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Examiners' Report/ Principal Examiner Feedback

November 2009

IGCSE

IGCSE Mathematics (4400)
Paper 3H Higher Tier

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IGCSE Mathematics
Specification 4400

There was an entry of approximately 2000 candidates, 600 Foundation and 1400 Higher. This total was the virtually the same as November 2008, however the intake at the higher level was greater for this session.

The papers were again marked online and it was pleasing to note that there were very few scripts which were unreadable. Candidates have heeded previous advice and most are using black pens for writing and HB pencils for graphs.

Paper 3H

Introduction

It was pleasing to note there were very few questions that were beyond the range of most candidates. Students were therefore able to access nearly all the questions and were able to make a reasonable attempt of even the more challenging questions towards the end of the paper.

Report on individual questions

Question 1

This represented a very easy introduction for most candidates who usually produced the favoured method of $\frac{10}{15}+\frac{3}{15}=\frac{13}{15}$

Question 2

Most candidates jumped straight to $3y = 12$ and this was sufficient to justify they had used an algebraic method to obtain the correct answer. Numerical treatments to get the correct answer gained no marks and were reasonably rare. Most candidates attempted an algebraic approach and gained full marks.

Question 3

In part (a) the first method mark was for 360 ÷ 8 (= 45). This could be either the external angle or the angle at the centre O. From this the correct answer of 67.5^{o} came from (180 – 45)/2. Wrong answers were rare but the most common was to assume the triangle was equilateral or divide the base into three equal angles and calculate 180÷3.
In part (b) the most popular way was to use the external angle route and divide 360 by 30. Occasionally candidates used 180 ÷ 30 and gained no credit. A more complicated method was to use the interior angle of 150^{o} in the equation $150=\frac{180(n-2)}{n}$ to reach the correct answer of 12 sides. Several candidates who tried to use this equation set 180(n-2)/n =30 rather than 150. Some simply knew that the interior angles of an octagon total 1080, and divided this by 8 and then halved.

Question 4

Most candidates were untroubled by gaining a decimal answer (3.75) as the mean number of people in each family. For those that did round up to 4, or even down to 3, full marks were awarded as long as 3.75 was seen beforehand by a legitimate method.

Question 5

In part (a) simplified answers were not required and hence $12x + 6(x + 2)$ was sufficient. If candidates got this and then went on to simplify incorrectly they were penalized one mark. Candidates were not specifically asked to form and solve an equation in part (b) and hence numerical approaches were given credit.

Question 6

A common mistake in part (a) was to list the members of the set S union T and this gained no credit. Part (b) posed few problems though some gave the intersection of S and T or {1,2,3,3,3,4,4,5,5}.
In part (c) a simple statement of “Black Cats” or “Cats which are Black” was required rather than replacing the intersection symbol with the word “and”. Writing “Cats and Black animals” was therefore deemed insufficient.

Question 7

In part (a) most candidates applied the given formula correctly and used the π button on their calculator. Decimal approximations of 3.14 or better or $\frac{22}{7}$ were accepted as these led to answers rounding to 188 or 189 cm. Only a very few confused πr^2 with $2\pi r$.

In part (b) better candidates were able to retain accuracy and produce a final answer rounding to 3.78 or 3.79. Premature rounding again cost some candidates the final accuracy mark. At foundation level there was the occasional confusion that led to some candidates subtracting a circumference value away from an area of a square. In these cases, only the first method mark was awarded for the area of the square.

Question 8

This question enables most candidates to gain full marks. The only mistake, which intermittently occurred, was to see the last four rows in the table added. Some candidates used the more elaborate method of subtracting the sum of the probabilities less than or equal to 3 away from 1.

Question 9

In part (a) the correct expansion of the expression was performed by most candidates. Three of the four terms were to be correct to gain the first method mark. Some errors did arise from collecting the terms notably on the constant term, most commonly giving the answer $5w + 21$. An equation which is given, and requires at least a two-step application, also requires an algebraic process to gain marks, and therefore answers only, or a trial and error approach or a purely numerical approach in part (b) gained no credit. Here $x - 5 = 3 \times 9$ or $x - 5 = 27$ would have satisfied the condition of an algebraic process. The inequality in part (c) posed no significant problems, though some who evaluated correctly did not express their final answer as an inequality and were penalized for this.

Question 10

Better candidates scored full marks here and this was a good discriminatory question at the lower grades, because it required several stages to be accurately processed, to gain full marks.

Question 11

Provided the first step of squaring both sides was seen, this was a well answered question. Some weaker attempts involved attempting to get rid of the square root by square rooting the letter *P* leading to
$\sqrt{P}$ = a b

Question 12

Both Pythagoras and trigonometry are well tested topics, and again caused no significant problems. Premature rounding of answers to 1 decimal point in part (a) caused a small minority to lose the final accuracy mark. Three significant figures is a guideline to prevent attempts at scale drawings. In part (b) a surprising number chose to evaluate the top angle (70^{o}) and then use the sine rule (not the sine formula) to get the correct answer. Another group chose to calculate the opposite side using tangents and then move on to Pythagoras to reach the final answer. Only final accurate answers gained credit, using the latter method.

Question 13

A few candidates completed the unnecessary step of converting each number in the table into standard form before adding, and this led to errors in a minority of cases. On most calculators entering the five areas in standard form, delivered a full seven-digit answer. A final answer in standard form was required to gain the two marks available. Rounding from 4.348 to 4.35 was allowed.

Question 14

Many noticed the economical method of doubling the terms of the first equation and then adding, gaining the value of $x = 1$ in the process. This was easier than alternative methods which led to the y value of -1/3. Use of - 0.3 or- 0.33 for y led to incorrect values for x and was penalized.

Question 15

Dividing 2125 by 0.85 remained the most popular choice of method. Some used a step process where 2125 was equivalent to 85%, this was reduced to 1% before increasing to 100%. If this led to the correct answer full marks were awarded. Any percentage calculation performed directly on 2125 yielded the wrong answer and gained no marks.

Question 16

Wrong answers in parts (a) or (b) were rare. In part (a) some misreading of the scale on the horizontal axis occurred, giving 52 as an answer and scored no marks if the median line was not drawn.

Question 17

The majority recognized the difference of two squares. For others $(x)(x) - (y)(y)$ or $xy(x - y)$ or $(x - y)^2$ was offered as an answer.
In part (b) most did not follow the line offered in part (a) but obtained the correct answer by squaring out the bracket and gathering the terms though many failed to make the final step in factorizing gaining just 1 mark. Part (c) was done well by the majority.

Question 18

More astute candidates realized that the shaded sector amounted to 7/9 ths of the whole circle area via 112π / 144π and hence obtained the correct answer without resorting to decimals. A minority assumed the sector was the cutout region (the minor sector) and obtained an angle of 80°, which they stated to be x without reference to the original diagram which clearly indicated x as a reflex angle.

Question 19

Part (a) was usually well done. One of the two marks was awarded for factorizing the denominator but a number failed to take this further. Sometimes cancelling took place between the x^2 in the numerator and the x^2 in the denominator, reducing the fraction to $1/\pm2x$ or $-2x$ or $0/\pm2x$.
Part (b) proved to be one of the more challenging questions on the paper in that it required several lines of correct algebra to reach as satisfactory conclusion. The key at the start was to recognize a common denominator was needed when subtracting the two fractions. Marks were dropped by failing to retain the structure of a fraction or multiplying the brackets out incorrectly to reach $2x$ -1 as the second term in the numerator rather than $2x + 1$. The final answer did not require the brackets in the denominator to be multiplied out.

Question 20

This was a good source of marks from a question late on in the paper. Although a tree diagram was not required, many chose to draw and use one, particularly in part (b). In doing so, most concluded that three branches were needed for 2 wins out of 3, and reached the correct answer of 12/27 or 4/9.

Question 21

Some precision was required in setting up a formula in which t was directly proportional to $\sqrt{d}$. Misinterpretations such as proportional to d^2 or inversely proportional to $\sqrt{d}$ gained no credit. In part (a) a final answer was required in which t was the subject. Candidates that overcame these hurdles found part (b) to be an easy source of two marks. A full follow through was awarded from part (a), only for a wrong value of k in a formula in which t was proportional to $\sqrt{d}$.

Question 22

One mark was awarded for the recognition that the use of the cosine rule was appropriate but only if the angle used was 80° or 210° or the correct value of 140°. In the latter case, using the correct angle usually led to the correct answer, though in a minority of cases some candidates forgot to square root the value of $(AB)^2$.

Question 23

This question required careful analysis on the part of the candidate and careful scrutiny by the marker. Awarding full marks for a correct answer of 33 minutes and 43 seconds was not common. Despite careful wording in the question, some candidates tried to find the time for only one lap. This could have gained 2 marks if 4.95 or 400.5 were seen followed by a division of 60 to convert from seconds to minutes and seconds. Many candidates approximated 5.0 m/s to 5.05 by deciding to round up both the length of the track and the speed to their upper bounds. In the marking scheme the third method mark was dependent on at least one previous method mark gained before. Weaker candidates gave comically long or short times to run approximately 10,000 metres and compounded this by giving the wrong units.

Question 24

Functions were not attempted particularly well by the weaker candidates on this paper, who were unsure what process was being asked of them
$x^3 - 3$ occurred regularly in part (a i) from $x(x^2) - 3$. Later in the question, an algebraic method was required to solve the quadratic equation, which did factorize, but many chose to use the formula instead.

Question 25

In part (a) a numerical approach was attempted successfully by some candidates by typically using 2 or 3 to replace the letter a to reach the correct answer. More confident candidates treated the problem algebraically and examined index values, however a significant number of candidates simply converted the LHS of the equation to a^3.5 and gave 3.5 as the value of n.
In part (b) there were a variety of approaches in which rationalizing the denominator was among the most popular. Many candidates were unable to go beyond √2/4 and all surds had to be removed to gain full marks.

Statistics

Overall Subject Grade Boundaries – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Overall subject grade boundaries	100	85	66	47	28	15	8

Paper 3H – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Paper 3H grade boundaries	100	86	66	46	27	15	9

Paper 4H – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Paper 4H grade boundaries	100	85	66	47	28	15	8

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