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Report on the Examination

Mathematics

Specification A

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Paper 1F

General Comments

The general impression of the standard of work was good with the majority of candidates finding enough straightforward questions at the start of the paper. Most candidates attempted nearly all of the questions and appeared to complete as much as they could in the time available. However, there was a significant number of candidates who were totally unprepared for the paper and scored less than ten marks, and it was evident that their mathematical ability was somewhat limited.

The work was generally well presented with answers correctly given on the answer line. Centres should discourage candidates from writing answers only, particularly when the rubric of some questions clearly states that working must be shown. Candidates need to be informed that, if working is not shown in these questions, then marks will almost certainly be deducted. It was evident that a small, but significant number of candidates did not possess the necessary mathematical equipment required for the examination, especially in question 9 where candidates were expected to use a ruler and protractor.

The standard of written English was often poor, with the spelling of mathematical words particularly weak, and candidates unable to express themselves well when an explanation was required.

Topics that were done particularly well:

- place value
- rounding to the nearest 100
- substitution into a formula given in words
- interpretation of statistical diagrams
- simple probability

Topics that caused particular difficulty:

- recognising prime numbers
- knowing specific geometrical terminology
- addition of fractions
- confusion between perimeter and area
- finding the median from a stem and leaf diagram
- substitution into an algebraic expression
- transformations
- approximations

Question 1 *(a) twelve thousand five hundred and eighty four (b) (i) 80 (ii) 2000*
(c) 3146 (d) 12 600

Candidates generally coped well with this question and it was a good source of marks for the weaker candidates. The spelling in part (a) was often very poor, particularly ‘thousand’ and ‘eighty’. In part (c), some candidates clearly preferred to find a quarter by doing a repeated division by two, which then often led to the wrong answer. Surprisingly, quite a number of candidates thought that 12 584 had to be divided by three.

Question 2 *(a) 28 (b) 6* and *8 (c) 25 (d) 11*

Most candidates correctly answered part (a), but only the more able found both factors in part (b). Square numbers and prime numbers appear to be unknown to a good proportion of the candidates.

Question 3 *(a) (i) $3\frac{1}{2}$ shown on scale (ii) 7 or 8 (b) 2 hours 10 minutes*

Very few candidates could convert $3\frac{1}{2}$ kg to the nearest pound in part (a) (ii), with many multiplying by 100 or 1000. A few gave the answer simply as £3.50. In part (b) many candidates gave the correct answer and the most common error was to add the 20 to the 30 and then multiply by 5. It was disappointing to see that quite a number of candidates think that there are 100 minutes in an hour.

Question 4 *chord, circumference, radius and tangent*

This question was not well attempted by a good proportion of the candidates, with quite a significant number scoring no marks. The terms ‘chord’ and ‘tangent’ appear to be not well known.

Question 5 *(a) pentagon (b) obtuse angle shown at B or E (c) DE (d) CD*

Many candidates could identify the pentagon, but it was common to see ‘quadrilateral’, ‘hexagon’ or even ‘house shape’. Candidates usually could identify an obtuse angle and the line parallel to **BC** but in part (d) the word ‘perpendicular’ was less widely understood, with **AE** being a common incorrect response. The correct notation for a line segment was rarely seen with some candidates giving only a vertex.

Question 6 *Fulham*

There were many pleasing attempts to answer this question, with working out fully shown and Fulham correctly identified. The most common errors were to add 3 to the number of games won and add 1 to the number of games drawn, or to simply add the numbers in each row to arrive at 20 for each team.

Question 7 *(a) (i) 70 (ii) 195 (b) 10*

This question was well done by the majority of candidates, with some not obtaining full marks because of errors in multiplying by 25. The most common error was to add 25 to 20 and then multiply by the number of days hired. A few candidates thought that there are five days in a week.

Question 8 *(a) London and Moscow (b) (i) 8 (ii) 9 (c) False for Athens (about $\frac{3}{4}$) or Moscow (about $\frac{1}{3}$)*

There were some good responses to this question, but few candidates gained full marks, mainly because their explanation in part (c) was insufficient. In part (b), some candidates misread the scale for the temperature, thinking that the divisions were in units.

Question 9

Those candidates who did have a protractor and ruler usually obtained full marks for this question.

Question 10 (a) $\frac{3}{5}$ (b) *35* (c) *60* (d) $\frac{7}{10}$

In part (a), $\frac{6}{10}$ was often correctly identified, but it was then either not cancelled down or cancelled down incorrectly. The more able candidates were familiar with how to find a fraction and a percentage of a quantity in parts (b) and (c), but it was extremely rare to see a correct answer to part (d), with the majority giving the incorrect answer of $\frac{2}{7}$.

Question 11 *(a) Mr Key bought the most tickets (b)* $\frac{6}{200}$ *or equivalent (c)* $\frac{180}{200}$ *or equivalent*

A good number of candidates scored well on this question. Part (b) was usually correct, but some candidates gave Mr Key's probability. There was less success in part (c), where many candidates did not subtract the total number of tickets from 200. A number of candidates gave the probabilities in an incorrect form, such as a ratio, or opted for terms such as 'likely'.

Question 12 *£ 42*

Many candidates did not have the necessary arithmetical skills to answer this question even though they knew the correct method. Most attempted to calculate 140 × 80 by various tortuous methods, including repeated addition, but were usually unsuccessful in obtaining the correct answer. Those candidates who saw that 14 × 8 was required usually gained full marks.

Question 13 *40 cm*

The majority of candidates knew that 0.4 × 100 was required, but then failed to work it out correctly. Common incorrect answers were 0.400 or 104.

Question 14 *(a) B(3,2) C(2, -2) D(-3, -2) (b) BC and AD are greater than 4 cm (c) 20* cm^2

Despite the example given in the question, there were many candidates who gave the co-ordinates in part (a) in the wrong order for at least one point, often **D**. It was rare to see a correct reason for part (b) with some candidates confusing perimeter with area. However, there was more success with part (c), with some candidates preferring to count the squares inside the parallelogram.

Question 15 *(a) 9 (b) 42 years (c) 35 years*

A large number of candidates seemed unfamiliar with this new topic. Few candidates knew how to interpret the stem and leaf diagram with 6 being a very common answer in part (a). In part (b), the answer of 43 was more common than the correct answer of 42 and a few candidates attempted to find the mean instead of the median. There was more success with part (c), although some candidates left their answer as 27 - 62 or could not do the subtraction correctly.

Question 16 *(a) -1 and 3 (b) line drawn from (-1, -3) to (3, 5)*

In part (a), the calculation of the y value for $x = 0$ was usually unsuccessful, and only a few candidates could plot the points correctly from the table. Very few correct lines were seen in part (b).

Question 17 *(a) 100 000 (b) 36 (c) 100*

Only the more able candidates scored marks in this question. In part (a), the incorrect answer of 50 was extremely common and in part (b), those candidates who could calculate 12 × 18 correctly often then proceeded to subtract 10 from their answer before multiplying by 18. The majority of candidates had little or no idea how to do the approximation in part (c). Most attempted to carry out a long multiplication followed by a long division without any success.

Question 18 *(a) 1440m*^{3} *(b) 93%*

A good proportion of candidates knew how to find the volume of a cuboid in part (a), but were unsuccessful in multiplying the three dimensions. Even so, it was quite common for candidates to simply add the three dimensions. There was a variety of methods employed in part (b), but the calculations proved to be too difficult for most candidates and only a handful of correct answers were seen.

Question 19 *(a) (i) 26 (ii) 6 (b) 33*

The more able candidates usually obtained a good number of marks in this question. For some candidates, substitution into an expression is not understood. For example in part (a), 32 + 45 = 77 and 36 – 1 were seen on many occasions. In part (b), some candidates showed a lack of understanding of indices by writing down 6 + 10 = 16.

Question 20 $a = 50$, $b = 110$

It was quite common for candidates to either measure the angles or subtract the two given angles from 90° or 180°. For those candidates who were familiar with parallel lines, this was an easy two marks.

Question 21 *rotation of 180° about the origin*

Fully correct answers were extremely rare, with those candidates who did realise a rotation was required forgetting to include the angle of rotation or the centre of rotation. Many candidates thought that the transformation was a reflection or used terms such as ‘ a half turn’ or ‘flipped over’.

Question 22 *39 cm*^{2}

The majority of candidates answered this question very poorly. Many candidates considered the perimeter of the shape or found 3 × 9 + 3 × 7. The candidates who clearly showed the shape split into two rectangles on the diagram were usually more successful.

Question 23 *(a) odd (b) odd × odd = odd and odd + 1 = even or showing 3 correct examples*

A good number of candidates obtained the correct answer for part (a), but were less successful in part (b) where the square was often confused with doubling. However, a large number of candidates did recognise that an odd number + 1 gives an even number.

Paper 1I

General comments

The paper proved accessible with most candidates attempting most questions and with all but the weakest scoring marks throughout most of the paper. There were sufficient straightforward questions that enabled weaker candidates to display their knowledge and skill with relatively few scoring below 25%; consequently, the majority comfortably gained one of the allowable grades. However, a minority scored few marks and would have been more appropriately entered at the Foundation tier. Harder questions at all levels stretched the more capable and differentiated well, particularly between C grade and B grade candidates.

In general, presentation was good and most candidates attempted to show their method and scored marks even when final answers were incorrect. However, some candidates penalised themselves by failing to provide full working or to follow the instructions given in the question fully. A small minority clearly did not have a ruler or compasses and this limited their ability to gain credit in the construction question.

There were a significant number of candidates who were let down by poor arithmetic skills. In particular:

- The inability to multiply or divide whole numbers accurately.
- The inability to multiply or divide decimals accurately.
- Confusion with place value.
- Problems in handling negative numbers.

Topics that were well understood included:

- Area and volume.
- Rounding to 1 significant figure to make an estimate.
- Drawing an elevation from an isometric projection.
- Using relative frequency to estimate an outcome.

Topics that were less well done included:

- Standard form.
- Gradient of a line.
- Factorising.
- Constructing a perpendicular bisector in context.
- Highest Common Factor (HCF).
- Simplifying and evaluating powers.
- Compound Interest.

Question 1 *£42*

Many candidates scored 2 marks for knowing what to do but a significant number were unable to work out 140×80 (or its equivalent) accurately. Of those that managed this, many did not attempt to convert their answer to pounds or made a place value error when doing so. A minority of candidates forgot to subtract £70 or added it instead and scored 1 mark only. A few failed to decode the information completely and scored zero.

Question 2 *40 cm*

This was well done with the majority of candidates giving 100×0.4 and gaining 1 mark. Calculating this accurately proved a problem for some.

Question 3 *20 cm²*

This was answered well by the majority of candidates. Weaker candidates counted squares - not always accurately - but the majority calculated 5×4. Some attempted to use the formula for the area of a trapezium. A minority gave $\frac{1}{2} \times 5 \times 4$.

Question 4 *(a) 42 years (b) 35 years*

On the whole, this question was well answered.

Many candidates did not make direct use of the stem and leaf diagram and chose to write out the data again before attempting to find the median. Candidates from a minority of centres appeared to have no knowledge of a stem and leaf diagram.

Some candidates left their answer in the form 62 – 27 or 27 – 62 and did not gain the mark. Some clearly attempted to subtract 27 from 62 but did not do this accurately.

Question 5 *(a) -1 and 3 (b) line drawn from (-1, -3) to (3, 5) (c) (-0.5, -2)*

Part (a) was nearly always answered correctly.

In part (b) many correct lines were drawn but some candidates lost a mark by drawing their line shorter than asked for in the question. The point (0, −1) was sometimes plotted incorrectly. Weaker candidates did not appreciate the connection between the required co-ordinates and the table in part (a).

Part (c) was not very well answered; the identification of $y = -2$ was beyond many candidates.

Question 6 *(a)* $\frac{4}{200}$ *or equivalent (b)* $\frac{180}{200}$ *or equivalent*

This was done fairly well but incorrect answers of $\frac{2}{200}$ and $\frac{182}{200}$, allowing for one child only, were seen frequently. Incorrect notation, e.g. 4 in 200, was rarely used. Although it was not required, many candidates attempted to simplify their answer or convert them to a percentage, usually with success.

Question 7 *(a) 36 (b) 100*

Virtually no candidates spotted that the answer could be obtained easily from 2×18. Many obtained one mark for 216 but then used the incorrect order of operations and subtracted 10 before multiplying by 18 again. Many could not calculate 12×18 correctly but then gained one mark by using the correct order of operations and subtracting 180. There were a substantial number of correct answers.

In part (b) there was a substantial number of fully correct solutions coming from appropriate approximations. However, a significant number could not calculate $8000 \div 800$ correctly and lost one mark. Some candidates gained no marks, either because they rounded inappropriately, or attempted the calculation using the values given.

Question 8

This was well answered with most candidates gaining full marks and nearly all gaining at least one.

Question 9 (a)(i) *1440m ^{3} (ii) 336 m^2 (b) 93%*

In part (a)(i) most candidates knew the method although a minority of weaker candidates confused area with volume and did not attempt $4 \times 12 \times 30$. The resulting calculation defeated many with 144 being seen frequently.

In part (a)(ii) most candidates gained at least one mark for showing how to calculate the area of one of the walls. Many lost marks by including the area of the ceiling and/or floor and some forgot to double and found the area of two walls only. Some weaker candidates calculated the perimeter or the volume.

In part (b) only the most able candidates managed to see their way through to a correct conclusion in this question. Some appreciated the need to express 279 as a percentage of 300 (or its equivalent) but their arithmetical skills were not up to the conversion. Some candidates found 21 from 300 – 279 and managed the easier conversion to a percentage but many of these gave 7 rather than 100 – 7 as the answer. Many candidates gained the first method mark.

Question 10 *(a) 6 (b) 500 – 22x*

In part (a) most candidates gained at least one mark by showing 18 and –12. The subsequent addition proved a problem for many with 30 being a common incorrect answer.

In part (b) the mixed units caused problems with $5 - 22x$ a common incorrect answer. Many candidates gained one mark for an acceptable version of $22x$ with very few writing $x22$. Weaker candidates chose to ignore the x and gave 500 – 22 = 478 as their answer.

Question 11 *(a) a = 50° and b = 110° (b) Triangle C and Triangle D*

In part (a) both angles were usually calculated correctly.

In part (b) most identified at least one correct triangle with triangle *B* a common incorrect response.

Question 12 *(a) 100 (b) 8*

Part (a) was answered reasonably well and most candidates gained the method mark. A significant number could not calculate $80 \div 0.8$ correctly, giving either 800 or 10.

In part (b) nearly all gained one mark for –4 and the majority went on to score full marks although –8 was seen. A small number of candidates multiplied by 14 instead of subtracting.

Question 13 *Rotation of 180 degrees about (0, 0)*

Stronger candidates usually described all aspects of the single transformation correctly although some omitted either the centre or the angle of rotation. Weaker candidates either added a second transformation (often a translation) or gave a combined transformation (often two reflections) and gained no marks.

Question 14

Responses varied from centre to centre with very few candidates scoring full marks. The majority failed to draw the perpendicular bisector and on the rare occasions one was shown it was normally drawn without the aid of construction arcs. Most candidates had some success with the arcs from *B*, the line from the path and attempting to shade the area and scored between one and three marks.

Question 15 *(a)(i) 5, 9 and 13 (a)(ii) No (b)* $3n + 1$

Part (a)(i) was well done and the majority scored full marks. A few candidates gave 1, 5, 9 or 9, 13, 17, or made an error with one of the terms. Common incorrect responses were 5, 21, 85 (the candidates using the previous term in the formula) 5, 10, 15 or an algebraic response such as $4n + 1$, $4n + 2$, $4n + 3$.

In part (a)(ii) a substantial number of good explanations were seen.

Part (b) was answered reasonably well. A common incorrect response was $n + 3$ with $4n + 3$ also being seen. Some candidates simply gave the next term, 13.

Question 16 *odd x odd = odd and odd + 1 = even or showing 3 correct examples*

Many scored at least one mark for giving a partial explanation or one example and there were a substantial number of good and complete answers. Some weaker candidates doubled p instead of squaring it or confused odd and even.

Question 17 *(a) 125 (b) a = 2, b = 3 (c) 27*

In part (a) fully correct answers were rare. However, many candidates gained 1 mark for 5^3. Some candidates attempted to evaluate $5^7$and 5^4 and then divide but could not do this accurately. Common incorrect responses were 1^3, 0^3, 35 ÷ 20 or 50000000 ÷ 50000.

Part (b) proved demanding and hardly any fully correct responses were seen. Most candidates tried trial and improvement unsuccessfully, but some attempted to evaluate the cube root of 54. A number of candidates had a very unclear idea of what a prime number is.

Part (c) was a routine question that proved surprisingly demanding with very few obtaining the correct answer. Significantly, the method mark was rarely awarded. Prime factor decomposition was used by some candidates but the link between parts (b) and (c) was rarely seen. Some candidates showed some idea of what was required by writing incomplete or incorrect lists of factors and giving an answer of 3 or 9. A common incorrect response was the least common multiple, 270.

Question 18 *(b) 320*

Part (a) was well answered and most candidates scored at least one mark. The requirement for the first mark was a question involving both a time element and “pleasure”(a wide interpretation of this was allowed in the mark scheme). A minority of candidates did not appear to understand what a response section was and invented a reply to their own question.

Part (b) was a good source of marks for most candidates; however, the arithmetical skills required to obtain the correct answer defeated many. Some candidates also lost the accuracy mark by using a rounded value in their calculation.

Question 19 *£147*

Most candidates used simple interest and gained one mark only. Of those who used compound interest, many failed to answer the question giving the answer £847.

Question 20 *(a) 7.2×10^6g (b) 6×10^{-4}g (c) 1.2×10^{10}*

There were few fully correct answers in part (a). Most candidates could neither convert kilograms to grams, nor an ordinary number to standard form. Some managed one of these skills and gained one mark. Incorrect standard form notation was common.

Part (b) was a routine question that again exposed a gap in knowledge for all but the most capable candidates. A common incorrect answer was 0.6×10^{-3}.

Part (c) was very demanding for the majority of candidates and only the strongest scored full marks. Many of those candidates who realised that the problem was solved by division gained a method mark. A large number chose to multiply.

Question 21 *(a) A (–4, 0), B (0, 2) (b) $\frac{1}{2}$*

Part (a) was not a high scoring question, the concept being beyond a large number of candidates at this level. Point *B* was more often correct than point *A*.

Even strong candidates answered part (b) poorly. Of those who showed an appreciation of the concept of a gradient many did their calculation "the wrong way up". Some candidates attempted to rearrange the original equation to the $y = mx + c$ form but rarely carried this through successfully.

Question 22 *(a) $7(x + 2)$ (b) $10m – 3$ (c) $x = –3$, $y = 5$ (d) $(x + 8)(x – 2)$*

Part (a) was well done by the majority of candidates but many clearly did not appreciate the meaning of the instruction "factorise". $21x$ was a common incorrect response from weaker candidates.

Part (b) was well answered with many candidates scoring at least one mark. Errors mainly occurred in the number terms, either when expanding the brackets or in the subsequent simplification with $10m \pm 27$ being a common incorrect response.

There were a surprising number of good attempts at the question in part (c). Despite the instruction some candidates still used trial and improvement; these were normally unsuccessful. When the correct method was used, those finding y first tended to be more successful with many making a sign error when finding x, obtaining $5x = 15$ instead of $-5x = 15$.

The topic in part (d) was clearly beyond weaker candidates. However, stronger candidates scored well although some lost a mark because of a sign error. Some factorised the first two terms giving the answer $x(x + 6) – 16$.

Question 23 *(b) 0.09*

In part (a) the tree diagram was generally completed correctly.

In part (b) most candidates added along the branches to give 0.6 from 0.3 + 0.3. The other common incorrect response was $\frac{1}{4}$ and some candidates thought the probability was 0 "because there was no '4' on the spinner".
Candidates who knew that they had to multiply along the branches often gave $0.3 \times 0.3 = 0.9$.

Question 24 *(a)(i) 40 º (ii) 140 º (c) 36π cm²*

Part (a)(i) was usually correct.

Part (a)(ii) was rarely correct. Few candidates seemed to know about the opposite angles of a cyclic quadrilateral.

In part (b) many stronger candidates presented a well-argued "proof" on this new topic. There were two common approaches; the first started with angle $A = 90^{\circ}$ to give angle $ABD = 50^{\circ}$ and then used symmetry or congruence to calculate angle *ABC*. The second used symmetry to give angle $D = 80^{\circ}$ and then used the right angles at *A* and *C* and the angle sum of quadrilateral *ABCD*. Many candidates who presented an incomplete or faulty "proof" scored one mark for identifying the value of one of the angles required. Common faulty arguments either started with the 100° or used $180^{\circ} - 80^{\circ}$ "because the sum of the angles of a triangle = 180°".

In part (c), if candidates found the correct value of *OP* they often went on to score full marks. However, this proved difficult for most with values of 3, 4 or 8 often being used. The majority of candidates used πr^2 but many went on to calculate their version of this and did not give their answer in terms of π as requested. A few candidates used 2πr instead of πr^2 and some calculated $(\pi r)^2$.

Paper 1H

General Comments

The paper seemed to be accessible to all candidates with marks covering the whole range. The general impression was that there were a significant number of very high marks (85+) and not too many marks below 20. This suggests that most candidates were entered for the appropriate tier.

Candidates seemed to have adequate time to be able to demonstrate what they knew. The questions did not overly disguise the concepts to be tested and were a fair test of ability. The majority of the candidates were well prepared, having covered the specification thoroughly.

The presentation of work was quite good overall with most candidates showing sufficient working; this being particularly important in questions where all the evidence was specifically asked for (questions 2, 4, 9(b) and 14(c)).

Numeracy is still an issue for some, there being weak handling of decimals and fractions in too many cases, and there was some use of poor notation particularly in angle work.

Scripts were almost always done in pen, as per instructions, very few with significant amounts of pencil.

Question 1 *20*

Only moderately well done, even by better candidates. Sight of 18° gained an easy mark but many followed this with 180 ÷ 18 = 10 sides. Not many tried $(n - 2) \times 180 = 162n$ and of those who did few were successful. There were many attempts at trial and improvement but $n = 20$ did not lend itself to this method due to the amount of work needed.

Question 2 *2.5 or 2.45*

Very well done. Choosing 49 or 50 as an approximation for 48.8, along with 5 and 100, led to answers of 2.49 or 2.5, for 3 marks. Occasionally 250 ÷ 100 became 25. Thankfully there was little long multiplication.

Question 3 *Triangles C and D.*

Very well done. Most spotted both correct triangles and it was rare for candidates to score zero.

Question 4

The perpendicular bisector proved to be the biggest problem. Those who knew to draw it often couldn't construct it. Using the mid-point of *AC* and <u>one</u> pair of arcs is insufficient .Two arcs of 4cm, one from *A* and one from *C*, which just touch in the middle, then drawing a 'best guess' perpendicular bisector was quite common. Many just drew one arc of radius 4cm from *A* for 'nearer to *A* than *C* '. The other loci were usually well done. Some candidates, but only a small number, used the wrong scale.

Question 5 *(a) $4y(3y - 2)$ (b) -2,-1,0,1,2,3,4 (c) $8x^3y^6$*

Part (a) was well done. There were some 'partial' solutions but many fully correct.
Part (b) was usually well done, some, predictably, missing the '0', with only a few leaving their answer as an inequality.

Part (c) was less well done than (a) or (b). Many made a slip on one of the terms (eg. $8xy^6$ or $8x^3y^5$) for one mark, and some on two terms, thus scoring no marks.

Question 6 *(a) a = 2, b = 3 (b) 27*

There was a lot of trial and improvement but many correct answers to (a).
Part (b) was more varied. '9' was a common answer and when candidates tried to split 135 into its prime factors of 3×3×3×5 they did not often follow this with an answer of 27. Quite a few gave an answer of 270 (the LCM).

Question 7 *(b) 320*

Part (a) was usually well done but some asked 'how many' when the question needed to be 'how often'; 'for pleasure' was interpreted in many ways e.g. 'outside school' or 'in your spare time'.
Some of the response sections were rather poor but were tolerated for one mark. A few candidates gave (irrelevant) accounts of how one might use a stratified sample to select pupils, but these were ignored.

Part (b) caused few problems. Occasionally 16 × 20 became 220, or something similar, for the loss of one mark, but 320 was commonplace.

Question 8 *(a)* 7.2×10^6 *(b)* 6×10^{-4} *(c)* 1.2×10^{10}

In part (a) there were rather too many errors in converting 7200kg into grams but a pleasing number were able to use standard form when writing their answer. Part (b) was well done, the common wrong answer being 0.6×10^{-3}. In part (c) some candidates re-started e.g. 7200000 ÷ 0.0006 (or their version of this) but sometimes couldn't handle this rather 'off-putting' division. Follow through marks were available in part (c) so mistakes made in converting kilograms to grams in (a) were not penalised twice. The question was well done by many candidates.

Question 9 *(a) 10m – 3 (b) x = -3, y = 5 (c) (i) (x + 8)(x – 2) (ii) x = -8 and x = 2*

A very well done question! It is pleasing to see Algebra handled confidently even given that questions of this sort occur almost every year. Part (a) was very well done, part (b) found almost all candidates using an elimination method (very successfully) and part (c) was 3 easy marks for the vast majority.

Question 10 *(b) 0.09*

Very few errors on the tree probabilities. There were, of course, the predictable answers of 0.3 × 0.3 = 0.9 and occasionally 0.3 + 0.3 = 0.6 but 0.09 was obtained by many.

Question 11 *(a) 1 (b) 4 (c)* $\frac{1}{3}$

In part (a), whilst 11 and 0 appeared, there were many correct answers.

Part (b), however, was much less well done, a common error being $8^{\frac{2}{3}} = 8 \times \frac{2}{3} = 5\frac{1}{3}$.

Also the misconception that $8^{\frac{2}{3}} = 2 \times 8^{\frac{1}{3}}$, which although giving 4 is a wrong method and scored no marks. Those who 'knew their indices' had no such problems.

Part (c) was a step too far for many, 6 × 144 = 864 and -2 + 0.5 = -1.5 yielding $864^{-1.5}$ or perhaps $6^{-2} = -36$ and $144^{0.5} = 72$ giving rise to –2592 were all too common. Those who knew the correct procedure often left their answer as $\frac{1}{36} \times 12$ and so forfeited a mark, which was a pity.

Question 12 *(a) -2 (b) $y = -2x + 3$ (c) $y = \frac{1}{2}x + 3$*

There were a lot of varied responses to this question. In part (a) the most common error was to give a gradient of 2 rather than -2. Follow through meant that many still scored the mark in part (b). The answer in part (b) had to be an equation; $y = -2x + 3$ was required, $-2x + 3$ on its own was not enough.

In (c) it was common to see the $y = -2x + 3$ answer from part (b) become $y = 2x + 3$, in other words, a change of sign of the gradient was all that was required. Many candidates, however, did obtain the correct gradient either by using '$m_1 \times m_2 = -1$' or by drawing the perpendicular line on the grid and re-starting. If the latter method was used the gradient had to be $\frac{1}{2}$, nothing else was acceptable. As in (b) an equation ($y =$ ……) was required for full marks.

Question 13 *(a) 21 and 33 (b) T = 64*

Part (a) was reasonably well done although 1.4 × 15 did not always yield 21 and a common error was to use 1.2 × 30 rather than 1.1 × 30. It was not at all unusual for candidates to obtain two answers which did not total 54, even though 46 of the 100 shoppers were already accounted for in the table.

Part (b) proved to be beyond many candidates. Some tried to work out the time for the first 20 shoppers. Those who were successful usually calculated $\frac{4}{5} \times 20$ mins = 16 mins then obtained 64 from 80 – 16. Very few used the area concept (1 person = 20 small squares) easily obtainable from the first bar. It is worth noting that $\frac{4}{5} \times 80 = 64$ is a wrong method and scored no marks.

Question 14 *(a) (i) 40° (ii) 140° (c) angle BAD = 64°*

There were hardly any incorrect answers for (a) (i) but (a) (ii) by comparison was badly done; many candidates wrote 180° - 40° = 120°.

Part (b) was quite well done; once the other 40° angle and the two right angles had been spotted it was an easy 2 marks. Some tried the incomplete method of saying that since angle *ADC* = 80° then opposite angles of a quadrilateral totalled 180° hence angle *ABC* = 100°, without any reference to *ABCD* being a cyclic quadrilateral. This earned 1 mark.

Part (c) was a good discriminator. All working had to be shown and not complying with this incurred a penalty. Explanations were often poorly presented. There were, of course, some very good, clear expositions but comparatively few knew the alternate segment theorem and often went from angle *BAQ* = 32° to angle *CDB* = 32°. Others thought that angle *BAQ* and angle *ABD* were alternate usually then using the same false reasoning to equate angle *ABD* and angle *CDB* … which still arrives at angle *CDB* = 32°.

There was common misuse of angle *DCB* = 90° ('angle in a semicircle') and some poor use of notation such as 'angle *B* = 32°' when there were two possible angles at *B*.
The mark scheme did try to give credit for partial solutions and 2 or 3 of the 5 marks were possible for those who attempted some logical reasoning, even if it was incomplete.

Question 15 *(a) $W = 3\sqrt{P}$ (b) W = 15 (c) P = 49*

This question was done well, perhaps because it was direct proportion rather than inverse. Whatever the reason, candidates often picked up two of the three marks in part (a), the third being reserved for those who answered the question, i.e. 'express *W* in terms of *P*'.

Even those who could not score full marks in (a) often went on to get at least two of the three marks available in parts (b) and (c), the only problem coming in (c) when $\sqrt{P} = 21 \div 3 = 7$ was followed by $P = \sqrt{7}$ or even by $P = 7^2 = 36$. Nonetheless, $W = 15$ and $P = 49$ were very common answers.

Question 16 *(a) a = 5 (b) 18*

In part (a) the response was quite mixed. Good candidates knew the procedure and had no problem, weaker ones, predictably, thought that $\sqrt{12} + \sqrt{27} = \sqrt{39} = 13\sqrt{3}$ and hence that $a = 13$.

In part (b) it was rare to find candidates who could take the hint from (a) and write $\sqrt{8}$ as $2\sqrt{2}$ thus giving $3\sqrt{2}$ and hence $(3\sqrt{2})^2 = 9 \times 2 = 18$. Most tried to expand $(\sqrt{2} + \sqrt{8})^2$ with varying degrees of success.
It was not unusual for the expansion to be done correctly, but for the answer to be left as $10 + 2\sqrt{16}$ which resulted in the loss of one mark. The most common wrong answer was $(\sqrt{2} + \sqrt{8})^2 = 2 + 8 = 10$.

Question 17 $\frac{28}{90}$

Good attempts on the whole. There were some 'replacement' answers (gaining a maximum of 2 out of the 4 marks) and many correct answers which were ruined by poor fractions work e.g. $\frac{2}{10} \times \frac{1}{9} = \frac{3}{90}$ along with the usual mistakes when adding fractions. Some candidates used a mixture of fixed and conditional probabilities e.g. $\frac{5}{10} \times \frac{4}{10}$ etc. or $\frac{5}{10} \times \frac{5}{9}$ etc. and were thus only able to pick up the third method mark.

Question 18 *(a) (i)* $\boldsymbol{a} - 2\boldsymbol{b}$ *(ii)* $\frac{1}{3}\boldsymbol{a} + \frac{1}{3}\boldsymbol{b}$ *(iii)* $\frac{2}{3}\boldsymbol{a} + \frac{2}{3}\boldsymbol{b}$ *(b) OP = 2 × MQ <u>and</u> parallel ... hence* OMQP *is a trapezium.*

A few candidates took *OB* to be ***b*** rather than 2***b***, losing accuracy marks as a result of this misread, but most did manage to get the correct answer in (a) (i). In all parts full credit was given to correct but unsimplified solutions e.g. $\boldsymbol{b} + \frac{1}{3}(-2\boldsymbol{b} + \boldsymbol{a})$ in (a) (ii) but marks were lost due to missing brackets, making sign errors and using $-2\boldsymbol{b} + \boldsymbol{a}$ for *AB* instead of $2\boldsymbol{b} - \boldsymbol{a}$. The part (b) answer was dependent on fully correct answers in parts (a) (ii) and (a) (iii).
Vector answers may be required to be simplified in the future and candidates will need to be able to cope with this. Had this been the case for this paper many candidates would have lost marks.

Question 19 *(a) 18π cm (b) 9cm*

This question was not as well done as it ought to have been. The concept of the circumference of the base of the cone coming from the arc length of the sector is standard at this level. Many who realised that the correct method was $\frac{3}{4} \times 2 \times \pi \times 12$ failed to fully simplify this to 18π and so lost a mark. Poor notation ($\pi 18$) was penalised. Common wrong answers were: using <u>diameter</u> = 12, using $\frac{1}{4} \times 2 \times \pi \times 12$, and finding the <u>area</u> of the sector.

Part (b) could be done by using surface area methods as well as the more straightforward ones quoted in the mark scheme but attempts of any kind were rare and usually poor.

Question 20 *(a) Translation of 45° to the right,* P*(135, 1) (b) Sine curve of twice the amplitude,* P*(90, 2)*

In part (a) there were many correct solutions but also a significant number who translated the wrong way. Part (a) was less well done than part (b) where even weaker candidates often scored the full 2 marks. In both parts sketches were adequate rather than good but as long as 'key' points were seen the marking was reasonably generous.

Question 21 *$a = 5$, $b = -7$*

Good candidates obtained $(x - 5)^2 - 7$ either by inspection or by completing the square but all too often put $a = -5$ on the answer line. This was penalised despite the presence of the correct expression in the working.
Many tried to expand the right hand side but only succeeded in getting some awful algebraic expressions for the answers to a and b. When numerical answers were given they were often just guesses and a significant number of candidates made no attempt at all.

Paper 2F

General Comments

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. Probability notation showed few using ratios or odds to answer the questions. Incorrect money notation caused some candidates to lose some marks with £4.8 in question 1, £24.1 in question 8, and £248.4 in question 18, and some forgot to use the p when giving the answers in pence especially for question 1 with answers of 480, 230 and 225 instead of 480p, 230p and 225p. Candidates were poor at explaining answers or giving proofs and they need to develop these skills as they are increasingly required.

Question 1 *(a) £4.80, £2.30, £2.25, £9.35 (b) 4 (c) £15.59*

Apart from the money notation problems most did well on this question, but some just added £1.60, £1.15 and £0.75. Most got part (b) correct on follow through from their answer to part (a). Some just worked out the cost of the pens in part (c) as £4.41 and then stopped.

Question 2 *(a)* $\frac{2}{8}$, $\frac{6}{24}$ *(b) 0.25*

Most got $\frac{2}{8}$ in part (a) but often with $\frac{5}{16}$. Very few got part (b) correct with answers of 1.4, 0.4, and 0.14 being common.

Question 3 *(a) C and E (b) trapezium, hexagon, parallelogram (c) 8*

In part (a) B and E was a common answer. In part (b) most identified **Q** as a hexagon but got **P** and **R** interchanged. Most got part (c) correct with 5 being a common error.

Question 4 *(a) 5 (b) 6 (c) mode as will sell more of these*

Most got part (a) correct but 10 was a common answer to part (b), or the mean was calculated. The explanation in part (c) was poor with some contradicting themselves with answers such as " median as 5 is the most popular" or just stating the mode with no reason.

Question 5 *(a) 30, 37 (b) 30 (c) subtract 3*

Most got this fully correct with 29 and 36 being a common error in part (a). In part (c) some thought that the rule changed from subtract 3 at the start to add 3 later.

Question 6

Very few did not score full marks. All knew how to reflect the shape but occasionally started the reflection along the edge of the mirror line.

Question 7 *(a) cube (b) correct horizontal line (c) correct H shape*

Some gave box or cuboid or T shape as answers to part (a). Nearly all got part (b) correct, but many added the squares to form a larger T shape in part (c).

Question 8 *(a) £24.10 (b)(i) 8 (ii) 7,3 or 1,13 (c)(i) Saturday (ii) Thursday (d) 22°C*

Most got part (a) correct apart from money notation errors. In part (b)(i) many gave the wrong number, but showed no working so scored no marks. Part (b)(ii) could only be attempted by the more able candidates and many left it blank. Part (c) was well done but Wednesday was a common error in part(c)(i). Some gave the answer to part (d) as 132 or 21.

Question 9 *(a) 15 dots in triangle (b) 15 and 21 (c) add 1 to the difference each time*

Most got parts (a) and (b) correct, but many described how to construct the next triangle in part (c) or said "add 4, add 5, add 6 etc" instead of giving a general rule.

Question 10 *(a) 7 (b) 21*

Many scored full marks with 6 and 32 being common errors.

Question 11 *(a) 50° (b) 120° (c) 42° (d) angle sum of triangle is 180° and quadrilateral is 2 triangles.*

This was poorly answered. Many gave answers of 60, 110 and 55 by measuring the angles. Very few had any idea on part (d) and often gave 4 x 90 = 360.

Question 12 *(a) 10800 to 11200 (b) 1983 or 1984*

Most got this fully correct but some gave part (a) as 10500, and in part (b) tried to give the number of bottle banks in the year 2000.

Question 13 *(a) 3 (b) 2 lines of symmetry (c) 29.5cm to 30.5cm, 22cm to 23cm*

This was poorly answered. Most did not understand part (a) or gave 27 as an answer. Many gave 1 or 4 lines of symmetry in part (b), and in part (c) added on 5 to the measurements on rectangle A or B.

Question 14 *(a) 4 (b) 6 (c) 2 (d) 5*

Part (a) was poorly answered with many giving an answer of 9. Part (b) was usually correct. Parts (c) and (d) were poorly answered with some giving 16 as the answer to part (c), and then attempting part (d) by trial and improvement.

Question 15 *(a) 8 miles (b) not moving (c) 16 miles (d) 8 mph (e) line or curve from (10.00, 20) to (11.00, 0)*

Many gave part (a) as 12. Most got parts (b) and (c) correct, but many did not know how to find the speed in part (d) and often multiplied by 2. Very few got part (e) correct and most drew a line starting at (10.00, 0).

Question 16 *(a) 656 euros (b) 640 dollars*

Many multiplied or divided in both parts and so got half marks. Part (a) was more usually correct than was part (b).

Question 17 *£770*

Very few scored full marks but many got £550 for the son but found the calculation for the daughter too difficult. Those who showed their working were often able to get 2 marks with £1100 being a common final answer.

Question 18 *£248.40*

This question was poorly answered with £243.50 being a common answer. Many did not know how to calculate a percentage or gave a final answer of £8.40.

Question 19 *(a) 13.8m or 14m (b) 15m or 15.2m²*

This question was poorly answered and it was very rare to see the units given in part (b). Many missed out π in both parts and gave answers of 4.4 and 4.4^2.

Question 20 *(a)* $\frac{23}{40}$ *(b)* $\frac{16}{40}$ *(c) harder at A since 0.4 <0.7*

This question was poorly answered. Some gave answers to parts (a) and (b) as "likely" or "unlikely" or gave ratios or odds, and "23 out of 40" and "16 out of 40" were common and penalised one mark. Part (c) was answered better than parts (a) and (b).

Question 21 *(b) as it gets hotter more ice creams are sold or positive correlation*

Many started their line of best fit at the origin or attempted to connect up all the points and some did not use a ruler. Part (b) was answered better than part (a) but very few used the word "correlation".

Question 22 *Standard*

This question was very poorly answered. Many attempted a comparison by getting the cost of 450 standard sheets as £2.85, and then stating that for an extra 35p you get 50 sheets so Regular was the best buy. Even those who did correct calculations for the cost of one sheet or the number of sheets per penny often gave Regular as their conclusion.

Question 23 *(a) 2.6cm (b)* $0.06m^2$

This question was very poorly answered. Many gave the answer to part (a) as 22.94 and most had no idea how to do part (b) which is a new topic on this specification. Some gave an answer of 6 but some calculated the perimeter.

Paper 2I

General Comments

Candidates appeared to have had enough time to complete the paper to the best of their ability.

The standard of presentation was generally quite good, though there were a few candidates who refuse to show any working and who consequently lose the possibility of being awarded any method marks. There were a few untidy scripts though marking them did not present too much of a problem.

There are a significant number of candidates using inappropriate notation [e.g. 1 out of 6, 1 in 6 etc or ratios] in probability questions which incurs a penalty or, in the case of answers in ratios, results in a score of zero.

Algebraic questions and the question on transformations were not answered particularly well except by the best candidates.

Questions requiring candidates to write an explanation also often caused difficulties, not so much because of the mathematics involved, but more by the limitations of the candidates' ability to write their ideas clearly in English.

Question 1 *(a) 656 euros (b) 640 dollars*

Both parts of this question were generally well answered though there were those who thought that multiplication by the given conversion factor was needed in **both** parts.

Question 2 *(a) -4*

This was not so well answered as Question 1 mainly through inaccurate use of the calculator. A large number of candidates scored 1 mark for substituting F = 22 in the given formula, but then lost the next mark by giving an answer of 7 [from 22 - 30 ÷ 2].

Question 3 *(a) 114 (b) angle sum of triangle is 180° and quadrilateral is 2 triangles*

The responses to this question were rather mixed. Quite a large number worked out that **Q** and **R** were both 66°; some stopped there but quite a good number went on to give the correct solution. Nevertheless there was a significant number who thought that **R** = 48° and gave x = 132° thus scoring zero.

Part (b) was very poorly answered. Even some of the candidates who achieved very high total scores failed to score any marks on this question. It was very common to see explanations like "a quadrilateral adds up to 360° because a square does" or " a quadrilateral adds up to 360° because all four sided figures do".

Question 4 (*a) £770 (b) 3500*

This was a question which provoked a varied response. A good number of candidates scored full marks here. Of the other candidates many scored the mark for attempting to find $\frac{1}{4}$ of £2200 but then seemed to become confused and either tried to find 40% of the balance [£1650] or had trouble working out 40% of £2200.

Part (b) was a very mixed question. The correct solution was seen quite often but a wrong solution was also seen quite frequently. Common errors were (i) to divide 12000 by 3 and then give shares of £3000, £4000 and £5000 or (ii) to try to divide 12000 by 7.

Question 5 *(a) not moving (b) 16 miles (c) 8 mph (d) line (or curve) joining (10.00, 20) to (11.00, 0)*

Parts (a) and (b) were usually done correctly. Part (c) was also answered quite well but not quite as well as parts (a) and (b). Part (d) was generally poorly done with the vast majority of candidates drawing a graph which started from Newcastle rather than Ashington.

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

The correct answers to (a) and (b) were often seen here [(b) slightly less frequently than (a)] but it seemed that these had usually been found by trial; only the better candidates solved these two equations with algebraic steps.

Question 7 *(a) 13.8m or 14m (b) 15m^2 or 15.2m^2*

This was again very mixed. There were quite a lot of good answers but probably an equal number of very poor attempts. Some candidates have clearly not sorted out the formulae for circumference and area of a circle.

In (b) the units of the answer were often completely missed out even by some of the better candidates.

Question 8 *(a)* $\frac{23}{40}$ *(b)* $\frac{16}{40}$ *(c) harder at A since 0.4 < 0.7*

Parts (a) and (b) were often correct but quite a few cases of candidates using inappropriate notation for probability were evident.

Part (c) was not so well answered and in some cases it was the candidate's use of English which caused the problem. Not many candidates gave the answer "because 0.7 > 0.4"; most candidates seemed to opt for "fewer passed than failed at" and quite a few thought that this was because John was biased.

Question 9 *(b) positive correlation or the higher the temperature the more ice creams sold*

The majority of candidates scored full marks on this question though there was a significant number of candidates who thought that the line of best fit had to pass through the 'origin' (50,0).

Question 10 *standard*

The responses to this were very muddled.

Quite a number of candidates tried to compare 450 [or 600] sheets of 'Standard' with 500 sheets of 'Regular'. Those who worked out that they needed to do some division were often confused about whether they had calculated the cost in pence per sheet or the number of sheets per penny. It was also fairly common to see the two calculations in different units [e.g. sheets per penny for 'Standard' and sheets per pound for 'Regular']. The best candidates used the neat method of comparing 1500 sheets of each.

Question 11 *(a) Disagree: probability > 1 (b) Agree: 13 soft and 28 sweets (c) Disagree: probability still $\frac{1}{2}$*

In (a) most disagreed but missed the obvious fact that the probability stated was greater than 1 and gave reasons like "you can't predict the weather - it depends on the season" or "there are two possibilities, rain or sun, so probability should be $\frac{1}{2}$ "

Parts (b) and (c) were usually correct.

Question 12 *(a) Mr Dale (b) £76.50*

Part (a) was quite well answered by the majority though there was a little confusion about whether it was the new weekly wage that was needed for each person or just the increase in their weekly wages.

Part (b) was very poorly done; only the very best candidates tackled this reverse percentage problem correctly. The vast majority tried to work out 98% of £78.03.

Question 13 *3.23m*

The responses to this question were poor. Quite a few candidates did this correctly but a large number seemed to have little or no idea of Pythagoras' Theorem. Common incorrect answers were: $x = 3 + 1.2 = 4.2$ or $x = \frac{1}{2} \text{ x } 3 \text{ x } 1.2 = 1.8$ or some attempt at an incorrect form of trigonometry.

Question 14 *2.4*

Many candidates knew how to approach this problem and scored the first two marks for establishing a 'sandwich' in the range $2.3 \leq x \leq 2.4$ but then failed to score the final mark for carrying out a trial at 2.35 or 2.36 or 2.37. Others had problems deciding what the answer was since numbers like 30.02 were seen quite often on the answer line.

Question 15 *7.6 minutes*

This was not particularly well answered in spite of the fact that this type of question is regularly set. Some candidates simply added up the frequency column and divided that by 6. Cumulative frequencies were seen quite often followed by the sum of the cumulative frequencies divided by 6 [or occasionally 30]. Some tried to work out a total time but used the lower or upper class boundaries. Mid-interval values were usually only found, and used properly by the better candidates.

Question 16 *(a)(i) Reflection in x = -1 (b)(i) $\frac{1}{2}$ (ii) (-2, -1)*

This was very poorly answered. Candidates scoring full marks [or even more than half marks] were rare indeed.

In (a) (i) many ignored the requirement for a **single** transformation. Only a few could describe the transformation as a reflection and even fewer were able to give the equation of the axis of reflection. Part (a)(ii) was often correct and was equally often the only part that was correct.

Part (b) was very poorly answered indeed. Only a very small number of candidates had any idea in (i) about the scale factor for an enlargement and those who seemed to have some idea frequently gave an answer of 2. Finding the correct centre of enlargement in (b)(ii) was rarely seen. Many simply gave (0,0) as their answer or some other point which had no relevance to the point required.

Question 17 *(a) 6x (b)(i) x^3 (ii) y^7 (c) $4x^2 + 17x - 15$*

Part (a) was often correct but there was a significant number of candidates who left their answers as either $11x - 5x$ or $-x + 7x$.

In part (b) the responses were very mixed with quite a few correct answers and probably a larger number of incorrect answers. Common wrong answers were (i) x^{-10} and (ii) $y^{-2.5}$

In part (c) there were quite a number of candidates who seemed to have the right idea of expanding the brackets to 4 terms but who failed to score because their answers contained no term in x^2.

Question 18 *230 m*

This was not as well attempted as might have been expected. Some candidates had no idea which trigonometric ratio to use [Tan was a fairly common wrong choice].

Candidates who did choose Sine often then thought that $x = 125 \times \sin 33^\circ$ and the rounding to an appropriate degree of accuracy was not particularly well done [or completely ignored].

Only the best candidates solved this completely correctly

Question 19 *(a)(i) 27.383067(76) (ii) 27.4 (b) 1.3515×10^9*

In part (a) the answers given to (i) were often correct, but also often wrong because of poor use of the calculator facilities [i.e. failing to realise that $28.9^2 - 9.24^2$ needed brackets around it (or equivalent)]; -56.4776 was a very common wrong answer.

Part (ii) was not particularly well done; there seemed to be a lot of confusion between 3 significant figures and 3 decimal places.

In part (b) the required digits 13515 were frequently seen but the correct standard form was seen only rarely.

Question 20 *2cm*

There seemed to be a real lack of understanding of the principles involved with similar triangles. Some candidates gave a correct scale factor or ratio but then failed to use it; others simply gave an answer of 2 with no explanation or reasoning. A fairly common wrong answer was: $BC - DE = 9 - 6 = 3$ $\therefore AB = 4 + 3 = 7$ $\therefore BD = 3$.

Question 21 *14*

The responses to this were very mixed in quality.

Many of the better candidates produced a perfect solution. Equally there were many candidates who had little idea (i) about the relationship between litres and cm^3 [4 litres = 400 cm^3 was common] or (ii) how to calculate the volume of a cylinder.

Question *22* *$x = \sqrt{(w - y)}$*

This was poorly answered in the main. Only a very small number rearranged the formula correctly though quite a few candidates scored 1 mark for $w - y$. Of those who realised a square root was needed, many failed to bracket the $w - y$ or make the square root sign long enough to cover both terms.

Question 23 *8 packs of rolls. 15 packs of sausages*

A relatively straightforward question which was well answered by many but which also seemed to cause confusion with others. Listing multiples sometimes contained errors before reaching 240. Others seemed to totally ignore the requirement to have **exactly** the same number of bread rolls as sausages [1 pack of rolls and 2 of sausages giving *about* 30 of each was a fairly common wrong answer in this category].

Question 24 *(a) 4 (b) $x < 7$*

In (a) the correct answer was seen quite often but it seems to have been found mainly by trial and improvement. A correct algebraic solution was rarely seen. Of the candidates who tried to multiply both sides by 5, many made errors [usually sign errors] in the manipulation of the x term and/or the numbers

Part (b) was not well answered for a straightforward inequality. Many decided to convert to an equation and solved $3x + 8 = 29$ to give an answer of $x = 7$ and consequently scored zero. Others just gave a list of integers which they thought fitted the inequality.

Question 25 *11 minutes and 19 minutes*

Another poorly answered question. Most candidates failed to relate the middle 50% with the interquartile range and simply opted for 50% being at 20 on the cumulative frequency axis. Of those who did realise that quartiles were involved quite a few misread the horizontal scale giving answers of 12 and 18.

Paper 2H

General comments

This was the first paper of the new specification. The intention was to provide a paper that would be derivative of previous SEG and NEAB papers but at the same time gently introduce new topics. This seemed to be successful. There were few marks below 20%. On the whole candidates seemed to be well prepared for the new topics. Standards of presentation were good with working being shown where necessary. Answers to unstructured questions such as questions 17, 18 and 19 show good logical structure although many answers 'rambled' about the page.

Topics that were done particularly well.

- Pythagoras theorem
- Ratio
- Trigonometry
- Expanding brackets

Topics that caused particular difficulty.

- Algebra, particularly combining algebraic fractions and factorising and cancelling
- Proof
- Premature approximation of trigonometric values which lead to errors in the final answer
- Limits and calculating with limits
- Fractional scale factors for enlargements
- Solving algebraic inequalities
- Scale factors for areas and volumes of similar shapes
- Solving simultaneous equation when one is linear and one is non-linear

Question 1 *3.23m*

This was well done. Few errors were made.

Question 2 *£3500*

This was well done. Only arithmetical errors such as totalling the ratios to 25 were made.

Question 3 *2.4*

This was well done by all candidates, virtually all of whom scored at least 2 marks. The common errors were not testing a 2 decimal place value to establish which 1 decimal place value was nearest to the root or finding a value of x such that the answer to $x^3 + 7x$ was within 1 decimal place of 30.

Question 4 *£76.50*

The majority did this correctly, many using a multiplier of 1.02. The common error was to calculate 98% of £78.03. Centres should be aware that this type of percentage decrease question is below grade C and will never occur on a higher tier paper except in the context of compound interest. Another error was to write the answer as £76.5. Incorrect money notation will always be penalised.

Question 5 (*a*) *7.6 minutes* (*b*) $6 < t \leq 8$

The vast majority scored full marks on this question. Part (a) had the usual errors of using upper and lower class boundaries instead of the midpoints. Otherwise poor arithmetic led to a loss of marks. Part (b) was done correctly by almost all candidates. The common error was to give the modal class ($8 < t \leq 10$).

Question 6 *230m*

Trigonometry is a topic that has shown an increase in standards over the last few years. Finding a hypotenuse often causes problems due to the need to divide by the ratio. This proved to be the case here. The majority identified sine as the correct ratio and a significant majority of these did use the ratio correctly, although 125 x sin 33 was a common error. Most marks were lost by not rounding to an appropriate degree of accuracy. The values in the question are given to 3 significant figures. The answer should not be given to a greater accuracy than this. A small but significant number of candidates use calculators set on radians or gradians.

Question 7 *(a)(i) 27.383067(76) (ii) 27.4 (b)* 1.3515×10^9

Poor calculator skills caused errors in part (a) although the mark for (b) was a follow through and was often gained by rounding to 3 sf correctly. A common error was –56.4776 rounded to –56.5. Part (b) was not well done. Answers of 13.5 x 108 or similar were common. Candidates were not penalised for rounding 13515 to 1352 or 135.

Question 8 *(a) 4 (b)* $x < 7$

Part (a) was well done by the majority, but many candidates are unable to deal with firstly the division by 5 and secondly the negative value for x. Answers of ±19 and –4 were common.
Part (b) was very badly done. Too many candidates replace the inequality with an equals sign then fail to recover this in the answer. Others misinterpreted the question and gave answers of 6, 5, 4, …. presumably assuming x is an integer. Many candidates introduced the ≤ sign. This was condoned this year but may not be in future.

Question 9 *(a)* $\frac{1}{2}$ *(b) (-2, -1)*

Part (a) was invariably given as 2. Occasionally as $-\frac{1}{2}$. Much rarer was the correct answer.

Part (b) was well done by candidates who knew to draw rays through corresponding points, although too many candidates get co-ordinates the wrong way round. Candidates who did not draw the rays gave (0, 0) or (2, 1) as the centre.

Question 10 *(a)(i)* $a(2a - 1))$ *(ii) 45 (b)* $4x^2 + 17x - 15$ *(c)(i)* x^3 *(ii)* y^7

On the whole this question was well done. Part (a) was least well done. Factorising still causes problems. In (a)(ii) the vast majority substituted into the original expression. Squaring negatives and dealing with a 'minus, minus' combination caused problems. Answers of ±36 and –45 were common. Pleasingly few candidates calculated $2a^2$ as $(2a)^2$. Parts (b) and (c) were very well done. Marks were lost mainly by careless errors.

Question 11 $x = \sqrt{(w - y)}$

This was well done by a majority of candidates. Most started by writing $x^2 = w - y$, although having the subject on the right caused various combinations of minus signs. Common errors were then to divide by x or 2 or to only square root w.

Question 12 *11 minutes and 19 minutes*

This was well done by the majority of candidates. A common error was to misread the scales as 12 and 18. A minority read from 10.25 and 30.75.

Question 13 $y \geq 0,\ x \leq 6, y \leq \frac{1}{2}x$

This question was not well done. Few candidates scored full marks. Firstly they had difficulty finding the equations of the boundary lines, particularly $y = \frac{1}{2}x$. Secondly they then did not know how to write the inequality. There were many instances of poor notation such as $R \geq\ y = 0$. Very occasionally candidates gave the reversed inequalities, which presumably is from a linear programming approach of describing the unwanted region. The use of strict inequalities such as $y > 0$ was condoned.

Question 14 $\frac{16}{33}$

Candidates either knew the 'trick' or the method or they had no idea. $\frac{48}{99}$ was a common answer which scored 1 mark. A common error was $\frac{12}{45}$, which scored zero.

Question 15 *Angle A = Angle C (Alternate), Angle B = Angle D (Alternate), AB = DC, Congruent because of ASA*

This was a proof and some rigour was expected. Few candidates scored full marks. The most common approach was to state that the angles at *A* and *C*, *B* and *D* and the opposite angles at *E* were equal. To gain partial credit candidates had to justify why these angles were equal. Many failed to do this. The expected justifications were alternate or opposite angles. Many candidates used 'Z' angles as a justification. This is presumably what they have been taught. This was condoned this year but will not be accepted as a reason in future. Having found the angles congruency was justified by AAA. To gain full marks candidates were expected to re-state that *AB* = *DC* and use ASA or AAS as the justification. An alternative approach was to state that *ABCD* was a parallelogram. This then gave SSS, SAS or ASA as possible approaches to prove congruence. Too many candidates gave a lengthy written justification. This rarely gained any marks as 'all angles the same and one side the same length' is not a reason for congruence.

Question 16 *(a) 47 (b) No with justification using reference to graph (c) Two valid factors such as: age range, sample size, proportion within sample, location/time of survey, type of sample, processing of data*

Part (a) was well done and almost all candidates scored 2 marks. This particular part was often left blank. This may be due to candidates not knowing this (new) topic or missing the part and going straight to the graph.
Part (b) was also well done by almost all candidates. It was difficult not to score 2 marks here. Wrong conclusions or misreading the graph would be reasons for not scoring 2.
Part (c) was variable. A wide variety of factors were accepted: sample size, unbiased questions, different groups, methods of sampling, processing of data and location/time of sampling. Reasons for not gaining marks were factors not being sufficiently developed. 'Age of men', for example was not accepted whereas 'Age range of men' was. Many candidates also lost marks by giving questions for the survey such as 'How many cigarettes they smoke per day'.

Question 17 *21°*

Most candidates managed to gain some marks on this question which is an unstructured multi-step question. The majority were able to find *HF* as 13. This was then used in triangle *DHF* to find the angle. Errors made were using the wrong ratio or values in triangle *DHF*. Premature approximation in this question was common. *DF* was often found and rounded to 13.9 or 14. However, it was pleasing that many students could tackle a 3-D problem.

Question 18 *28.7 km*

This was a straightforward cosine rule question and as such was well done by many candidates. Common errors were to take *PAB* as a right-angled triangle or to work out the distance for 2 hours travelled. Another erroneous approach was to use the sine rule. However, the majority who adopted the cosine rule managed to score full marks. A very common error in using the cosine rule is to calculate 949 – 900cos82 as 49cos82.

Question 19 *5.33 cm*

This was a using and applying mathematics question. It was pleasing that many students had a strategy which was often clear and well explained. The majority could find the volume of the cylinder and the cone, although many strange hybrid formulae appeared for these. The difference in these was then divided by 9π to get 3.33. Adding the final 2 was sometimes forgotten. Once again premature approximation led to errors in the answer. This question can be done without a calculator and better students left answers in terms of π throughout.

Question 20 *(a)* $x^2 + 8x + 16$ *(b) Substituting and expanding, then dividing by 2*
(c) -5.74, 1.74

Part (a) was usually well done as it was a simple piece of algebra giving a clue to part (b). Unfortunately not many candidates appreciated this assistance and did not know what to do in part (b). Some 'started again' but many solved the equation. This is a new topic and it was clear that many candidates had not met this before.
Part (c) is clearly familiar to the majority of candidates but errors still occur in substituting into the quadratic formula and subsequent calculations. As the coefficient b is positive very few got the sign for $-b$ wrong but many could not evaluate $b^2 - 4ac$ accurately. Another common error is failure to divide the whole of the top line by $2a$. Only a handful of candidates used 'completing the square'. The handful who gave the answers only with no evidence of working scored zero marks as graphical calculators can solve these equations. Some working is asked for and must be seen for credit.

Question 21 *1620 ml (or cm^3)*

This was not well done. Few candidates had any concept of a volume scale factor. Basic examination technique should indicate that towards the end of a higher paper, there would be no credit for multiplying by 1.5. However, 720 was a very common answer. This was also the 'units' question. Candidates were expected to write the units (ml or cm^3) on the answer line. Failure to do this lost a mark.

Question 22 $-\frac{1}{3}$

Too many candidates have no idea how to start this type of problem. Those candidates who had some idea could often make an attempt to find the numerator on the left-hand side. This was then often incorrectly evaluated as $x^2 - 3x + 2$. Fewer knew to find the denominator or the right hand side as $x^2 - 1$. A common error was to find the numerator as $x^2 - 3x \pm 2$ and the denominator as $x^2 - 1$. The x^2 were then cancelled out. This led to the correct answer but gained no credit as the answer came from wrong work.

Question 23 $\dfrac{(t\pi + 3)}{(1 + 2\pi)}$

This was not well done overall. The expected way to start this question is to expand the bracket. Quite a few candidates managed to do this and some of these then managed to collect the r terms on one side. A surprising number think that $r + 2\pi r = 3\pi r$ or collected this as $3r$ then divided by π. A less popular approach was to divide the left-hand side by π. This gained a method mark but few candidates could progress beyond this.

Question 24 $\dfrac{(5x - 1)}{(x - 3)}$

This was not well done. A large number of candidates cancelled the x^2 terms or the –3 with the 9. Candidates who knew how to approach this did quite well, making the odd error with the factorisation of the numerator. Some found the answer and then went on to cancel or solve an equation.

Question 25 *No with full justification using appropriate limits for cup, coffee and milk.*

This was not well done in terms of the upper limits, although the majority of candidates showed a correct strategy. Upper limits cause problems. The upper limit for coffee was often given as 130.4 and the milk as 21.4. Any truncated value such as 130.49 will not gain credit, although indications of recurrence will. However, it is acceptable and easier to work with 130.5 and 21.5. The lower limit for the cup of 174.5 was usually done correctly. Candidates who made an attempt to find all appropriate limits could still gain a mark for a correct conclusion.

GCSE Mathematics Coursework

Specification A

General

Examiners and moderators reported that the majority of candidates were, understandably, less prepared for the handling data element of this component than for the investigative (AO1) task. The using and applying task almost invariably scored better than the handling data task. In the submissions of a number of centres, both tasks suffered from too much repetition and too little development.

Many examiners and moderators were concerned that candidates did not seem to be performing to their true potential. It was felt that a number of candidates were disadvantaged by a lack of understanding about the requirements of the coursework especially the handling data task. Many of the tasks set were decided by the centres and not the candidates.

In many centres, the work followed the same format making use of the same representations. The use of writing frames was not always beneficial where the candidate had no idea what was being asked.

Administration

Examiners and moderators reported that the vast majority of centres were well organised although, for a small number of centres, there were considerable problems over the completion of candidate record forms and other necessary administration.

Centres are reminded that:

- *All work submitted must be authenticated by the teacher and the candidate using the appropriate candidate record form.*
- *Candidate record forms are not returned with the work.*
- *It is expected that sufficient work is undertaken under the direct supervision of a teacher for the work to be authenticated.*
- *The criteria for the using and applying task have only undergone minor changes for 2003.*
- *The use of plastic wallets and elaborate folders to contain coursework is discouraged – treasury tags are much better.*
- *Coursework presented should be sequenced with page numbers and should identify candidate details on each page.*

The following comments are offered under each of the three strands for the using and applying 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 examiners' and moderators' reports might be useful to centres in preparing candidates for the using and applying mathematics coursework:

Making and monitoring decisions to solve problems

- *Candidates should be encouraged to ensure a systematic rather than random approach to their work.*
- *The provision of three correct results is sufficient for an award of mark 3 under this strand.*
- *An award of mark 5 can only be given where the task is independently extended and generates a further solution.*
- *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 for co-ordinating three features or variables.*
- *A fleeting glimpse of calculus is not sufficient for an award of mark 8 and the work must be extensive and sustained for such an award*

Communicating mathematically

- *Candidates should not waste time drawing graphs unless they are relevant and are commented upon and used in the writing.*
- *Candidates should be encouraged to make better use of algebra to provide a commentary for the work.*
- *An award of mark 5 can only be given (as best fit) where candidates make* ***use*** *of algebra rather than making an algebraic statement.*
- *The use of algebra for proving and justifying must be convincing if it is to be awarded any 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 only be undertaken on generalisations arising from the candidate's own work.*
- *Testing should be carried out on new data and include a comment to confirm whether the test was successful or not.*
- *An award of mark 5 can only be given where candidates demonstrate* ***why*** *a generalisation works – repeated testing does not constitute justification.*
- *An award of mark 7 under this strand can only be given where strand 1 has been awarded a mark of 7 or 8.*

***The following comments are offered under each of the three strands for the handling data task*:**

1. Specifying the problem and planning

This strand is about choosing a problem and 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 overcome them. For the higher marks, candidates need to decide upon a suitable sampling method, explain what steps were taken to avoid possible bias and provide a well-structured report.

2. 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 level statistical techniques and calculations from the higher tier GCSE mathematics specification content.

3. 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 examiners' and moderators' reports might be useful to centres in preparing candidates for the handling data coursework:

Specifying the problem and planning

- *Greater consideration needs to be given to the method and choice of sample to ensure that this is well considered at the start of the task.*
- *Many of the hypotheses set were rather simplistic and 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.*
- *Little detail was given of how the sampling was undertaken to avoid bias and ensure that it was truly representative of the population being investigated.*
- *An award of mark 5 can only be given if the task is substantial and developed beyond the original task.*
- *Little thought was given to the issue of bias or else such consideration was rarely commented upon in the write up.*
- *For the higher marks, work requires careful specification and more sophisticated statistical* thinking.

Collecting, processing and representing the data

- *Provision of mean, median, mode and range is not always appropriate for all tasks and calculations need to be considered for their relevance to the problem.*
- *Calculations should be accurate so that giving the frequency of the mode rather than the mode should not be credited.*
- *Too many representations were too inaccurate to provide useful information and not all graphical work made use of graph paper.*

- *Statistical representations and calculations add little to the task unless they are explained and interpreted.*
- *The use of representations such as box plots and stem and leaf diagrams is recommended as appropriate for much of the work seen.*
- *Cumulative frequency diagrams are most appropriate for continuous and/or grouped data.*
- *Correlation is an area that needs real improvement as many representations were ill considered and incorrect.*
- *The use of standard deviation alone is not an indicator for the higher marks unless it is appropriate, explained and interpreted.*

Interpreting and discussing the results

- *An award of mark 0 under strand 3 was commonly given where the candidate failed to make any comment on their findings or data.*
- *This strand is particularly used to assess candidate's interpretations of the representations and calculations credited in the second strand.*
- *Many candidates failed to evaluate their strategy thus limiting their marks under this strand.*
- *Suggestions that the hypothesis is proven or disproven needs to be backed up with evidence from the candidate's own work.*
- *Suggestions for improvement often mentioned larger sample sizes but this, alone, is hardly indicative of grade C work.*
- *For the higher marks, there was little evidence of candidates recognising possible limitations to their strategies.*

Option T – Teacher-Assessed

General

The tasks set were generally appropriate and allowed candidates to make some progress against the criteria on each of them. Board set tasks were particularly popular but a few centres set tasks were rather simplistic and did not allow more able candidates to progress to the higher marks. Many of the tasks set were decided by the centres and not the candidates.

Assessing the coursework

There were few problems assessing the coursework although difficulties, such as generous marking at the top end of the mark range and work which is under-valued at the bottom end of the mark range were prevalent in a very small number of centres.

In general, the using and applying mathematics work was marked accurately against the coursework criteria and the further exemplification provided by AQA, which was written in conjunction with the other examining boards. The handling data task was not marked so accurately and centres' attention is drawn to the documentation already provided in the AQA Teachers' Guide as well as the information from the Joint Council for General Qualifications.

Centres should be aware that the provision of board set mark schemes is intended to provide suggestions for possible routes through the board set tasks. The teachers notes provided in the right hand column are not intended as a replacement for the minimum requirements and original criteria against which all tasks should be marked. Similarly, centre set tasks should also be marked against these same minimum requirements and original criteria.

Internal standardisation is an important aspect of centre set and centre assessed coursework. Centres are required to confirm that procedures have been followed to ensure that the marking is of the same standard for all candidates. In some centres, difficulties had arisen as a result of work not being assessed to the same standards and scaling having to be applied to all of the work from the centre.

Annotation and further information

Moderators confirmed that information about the tasks was usefully provided by centres who also made good use of the Candidate Record Forms to support and justify their assessment of the candidate's work. Annotation within the script was less evident although, where this was provided, moderators were more easily able to provide useful feedback to the centres.

Option X – Externally Assessed

General

The board set tasks allowed candidates the opportunity to make some progress against the given assessment criteria and thus gain credit for their performance. Much of the work received from individual centres was very similar making it difficult to differentiate between the responses of different candidates. Supporting information, where provided by the centre, was always found to be most useful.

The most popular using and applying mathematics task seen was the 'Number Grid' task although submissions were received for all of the board set tasks. Much of the work received from individual centres was very similar, especially on the 'Number Grid' task. The similarity of the work made it difficult to differentiate between the responses of different candidates.

In a number of cases, the work was more repetitive than developmental so that most of the marks were awarded on the first few pages and subsequent work did little to develop the task further. In particular, the emphasis on collecting information rather than analysing information was particularly prevalent in tasks such as "Trios" and "Round and Round".

The most popular handling data task was "Read all about it" and candidates made good progress by providing comparisons between different types of newspapers and magazines. However the task was rarely extended further to produce a substantial task, and, even where candidates considered word length and sentence length, the work was rarely pulled together.

Too much work presented was repetitious and showed little evidence of any statistical thinking or development. Centres are reminded that it is not a requirement of coursework that newspaper and magazine articles are laboriously copied out by hand – original copies are quite acceptable.

The 'Guestimate' task was a popular alternative providing opportunities for sampling to take place but rarely giving sufficient detail on how this happened. 'Reaction Times' and 'Pulse Rates' were common cross-curricular activities, but small (convenience) samples and insufficient comment on how sampling was undertaken, often limited the marks under the first strand.

Annotation and further information

Annotation is not required for work submitted under this version but any information about how the task was undertaken or any comment to explain the candidates mathematical and statistical thinking will be considered by the examiner in the marking of the work.

Further Support

Centres are reminded that further support and advice are offered at the AQA standardisation meetings (Option T) which take place in the autumn term. These meetings are designed to give further elaboration and clarification of the assessment criteria as well as providing benchmark material for centres to use.

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

Further Information

The following statement has been issued on behalf of all Awarding Bodies in England, Wales and Northern Ireland;

This year there has been a change to the coursework requirement for all GCSE Mathematics specifications in that two tasks are now mandatory. The previous practice of marking the two pieces against the assessment criteria and selecting the better mark in each of the three strands no longer applies and all six strand marks now count (there are new criteria for the Handling Data task).

Previously the agreed notional grade boundaries for grades A, C and F were 20, 14 and 8 respectively out of 24 and this would suggest revised boundaries of 40, 28 and 16 out of 48 for the current year. In order to alleviate any initial problems encountered by the changes to the coursework requirement all Awarding Bodies have agreed to set reduced boundaries for the June 2003 examinations with A, C and F being fixed at 37, 26 and 14 respectively. These boundaries have been agreed for 2003 and it should not be assumed that they will remain at this reduced level in future years.

Mark Ranges and Award of Grades

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

Foundation tier written papers (32,315 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1F	100	100	40.6	15.9
3301/2F	100	100	49.9	14.4

Grade	Max. mark	D	E	F	G
3301/1F scaled boundary mark	100	58	44	30	16
3301/2F scaled boundary mark	100	62	49	37	25
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 (66,806 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1I	100	100	47.7	16.7
3301/2I	100	100	53.7	18.0

Grade	Max. mark	B	C	D	E
3301/1I scaled boundary mark	100	64	47	33	19
3301/2I scaled boundary mark	100	68	51	36	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 (30,412 candidates)

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/1H	100	100	55.5	20.0
3301/2H	100	100	59.7	18.7

Grade	Max. mark	A*	A	B	C
3301/1H scaled boundary mark	100	78	59	40	22
3301/2H scaled boundary mark	100	79	60	41	23
Uniform boundary mark for each written paper	240	216	192	168	144
Uniform boundary mark for the Foundation tier overall	600	540	480	420	360

Coursework (centre assessed) (103,950 candidates)

Grade	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/TC	48	48	26.6	10.3

	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) (25,583 candidates)

Grade	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3301/XC	48	48	22.8	8.1

	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: Option T

Foundation tier (26,531 candidates)

	D	E	F	G
Cumulative %	10.9	46.2	76.7	91.9

Intermediate tier (51,600 candidates)

	B	C	D	E
Cumulative %	17.9	54.3	83.8	96.7

Higher tier (25,819 candidates)

	A*	A	B	C
Cumulative %	13.4	45.8	82.5	97.7

Overall (103,950 candidates)

	A*	A	B	C	D	E	F	G
Cumulative %	3.3	11.4	29.4	51.2	68.7	84.1	91.9	95.8

Provisional statistics for the award: Option X

Foundation tier (5,784 candidates)

	D	E	F	G
Cumulative %	11.1	47.5	77.7	92.8

Intermediate tier (15,206 candidates)

	B	C	D	E
Cumulative %	11.6	45.8	77.8	93.6

Higher tier (4,593 candidates)

	A*	A	B	C
Cumulative %	10.1	39.6	77.7	96.3

Overall (25,583 candidates)

	A*	A	B	C	D	E	F	G
Cumulative %	1.8	7.1	20.8	44.5	66.1	83.6	90.5	93.9

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).

Uniform Mark: a score on a standard scale which indicates a candidate's performance. The lowest uniform mark for grade A* is always 90% of the maximum uniform mark for the component, similarly grade A is 80%, grade B is 70%, grade C is 60%, grade D is 50%, grade E is 40%, grade F is 30% and grade G is 20%. A candidate's mark for each component is converted to a uniform mark and the uniform marks for the components are added in order to determine the candidate's overall grade. By agreement with the regulatory authorities, overall grades are restricted to the range available for the tier of entry. Thus, on the Intermediate tier (grade range B-E) a candidate who obtains a total uniform mark above the grade A threshold will receive grade B, while a candidate who obtains a total uniform mark below the grade E threshold will be Unclassified.