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Examiners' Report

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IGCSE Mathematics 4400
Paper 3H

The candidates (almost 1100, 75% of them Higher tier) found the demands of all four papers reasonable and took the opportunity to show what they knew. Many questions had a high success rate and very few candidates were entered for Higher tier when Foundation would have been more appropriate. Working was generally well presented and methods clearly shown.

Introduction

This paper gave candidates the opportunity to demonstrate positive achievement and many gained high marks. Most of the questions proved accessible and had pleasing success rates although only a minority of candidates scored full marks on Q17(c) (Functions) and Q21(b) (Conditional probability). Methods were generally clearly explained and sufficient working shown.

Report on Individual Questions

Question 1

Although well answered, this question caused more problems than most others in the first half of the paper and it was not unusual for candidates to lose marks on this question, usually on part (b), and then go on to do very well on the rest of the paper.

In part (a), 250° (180° + 70°) appeared occasionally. In part (b), 134° (360° − 226°) was the most popular wrong answer and 44° (270° − 226°) also appeared regularly. No credit was given for answers such as 45° and 47° obtained by drawing as the instructions were to **work out** the bearing. Omission of the leading zero in the bearing was not penalised.

Question 2

Many candidates scored full marks, the only error which appeared with any regularity being the omission of the brackets in the expression for the height in the first part i.e.
$4x + 7$ instead of $4(x + 7)$.

Question 3

The only consistent error was with the selling price of each cake on Tuesday, 0.8 or 3.8 (4 − 0.2) sometimes being used instead of 3.2 (4 − 0.8). A minority had problems dealing with the unsold cakes but full marks were common.

Question 4

Errors were rare in part (a), the answer usually being given as a fraction, often $\frac{5}{12}$, but decimals and percentages were, of course, accepted.

In part (b), many candidates realised that the $15 \le x < 19$ interval was wider than the others and took 17 as the halfway value. Those who took 16 and used it correctly could still score 3 marks out of 4. Those using halfway values of 9.5, 11.5, 13.5 and 16.5 correctly could score 2 marks.

Question 5

The majority of candidates obtained the correct answer and many of the rest scored 2 marks out of 3 for an answer of 80% $\left(\frac{48}{60}\times 100\right)$. Occasionally, $\frac{60}{48}\times 100 = 125$ and $\frac{60}{100}\times 48$ resulted in answers of 25% and 28.8% respectively.

Question 6

The vast majority of candidates scored full marks. Those who did not usually shared £240 in the ratio 2 : 5 and gave an answer £171.43.

Question 7

Most candidates were able to simplify the inequality to $4x < 6$ but some lost a mark by then writing $1\frac{1}{2}$ or $x = 1\frac{1}{2}$ as the answer instead of $x < 1\frac{1}{2}$. A few solved $4x < 6$ as $x < \frac{2}{3}$.

Question 8

The majority found the probability (0.1) that Danielle will win the race and, although a few gave this as their final answer, most went on to use it correctly and gain full marks. A small minority multiplied 0.3 and 0.1, instead of adding them.

Question 9

Most used Pythagoras' theorem successfully in the first part. If a mistake were made in the second part, it was usually in calculating the area of the triangle, not failing to divide by 2, but using 13 cm as the "height". A less common, but still noticeable, error was the use of $\frac{1}{2}\times 5\times 12$ to find the area of a triangular face but there were many completely correct solutions.

Question 10

This was very well answered, although occasionally the reflection was in the *x*-axis or the rotation anticlockwise. When a **single** transformation is asked for, no marks are awarded if more than one transformation appears in the answer, even if the correct one is included.

Question 11

Although this question was quite well answered, familiarity with interquartile range varied widely. In part (a), the marks were sometimes not put in order and their total (72) used in a variety of ways. Unfortunately, it was possible to obtain the correct answer using the range, 8, and finding $\frac{3}{4}\times 8 - \frac{1}{4}\times 8$. Answers clearly obtained in this way received no credit.

In part (b), although comparisons such as "Class *B*'s marks were less spread." were hoped for, quantitative comparisons like "*B*'s median was 2 more than *A*'s median." were accepted. Some candidates used words like "they" and "it" without making clear which class they were referring to.

Question 12

Knowledge of $y = mx + c$ varied but it was well understood by the many candidates, full marks frequently being awarded. Very occasionally, the line $y = -2x + 1$ was drawn in the second part.

Question 13

A small minority gave their answers as decimals and received no credit. Most candidates scored the mark in the first part with an answer of $\frac{1}{8}$ but any equivalent fraction was accepted. $\frac{1}{2^3}$, however, was not. In the second part, $\frac{9}{343}$ $\left(\frac{27 \times \frac{1}{3}}{343}\right)$ sometimes appeared but the final part was usually correct.

Question 14

Few candidates were unable to score at least one mark on part (a) and many gained full marks on the whole question. In part (b), *y*, instead of $\frac{\mathrm{d}y}{\mathrm{d}x}$, was sometimes equated to 0 and answers of (4, 0) were not unusual, the *y*-coordinate resulting from the substitution of $x = 4$ into $5000 - 1250x$. In part (c)(ii), any reasonable explanation was accepted e.g. “a negative parabola” and the evaluation of $\frac{\mathrm{d}y}{\mathrm{d}x}$ for values of *x* on each side of $x = 4$. Finding $\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} = -1250$ and the comment that this is negative was, of course, accepted, even though knowledge of this approach is not included in the specifications. In part (d)(ii), candidates were expected to relate their answer for part (i) to the context with comments such as “This price gives the greatest profit.”

Question 15

Many candidates gained full marks but the others made a wide variety of errors. The most frequent one was failing to halve the volume of a sphere to find the volume of the hemisphere. The information on the formula sheet was not always used correctly or, perhaps, it was ignored. Thus, sometimes, volume of cone = $\frac{1}{2}\pi r^2 h$ was used or the formula for the surface area of a sphere used, instead of that for the volume. $V = \frac{4}{3}\pi r^2$ was seen regularly, either for the volume of a sphere or as the “simplified” form of $V = \frac{4\pi}{3} . \frac{r^3}{2}$. Even when the correct formula for the volume of a sphere was used, 3^3 was occasionally evaluated as 9.

Question 16

Few candidates failed to score at least one mark. If an error were made, it was more likely to be on the first part, with a wrong answer of $A \cap B = A$ or $A \subset B$, both of which suggested some knowledge of subsets. $A \cup B = \mathrm{E}$ was the most likely wrong answer to the second part.

Question 17

Parts (a) and (b) were well answered. In part (a)(ii), $-\frac{3}{4}$ and $\frac{-3}{-4}$ appeared sometimes; both scored no marks. In part (b), 0 was the most common incorrect answer. Those giving both 0 and 1 as their answer also scored no marks.

The algebraic manipulation in part (c)(i) was beyond all but the strongest candidates but there were a small number of elegant solutions. Even those starting with the expression $\dfrac{\frac{x}{x-1}}{\frac{x}{x-1}-1}$ frequently "simplified" it to 0, 1 or −1. In part (c)(ii), candidates were expected to state, either in words or symbolically, that f is its own inverse.

Question 18

Although, like Q17, the algebra is demanding, it was probably more familiar to candidates and the solutions of the simultaneous equations were found competently and accurately by many of them.

Question 19

$7-x$ was the simplest answer to the first part but any unsimplified expression, if correct, was accepted, as was a formula such as $n = 7 - x$ but not $x = 7 - x$.
In the second part, many scored one mark for marking 13, 6 and 9 correctly on the Venn Diagram but finding the value of x proved much more demanding. Arithmetical or trial methods were as likely to be successful as algebra. Some candidates trying to construct an equation used $6-x$ instead of 6, which led to 1 as the value of x. Those giving an answer of $x = -3$ would have been well advised to reflect on their answer.

Question 20

Areas of similar shapes is a topic that many students find difficult and part (a) was intended to help with part (b). In fact, it was not unusual to see part (b) answered correctly after an incorrect part (a). The most common wrong answer to part (a) was $1 : \frac{1}{2}k$ while, in part (b), $\sqrt{10}$ appeared regularly.

Question 21

As in Question 20, the aim of the first part was to help candidates with the second part. In this case, the first part was quite well answered, any expression, such as $n + 2n$, which is equivalent to $3n$ being accepted. $n + \frac{2}{3}$ was a regular wrong answer.

Only a minority answered the second part successfully and, although the first part directed candidates towards an algebraic method, the correct answer was obtained by trial methods as often as by building up an equation and solving it. Some candidates did not appreciate that this was a "without replacement" situation.

IGCSE Mathematics 4400
Paper 4H

Introduction

The majority of candidates showed a very good understanding of most of the mathematics tested in this paper and marks were generally high. For the ablest candidates, only Q15 and Q25(a) gave serious pause for thought. There were a few cases of candidates failing to show working and thereby losing method marks.

Question 1

Just a few candidates calculated 6.46 ÷ 1.8 + 1.6 = 5.18.

Question 2

(a) 6t + 5 was occasionally seen but most candidates obtained 6t + 15.
(b) Errors in the powers were sometimes seen.
(c) A few candidates clearly did not know how to remove brackets of this type. Some gave $2x$ instead of x^2. Others expanded correctly but then "collected up" incorrectly.
(d) This part was usually correctly answered.

Question 3

A few found 45 ÷ 4 = 11.25

Question 4

(a) P = n + 1 x 2 was probably the most common mistake. Those whose notation was slack in this way also tended to struggle with the rearrangement in part (b).
(b) Those who scored 3 marks for (a) tended to succeed in (b), although $n = {}^{(P-1)}/_2$ was common.

Question 5

This question was answered correctly by most candidates. Division by 7.45 (or 465 without considering units) accounted for almost all mistakes. Very few candidates failed to gain a mark for dividing by time.

Question 6

Some centres seemed more familiar with set notation than others. A few candidates insisted that 9 was a member of M (perhaps misunderstanding the '∈') and some invented more obscure reasons for (a)(i). Despite this hint that the universal set was involved, it was not uncommon to see odd numbers listed for (a)(ii) and (b). {3, 6, 9, 12, 15, 18} was probably the most common wrong answer for (a)(ii), often accompanied by {3, 6, 12} for (b). A few scored 1 mark for {6} in (b).

Question 7

Nearly all candidates recognised that 9.4 had to be halved to give the radius. Just a few candidates failed to carry out the calculation correctly having gained the method marks.

Question 8

The very few mistakes that were made tended to be mishandling negative signs. In these cases the method mark was usually gained.

Question 9

Part (a) was usually correct. In part (b) weaker candidates tended to calculate ½ x 48 = 24, 24 – 18 = 6, failing to realise that there will be more than 48 beads after the new red beads are added. Some others gave long answers, possibly using an algebraic approach. A few candidates gave concise answers, recognising that there were 30 blue beads, so 12 more red ones were needed.

Question 10

This question provided easy marks for most candidates. A few of the weaker ones failed to reduce to primes, giving products such as 15^2 or 9 x 5 x 5, or failed to use indices in their answers. Just a few listed the factors without expressing them as a product.

Question 11

(a) A few candidates (mostly at the weaker end) lost all marks by combining a rotation with a translation. Odd marks were lost by not including all three parts of the answer, with the centre being most likely to be omitted. Some incorrect centres were given (such as (0 , 0) or (4 , 5)). A few scale factors of 2 were given, even by some better candidates.

(b) Some sort of translation was nearly always shown, usually by 3 units in one direction and 1 unit in another, but not always in the correct directions.

Question 12

Nearly all candidates knew what to do. The better ones were nearly always correct. Errors tended to be with signs or failing to multiply coefficients when adjusting an equation.

Question 13

Most candidates scored well on this question. In part (c) 3.75^{-12} was seen occasionally. Some candidates rounded to 3.8; others found 0.375×10^{-11} correctly and either stopped or gave 3.75×10^{-10}.

Question 14

(a) This part was usually answered correctly. A few candidates used the fraction upside down. Fewer still got muddled with sine or cosine, sometimes having worked out the hypotenuse.

(b) The most common problem was in the upper bound, with answers such as 5.445, 5.44 and 5.5

(c) A surprising number calculated the length of the hypotenuse. Some simply used the working values of 9.3 and 5.4. A few found $\tan^{-1}$(gradient). Those who lost marks in (b) also tended to score zero in (c).

Question 15

This question was found difficult by many candidates. Many got as far as 36^o, but thereafter made errors. The more perceptive candidates quickly recognised the sequence of 36^o, 144^o, 156^o, 24^o, 15 sides. Others laboured through more convoluted working to reach a correct answer, whilst the weaker candidates got lost on the way. It was one of the few questions that a few candidates failed to attempt at all.

Question 16

Only the weakest candidates failed to complete the table correctly. Points were normally plotted correctly, nearly always using the interval end-points, although a significant minority plotted at the midpoints. A few drew bars. Method was usually shown in part (c). Quite a few answers were left as 68. Some others used the scale incorrectly and took readings at 16, 17.5 or 18.5 .

Question 17

This question was well answered on the whole. A few candidates used $2\pi r$. Some lost accuracy (and a mark) through premature rounding of $^{67}/_{360}$ or $^{360}/_{67}$. A few approximated to $^{1}/_{6}$.

Question 18

The table was usually completed correctly. The graph was often correct although careless plotting sometimes lost a mark. A surprisingly large number of candidates plotted at (1.5. - 0.25) instead of (1.5, 0.25) despite having the correct value in the table. A few plotted -5.75 at -7.5. Curves were usually reasonable (but the quality of curve drawing is rarely *good*). Numerous candidates joined some or all points with line segments. Very thick lines and discontinuous lines were not unusual. Candidates generally looked for the correct reading in (c), although inaccurate graph-drawing often led to the loss of a mark. Part (d) was only answered correctly by the ablest candidates. There were attempts at drawing the new curve, often resulting in a correct but unrewarded answer, and y = -2x was not uncommon. Some candidates made no attempt. The better candidates easily identified the correct line and earned both marks.

Question 19

Many candidates had no difficulty with this question. Some simply wrote 23/100. More inventively, the argument $0.\dot{2}\dot{3} = 0.\dot{2} + 0.0\dot{3} = \frac{2}{9} + \frac{3}{90} = \frac{23}{90}$ arose from time to time. This would appear to be due to a muddling of the 'short cut' methods for $0.\dot{2}$ and $0.2\dot{3}$.

Question 20

Many fully correct answers were seen. 119^0 was often given in (a) – "opposite angles equal" or even "came from the same chord". Some lost a mark for the reason by omitting the word "opposite" or failing to describe or specify a cyclic quadrilateral, even though they were using the correct reasoning. $119^0/2 = 59.5^o$ was sometimes seen. Part (b) was usually answered correctly, although it was rarely possible to award the method mark when the answer was wrong. $119^0/2 = 59.5^o$ was common here also.

Question 21

Nearly all of the stronger candidates understood the concept of frequency density. Many scored full marks although there were frequent slips in calculations. Weaker candidates did not have a grasp of what was required, rarely scoring any marks. The better of these thought they could equate height to frequency, usually using the second bar to create a scale. Luckily for them, this provided the correct frequency of 72 but it gave a frequency of 90 for the first bar and a height of $22^2/_3$ small squares for the third bar.

Question 22

Some candidates sensibly used a tree diagram to help. Weaker candidates tended to favour 0.64^2, or possibly just 0.64 . Only the many better candidates could take the step of finding 0.6, and they usually completed the question correctly.

Question 23

This question produced varied responses. Some candidates did not recognise the need to factorise, attempting to cancel individual terms. Others tried to factorise and failed. Some made minor mistakes, most commonly getting the signs wrong in the numerator. Not all of those who were able to factorise the numerator could manage the difference of two squares in the denominator.

Question 24

Better candidates were usually successful, though some lost a mark due to premature rounding. Others offered a range of responses, many not helped by disorganised working. The weakest stumbled because the 75^0 angle was not given. Some dropped a perpendicular to the base, expecting it to bisect either the base or the angle. Some curiously used the sine rule without any sines (8.6/75 = a/48). Others simply made mistakes in manipulating their equations and calculating values. Most candidates recognised the area formula using two sides and the included angle, although some wasted time (and risked errors) by finding both unknown sides and using these, rather than finding just one and using this and the given side.

Question 25

The very able candidates picked up the first four marks effortlessly, and for them the second part was routine. More commonly, only $x + 4$ provided a mark in part (a). Many candidates spent much time trying various unproductive attempts at the proof. Few identified the crucial right-angled triangle. It was common to see the diagonal given as 2x + 8, leading to $(2x + 8)^2 = 9^2 + 10^2$. In part (b) not all candidates who found correct roots were able to identify that only the smaller value was useful. The weaker candidates had no idea what to do with (a) and often failed to treat (b) as a quadratic equation at all, even if they realised that they were meant to solve this equation. A disappointing number who failed in part (a) seemed not to realise that part (b) was still available to them. A large minority of candidates (in either part (a) or (b)) found the areas of the circles and attempted to equate their sum with the area of the box. In part (b) incorrect use of the formula was not uncommon, usually involving an incorrect sign. A few candidates attempted trial and improvement to solve the quadratic equation - almost always unsuccessfully. This method usually gains no marks at all and should be strongly discouraged.

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