Examiners' Report November 2007

IGCSE

IGCSE Mathematics (4400)

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November 2007

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There was an entry of approximately 1450 candidates (350 Foundation and 1100 Higher) who found all four papers to be accessible and gave them the opportunity to show what they knew, an opportunity taken by the majority of them.

Centres should remind candidates that, as papers are now marked online, working should not be shown outside the designated area on the paper, in blank areas or on the formula sheet. If a candidate runs out of working space, a supplementary sheet should be used. Candidates should also be advised that an HB pencil, which is not too sharp, should be used for graphs, constructions and drawings. It is also important that candidates should use only black pens (or blue, but this is less satisfactory) and make sure that pencil drawing is not faint. The writing on some scanned scripts was difficult to read.

Candidates should be aware that, when geometrical reasons are required, the terms 'alternate angles' and 'corresponding angles' should be given, rather than 'Z angles' and 'F angles', which are not now accepted. The term 'C angles', used instead of 'allied angles' or 'co-interior angles', was accepted on this occasion but will not be in future.

IGCSE Mathematics 4400
Paper 1F

Introduction

There was some evidence of good basic skills, and the standard of algebra was often reasonably good. Questions requiring "backwards" methods (11(b) and 12(b)) were not well answered. Trial and Improvement methods were, happily, not greatly in evidence. Where they were seen, they often failed to result in fully correct answers. Centres should note that as from May 2008, Trial and Improvement methods, even when leading to correct answers, may not be awarded any marks.

Report on Individual Questions

Question 1

Most parts of this question were answered correctly by most candidates. 27 was sometimes given as the answer to either (d) or (f).

Question 2

Part (a) was well answered. Answers in part (b) often included (i) 4 and/or (ii) 2.

Question 3

This question was well answered, with very few errors.

Question 4

Parts (a) to (e) were generally answered correctly, with a few candidates giving USA for (d) and a few drawing a bar of height just less than 12.5% in (e). In (f) the usual errors were common, such as $4.6/30\,000 \times 100$ and $4.6 \times 30\,000$ without $\div 100$.

Question 5

A few candidates gave 52 + 73 = 125.

Question 6

In (a) diameter was usually given, although radius was also seen. Answers to (b) varied and included sector and tangent.

Question 7

(a) This was well answered
(b) Many candidates gave 5.7 or 6.3. Others found the mean.
(c) Both parts were generally well answered. A few candidates had a denominator of 5. Perhaps this was due to miscounting or perhaps it showed a misunderstanding of the phrase " . . is taken at random.".

Question 8

This question was well answered except for many cases of $2 \times 65 + 5 = 135$ in (a)(ii).

Question 9

(a) This part was well answered.
(b) Many candidates attempted to include the values from (a) in their answer, e.g. $5x + 7y$. Others just gave $x + y$. Many gave a numerical answer.

Question 10

(a)(i) and (b)(i) were well answered.

(a)(ii) Some candidates rounded to three significant figures. Others gave incorrect roundings such as 2.455.
(b)(ii) Many candidates gave 79 or 79.5 or 79.51.

Question 11

(a)(i) This was well answered on the whole.
(a)(ii) Some candidates found the surface area. Others multiplied $2.5 \times 1.2 \times 80$.
(b) Few candidates understood how to approach this part. Many carried out some sort of area calculation. Some included 0.8. Many multiplied 2.1 by some combination of numbers.

Question 12

Some candidates understood the context well and answered part (a) and possibly (b) well. Others tried some sort of proportion method based on £45 for 200 km. In (b) many candidates omitted to subtract £45.

Question 13

(a) This was well answered. A few candidates started with $3x = 23$. Others obtained $3x = 15$ but then gave $x = 3$.

(b) Many candidates failed to understand the significance of the bracket. Some started with $5y = 31$ or $y + 4 = 30$. Others replaced $y + 4$ by $4y$.

Question 14

Many candidates assumed that the triangles were equilateral. This led to $y = 60$ in (b) by a correct method, but credit could only be given here if the method was shown. Some found 72^o in (a) then halved it in the hope of finding x. In (b) some just subtracted their answer to (a) from 180^o.

Question 15

The usual incorrect methods were common: 20/4, 20/10, 46/4 and 46/10.

Question 16

(a) was usually correct allowing for many extraordinary spellings such as "Icoles".

(b)(i) Many candidates appeared not to appreciate what an "equation" is, giving merely an expression for the perimeter. Others wrote "= P", or similar, after their expression. Some candidates wrote $2x + 2x + x = 12$, but not realising that this is the answer, they went on to simplify until they had obtained what they felt was actually an "equation". A common error was $4x + 2 = 12$, as was $x = 4x + x$. Following multiplication rather than addition, x^2 appeared frequently.

(b)(ii) Those who answered (a) correctly, usually also answered (b) correctly. Some who failed to find the equation in (a) did so in (b).

Question 17

(a) Many different answers were seen, such as 16 : 12, $^4/_3 : 1$, 1: 0.75 and just $^4/_3$ or $1^1/_3$.

(b) This was well answered by many candidates. Others found 160% of 280 or did $280 \times 100 / 160$. Many just found $^{160}/_{280}$, omitting "× 100".

Question 18

(a) This was well answered on the whole. Afew found an area without using π.

(b) Some found $\pi \times 1^2$. Others tried $\pi \times 3^2 - \pi \times 1^2$.

(c) $2\pi \times 2$ appeared, and sometimes $2\pi \times 3 - 2\pi \times 2$, or even $2\pi \times ½$, possibly halving the width of the path as a value for r.

Question 19

This straightforward trigonometry question was sometimes answered correctly to the required level of accuracy, though notation was often poor. A few candidates used the sine rule. A few used cosine. Some found $\sin a = 0.352$ and then gave $a = 35.2$ or 0.352. A significant proportion of candidates did not use trigonometry, and $a^2 = 2.5^2 + 7.1^2$ was common. As usual, some candidates used a two-step method involving Pythagoras and either cos or tan. These candidates often lost accuracy through premature rounding.

Question 20

(a) Many candidates found $A \cap B$. Others gave 1, 2, 3, 4, 2, 4, 6, 8.
(b) Some candidates gave 1, 2 only. Others gave 1, 2, 9, 10.

Question 21

This was well answered. A few candidates found P(Bull's Eye) = 0.1 correctly, but stopped there. Others found the correct answer but subtracted it from 1. A few candidates found 0.1 × 0.3 . Others misunderstood the requirement and gave two separate answers, usually 0.1 and 0.3.

Question 22

(a) Some answers were left as w^{10}/w^2 whilst in other cases an attempt was made to cancel this fraction to w^5/w^1, giving either w^5 or w^4 as the answer. Another common attempt was w^{21}/w^2.
(b) Some candidates multiplied x by either 7 or 17. Others gave $17 - x = 3$ as the first step. Many achieved $17 - x = 21$ and some of these finished correctly but others made a sign error, leading to $x = 4$ or $x = 38$.
(c) Some candidates solved the inequality an equation; some then gave the answer as an inequality whilst others did not. Strangely, there were some candidates who solved the inequality correctly, as an inequality, but gave the final answer as $y = 2.75$ or just 2.75 . There were some arithmetic errors and odd cases of $<$ becoming $\leq$ or $>$.

IGCSE Mathematics 4400
Paper 2F

Introduction

This paper made appropriate demands of candidates and all questions had encouraging success rates. Most candidates showed their methods clearly and presented their working neatly.

Report on Individual Questions

Question 1

Errors were rare in parts (a) and (b). Part (c) also caused few problems, although 4878 was occasionally rounded to the nearest hundred, instead of to the nearest thousand. In part (d), 180 appeared with some regularity but most candidates correctly gave the difference as 520, −520 also being accepted. The majority were, in part (e), able to express 11% both as a fraction and as a decimal.

Question 2

In parts (a) and (b), only part (b)(iii) caused any difficulty, albeit to only a minority who, even though any number, including non-integers, between 25 and 30 was accepted, gave an answer, usually 30, outside this range. Parts (c) and (d) were usually correct. Those who did not gain full marks in part (d) often scored one mark for the unsimplified fraction $\frac{14}{35}$. Part (e) was harder but still well answered, although a minority misinterpreted the question and shared 72 in the ratio
6 : 7.

Question 3

In all three parts, the majority of candidates stated the correct unit, or its abbreviation, but a range of incorrect units, both metric and imperial, also appeared. In the first part, centimetres were the most common wrong answer while, in the second part, milligrams were popular, although ounces had some support. It was, however, in the third part that imperial units were most in evidence, ‘feet’ appearing regularly.

Question 4

Almost every candidate read the scale accurately in part (a). Most marked 2.48 correctly in part (b)(i) but a surprising number of arrows were drawn between 2.44 and 2.45. In part (b)(ii), the value of 8 could be given as a fraction, as a decimal or in words and there were many correct answers but it was not unusual to see ‘tenths’ or ‘units’. Part (b)(iii) was well answered and, on the rare occasions that anything other than 2 appeared, it was usually 2.5 or 3. The errors in part (c) were almost always notational (2.48½ or 2.48.5) but were made by only a few candidates.

Question 5

In the first part, most candidates were familiar with the names 'cube' ('cuboid' was also accepted) and 'cylinder' but 'prism' was much less widely known. 'Hexagon' was a popular answer and inventive candidates used this as a basis for coining new names such as 'hexaclone', hexagonoid and 'hexcilinder'.
In the second part, the number of faces of a cube was almost always correct but the number of edges of a hexagonal prism was frequently given as 12 and occasionally as 6.

Question 6

Every part of this question was well answered. The vast majority of candidates found the next term of the sequence accurately in part (a) and the success rate for the explanation in part (b) was almost as high. 'Double' or 'multiply by 2' appeared most regularly but there were several acceptable alternatives including 'Add each number to itself' and 'The gap doubles each time.' Part (c) was usually correct, most candidates realising that halving was required, and there was a wide variety of successful responses to part (d)., often based on the fact that 513 is odd or that the terms of the sequence are even, although there were other possible explanations, such as '512 is in the sequence.' and '513 ÷ 2 is not a whole number.'

Question 7

The majority simplified $d + d$ correctly but d^2 was a common wrong answer. $p \times q \times 6$ was usually simplified correctly but pq^6 appeared occasionally. The remaining two parts, though more demanding, were also well answered but produced more incorrect expressions. In part (c) both $11x - 2y$ and $3x - 2$ were in evidence, while, in part (d), both $5n$ and $6n$ were popular with some support for n^6 and $5n^2$.

Question 8

Ordering whole numbers and directed numbers in the first two parts proved very straightforward but ordering decimals in the third part led to many errors. These had no obvious patterns, although it was noticeable that a substantial proportion of candidates believed that 0.7 was the largest number. Many gained full marks in the final part and few failed to score at least 1 mark, either for writing three of the numbers in the correct order or for correctly converting either a fraction or the percentage to a decimal. A common misconception was that 30% is greater than 0.35.

Question 9

Both parts had a high success rate, the most common reason for loss of marks being confusion between perimeter and area. An answer of 43 (28 + 15) appeared occasionally for the perimeter.

Question 10

Few candidates failed to score the mark in part (a), usually for an answer of 0, although $\frac{0}{3}$ and $\frac{0}{100}$ were also accepted. 'Impossible' and 'No chance', however, were not. There were many complete lists in part (b), although it was not unusual to see only six combinations listed, often the result of omitting the repeated pairs of values (1, 1), (2, 2) and (3, 3).
There were many correct probabilities in part (c). Some candidates did not appreciate the link with part (b) and started again, often with $\frac{2}{3}$.

Question 11

The first two conversions were usually correct, although very occasionally division by 2.61 was used in part (a) and multiplication by 1.45 in part (b). The third conversion was more demanding but was nevertheless performed accurately by the majority of candidates. The most likely answers resulting from unsuccessful attempts were 166.47 euros (630 ÷ 2.61 ÷ 1.45) and 913.5 euros (630 × 1.45). Some candidates whose method was correct lost a mark for inappropriate rounding, either in their working or in giving their answer. Others did not show any working and, despite giving answers very close to the correct answer, failed to score any marks.

Question 12

There were many correct solutions to the equation in the first part, although $4x = 3$ sometimes led to the solution $x = \frac{4}{3}$. In the second part, there was great variation in candidates' knowledge of the conventions for representing inequalities on a number line. Even limited knowledge was rewarded, 1 mark out of 2 being awarded for an open circle at −2 or a solid circle at 3.

Question 13

Part (a) was well answered, the most popular method using firstly the fact that opposite angles of a parallelogram are equal and then the angle sum of a quadrilateral. 180 − 64 also appeared regularly as working. Occasionally, it was apparent from additions to the diagram that corresponding angles and the sum of the angles on a straight line were being used but usually there was no clue to its source. Perhaps candidates were using allied angles or perhaps they merely realised the answer had to be an obtuse angle. The most common wrong answer was 64°, the strategy of writing the given angle as the answer being unsuccessful on this occasion. Part (b) proved far from trivial and 16° (64° ÷ 4) appeared often. In parts (c) and (d), though, there were few errors.

Question 14

The majority of candidates found the pie chart angle correctly in the first part, the most common wrong answer being 23.3° $\left(\frac{35}{150} \times 100\right)$, the percentage of Medium grade eggs, which earned 1 mark for $\frac{35}{150}$.

In the second part, candidates were expected to work out $\frac{55}{150} \times 60$ but many did not appreciate this. 18, obtained by ignoring the 60 altogether and finding $\frac{4}{12} \times 55$, was a very popular wrong answer. 20 $\left(\frac{1}{3} \times 60\right)$ also appeared regularly. Candidates with this answer possibly misinterpreted the significance of 'estimate' and approximated $\frac{55}{150}$ to $\frac{1}{3}$ but, more likely, they used the fact that 4 months is $\frac{1}{3}$ of a year.

The third part was fairly well answered but candidates who used inconsistent values in the Large and Medium weight ranges scored no marks. Even end points used consistently, which

occurred quite often, scored 1 mark, as did the use of 67.5 and 57.5 or 68.5 and 58.5 but halfway values of 68 and 58 were needed for full marks.
In the final part, an acceptable explanation had to refer to the problem arising with either Small eggs or Extra Large eggs, for example, 'There is no upper limit for Extra large eggs.' Many candidates did not realise this. Some just commented in a general way about the inaccuracy of the estimate or the wide ranges for all grades but the most common misconception was that it was necessary to know the weight of each egg, in order to work out an estimate of the total weight. The provision of a single answer line and a mark allocation of 1 should have suggested that only a brief explanation was necessary but some candidates did not allow this to restrict them. For all reasons and explanations, conciseness is advisable.

Question 15

In part (a), very few failed to give the value of x correctly, although both 71° and 109° appeared occasionally, but giving the reason proved much more demanding and only a minority were successful. To score this mark, a recognisable attempt at 'alternate' was required. Some latitude was allowed but 'Z angles' was not accepted. The other most common wrong reasons referred to 'corresponding angles', 'opposite angles' or 'parallel lines'.
In part (b), a substantial proportion of candidates found the size of the angle accurately but many of these failed to give any reasons or gave insufficient or incorrect reasons. Candidates should be encouraged to make their reasons brief and to the point; 'mini essays' are not appropriate. It was not unusual to see evidence of confusion between alternate angles and corresponding angles. Several approaches were possible but, whichever one was used, the two or three reasons relevant to that approach were expected. 'Z angles' and 'F angles' were not accepted as reasons. On this occasion, 'C angles' was accepted as equivalent to 'allied angles' or 'co-interior angles' but will not be in future.

Question 16

The majority of candidates evaluated the expression accurately. Of those who did not, many scored 1 mark for showing the value of either 5.9 − 4.3 or 1.3 + 1.2 correctly. The most common wrong answers were 4.18 $\left(5.9 - \frac{4.3}{1.3 + 1.2}\right)$ and
3.79 (5.9 − 4.3 ÷ 1.3 + 1.2).

Question 17

Both factorisations, especially the first, were done well. Some candidates clearly did not understand the requirements of the question, resulting in answers such as 4 and $-15x$ for the first part and $6y^3$ and $7y^2$ for the second part.

Question 18

Many candidates described the transformation fully. A minority either failed to mention the mirror line or gave it as the line $y = 4$ or $4x$, instead of $x = 4$. A few gave 'mirrored' or 'flip' instead of 'reflection' and these terms received no credit. Irrelevant extra information, for example, mention of symmetry, accompanying a correct answer was ignored but, if a second transformation were mentioned or implied, no marks were awarded, as a **single** transformation was specified in the question.

Question 19

This question had quite a high success rate, the unsuccessful minority usually giving an answer of 330, 235 or 655. The first of these came from $\frac{420}{56} \times 44$, which gives the number of boys. Of course, this method received full credit if the number of girls were then added, but not otherwise, although $\frac{420}{56}$ gained 1 mark. 235 is the rounded value of 56% of 420 and may have resulted from misreading, and simplifying, the question. 655 was obtained by candidates who, having obtained 235, possibly realised that it was not a sensible answer and added 420 to it.

Question 20

There were many completely correct constructions. Candidates drawing an arc with centre B cutting AB and BC scored 1 mark but those who drew their angle bisector first and then drew some spurious arcs as their 'construction' gained no credit.

Question 21

The table was completed correctly by a high proportion of candidates. Predictably, errors were most likely for negative values of x, −11 and −6 appearing regularly as the values of y when $x = -3$ and $x = -2$ respectively. Also, a minority either made their y values equal to the x values or entered y values which, when plotted, gave other straight line graphs.
Many candidates plotted the points accurately and drew the correct curve. Occasionally, though, points were joined with straight lines, which was penalised.

Question 22

The majority of candidates were used Pythagoras' theorem correctly and few failed at least to start with $4.9^2 + 16.8^2$. Occasionally, candidates evaluated this expression but did not find its square root. Otherwise, apart from a handful of candidates who started with $16.8^2 - 4.9^2$ or simply added 4.9 and 16.8, there were no regular errors.

IGCSE Mathematics 4400
Paper 3H

Introduction

Most candidates showed competence in a good number of the topics tested on this paper. Performance on individual questions showed a wide variation, from excellent answers which were presented clearly and accurately to weak attempts showing little understanding. In this respect the paper seemed to offer sufficient for the more able candidates whilst allowing all but the weakest to demonstrate some success.

Report on Individual Questions

Question 1

This question was well answered by many candidates, although some assumed that the triangles were equilateral. This led to $y = 60$ in (b) by a correct method, but credit could only be given here if the method was shown. In (a) some found 72° then halved it in the hope of finding x. In (b) some just subtracted their answer to (a) from 180°. Some candidates attempted to use $180 \times (n - 2)/ n$, but these often made errors such as omitting the "-2" or using 360 instead of 180. The more straightforward start using 360/5 was more productive. Some candidates stopped at $x = 72^{\circ}$.

Question 2

The usual incorrect methods were common: 20/4, 20/10, 46/4 and 46/10.

Question 3

(i) A few candidates appeared not to appreciate what an "equation" is, giving merely an expression for the perimeter. Others wrote "= P", or similar, after their expression. Some candidates wrote $2x + 2x + x = 12$, but not realising that this is the answer, they went on to simplify until they had obtained what they felt was actually an "equation". A common error was $4x + 2 = 12$, as was $x = 4x + x$. Following multiplication rather than addition, x^2 appeared frequently.

(ii) Those who answered (a) correctly, usually also answered (b) correctly. Some who failed to find the equation in (a) did so in (b).

Question 4

(b) This was well answered by most candidates. A few found 160% of 280 or did $280 \times 100 / 160$. Some just found $^{160}/_{280}$, omitting "× 100".

Question 5

(a) This was well answered on the whole.

(b) Some found $\pi \times 1^2$. Others tried $\pi \times 3^2 - \pi \times 1^2$. A few used $2\pi r$.

(c) $2\pi \times 2$ appeared, and sometimes $2\pi \times 3 - 2\pi \times 2$, or even $2\pi \times \frac{1}{2}$, possibly halving the width of the path as a value for r.

Question 6

Most candidates had no difficulty with this question, although notation was often poor. A few candidates used the sine rule. Some gave the answer to only two significant figures. A few used cosine. Some found sin $a = 0.352$ and then gave $a = 35.2$ or 0.352. A small proportion of candidates did not use trigonometry and $a^2 = 2.5^2 + 7.1^2$ was sometimes seen. As usual, some candidates used a two-step method involving Pythagoras and either cos or tan. These candidates often lost accuracy through premature rounding.

Question 7

(a) Some candidates found $A \cap B$. Others gave 1, 2, 3, 4, 2, 4, 6, 8.

(b) Some candidates gave 1, 2 only. Others gave 1, 2, 9, 10.

Question 8

This was well answered. A few candidates found P(Bull's Eye) = 0.1 correctly, but stopped there. Others found the correct answer but subtracted it from 1. A few candidates found 0.1×0.3 . Others misunderstood the requirement and gave two separate answers, usually 0.1 and 0.3.

Question 9

(a) Some answers were left as w^{10}/w^2 whilst in other cases an attempt was made to cancel this fraction to w^5/w^1, giving either w^5 or w^4 as the answer. Another common attempt was w^{21}/w^2.

(b) A few candidates multiplied x either by 7 or 17. Others gave $17 - x = 3$ as the first step. Many achieved $17 - x = 21$ and some of these finished correctly but others made a sign error, leading to $x = 4$ or $x = 38$.

(c) Some candidates solved the inequality an equation; some then gave the answer as an inequality whilst others did not. Strangely, there were some candidates who solved the inequality correctly, as an inequality, but gave the final answer as $y = 2.75$ or just 2.75 . There were some arithmetic errors and odd cases of $<$ becoming $\leq$ or $>$.

Question 10

A disappointing number of candidates changed all four numbers into ordinary form, although this was wholly unnecessary.

(a) This was usually answered correctly. A few candidates gave Africa.

(b) This was also well answered. A few candidates rounded 1.114 to 1.12. Some gave the answer as 11.14×10^9. A few added each part of the standard form separately to give $1.87 \text{ x } 10^{36}$.

(c) There were many correct answers, though some candidates divided upside down. A few added, subtracted or even multiplied.

Question 11

There were many good answers to this question but some candidates obtained $4x = y + 7$ or $2x = 7 - y$.

Question 12

Many candidates gave clear and accurate answers to the whole question, but there were also plenty of mistakes. Using a rounded value of 7.3 from (a) was common, leading to an inaccurate answer of 1.72 cm for *CD*. Some wrote $BC = 8 \sin 25$ and others assumed that angle *CBD* was 25°. Some added $7.5^2 + 7.25^2$ when applying Pythagoras, showing no concern that it gave a result greater than the hypotenuse. A few forgot to take the square root.

Question 13

(a) Most candidates were successful here. Some common errors were $x(x - 100)$, $x \times x - 10 \times 10$ and $(x - 10)^2$.

(b) This was usually answered correctly. A few candidates made sign errors.

(c) This part was also very well answered.

In (b) and (c) some candidates went on to solve the corresponding quadratic equation. A few did this from the start, without factorising, and hence gained no marks.

Question 14

Many candidates completed the solution concisely and accurately. A significant minority made mistakes with signs and/or arithmetic. Many chose a route other than the simple doubling of the first equation. Some failed to multiply all terms when trying to achieve a pair of equal coefficients. It was usually the constant term that was forgotten but a first step of $8x + 5y = 16$, $8x + 3y = 11$ was also seen. It was not uncommon to see equations added rather than subtracted. There were some attempts to "cancel" one of the variables, giving $2x + 5 = 16$, $4x + 3 = 11$. Some candidates used a substitution method, often successfully, although arithmetical errors were common.

Question 15

A common mistake was to find $^{50}/_{360} \times \pi \times 12^2$ and no more. The triangle area formula $\frac{1}{2} \times 12 \times 12 \times \sin 50$ appeared surprisingly often. A few candidates used an incorrect fraction of the whole circle, often $^{1}/_{6}$ or $^{5}/_{6}$ or $^{12}/_{360}$.

Question 16

(a) This relatively innocent question caused difficulty. Many candidates embarked on long and complicated algebra, often incorrect, undeterred by the small working space provided. Inserting "= 1" or "= 0" was common, creating an equation which, at best, was dealt with by cross multiplication. The "=" was sometimes dropped again in the final answer, leading to expressions like $(x - 3)(x - 2)$ (from simplifying the "= 1" equation) and $(x^2 - 3x)(2x - 6)$. Others just treated the original sum as an equation and "cross-multiplied". Incorrect cancelling was common, such as
$\frac{x^2 - 3x}{2x - 6} = \frac{x^2 - x}{2x - 2} = \frac{x - x}{2 - 2}$ which was usually simplified to 0 or 1,
or $\frac{x^2 - 3x}{2x - 6} = \frac{x^2 - x}{2x - 2} = \frac{x(x - 1)}{2(x - 1)} = \frac{x}{2}$, which is, unfortunately, the correct answer.
Worse still was a failure to understand the idea of like and unlike terms in working such as $\frac{x^2 - 3x}{2x - 6} = \frac{-3x^3}{-4x}$. Better candidates completed the factorisation but not all of them cancelled. The best candidates gave clear and concise answers.

(b) Only the better candidates achieved any success in this part. Even those who gained both method marks were not always able to finish, often making a sign error, trying to cancel $(x - 1)$ to give $(2x - 3)/x$, or trying to simplify the correct answer further. Many candidates obtained the correct denominator, but attempted too much "in their head" and obtained a numerator of $2x - 3x - 1$. The denominator was sometimes ignored completely. Other candidates formed a common denominator by adding to give $2x - 1$ or subtracting to give -1. Similarly -1 or 5 were not unusual as numerators.

Question 17

(a) The tree diagram was done well. Occasional candidates merely filled in ¼ on the dotted line; just a few failed to create the correct structure for the tree, typically either branching from the goal outcome only or just putting one line from each of the previous outcomes. A few missed out the labels or probabilities, and a small number used incorrect probabilities, including values that did not total 1 for each branch. A few used a bogus "without replacement" method, with $^3/_4$ becoming $^2/_3$ on the second pair of branches.

(b) Those with correct trees were most successful in (b). In (i) a few candidates added ¾ + ¾ , not worrying about the magnitude of the result and in (ii) the second option ($^1/_4 \times ^3/_4$ or vice versa) was sometimes missed.

(c) This part discriminated well between the able and the very able candidates. Extended diagrams were often used well but some candidates appeared to use binomial theory directly. Not accounting for all combinations was a main source of error, whilst poor arithmetic spoilt the attempts of many weaker candidates. The wording of the question unfortunately led some candidates to consider 5 shots rather than just 3. These were frequently the stronger candidates, some of whom calculated the appropriate result correctly and scored full marks, although many failed to take account of all 15 possible routes.

Question 18

(a) This was well answered, with only a few candidates giving 68.4, 68.05, 68.49 or 69.

(b) The intention of the question is unambiguous yet nearly all candidates were misled by the word *greatest*, proceeding to calculate 1250/67.5, some rounding the result up and some down and some not at all. This was far from the only problem, however. 1200 was frequently used, and there were plenty of other variations such as 1200.5, 1240 and 1195.95 . Similarly, numbers like 68, 68.4 and 68.05 were also used. It was slightly reassuring that correct answers were usually clear and supported by well argued reasoning, in contrast to most of the wrong answers.

Question 19

The question seemed to discriminate well between candidates of varying ability. Strong candidates gave concise and accurate solutions. Weaker candidates often fell at the first hurdle, typically assuming $P = kw$ or $P = w^3$. In (a) some able candidates wrote $P = kw^3$, found k correctly, but failed to write the equation with the value of k inserted. There were a few cases of inverse proportion. In (b) premature rounding frequently led to a value of 73.4. Weaker candidates made no real progress in (c). The main mistakes amongst those who did get started were of the type $k \times 10^3 = 2kw^3$ and $2k \times 10^3 = kw$. A few reached the correct statement $w^3 = 2000$, but then either took the square root of 2000 or gave 2000 as the answer.

Question 20

(a) This part was was frequently answered well

(b) Most candidates applied their answer to (a) well. Some used decimal values and, since a surd answer was specified in the question, could only gain 1 mark in this part. A few candidates used Pythagoras or even ½ ab sin C, but most candidates started with a sensible application of the cosine rule. A large number of candidates were unable to simplify correctly the expression obtained. Common mistakes were the omission of brackets in the term $2 \times 2(1 + \sqrt{3})\cos 60$ or the usual "collapsing" of the cosine rule ($(b^2 + c^2 - 2bc)\cos A$). Despite this, $PR^2 = 6$ was not too uncommon though numerous candidates obtained this only by decimal approximation rather than the required exact manipulation of surds. A few able candidates offered an alternative, neat solution: Let the perpendicular from P to QR meet QR at H. $PH = 2\sin 60 = \sqrt{3}$, then $QH = 2\cos 60 = 1$, $RH = (1 + \sqrt{3}) - QH = \sqrt{3}$, allowing Pythagoras in triangle PRH to give the required result.

Question 21

Some concise, elegant solutions were seen. However, many candidates wrote a mass of jumbled working to little effect. Perhaps the majority of candidates chose to work backwards from the given quadratic rather than try to establish it. It was not unusual for candidates to identify values of 0.2 and 0.8, although these were not needed. These often came from solving the equation although sometimes they just appeared. Many candidates thought that they had then finished, although a few went on to show that the solutions to the equation also satisfied what was required by the context, i.e. $2 \times 0.2 \times 0.8 = {}^{8}/_{32}$. Some solved the equation and then just verified that their solutions satisfied the equation! Only the more able candidates adopted a clear algebraic approach using $2p(1 - p) = {}^{8}/_{25}$, sometimes with the help of a tree diagram. Many of these derived the equation convincingly. Common errors amongst those adopting an algebraic approach were $p(1 - p) = {}^{8}/_{25}$ and $P(T) = (p - 1)$. Some of those who made such mistakes contrived to make their incorrect algebra provide the required equation. A few candidates observed that $1 - P(HH) - P(TT) = P(\text{one H})$, so $1 - p^2 - (1 - p)^2 = {}^{8}/_{25}$. Although this is no easier than the more usual approach, it does work out neatly.

IGCSE Mathematics 4400
Paper 4H

Introduction

The demands of this paper proved to be appropriate, many candidates achieving high marks. Methods were generally well explained and there were many commendable solutions to the more demanding questions at the end of the paper, such as Q26(b).

Report on Individual Questions

Question 1

The vast majority of candidates evaluated the expression accurately as either 0.64, which was the usual answer, or $\frac{16}{25}$. Of those who did not gain full marks, many scored 1 mark for showing the value of either $5.9 - 4.3$ or $1.3 + 1.2$ correctly.

Question 2

It was unusual to see an error in either factorisation.

Question 3

The currency conversion was performed accurately by the majority of candidates. The most likely answers resulting from unsuccessful attempts were 1134 euros ($630 \times 2.61 \div 1.45$), 913.5 euros ($630 \times 1.45$), 166.47 euros ($630 \div 2.61 \div 1.45$) and 2384.24 euros ($630 \times 2.61 \times 1.45$). Very occasionally, candidates whose method was correct lost a mark for inappropriate rounding, either in their working or in giving their answer.

Question 4

Most candidates described the transformation fully. A minority either failed to mention the mirror line or gave it as the line $y = 4$, instead of $x = 4$. A few gave ‘mirrored’ or ‘flip’ instead of ‘reflection’ and these terms received no credit. Irrelevant extra information, for example, mention of symmetry, accompanying a correct answer was ignored but, if a second transformation were mentioned or implied, no marks were awarded, as a **single** transformation was specified in the question.

Question 5

Only a small minority failed to score full marks. Of these, most gained 1 mark for $72 \div 6 = 12$, although a few misinterpreted the question and shared 72 in the ratio 6 : 7.

Question 6

In part (a), very few failed to give the value of x correctly but, although still well answered, giving the reason proved more demanding. To score the mark for this, a recognisable attempt at ‘alternate’ was required. Some latitude was allowed but neither ‘Z angles’ nor ‘alternate segment theorem’ were accepted. The other most common wrong reasons referred to ‘corresponding angles’, ‘opposite angles’ or ‘parallel lines’.
Similarly, in part (b), although there were many concise, correct solutions, some candidates found the size of the angle accurately but either failed to give any reasons or gave insufficient or

incorrect reasons. Candidates should be encouraged to make their reasons brief and to the point; 'mini essays' are not appropriate. It was not unusual to see evidence of confusion between alternate angles and corresponding angles. Several approaches were possible but, whichever one was used, the two or three reasons relevant to that approach were expected. 'Z angles' and 'F angles' were not accepted as reasons. On this occasion, 'C angles' was accepted as equivalent to 'allied angles' or 'co-interior angles' but will not be in future.

Question 7

In the first part, candidates were expected to work out $\frac{55}{150} \times 60$ and this is what many did. Of the candidates who received no credit, some found $\frac{1}{3} \times 60$, possibly misinterpreting the significance of 'estimate' and approximating $\frac{55}{150}$ to $\frac{1}{3}$ but, more likely, using the fact that 4 months is $\frac{1}{3}$ of a year. Others ignored the 60 altogether and found $\frac{4}{12} \times 55$, obtaining an answer of 18.

The second part was well answered but candidates who used inconsistent values in the Large and Medium weight ranges scored no marks. Even end points used consistently scored 1 mark, as did the use of 67.5 and 57.5 or 68.5 and 58.5 but halfway values of 68 and 58 were needed for full marks. A minority who, having obtained the correct answer 5294, divided it, usually by 83, were penalised.

A wide variety of explanations, both correct and incorrect, appeared in the final part. An acceptable explanation had to refer to the problem arising with either Small eggs or Extra Large eggs, for example, 'There is no upper limit for Extra large eggs.' Some candidates just commented in a general way about the inaccuracy of the estimate or the wide ranges for all grades but the most common misconception was that it was necessary to know the weight of each egg, in order to work out an estimate of the total weight. The provision of a single answer line and a mark allocation of 1 should have suggested that only a brief explanation was necessary but some candidates did not allow this to restrict them. For all reasons and explanations, conciseness is advisable.

Question 8

In part (a), a high proportion of candidates drew an open circle at −2 joined by a **single** line to a solid circle at 3, which was required for full marks. Of those who did not, many scored 1 mark out of 2 for either an open circle at −2 or a solid circle at 3. Of those who scored no marks, some either reversed the open and full circles while others gave answers which indicated some understanding of intervals but not familiarity with the conventions for representing them on number lines.

In part (b), the correct integers were almost always listed. When the list was incorrect, it was usually because either 0 or 1 had been omitted.

Question 9

There were many completely correct constructions. Candidates drawing an arc with centre B cutting AB and BC scored 1 mark but those who drew their angle bisector first and then drew some spurious arcs as their 'construction' gained no credit.

Question 10

Incorrect entries in the table were very rare. If they occurred, they were most likely for negative values of x, with −11 and −6 appearing as the values of y when $x = -3$ and $x = -2$ respectively. Many candidates plotted the points accurately and drew the correct curve. Very occasionally, points were joined with straight lines, which was penalised.

Question 11

This question had a high success rate, the unsuccessful minority usually giving an answer of either 330 or 235. The first of these came from $\frac{420}{56} \times 44$, which gives the number of boys. Of course, this method received full credit if the number of girls were then added, but not otherwise, although $\frac{420}{56}$ gained 1 mark. 235 is the rounded value of 56% of 420 and may have resulted from misreading, and simplifying, the question. Some candidates who obtained 235, possibly realising that it was not a sensible answer, added 420 to it.

Question 12

Errors were rare in the use of Pythagoras' theorem and few failed at least to start with $4.9^2 + 16.8^2$. Occasionally, candidates evaluated this expression but did not find its square root. Otherwise, apart from a handful of candidates who started with $16.8^2 - 4.9^2$ or simply added 4.9 and 16.8, there were no regular errors.

Question 13

There was a high proportion of correct solutions but, predictably, a popular wrong answer was 17892.3, obtained by finding 14% of 20 805 and then subtracting the result from 20 805. A few candidates either just worked out 14% of 20 805 (2912.7) or added 20 805 to this result and gave 23 717.7 as their answer.

Question 14

The majority of candidates were successful on part (a) but $6n$ was a popular wrong answer and there was some support for $5n$.
In part (b), the answer was usually correct, the only incorrect answers which appeared with any regularity being $3xy^2$ and $3xy^6$.
There was a high success rate for part (c), but a variety of wrong answers was seen, notably t^7.
If a candidate made an error in this question, it was most likely to be with the coefficient in part (d), $2p^6$ appearing very regularly.

Question 15

Apart from occasional reversal of the answers and attempts to use Pythagoras' theorem or trigonometry, the first two parts were very well answered. A version of the intersecting chords theorem, $AC \times CE = BC \times CD$, was used occasionally.
The last part provided a greater challenge, although many candidates obtained the correct answer using the most efficient method, which was simply finding the scale factor and squaring it. Others embarked on long, often doomed, ventures involving the cosine rule and the use of $\frac{1}{2} ab\sin C$. If carried out accurately, such methods were, of course, accepted but those who obtained the correct answer by an incorrect method, such as assuming that AE and BD intersect at right angles, went unrewarded.

Question 16

Part (a)(i) was almost always correct but there were three recurring incorrect answers in part (a)(ii), although it was still well answered. Some candidates read off a cumulative frequency of 44 and left this as their answer, failing to subtract it from 52. Others gave an answer of 6, as they subtracted 44 from 50 instead of 52. Reading from 70, instead of 75, led to an answer of 12.

Most candidates found the median correctly in the second part but those who used a cumulative frequency of 25 instead of 26 or 26½ received no credit for their answer. Candidates who misread the scale, usually giving 47.5 as their answer, could still gain a mark by using a correct cumulative frequency on their graph or by showing this value in their working but, as is normally the case, an incorrect answer without working scored no marks.

Question 17

Both parts were well answered using a variety of approaches. Some candidates used products of prime factors from factor trees or repeated division; others used lists or informal methods. A small number of candidates confused Highest Common Factor with Lowest Common Multiple.

Question 18

While many candidates gained full marks, knowledge of $y = mx + c$ varied quite widely. In part (a), attempts to rearrange $x + 2y = 6$ were often successful but it was not unusual to see $2y = 6 - x$ followed by $y = 6 - \frac{x}{2}$. The most common incorrect gradient was ½ . Even when the answer to part (a) was wrong, candidates could still score the mark in part (b), if the equation was correct for their numerical gradient.

Question 19

The first two parts had a high success rate, the only wrong values that appeared with any regularity being 2 (5 − 3) in part (i) and 15 (7 + 5 + 3) in part (ii). The third part proved more demanding but was nevertheless well answered. The most common wrong numerical answer was 5 $(n(P \cap Q'))$. An answer of Ø showed some understanding but could not be accepted. Incorrect answers, especially 7 $(n(P \cup Q)')$, outnumbered correct ones in part (iv).

Question 20

In the first part, most candidates differentiated accurately. Some went no further, other than perhaps differentiating again, but many went on to substitute $x = 2$ into their derivative and obtained 0 for the gradient. A minority, presumably having obtained the correct answer from a graphical calculator, inserted some incorrect working to support their answer and consequently gained no marks.

The second part was generally well answered, the majority of correct answers using the term ‘turning point’, although a variety of other answers was also accepted.

Question 21

Histograms were well understood by the majority of candidates and many scored full marks. In part (b), a minority confused frequency density with frequency and drew bars with heights 1.05 cm and 0.9 cm.

Question 22

The size of the angle in the first part was almost always correct but providing a reason proved less straightforward. The circle property 'Angles in the same segment are equal.', as it is stated in the specifications, was hoped for but less formal statements which gave evidence of a clear understanding of the property were accepted.
In the second part, the majority of candidates found the size of the angle correctly. Those who did not could still gain 1 mark for giving evidence that they knew that angle ADC (the angle in a semicircle) is a right angle, either by stating it or by marking it on the diagram.

Question 23

Many candidates scored full marks for the correct simplified expression for $fg(x)$ in part (a). Some of the rest understood the meaning of $fg(x)$ but failed to simplify their expression, leaving it as $3(2x-5)+2$. Those who did not understand the meaning of $fg(x)$ generally gave an answer of $6x-1$ ($gf(x)$), $5x-3$ ($f(x)+g(x)$) or $(3x+2)(2x-5)$ ($f(x)\times g(x)$).
Part (b) was also well answered, the majority of successful candidates using an algebraic method, either making x the subject of $y = 3x + 2$ or interchanging x and y and starting with $x = 3y + 2$. A minority used a flow diagram approach, usually obtaining the correct inverse function. Occasionally, $f^{-1}(x)$ was confused with $(f(x))^{-1}$.

Question 24

The majority of candidates interpreted the question correctly as conditional probability and many of these completed correct solutions, although it was not unusual to see the partial solution $\frac{3}{5}\times\frac{3}{4}=\frac{9}{20}$, that is, the only case considered was the one in which a black counter was transferred from Box A to Box B. The most common incorrect approach, used by only a small minority, led to the product $\frac{3}{4}\times\frac{2}{4}$, the fractions being the probability of taking a black counter from Box B when a black counter and a white counter respectively are transferred from Box A.

Question 25

There was a high success rate for the first part, the majority of candidates taking as their starting point $3x + x(4-x) = 11$ or $4x + x(3-x) = 11$, although some used $12-(4-x)(3-x) = 11$. Either intentionally or unintentionally, a minority of candidates, in their determination to obtain the given equation, included some incorrect algebra in their solutions. A few candidates solved the equation.
In the second part, many candidates found the solution of the quadratic equation using the formula a routine procedure but the interpretation of the solutions in the final part, although well answered, proved more searching and was not attempted by a sizeable minority. Of those who made an attempt, some thought that both values of x were physically possible but most understood the key point that lengths cannot be negative.

Question 26

In part (a), most candidates obtained the required result clearly and concisely, although some spurious algebra was evident in a few proofs. Part (b) was demanding and beyond the scope of weaker candidates but many able candidates produced pleasing proofs, finding an expression for the total surface area of the solid and then either showing that $l=\sqrt{r^2+r^2}=r\sqrt{2}$ or using the fact that $l > r$.

Statistics

Overall Subject Grade Boundaries – Foundation Tier

Grade	Max. Mark	C	D	E	F	G
Overall subject grade boundaries	100	72	57	42	27	12

Paper 1F

Grade	Max. Mark	C	D	E	F	G
Paper 1 grade boundaries	100	71	56	41	26	11

Paper 2F

Grade	Max. Mark	C	D	E	F	G
Paper 2 grade boundaries	100	73	57	42	27	12

Overall Subject Grade Boundaries – Hier Tier

Grade	Max. Mark	A*	A	B	C	D
Overall subject grade boundaries	100	84	65	46	27	15

Paper 3H

Grade	Max. Mark	A*	A	B	C	D
Paper 3 grade boundaries	100	86	66	46	27	15

Paper 4H

Grade	Max. Mark	A*	A	B	C	D
Paper 4 grade boundaries	100	83	64	45	27	15

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