Examiners' Report/
Principal Examiner Feedback

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Pearson Edexcel International GCSE
in Mathematics A (4MA0) Paper 3H

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Grade Boundaries

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http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Students who were well prepared for this paper were able to make a good attempt at all questions.

Working was generally shown but it was not always easy to follow through. When questions require that students ‘show clear algebraic working’ or ‘show each stage of working clearly’ it is essential that these instructions are adhered to. Failure to do so can result in no marks being awarded even when a correct answer is given. In particular, when using the quadratic formula to solve a quadratic equation, substitution into the quadratic formula should be shown.

Students should be reminded to retain full accuracy when working through multi-step calculations and ensure that their calculator is in degree mode before the start of the examination.

1 Part (a) was generally correct although a small minority of students misread the ingredient and worked with flour rather than sugar. In part (b) a significant number of students got as far as finding the correct scale factor of 6.25 but then gave that as the answer. Some lost the accuracy mark due to premature rounding, usually from finding 250 ÷ 12 first and then working to 3 sig fig.

2 Success in part (a) depended on entering negative numbers into a calculator. Too many students evaluated $2\times-5^2 + 2\times-12$ rather than $2\times(-5)^2 + 2\times-12$. Thus −62 was a very common incorrect answer. A significant number wrote expressions that were correctly bracketed and still got the wrong answer.

Those who got to the correct answer of $T = 4x + 10y$ in part (b) and then attempted to simplify and gave their final answer as $T = 14xy$ or $T = 2x + 5y$ were penalised by the loss of one mark. Many failed to use the fact that there were 4 pens in a small box and 10 pens in a large box and just gave an answer of $T = x + y$. Some just gave an expression for the total cost rather than a formula.

3 This question was, on the whole, very well answered. The error of $0 \times 4 = 4$ was seen reasonably frequently. There are still a good number of students who do not understand the correct way to find the mean from a frequency table with division by 8 the most common error.

4 Part (ai) was answered more successfully than part (aii). Most were able to give a satisfactory explanation in part (b). However, some students simply explained what the notation meant rather than answer the question.

5 Many correct straight lines were seen; there were still a few cases seen where students plotted sufficient correct points but then failed to draw a line through the plotted points. Or the line stopped at the penultimate point. A minority of those students who used the y intercept of (0, −5) and gradient of 3 did not take careful note of the scale on the x axis and drew a line with a gradient of 1.5

rather than 3. This lost 2 marks. Those that used a table of values were generally successful in drawing a correct graph. Many failed to recognise that this is a linear function and a curve was drawn to accommodate any points that did not fall on the line rather than to check them to ensure that they were correct.

6 Part (a) was well done with the vast majority of students able to show the correct use of common denominators to add fractions. The most common method seen in part (b) was to change the given fractions into improper fractions and multiply by the reciprocal of the second fraction although other correct methods were seen. Some students failed to show sufficient steps in their response by, for example, going directly from $\frac{21}{8}\times\frac{6}{7}$ to $\frac{9}{4}$ without showing the step in-between and were penalised by the loss of the final mark. Some students tried to work with decimals rather than fractions; such responses attracted no marks. Some students who chose to express the fractions with a common denominator of 24 got as far as $\frac{63}{24}\div\frac{28}{24}$ but did not seem to know how to proceed from this point. It was fairly common to see $\frac{54}{24}$ as the next step which presumably meant that they were working back from the answer of $\frac{9}{4}$ rather than actually working with their 2 fractions.

7 When an error occurred in part (a) it was generally due to the student misinterpreting the question and attempting to simplify (incorrectly) resulting in the incorrect answer of $5y^2$. A common error in part (b) was – 7 rather than – 18; some students also had difficulty in simplifying $-9x + 2x$ correctly. Students should be reminded that the final answer when solving an inequality must be an inequality; too many gave the answer $k = 2.5$ rather than $k < 2.5$ in part (ci). In part c(ii) a number of students did not understand that an integer value meant 2 and not eg 2.49 as the first integer less than 2. Part (d) was well answered.

8 It was clear that some students had their calculator in the wrong mode – usually gradians rather than degrees – those that showed the correct method and got as far as 13.4 × sin53 were able to score the two method marks but any who went straight to the incorrect answer of 9.91… gained no marks. It is important that correct mathematics is shown in working, for example, a number of students write 53sin13.4 rather than the correct 13.4sin53. A small number attempted to solve this using the sine rule; these responses were generally less successful than those using the more straightforward standard method.

9 Whilst many correct answers were seen, some students were unable to successfully navigate their way through this problem. It was not uncommon, for example, to see students who correctly shared £6000 in the given ratio but then found $\frac{3}{5}$ of £1000 rather than £3500. Those who did get as far as calculating $\frac{3}{5}$ of £3500 then frequently forgot to add this to Bhavin’s share or subtracted this

instead. A number of students stopped at £3100 instead of continuing on to give this as a percentage of £6000.

10 The majority of students gained full marks for this question. Those who failed to gain full marks usually scored at least one mark in this question for a method to find either the area of the rectangle or the area of the circle. Some students failed to maintain full calculator accuracy throughout their calculations and so lost the final accuracy marks. As ever, there were some who used the formula for the circumference instead of πr^2. A common mistake here was that students deduced that this required cos(53) rather than sin(53). Nearly all that attempted this question did correctly choose to multiply 13.4 with sin/cos(53) rather than divide.

11 The common error when plotting points was to plot against weights of 45, 55, 65 rather than 50, 60, 70. A histogram rather than a cumulative frequency graph was sometimes drawn; this gained no marks unless the correct graph was superimposed. In part (c) some took a reading from the graph using 85 kg but then failed to subtract their reading from 80. Part (d) proved more problematic with some subtracting 60 and 20 to get 40 and then reading from the cumulative frequency axis at 40.

12 As ever in this specification those students who gave the correct answers without showing any algebraic working gained no marks. The most popular method of solution was to eliminate one variable by multiplying both equations and then either adding or subtracting, as appropriate. Unfortunately, arithmetic errors often caused students to lose both accuracy marks. Elimination by substitution having rearranged one of the equations was surprisingly popular although the involvement of fractions (often converted to decimals) meant that the accuracy marks were, again, sometimes not gained.

13 It was disappointing to see so many make an early error and give the gradient as $\frac{4}{3}$ rather than $\frac{3}{4}$. Many stopped at this point or at $y = \frac{3}{4}x + c$. Having got this far, those who chose to attempt to plot points generally gained no further marks as their sketches (even when graph paper was used) were insufficiently accurate to arrive at $c = -4.75$. Those who substituted the values from $(5, -1)$ gained a further mark although poor arithmetic often meant that students arrived at an incorrect value for c. Some students did make the error of substituting the coordinates of one of the points on **L.** Many left their answer as $y = 0.75x - 4.75$ rather than going on to give the equation in the form required by the question. The greatest success in reaching the correct final answer was seen by those using the $(y - -1) = m(x-5)$ approach, as it was easier to deal with the fractional gradient. Many made errors in getting from this answer to the required form. A number of responses showed misunderstanding of the equation of a straight line; having found the gradient correctly they used it incorrectly in the given form ax + by = c

14 Those who understood the need to differentiate in part (a) generally gained full marks although some students did go on in part (a) to find the second derivative and give this as their answer. A common error was to attempt to use speed = distance/time and divide the given expression by t. A correct answer in (a) generally then led to a correct answer in (b) although some students did attempt to put the expression for s equal to zero and then solve the quadratic equation – a clearly incorrect approach that gained no marks.

15 The most common approach to this question was to divide the given areas and then use the resulting scale factor to multiply the given volume, giving the commonly seen incorrect answer of 256 cm^3. This gained no marks. Those who realised that the division of areas gave the area scale factor from which the linear and then volume scale factor could be calculated generally gained full marks.

16 Identifying the correct angle to find proved the first hurdle in answering this question. A significant number of students attempted to find the value of angle *BHG* using the 5cm and 17 cm given in the diagram. A few students thought that angle *HAF* was the angle to be found. Many were able to gain a mark for a method to find the length of either *FH* or *AH*; those who realised that they had to find angle *AHF* generally then went on to gain full marks.

17 The lack of brackets around expressions of length caused a significant number of students to make errors in part (i). Writing, for example, $(3x – 4 – x + 6)$ rather than $(3x – 4 – (x + 6))$ or $(3x – 4 + x + 6)\ x – 1$ instead of $(3x – 4 + x + 6)\ (x – 1)$ meant that subsequent equations were incorrect. Whilst many correct solutions were seen, working was often disorganised and difficult to follow through. The most successful solutions were when students used the formula for the area of a trapezium rather than attempting to split the shape into a rectangle and triangle. When splitting the shape the issue of not using brackets was the same, most wrote $3x – 4 – x + 6 = 2x + 2$ rather than $3x – 4 – (x + 6) = 2x – 10$. A significant minority just solved the given quadratic equation at this stage.

In part (ii), students were instructed to show clear working. Thus, the correct answer without supporting working gained no marks. Simply writing $a = 2$, $b = −1$, $c = −120$ followed by an answer of 8 is not clear working; students must either show substitution into the quadratic formula or correct factorisation in order to gain full marks. Inevitably, many gave the answers of $x = 8$ and $x = −7.5$ rather than selecting just the positive root.
An important failing in part (ii) was the evaluation of $(-1)^2$. While we do condone the omission of the brackets here it needs to be emphasised that the brackets need to be present when squaring −1 on most calculators.

18 The vast majority of students were able to gain the first method mark for multiplying both sides of the equation by $(t – 3)$ but the lack of brackets frequently meant that the subsequent line of working had $mt – 3$ rather than the correct $mt – 3m$ on the left hand side. Sign errors when manipulating terms within an equation were also a frequent source of errors. When faced with a correct equation of $mt – t = 1 + 3m$ some failed to recognise the need to factorise.

19 Students who were able to use both ‘angle at centre is twice the angle at the circumference’ and ‘opposite angles of a cyclic quadrilateral sum to 180^o’ correctly generally went on to gain full marks. However, many were unable to apply these two circle theorems and so failed to make any real progress into the question. Common errors seen were to give angle *DOB* as 37.5^o instead of 150^o or angle *DCB* as 75^o or as a right angle Sight of 150^o within working was not sufficient in order to gain a method mark, angles must be identified either by writing found angles on the diagram or using appropriate notation within working by stating, for example, angle *DOB* = 150^o There were some that only identified the two angles and did not recognise they needed to use the isosceles triangle to get the 15^o angle, Most of these found the 48^o angle and left this as their final answer. Many arrived to the point where they had calculated all the relevant information needed to correctly answer this question but failed to add the correct two angles.

20 Those who realised that it was necessary to use upper and lower bounds in order to provide the correct solution to this question frequently used 4.55 rather than 4.75 for the upper bound of the length of the cube leading to the common incorrect answer of 1439. However, the most common errors were simply to use the values given in the question both ignoring the need to use bounds and the need to use consistent units. There was a method mark available for the volume of the cube divided by the volume of sphere provided units were consistent. However, too often either inconsistent units were used or the formula for the volume of a sphere was copied incorrectly or the wrong formula was used. In the latter instance the formula for the surface area of a sphere or area of a circle were frequently seen. Those that did realise that consistent units were required often still did not get the mark because they used a factor of 10 rather than 1000 when converting a volume.

21 A common incorrect answer was $\frac{5}{84}$ from students who realised that the combinations of 2,2,2 and 1,2,3 were needed but failed to realise that there was a total of 6 different ways that 1,2,3 could be selected. Some failed to realise that this was a non-replacement problem and so gained a maximum of 3 marks out of the 5 available. Occasionally, probabilities were added rather than multiplied. Those who tried to write out all the possible combinations rather than work with probabilities were generally unsuccessful and gained no marks.

22 Those who realised the need to work first with a triangle with sides 12 cm and 8 cm and included angle of 105^o generally gained 3 marks by using the cosine rule to find the third side of the triangle and by using $\frac{1}{2}ab\sin C$ to find the area of the triangle, although it was common to see the cosine rule expression evaluated in the wrong order or the double negative overlooked. Following these calculations, many were unable to make further progress. Those that did continue on to work with the central triangle in the pentagon frequently used 7.5 rather than 6.5 as half of 13 – a careless error particularly at this stage in the paper. It was pleasing to see so many students able to navigate their way through this problem and provide the correct answer of 188 cm^2. Students who were unable to make progress often made incorrect assumptions such as all the angles

were 105^{o} or used an incorrect method – it was not uncommon for students to attempt to use Pythagoras's theorem in the triangle with an angle of 105^{o}. Those students who knew the cos A = form of the cosine rule, generally did well.
A small number of students successfully used Heron's Formula to find the area of the central triangle. This is not on the IGCSE specification, but is, of course, a valid method.

Summary
Based on their performance in this paper, student should:

- ensure that full accuracy is maintained throughout multi-step calculations, only rounding the final answer

- take care with very simple arithmetic and check answers

- make sure your calculator is in degree mode before the examination

- use the correct formulae for the area and circumference of a circle – these are currently on the formula sheet

- use brackets around two term expressions in algebra and when calculating with negative numbers

- show any calculated angles on the given diagram when solving a geometric problem.

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