full marks. The most common error was to include two lots of £1.40.

Question 13 *(a)(i) 78° is acute, 144° is obtuse* *(a)(ii) 138°* *(b) Angles should total 180°*
but these don't (190°), so no

Surprisingly part (a)(i) was answered least well with a plethora of words such as right, reflex, left and interior occurring. The remaining parts were well done with a great many candidates knowing that angles around a point made 360° and angles on a straight line added up to 180° and showing that they could apply their knowledge.

Question 14 *(a) 7* *(b) 11* *(c) 2.5* *(d) 3*

Manipulative algebra is a stumbling block for many Foundation tier candidates. Trial and improvement is still a common approach. Weaker candidates generally picked up the first two marks and the more able in part (d) ignored the $-2t$ which gave them an answer of $t = 5$

Question 15 *£ 63*

This was correctly answered by many, but often no working at all was shown. A common error was to include only one night's accommodation leading to £167 which was given some credit.

Question 16 *(a) 7, 13 (b) Correct plotting and correct line drawn (c) Correct line drawn*

Questions involving line graphs are generally done better when a table of values is included for candidates. Few candidates appreciated that a vertical line was required in part (c).

Question 17 *(a) 0.308, 0.35, 0.4 (b) 15.29 (c)(i) 0.08 (c)(ii) 12.5*

(d) Square any number between 0 and 1 inclusive

Overall, this question was poorly done. A worrying number of candidates thought that the size of the decimal numbers literally depended on the number of digits written down and that rounding to 2 decimal places simply meant moving the point 2 places giving an answer of 1528.64. Also many could not use a calculator correctly in part (c). However, it was pleasing to see many candidates find a correct example in part (d).

Question 18 *(a)(i) 034° (a)(ii) 147° (a)(iii) 42 – 43.6 miles (b) 48 mph*

Bearings seemed a closed book to a great many candidates. It should be pointed out to students that measurements from such diagrams are expected to the nearest mm. 44 miles was a common answer in part (a)(iii). The average speed was often correctly worked.

Question 19 *(a) £151.20 (b) 35%*

Many candidates tried to build up their percentages often making an error on the 1% part and part (b) was poorly done.

Question 20 *(a) 1 (b) 3n + 7*

Nearly everyone answered part (a) correctly but in part (b) many tried to simplify their correct algebraic answer to 10*n* thus not gaining the final mark.

Question 21 *(a) 58 (b) 13 (c) 15 (d) 22.15(...)*

The interpretation of a stem and leaf diagram proved too difficult for weaker candidates, with many just using the leaf numbers giving a total of 48. The usual confusion between mean and median was noticeable, but many that did know the correct definitions failed to score because they could not apply their knowledge. The more able candidates scored 5 or 6 marks out of 6.

Question 22 *£365, £73*

Generally, a poorly attempted question. Ratio is a problem area for weaker candidates. Many divided by 5 rather than 6 and some divided by 5.1!

Question 23 *18.8 to 18.9 m*

Only about 25% of candidates knew the formula for the circumference of a circle.

Question 24 *Construction of correct rhombus*

The properties of a rhombus were not known and compass work was not generally seen.

Paper 2: Intermediate Tier

General

Most candidates were correctly entered for this tier with most scoring between 20 and 80 marks. The standard of presentation was usually good, and there was no evidence that the candidates had insufficient time to attempt all the questions. Many candidates lost marks by not showing any method for many questions; just their incorrect answer. It is pleasing to report that fewer candidates are now using "trial and improvement" to solve equations, and the ability of candidates to explain their answers clearly is improving.

Topics that were done well included:

- Simple percentages
- Linear graphs
- Simple geometry
- Two-stage operations
- Squaring numbers
- Simple probability

Topics which candidates found difficult included:

- Metric to Imperial conversion
- Inequality
- Ruler and compass construction
- Relative frequency
- Calculations using data
- Difference of two squares
- Equation of a line

Question 1 *(a) 12.5 (b) £151.20 (c) 35%*

Most candidates got part (a) correct but occasionally 0.6^2 was seen as 0.12 or 0.62. Many candidates gave the answer to part (b) as £151.2 or interpreted "of" as "off" and went on to give an answer of £268.80. Many candidates misread part (c) as £420 from part (b) and so gave an answer of 20% which scored one mark under the misread rule.

Question 2 *£63*

This was well answered. Some candidates did not know whether to multiply the 52 and/or the 26 by 3 or 1, and so answers of 167 (245 – 26 – 52) and 11 (245 – 156 – 78) were common.

Question 3 *(a) 7, 13 (b) Correct plotting and correct line drawn (c) Correct line drawn*

Most candidates scored well on this question. Part (a) was usually correct but in part (b) many just plotted the points without joining them up with a line. Many candidates missed out part (c) or just plotted a cross at (2.5, 0) or thought the line $x = 2.5$ was parallel to the line $y = 3x + 4$, or drew the line $y = 2.5$.

Question 4 *(a) 45 mph (b) 57* ***or*** *57.1 kilometres per hour*

Many candidates did not attempt part (a) or gave answers such as 720 or 7.2 or 0.72. Most scored some marks in part (b) but calculations such as 200 ÷ 3.3 leading to 60.6, 200 ÷ 330 or 200 ÷ 210 were common. Many candidates forgot to round their answer to 1 or 0 decimal places.

Question 5 *Correct drawing*

Many candidates achieved full marks on this question. The usual errors were to put curved sides on the prism, or to draw a pyramid with either a triangular base or a square base.

Question 6 *$x = 27^o$ $y = 153^o$*

This was well answered. Common errors were answers of 54 or 63 for x associated with 126 or 117 for y.

Question 7 *(a) 1 (b) $3n + 7$*

This was well answered. Most candidates got part (a) correct with occasional answers of 13 or -13. There were more errors in part (b) with many candidates getting $3n + 7$ but then trying to simplify it further and giving answers such as $10n$ or $n^3 + 7$ for which marks were lost. Some candidates used incorrect algebraic notation and gave an answer

Question 8 *(a) 58 (b) 13 (c) 15 (d) 22..15(...)*

Most candidates got parts (b) and (c) correct. In part (a) the usual common errors were to give answers of 59 or 1 – 59, and in part (b) answers of 5 or 6. Some candidates did the mean calculation in part(c) and other answers were 5 or 23. In part (d) many did 48 ÷ 5 or 48 ÷ 6 or just gave an answer of 288.

Question 9 *Square any number between 0 and 1 inclusive*

This was well answered. Most candidates gave 0^2 or 1^2 and there were rare errors such as $1^2 = 2$. Some candidates tried negative numbers and errors such as $-2^2 = -4$ were seen.

Question 10 *−2, 1, 6*

This question was answered well. Common errors were answers of 1, 6, 13 or −3, −2, 1 or −2, −7, −52. Some candidates tried to give algebraic answers such as $n^2 - 1$, $n^2 - 2$, $n^2 - 3$.

Question 11 *10*

Most candidates scored some marks but very few scored full marks as they did not subtract 70. Most did volume calculations and gave an answer of 80, but some tried to do calculations using the surface areas. Some candidates correctly compared the relevant sides and gave answers of 4, 2 and 10 but then added the sides to get an answer of 16.

Question 12 *(a) 2.5 (b) 3 (c) 65 (d) 6*

Most candidates scored marks in parts (a) and (c). In part (a) the usual error was an answer of 2 from 8 ÷ 4. The common errors in part (b) were 23 from 19 + 4 or 15 from 19 – 4 or 5 from $3w + 4 = 19$. In part (c) common answers were 2.6 from 13 ÷ 5 or 13 from 65 ÷ 5 or 57 from 55 + 2. In part (d) the multiplication of the brackets was good but then answers such as $5y = 6$ or $13y = 30$ followed.

Question 13 *$x > 1.4$*

This was very badly answered with many candidates not even attempting the question. Some candidates got $5x > 7$ but then gave $x = 1.4$ on the answer line, whilst others got $x > 1.4$ but then gave their final answer as $x = 1.4$. In both cases the candidates did not gain the final mark.

Question 14 *Construction of correct rhombus*

This was very poorly answered with very few scoring full marks. Many candidates interpreted the diagram as a parallelogram with sides of 4 cm and 6 cm or drew a rhombus made from two equilateral triangles with sides 6 cm. Those who drew a correct rhombus often did not show their construction arcs and so only scored half marks.

Question 15 *Angle bisector and correct line segment indicated.*

Most candidates scored some marks in this question. Most bisected the angle correctly and then drew two crosses on the line at 4 cm and 7 cm, but then failed to indicate clearly which line segment was the correct one. Some candidates only plotted points for the angle bisector and so could only score one mark for the correct crosses at 4 cm and 7 cm.

Question 16 *(a) Plot at (50, 0. 4) (b) 27 (c) Yes with reason with numbers, such as if fair probability is 0.25 or expect 15 A's*

(d) 300 to 500 (e) 0.7

Most candidates scored no marks in parts (a) and (b) but usually got part (e) correct. Many gave 0.2 in part (a) and then 45 or 25 in part (b). In part (c) many stated that the spinner was unbiased as the four sections were all the same size. Most candidates gave 250 for part (d) and the rare errors for part (e) were 0.3 × 0.4 or 1 – 0.7.

Question 17 *Fruity bar 10.9 g, Sports bar 33 g*

This was poorly answered. Many candidates did 62.6 ÷ 17.4 for 3.6 and then 3.4 × 10.3 for 35.02. Others assumed the data in the two rows was connected and did ratio calculations such as 10.3 ÷17.4 × 62.

Question 18 *(a) (m – 7(m + 7) (b) x = 2.25, y = −1.75*

Part (a) was very poorly answered with most not attempting it. The most common answer was $m(m – 49)$. Part (b) was done better than in previous years with fewer attempts using trial and improvement with many scoring at least two marks for the correct methods but common answers were $26x = \pm 99$ or $26y = \pm 77$.

Question 19 *25% of £4 is £1 so cost is £3, hence Jill and £7 is 70% of £10*

This question was well answered with most of those who got £3 or £1 making the correct conclusion. Those candidates who did not do any percentage calculations often stated "Jack as 60% + 25% = 85%".

Question 20 *(a) 0.007 (b)(i) 0.9119215 (b)(ii) 0.912 (c) 0.00805* ***or*** 8.05×10^{-3}

Most candidates got parts (a) and (b)(i) correct. In part (a) all the other answers appeared equally as errors. Some gave part (b)(i) as 0.9999999…. Most candidates gave their answer to part (b)(ii) to 3 significant figures or in standard form but rarely both with 0.911×10^{-1} or 0.912 being common answers. Most gave answers of 0.805 or 0.0805 or 8.05^{-03} for part (c).

Question 21 $y = 5x – 2$

This was very poorly answered with many candidates failing to attempt it. Some scored some marks for answers such as $y = \pm 4x – 2$, $y = – 5x – 2$ or $y = – 2$.

Question 22 *76.4 m*

Most candidates scored some marks in this question. Many gave answers of 240 or 120 or did more divisions to get answers of 60, 40 or 80. Some gave answers of 38.2 which scored 3 out of 4 marks. Some candidates did some area calculations with $\pi r^2 = 240$ or $\pi r^2 = 400$ seen.

Question 23 *(a) 8.66cm (b) 60 º*

This was better answered than in previous years. More candidates got part (a) correct than part (b). In part (a) the usual error was $\sqrt{125}$, and in part (b) many candidates scored marks for $\cos P = \frac{5}{10}$ but then often failed to get to 60º. It was rare to see candidates using sine or tangent and many guessed at an answer usually 45º.

Question 24 *Yes. New amount is £4008.(46)*

A significant number of candidates achieved at least one mark for 144 or 1.072. Many used simple interest and gave an answer of 2000 + 1440. Many worked out each year separately and often made an arithmetical slip, but those who used 1.072^{10} got the correct answer more often.

Paper 2: Higher Tier

General

Overall the paper was accessible, with many high scores and relatively few low scores. There appeared to be an improvement in standards of Algebra which is pleasing. Questions 10(b), 15(c) and 16 showed evidence of improved algebraic skill, although the 'invisible bracket' continues to cause problems. Standards of presentation were good overall with working being shown where necessary. There were several lengthy multi-step and Using and Applying mathematics questions in this paper. These continue to be a weak area in terms of presentation and communication. Question 12(b) in particular was very badly presented. Basic communication and use of mathematical symbolism is a weak area in presenting a complex answer with many stages. Numeracy is another weak area, for example $3 \times 4 = 7$ was often seen in question 10(a) and $1^2 = 2$ was often seen in question 15(c). Accuracy continues to cause problems, with candidates rounding off or truncating values. This was most evident in questions 12(b), 14 and 21. Candidates should work to at least 4 significant figures when writing down intermediate values or use the numbers in the calculator display. Topics not normally classed as Higher tier material continue to cause problems. For example Stem and Leaf Diagram (Question 2), Density (Question 6) and area of a trapezium (Question 13). Centres are reminded that the Higher tier specification assumes knowledge of both Intermediate tier and Foundation tier specifications.

Topics that were done well included:

- Basic percentage
- Use of calculator
- Compound interest
- Pythagoras' theorem and trigonometry

Topics which candidates found difficult included:

- Interpreting Steam and Leaf diagrams
- Density
- Area of a sector
- Area of a trapezium
- Perpendicular lines
- Circle theorems
- Transformations of fuctions

Question 1 $x > 1.4$

This question was well done by the majority of candidates. There was evidence that some candidates do not understand inequalities and write $x = 1.4$ on the answer line or $x > 1.5$ after a correct answer. Some candidates still use the 'make it into an equation, solve it and put the inequality back at the end' method, which is acceptable, providing the inequality is replaced. Very often it is not.

Question 2 *9*

This was not a well done question. There were two main errors. Firstly it was clear that many candidates did not understand a stem and leaf diagram. The first line (with a stem of zero) was often ignored, and other lines were interpreted as, for example, 20 + 3 + 6 = 29. The values of 40 and 50 were often ignored. The second problem was ignoring the 17 pupils who were never late. This is a failure to read the question thoroughly.

Question 3 *(a) Plot at (50, 0. 4)* *(b) 27* *(c) Yes with reason with numbers, such as if fair probability is 0.25 or expect 15 A's*

(d) 300 to 500 *(e) 0.7*

This was well done on the whole. Few errors were made. Part (c) was the least well done part, the most common error being a failure to give a valid numerical value, but most candidates managed to score at least one mark. In part (d) 250 was a common wrong answer and in part (e) 0.3×0.4 was a common wrong method.

Question 4 *Sports bar 33g, Fruity bar 10.9g*

This question was generally 4 marks or zero, with a slight majority scoring 4. There were many wrong methods involving dividing and or multiplying values wrongly, giving 3.6 for the Fruity bar and 35 for the Sports bar, or trying to compare the two bars using subtraction or a ratio. Of the two parts the Fruity bar was answered slightly more successfully than the Sports bar.

Question 5 *25% of £4 is £1 so cost is £3, hence Jill and £7 is 70% of £10*

This question was well done by the majority of candidates. Justifications varied from the rambling to the elegant but on the whole most realised that the price of the towels was now £3 and this was a 70% reduction. There was some poor notation such as 70% of £10 = £3 but this was tolerated.

Question 6 *0.0068 kg/cm^3 or 6.8 g/cm^3*

This question was very badly done and full marks were rare. The values of 250 and 1.7 were often multiplied or divided wrongly. There were some attempts to convert 250 cm^3 to m^3, which usually meant dividing by 100. This was also the units mark question. Units needed to be consistent with working unless no credit was given for the method in which case the units mark was independent. It was clear that the vast majority of students had no idea what density is.

Question 7 *76.4m*

This question was well done and often scored full marks. Common errors were to misinterpret the circumference of the circle or to use the area formula. A common wrong answer, for example, was 38.2 where $240 \div 2\pi$ was used and the answer was not doubled to give a diameter. This particular answer scored 3 marks.

Question 8 *(a) 0.007 (b)(i) 0.9119215 (b)(ii) 0.912 (c) 0.00805* ***or*** *8.05×10^{-3}*

This was well done by the vast majority of candidates. Full marks were common. There were no common errors, just a few misreads, for example cos(tan 0.45) and cos(tan^{-1} 45) in part (b), although a follow through mark could be gained in these cases.

Question 9 *Yes new amount is £4008.(46)*

On the whole this question was well done. The majority of candidates scored at least 3 marks. Many candidates worked out the yearly interest and added this on, then did the same for the next year and so on. Not surprisingly they found space limited. However, it was pleasing to see that the majority used the formula 2000×1.072^{10}. Use of the percentage multiplier is to be encouraged as candidates adopting this approach generally score full marks. Candidates working out the yearly amounts often made errors, although the accuracy requirements on this question were not as strict as usual so candidates, who truncated, rounded or a mixture of both did not get penalised. Also candidates who made just one error in their calculation but reached a valid conclusion based on their answer scored 3 marks. Other common errors were to use a multiplier of 1.72 which more than doubles the money or to take year 1 as 2000, leading to £3739 in year 10 and a conclusion of 'No'. This only scored 2 marks as it shows a misunderstanding of compound interest. Quite a few candidates calculated Simple Interest.

Question 10 *(a) 6 (b) $x = 2.25$, $y = -1.75$*

Part (a) scored full marks for the majority of candidates. There were the usual errors such as a failure to expand one of the brackets properly or a sign error when rearranging the equation. Follow through usually gave candidates at least 2 marks.

Part (b) was very pleasing. Linear simultaneous equations have not been a success story in recent years but over half the candidates scored full marks and most scored the 2 method marks. The answers prevented Trial and Improvement being used successfully and few candidates tried this approach. The vast majority attempted to balance one of the variables and eliminate by adding or subtracting. Naturally there were many errors involving minus signs. However, candidates used their value to substitute back to find the other variable. A few tried to rearrange one equation to the form $y =$ or $x =$ and substitute into the other but the fractions involved meant that this was not a successful approach although once again 2 method marks could be scored. Centres should make candidates aware that if they get a value for x or y that is a long string of decimal places, they will have made a mistake. Answers in simultaneous equations may be negative and they may be decimal fractions, but they will always be straightforward terminating decimals.

Question 11 *(a) $a = 4$, $b = -21$ (b) 0.58 and −8.58*

Part (a) was not well done. Completing the square is a topic that is not well done in general. Candidates who know the method do well but many clearly do not know the method and try to expand the Right Hand Side, but then fail to equate coefficients. Writing b as 21 was an error which lost a mark.

Part (b) was quite well done as the majority reverted to the 'or otherwise' method of using the formula. Perhaps because this was a reasonably straightforward equation there was more success in using the formula than in previous years, the most common error being to calculate $-4ac$ as -20 or to not divide the whole of the numerator line by 2. Once again candidates who knew how to use the answer to (a) to get $-4 \pm \sqrt{21}$ did well. A few only took the positive root.

Question 12 *(a)(i) 8.66 (a)(ii) 60° (b) $2.17\,cm^2$*

Part (a) was well done by the majority of candidates, with part (i) being slightly better that part (ii). Full marks were common. There were the usual errors such as adding the squares in part (i) and using alternative methods in part (ii). Many candidates used the value that they had calculated in part (i) to solve part (ii). This often led to answers of 59.7 or 60.5° due to rounding the value in part (i). There was no follow through allowed as using the values given leads to 60°. Centres should advise candidates to use given values rather than any calculated values as these will clearly lead to the correct answer.

Part (b) was by far the most challenging question on the paper. Despite the clear instruction to use the answers from part (a), the majority did not see any connection between the parts. Those that did usually gained full marks but these were a minority. Many did not attempt this question. Others calculated arc lengths. Another disappointing aspect of this question was the failure to present a logical solution. Few candidates drew the line AX and even those that did failed to relate their calculations to parts of the diagram. Marks may have been lost as it was not clear what was being calculated. Candidates should not assume that an examiner will 'fill in the gaps'. Another common approach was to draw a whole circle within a 20 by 20 square and attempt to relate the area outside the circle to the required area.

Question 13 *2.5cm*

Overall few candidates scored full marks on this question, but 2 marks for a Trial and Improvement approach was common. Recollection of the area of a trapezium formula was patchy and on substituting values the bracket around $(a + b)$ was often ignored. This was recovered in many cases but not always. Another common approach was to split the shape into a rectangle and a triangle. Poor algebra at this stage prevented further progress for many but pleasingly many found equations of the form $x^2 + 1.5x = 10$ or $2x^2 + 3x = 20$. A failure to rearrange into the general quadratic form prevented progress for the vast majority but those that did usually went on to solve the equation. Another pleasing aspect was the rejection of the negative root as 'impossible'.

Question 14 *33.2m*

This question was quite well done with some complete, well presented answers. However, many candidates did not attempt it or tried to use right-angled triangle trigonometry. The expected approach of using the sine rule on triangle *ATB* to find *AT* or *BT* and then using trigonometry to find the height of the cliff and the tower was the most common. Problems rearranging the sine rule and a failure to use trigonometry for the last step were the most common errors in this approach. A few attempted to use tangents of 48 and 70 to obtain simultaneous equations involving *h* and *x* the distance from *B* to the base of the cliff. This approach was rarely completely successful. Another reason for lost marks on this question was premature rounding where values of sines or *AT* or *BT* were rounded to an accuracy that led to the final answer being outside the acceptable range.

Question 15 *(a) 5x (x + 4)* *(b) (x + 7) (x − 7)* *(c) 5 (x + 3) (x + 1)*

Parts (a) and (b) were usually correct, with $(x - 7)^2$ a common error in (b). Part (c) was done correctly by less than half the candidates. Hardly any candidates used the difference of 2 squares to answer this. The vast majority tried to expand, subtract and then factorise. Although the 'invisible bracket' for the expansion of the second bracket (ie, $9x^2 + 24x + 16 - 4x^2 + 4x + 1$) was tolerated for the method mark, unless it was recovered no further marks could be scored on this question. Pleasingly many candidates did recover this and went on to give a complete answer. Others got to the stage of $5x^2 + 20x + 15$ and either cancelled 5 or left the answer as $5(x^2 + 4x + 3)$.

Question 16 $x = \frac{2y + 1}{y}$ ***or*** $x = 2 + \frac{1}{y}$

This was quite well done although 4 marks was rare. The main error was a failure to fully cancel 2 from the final answer, or oddly to leave the denominator as $3y - y$ or $y(3 - 1)$. Once again the 'invisible bracket' (ie, $y \times 3x - 4 = xy + 2$) caused problems and for once this was rarely recovered thus scoring zero marks. There were the usual sign errors when moving terms across the equals sign but this question showed a marked improvement over similar questions from previous years.

Question 17 $y = -\frac{2}{3}x + 3$

Surprisingly, given that the candidates had a grid on which to draw the required line this question was very badly done. It was also badly presented so seeing a statement such as gradient = $\frac{2}{3}$, with no indication of where it is from scored zero, whereas gradient of perpendicular line = $\frac{2}{3}$ could score 1 mark for method.

Few candidates seemed to know the technique of finding the gradient of *AB* and then finding the negative reciprocal to get the gradient of the required line. It was expected that they would draw the perpendicular to find the intercept but the lines drawn through the mid-point were anything but perpendicular. A line with gradient –1.5 through (3, 1) was popular. A handful of candidates substituted into $y = mx + c$ to find the value of *c*.

Question 18 *At least three appropriate angles shown and a valid conclusion.*

There were many approaches to this question. For example it could be shown that $\angle CBD = \angle ADB$ are alternate angles, or that $\angle DCB + \angle CDA = 180$ or that *ADCB* is an isosceles trapezium. Candidates were asked and expected to give reasons for stating the values of angles. The vast majority ignored this instruction. In the event only the first failure to give a reason was penalised and wrong angles and reasons were ignored. Despite this generosity few scored full marks on this question. Some of the more common errors were: failure to give reasons for angles; using alternate segment theorem wrongly.

(eg, $\angle ABD = 38°$); taking $\angle ADC$ and $\angle CBA$ as 90°; Using 'Z' angles as the final reason. Centres are once again reminded that 'Z', 'F', 'C' or 'U' angles, etc will not be accepted as reasons and that the correct mathematical terms such as alternate, corresponding, allied, interior etc, must be used.)

Question 19 *(a) y = cosx + 1* *(b) y = 2cosx* *(c) y = cos2x*

(d) y = cos (x – 90) or equivalent

This was very badly done. Part (a) was the most successful and part (d) the least successful. Candidates on the whole do not find this an easy topic. Many strange answers, not always involving cos were seen. Also an answer such as cos $x \times 2$ is ambiguous and may not score marks. Part (d) also suffered from a lack of brackets so cos $x - 90$, for example, scored zero.

Question 20 *(a) 156* *(b) 3.77ohms*

Use of limits in calculations is still a topic that many candidates find difficult to grasp. The upper limit in particular is still a common source of lost marks as is the failure to combine limits in the appropriate way.

In part (a) 2549, 2600, 2554 for example, were common examples of the upper limit. These could be followed through providing the resulting decimal was truncated. In part (b) the minimum value for W was divided by the minimum value of I squared in the majority of cases. Some follow through was allowed for a lower limit divided by an upper limit squared but full marks were rare in these questions. The upper limit in part (a) was 2550 and in part (b) was 25.5. Candidates using any other values lost at least one mark.

Question 21 *1375*

This question was not well done with a small percentage of candidates scoring full marks. There were two approaches, both of which required candidates to measure the radii of the circles at some stage (Candidates should be advised that when a diagram is labelled 'drawn to scale' it means they will have to measure from it in some way). The first was to find the population of A (1980), then use the areas to find the population of B (5500) and then calculate the final answer. This was the most common approach amongst the few successful candidates. The other method was to find a scale factor for population per area or area per person. Both methods suffered from premature rounding. The most common error was to not take the area into account and just multiply by a linear scale factor. Many candidates made no or little attempt to answer this.

Coursework

General

Moderators and examiners reported that there had been a noticeable improvement in the work submitted for this session especially in terms of centres' better understanding of the requirements of the handling data coursework and their growing familiarity with the assessment criteria. Centres are reminded that the expectation for Specification A is a portfolio consisting of one AO1 (using and applying) task **and** one AO4 (handling data) task

The majority of candidates were suitably prepared for this coursework component although some candidates were disadvantaged by a lack of understanding about the coursework criteria. However, in a significant minority of centres there was still a tendency to over-mark at the top of the mark range and under-mark at the bottom end of the mark range.

Centres are reminded to encourage candidates to explain their thinking and to communicate this at each stage of their work. It is not the moderator/examiners' responsibility to try to guess what the candidate was thinking when they wrote up their work.

Administration

Examiners and moderators reported that most centres were well organised although a number of centres are failing to meet AQA-set deadlines for submission of coursework. Some centres are still not using the latest Candidate Record Forms or else fail to complete all the required information on these forms especially information like centre numbers and candidate numbers.

Similarly, missing teacher and missing candidate signatures are essential to demonstrate that the work is the candidate's own. Authenticating the work is still problematic in some centres resulting in work having to be returned and authentications sought thus slowing down the process and reducing the time available to moderators and examiners.

Centres are reminded that:

- *all work submitted must be authenticated by the teacher/lecturer as well as the candidate - arrangements may need to be made to ensure that this happens*
- *sufficient work must be undertaken under the direct supervision of a teacher/lecturer for the work to be confidently authenticated*
- *task starters and/or any other material used (for example writing frames, help sheets or marking schemes) should be forwarded with the coursework for information*
- *centres devising their own assessment criteria should ensure that these criteria include reference to the original coursework criteria*
- *the use of plastic wallets and elaborate folders to contain coursework is actively discouraged and treasury tags should be used to bind work together*
- *coursework presented should be sequenced with page numbers and should identify candidate details on each page*
- *deadline dates are not optional and should be adhered to.*

The following comments are offered under each of the three strands for the *Using & Applying Mathematics* task.

1. Making and monitoring decisions to solve problems

This strand is about deciding what needs to be done, then doing it**.** The strand requires candidates to select an appropriate approach, obtain information and introduce their own questions which develop the task further. For the higher marks candidates need to analyse alternative mathematical approaches and apply, independently and extensively, a range of appropriate techniques.

2. Communicating mathematically

This strand is about communicating what is being done using words, tables, diagrams and symbols. Candidates should consider the appropriateness of their chosen presentation and amend this as necessary. For the higher marks candidates will need to use mathematical symbols accurately, concisely and efficiently in presenting a reasoned argument.

3. Developing skills of mathematical reasoning

This strand is about testing, explaining and justifying what has been done and requires the candidate to search for patterns and provide generalisations. Generalisations should then be tested, justified and explained. For the higher marks candidates will need to provide a sophisticated and rigorous justification, argument or proof which demonstrates a mathematical insight into the problem.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the Using and Applying mathematics coursework:

Making and monitoring decisions to solve problems

- *An award of mark 5 can only be given where the task is independently extended beyond the original problem set.*
- *An award of mark 6 is appropriate where a candidate 'pulls together' their various algebraic investigations at a level commensurate with grade B work.*
- *The inclusion of an algebraic formula is, on its own, insufficient to suggest an award of mark 6.*
- *An award of mark 7 can only be given where the candidate co-ordinates three features or variables at a level commensurate with grade A work.*
- *The inclusion of an algebraic formula such as t = g(h-1)(w-1) is not usually indicative of a mark 7 without further supportive work.*
- *An award of mark 8 is appropriate where a candidate explores a task* ***extensively*** *and* ***independently*** *.....similar work is unlikely to be independent.*

Communicating mathematically

- *Candidates should not waste time drawing tables and/or graphs unless they are relevant, commented upon and interpreted.*
- *All candidates should be encouraged to make better use of algebra to provide a commentary for the work.*
- *An award of mark 4 requires candidates to consider their representations (tables or graphs) and make some appropriate and correct comment.*
- *An award of mark 5 can only be given (as best fit) where candidates make use of algebra rather than simply making an algebraic statement.*
- *Substitution into the candidates own derived formula might be sufficient to suggest an award of mark 5*
- *An award of mark 6 can only be given where candidates show* ***sustained*** *evidence of correct and convincing algebraic manipulation, factorisation or transposition.*
- *The use of algebra for proving and justifying must be accurate and convincing. Centres are advised to check the accuracy of algebraic manipulation and ensure that all working is clearly shown.*
- *Pattern spotting is not a higher tier technique and an algebraic approach to the work is necessary for the higher marks.*

Developing skills of mathematical reasoning

- *Where generalisations are written down it is important that they are adequately explained in the text to confirm the candidate's own understanding.*
- *Testing should be undertaken on candidate's own generalisations and make use of new data with a comment to say whether the test works or not.*
- *An award of mark 5 can only be given where candidates justify (ie, prove) why a generalisation works…..repeated numerical substitution does not constitute a proof.*
- *An award of mark 7 under this strand can only be given where strand 1 has been awarded a mark of 7 or 8.*
- *An award of mark 8 would usually require the candidate to give some consideration to the conditions under which their proof remains valid.*

The following comments are offered under each of the three strands for the *Handling Data* task.

Specifying the problem and planning

This strand is about choosing a problem, deciding what needs to be done then doing it. The strand requires the candidate to provide clear aims, consider the collection of data, identify practical problems and explain how they might be overcome. For the higher marks, candidates need to decide on a suitable sampling method, explain what steps were taken to avoid possible bias and provide a well-structured report.

Collecting, processing and representing the data

This strand is about collecting data and using appropriate statistical techniques and calculations to process and represent the data. Diagrams should be appropriate and calculations mostly correct. For the higher marks, candidates need to accurately use higher statistical techniques and calculations from the Higher Tier GCSE Mathematics specification content.

Interpreting and discussing the results

This strand is about commenting, summarising and interpreting data. The discussion should link back to the original problem and provide an evaluation of the work as a whole. For the higher marks, candidates need to provide sophisticated and rigorous interpretations of their data and provide an analysis of how significant their findings are.

The following additional comments from moderators' and examiners' reports might be useful to centres in preparing candidates for the *Handling Data* task.

Specifying the problem and planning

- *Greater consideration needs to be given to the planning of the task and the choice of sample….stratified sampling is not always appropriate.*
- *Little thought was often given to the sample size and why, for example, 30 people or 100 words might be an appropriate sample size.*
- *Little detail was often given of how the sampling was actually undertaken in order to avoid bias and ensure that the sample was truly representative.*
- *Many of the hypotheses set were rather simplistic and there was little consideration given to how the work might be extended and developed.*
- *Candidates are encouraged to pursue one hypothesis in some depth rather than a number of hypotheses superficially.*
- *An award of mark 5 can only be given if the task is substantial and developed beyond the original task at a level commensurate with grade C.*
- *Databases, where used, should be sufficiently large to allow sampling to take place and provide a variety of possible extensions to the original task*
- *For the higher marks, work requires careful specification and evidence of extensive, independent thought.*
- *Candidates should be encouraged to make greater use of pilot surveys, control groups and pre-testing as appropriate to the task*

Collecting, processing and representing the data

- *Calculations and representations need to be considered for their relevance to the problem. Statistics for the sake of statistics gains few marks.*
- *Statistical representations and calculations add little to the task unless their inclusion is explained and the outcomes interpreted.*
- *Many representations were too small or inaccurate to provide useful information. Calculations should be accurate.*
- *Cumulative frequency diagrams are most appropriate for continuous and/or grouped data.*
- *The use of techniques such as standard deviation and rank correlation are not indicators for the higher marks unless they are appropriate, explained and interpreted.*

Interpreting and discussing the results

- *Comments such as 'mean =' or 'range =' which are related to the task are often worthy of some marks under this strand.*
- *Too often, conclusions made little use of the representations and calculations provided and were not always related back to the original hypothesis*
- *Suggestions that the hypothesis is proven or not proven need to be backed up with evidence from the candidate's own work*
- *Candidates are now showing evidence of evaluating their strategy focussing on each aspect of their work.*
- *Simplistic evaluations such as those suggesting the use of a bigger sample need to explain why or else consider other possible areas for improvement.*
- *Comments on representations and calculations were often descriptive eg, "the distribution is negatively skewed" without interpreting this in terms of the hypothesis*
- *For the higher marks, candidates must recognise possible limitations to their strategies.*

Option T: Teacher-assessed task

General

The tasks set were mostly appropriate and allowed candidates to make some progress against the assessment criteria. AQA-set tasks were again popular, especially *Number Grid* and *Read All About It.* An increasing number of centres also made use of the new *Where in the World* task which offered many opportunities for candidates to pursue cross curricular work with geography and citizenship.

Assessing the coursework

Centres are asked to note that the provision of the original mark schemes for the AQA-set tasks was intended to provide suggestions for possible routes through these tasks. The teachers' notes in the right-hand column are not intended as a replacement for the minimum requirements and original criteria against which all tasks should be used when assessing coursework.

Mark schemes produced prior to 2003 and mark schemes from other awarding bodies often caused problems where centres took insufficient notice of the original criteria. Centres are advised to contact their coursework adviser if they are not sure about the suitability of mark schemes being used.

Similarly tasks produced prior to 2003 and tasks from other awarding bodies also caused problems especially where tasks were over prescriptive or else the tasks were not suitable for candidates on the Higher Tier. Again, centres are advised to contact their coursework adviser if they are not sure about the suitability of tasks being used.

Moderators reported that a small number of centres were not undertaking sufficient internal moderation to ensure that the work submitted produced a valid rank order. Regular internal moderation opportunities are essential to keep staff (especially new staff and part time staff) up to date with the additional exemplification offered and ensure that marking is consistent across all staff in each examination session.

Annotation and further information

Centres are reminded that all coursework submitted under Option T must be suitably annotated to explain how work has been assessed and how marks have been arrived at. This information is usually included on the *Candidate Record Form* under the heading of key evidence. Any other information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate's thinking will be considered by the moderator in the assessment of the work.

Option X: Externally-assessed task

General

The AQA-set tasks allowed candidates the opportunity to make some progress against the assessment criteria and thus gain credit for their performance. The most popular Using and Applying task seen was *Number Grid* but much of the work received from individual centres was very similar in terms of content and routes through the problem. The task often suffered from excessive teacher guidance so that work followed the same format with little evidence of candidates really understanding what they were doing.

The most popular handling data tasks were *Read All About It* with *Guestimate* also popular. In most cases, however, the tasks were rarely extended beyond the original to produce a substantial task. In particular, too much work in the *Guestimate* task concentrated on the guesses rather than the errors. An increasing number of centres also made use of the *Where in the World* task which offered many opportunities for candidates to pursue cross curricular work with geography and citizenship.

Pulse Rates and *Reaction Times* were less favoured, presumably due to the amount of time required to set up the experiments to collect data. Centres' attention is drawn to the *Census at School* website at www.censusatschool.ntu.ac.uk where candidates may collect data on reaction times from a database.

Centres are reminded that the tasks titled *Round and Round* and *Tangled Triangles* have now been withdrawn from the list and can no longer be submitted under Option X. Submissions of these titles can only be made under Option T (ie, teacher assessed and AQA moderated).

Annotation and further information

Annotation is not required for coursework submitted under Option X but any information provided by the teacher/lecturer about how the task was undertaken or any comment to explain a candidate's thinking will be considered by the examiner in the assessment of the work.

Further support

Additional support for centres is provided through AQA's network of coursework advisers who are assigned to each centre. Further details and contact details for coursework advisers can be obtained by contacting the AQA (Manchester) office.

Mark Range and Award of Grades

In this specification, scaled marks are the same as raw marks.

Foundation tier: written papers (24942 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1F	100	100	47.1	14.7
3301/2F	100	100	43.8	14.1

Grade	Max mark	D	E	F	G
3301/1F scaled boundary mark	100	61	48	36	24
3301/2F scaled boundary mark	100	58	45	33	21
Uniform boundary mark for each written paper	143	120	96	72	48
Uniform boundary mark for the Foundation tier overall	406	300	240	180	120

Intermediate tier: written papers (53709 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1I	100	100	50.5	15.1
3301/2I	100	100	47.6	17.0

Grade	Max mark	B	C	D	E
3301/1I scaled boundary mark	100	63	48	36	24
3301/2I scaled boundary mark	100	62	45	33	21
Uniform boundary mark for each written paper	191	168	144	120	96
Uniform boundary mark for the Intermediate tier overall	502	420	360	300	240

Higher tier: written papers (26532 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1H	100	100	48.3	17.8
3301/2H	100	100	51.8	18.9

Grade	Max mark	A*	A	B	C
3301/1H scaled boundary mark	100	67	48	34	20
3301/2H scaled boundary mark	100	70	48	34	20
Uniform boundary mark for each written paper	240	216	192	168	144
Uniform boundary mark for the Higher tier overall	600	540	480	420	360

Coursework (teacher-assessed) (86459 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/TC	48	48	29.1	8.3

	Max mark	A*	A	B	C	D	E	F	G
Scaled boundary mark	48	43	37	31	26	22	18	14	10
Uniform boundary mark	120	108	96	84	72	60	48	36	24

Coursework (externally-assessed) (17238 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/XC	48	48	25.2	6.5

	Max mark	A*	A	B	C	D	E	F	G
Scaled boundary mark	48	43	37	31	26	22	18	14	10
Uniform boundary mark	120	108	96	84	72	60	48	36	24

Provisional Statistics for the Award

Foundation tier (24942 candidates)

Grade	D	E	F	G
Cumulative %	15.8	46.9	74.4	89.7

Intermediate tier (53709 candidates)

Grade	B	C	D	E
Cumulative %	19.1	55.4	82.5	94.5

Higher tier (26532 candidates)

Grade	A*	A	B	C
Cumulative %	14.5	47.6	82.5	98.1

Overall (103697 candidates)

Grade	A*	A	B	C	D	E	F	G
Cumulative %	3.8	12.3	31.2	54.0	71.6	84.8	90.9	94.4

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade. Although component grade boundaries are provided, these are advisory. Candidates' final grades depend only on their total marks for the subject.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).