Examiners' Report/ Principal Examiner Feedback

Summer 2010

IGCSE

IGCSE Mathematics (4400) Paper 4H Higher Tier

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There was an entry of just over 29,500 candidates, 2,500 more than a year ago. This comprised 19,000 from the UK and 10,500 from overseas. The Foundation tier entry actually declined slightly but this was more than compensated for by a 10% increase in the Higher tier entry.

All papers proved to be accessible, giving candidates the opportunity to show what they knew, an opportunity taken by the majority of them.

Paper 4H

Introduction

The majority of this paper proved accessible to most candidates offering routine questions in probability, Pythagoras, similar shapes, quadratics etc. There were some challenging questions involving histograms, probability trees, surface areas, and functions later in the paper, which stretched and challenged the more able. On these questions, many gave concise, elegant working and gained full credit.

Despite advice given to centres regarding not writing outside the space set aside for questions, many candidates continued writing outside these limits and would continue their working in any available free space. There is always a danger written work such as this, might go undetected.

Candidates requiring more space in which to complete their answers to any question, should use additional answer sheets. They should also clearly indicate this in the answer area of the relevant question in the examination booklet.

Report on individual questions

Question 1

Most candidates scored full marks here. The equation was sufficiently difficult to prompt an algebraic approach rather than trial and error or a purely numerical process. The latter techniques would score no marks even if the correct answer was obtained. Answers of 16/3, $5\frac{1}{3}$ or 5.33 (2 dp at least) scored full marks if seen in the body of the script. Answers that truncated to 5.3 (1dp) without 16/3 (or equivalent) seen, lost the final accuracy mark.

Question 2

In part (a) candidates were expected to measure the required angle within a tolerance of ±2°. Full marks were therefore gained for answers in the range 248° to 252° inclusive. A common wrong answer was 110° but generally candidates scored well with this part of the question.

Part (b) was less well done. An exact answer of 230° was required from a calculation. Many candidates offered 310° (from 360° - 50°),or 130 (from 180° - 50°) and scored no marks for this. A diagram produced by the candidate often showed the correct approximate position of C but from there many were unsure which angle to take as the correct answer.

Question 3

Both parts (a) and (b) scored well in this straightforward probability question. The occasional miscalculation in choosing the expected number of red, rather than blue, beads (giving 0.5 x 30 =15) was not taken as a misread, and gained no marks.

Question 4

In part (a) the conversion of 1 hour 15 minutes to hours was the main source of errors. Credit was given (M1) for dividing by 1.15 or 75 (minutes) in lieu of 1.25, (but not 1.4 or other values) as this showed some recognition of an attempt to divide a distance by a time.

Parts (b) and (c) posed no real difficulties. In the latter case most opted for a longer method of finding 15% of £12 (£1.80) before subtracting this from £12. Some candidates treated the question as a reverse percentage and divided £12 by 1.15 to get an answer of £10.43.

Question 5

Very few candidates opted to attempt anything other than a Pythagoras method. Failure to round off correctly to 3 significant figures was not penalised, provided any decimal rounding to 3.76 was found beforehand in the body of the script, with no subsequent working done on this value. Some candidates lost the final accuracy mark through premature rounding.

Question 6

Part (a)(ii) posed a greater challenge than (a)(i) with many candidates either giving an answer of 8, having counted all the members separately, or more usually stating the elements of A U B.

Part (b) was answered well by the more able candidates. Pitfalls that caught some students out were forgetting that P and Q had to have 3 members each and both sets had to contain the members 3 and 4. A number of students gave Q = 3,4,6 or 3,4,7 and R = 3,4,6 or 3,4,7 effectively letting the marker choose the correct answer. Answers presented in this order scored one mark, as did answers of 3, 4, 6 or 7 given in both parts.

Question 7

This proved to be a challenging question for the weaker candidates, though a majority picked up some marks. In part (a) a correct equation was required to be established based on perimeter or semi-perimeter, (typically $7(x+1) +3(5x-2) =34$ or equivalent). Marks were not deducted if wrong algebra followed from this, as mistakes were likely to be penalised later in part (b). The most common mistake was to sum only two sides together and make this equal to 68. If correct algebra followed from this the candidate would reach $22x=67$ rather than $22x=33$ or $44x=68$, and would then gain 4 of the 6 marks available.

Question 8

Most candidates who gained marks chose the conventional method of converting from mixed to improper fractions and then inverting the second fraction before showing an intention to multiply. The final mark out of the three was dependent upon the preceding calculation. For example 3/2 x 4/5 = 12/10 would gain B3 whilst 3/2 x 4/5 = 6/5 would only gain B2 unless clear evidence was shown that cancelling had taken place. For dividing methods the final mark was again dependent on the preceding calculation; 6/4 ÷ 5/4 =6/5 and 12/8 ÷ 10/8 = 12/10 would both gain B3 but 12/8 ÷ 10/8 = 6/5 would only gain B2.

Decimal treatments were ignored and gained no credit for that stage.

Question 9

Correct answers were seen in a majority of cases but a significant number chose to divide the difference (1.75m) by the finishing figure (15.75m) instead of the starting value (14m). This yielded a percentage increase of 11.1%. Candidates gained 2 of the 3 marks in these cases.

Question 10

In part (a) the correct *use* of the scale factor (either 1.6 or 0.625) gained the method mark.

It is disappointing to see a significant number of candidates who believed the angle changed size by the same scale factor as the sides, and hence 83.2° was a common wrong answer in part (b).

Question 11

Final answers had to be fully simplified to gain full marks. Correct answers which fell short (i.e $22x/24$) gained 2 of the 3 marks available.

Question 12

In part (a) the correct equation of $y = -0.5x + 4$ was formed in a majority of cases, but marks were frequently lost by a failure to spot the gradient was negative. Many candidates failed to show how they were obtaining their gradients and lost possible follow through marks as a result.

Part (b) was less well done. Inequalities were sometimes facing the wrong way and some candidates failed to spot the obvious connection with part (a). Many weaker candidates were unsure what form their answers should take, offering equations rather than inequalities or getting the notation wrong (i.e. $y=>x$). Commonly seen was y greater or equal to -1 instead of x. These latter cases all gained no credit.

Question 13

Many candidates opted to use the formula method in part (a) rather than attempt a relatively easy factorisation. Formula methods need to be developed beyond the first line of simple substitution to gain full credit. Some candidates factorised correctly but stopped short of giving solutions for x. Correct answers by trial and error, or educated guessing, were extremely rare and gained no credit.

As in part (a) an algebraic treatment was required to gain marks in part (b). Most spotted the relatively easy substitution from $y = 2x$ and proceeded efficiently to $-6x = 9$ or $-3y = 9$. Correct answers usually then followed to secure full marks. Any correct equation involving only one variable was sufficient to secure the method mark.

Question 14

Some candidates took the triangle to be right angled, tried to use $\cos x° = 4/6$, and hence scored no marks, but for the more able this was an easy source of three marks. Truncation of answers to the nearest degree occasionally cost some their final accuracy mark, if a more accurate angle was not found beforehand, in the body of the script.

Question 15

Candidates had to correctly calculate the frequency in either of the intervals 4.5 to 6 metres or 6 to 10 metres to gain the first method mark. The larger interval was much easier to partition than the first. Some candidates bypassed this, and gained 2 marks directly, by using the fact that there were 8 large squares, each worth 20 trees, to make up the required area or 200 small squares, each worth 0.8 trees. An alternative method was to work out the frequency densities, (worth 1 mark) and this then simplified the process of working out areas. This latter method was not seen very often. When a scale was added to the vertical axis, it was often double the correct values.

In part (b) a tolerance of ½ a small square was allowed in either the height or the width of the rectangle to be drawn. A number of candidates drew 'stepped' blocks offering a rectangle for the 10 >> 12 metre interval and a different rectangle for the 12 >> 13 metre interval.

Question 16

Part (a) was marred in a minority of cases by some candidates selecting discs with replacement or by not labelling all branches correctly. This was penalised by deducting 1 mark from the 3 available. If this misunderstanding was carried through, it carried further penalties in part (b) through the loss of the accuracy mark and made the whole of part (c) superfluous as there would still be 4 discs left in the bag after taking picks.

Part (c) proved challenging for many candidates either by the process of adding 3 correct branches accurately (WWB, WB and B) or by the concept of selecting 3 whites and then subtracting this total from 1.

Question 17

The recognition that a correct fraction (84/360) was needed, gained the first method mark. Many candidates started by finding the area of a full circle, which gained no credit as the first stage. In a small minority of cases, the circumference, rather than area formula was selected. Errors in rounding off to 3 significant figures (typically offering 148 as an answer) were not penalised if a better answer was found in the body of the script.

Question 18

The majority of more able candidates correctly selected the sine rule, and those that did then usually proceeded on to the correct answer, but surprisingly many found the 'wrong' side by using the 40^o angle. Answers were not penalised when incorrectly rounded, provided an angle rounding to 6.39 cm was found in the body of the script and no further calculations done with it.

Question 19

This proved to be one of the more challenging questions on the paper. A full algebraic treatment was required to gain full marks. This broke down into forming an equation based on total surface area, reducing this to a quadratic equation equal to zero, and solving this quadratic algebraically to reach the correct answer. Gaining the first method mark was relatively straightforward for most. Some lost this mark by only equated the curved surface area to $33\pi/4$ or by substituting the value of $l = 4$ much later (and by then into possibly a wrong equation).

The inclusion of π into the expression for the given total surface area caused most problems. Incorrect cancelling often followed. Others converted the given area to a decimal value and then truncated this, which led to a quadratic that could not be factorised. There were instances were candidates combined the $4\pi r$ with the πr^2 to gain a cubic in r.

In some cases, candidates, with time on their hands, resorted to trial and error, but even if this led to the correct answer, full marks were not awarded.

This question provided a challenge and a stimulus for able candidates who coped well with the mathematics involved.

Question 20

Parts (a) and (b) were usually well done by those familiar with function notation.

Part (c) required the solving of an equation. Although the function turned out to be a self inverse, calculating g(1.2), rather than solving $g(x)=1.2$ as requested, was not given any credit, even though these two methods led to the same answer.

Part (d)(i) required a full algebraic treatment starting from $y = x\ /(x\text{-}1)$ or $x = y/(y\text{-}1)$. Good candidates were usually able to proceed and gain full marks, but some candidates (unsuccessfully) tried to use a flow diagram.

In (d)(ii) answers were not required to be simplified. Therefore if $x/(x\text{-}1) \div [x/(x\text{-}1) - 1]$ was offered as an answer, and no errors followed, the accuracy mark was awarded.

Question 21

Part (a) was answered well. Varieties of quadrilaterals were offered in part (b); “rhombus” and “parallelogram” were the most frequent wrong answers.

Part (c) defeated most candidates. Only answers relating to a+kc were accepted. These included k=1 stated (or implied by kc=c or a +kc=a+c) and the magnitude of a = magnitude of c, stated by a=c (or implied by a=kc) Many answers simply recounted known facts about a rhombus (i.e “sides have equal lengths”, “diagonals bisect each other at right angles” etc) and gained no credit for this.

Question 22

Answers were required which were not truncated, and in standard form, for full marks in part (a).

In part (b) if both sides were divided by 10^4 this gained the first method mark. If no further work was done, the accuracy mark was also awarded as the question did not request the answer to be simplified. The most economical form was to put c = b + a/100.

The answer 0.0a, for a/100, was seen on several occasions.

Statistics

Overall Subject Grade Boundaries – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Overall subject grade boundaries	100	79	61	43	26	14	8

Paper 3H – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Paper 3H grade boundaries	100	80	62	44	27	14	7

Paper 4H – Higher Tier

Grade	Max. Mark	A*	A	B	C	D	E
Paper 4H grade boundaries	100	78	60	42	25	14	8

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