Examiners' Report/
Principal Examiner Feedback

January 2012

International GCSE Mathematics A
(4MA0) Paper 4H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our qualifications website at www.edexcel.com. For information about our BTEC qualifications, please call 0844 576 0026, or visit our website at www.btec.co.uk.

If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

http://www.edexcel.com/Aboutus/contact-us/

Pearson: helping people progress, everywhere

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2012

Publications Code UG030748

International GCSE Mathematics A
Specification 4MA0
Paper 4H

General Introduction to 4MA0

January 2012 hosted for the first time, the winter session of the International GCSE Mathematics A. All previous sessions had taken place in November. The total number of candidates rose to slightly over 2550, the highest entry for a winter session. Foundation entries, which had been decreasing, recovered to nearly 450 (from 300 in November 2010). Candidate entries for the higher tier were just over 2100.

Most of the 480 Foundation tier and 2200 Higher tier candidates took the opportunity the papers gave them to show what they knew.

Paper 4H

Introduction

The standard of this paper proved to be appropriate. With two minor exceptions, all questions were accessible and overall success rates were commendable. The exceptions were two low tariff questions (Q19(b)(ii) $\mathrm{n}(A' \cup B')$ and Q21(b) – Indices), which were seldom answered correctly. In addition, full marks were rare on Q15 (Quadratic inequality). Most of the more demanding later questions, though, were well answered and, in general, methods were well explained with working presented clearly and neatly.

Report on individual questions

Question 1

The vast majority of candidates evaluated $\dfrac{6.7-2.5}{2.8\times 0.4}$ accurately.

Question 2

Most candidates started correctly with $\dfrac{135}{180}$ and many of these went on to use this quotient to find the correct time, although a substantial minority gave answers of 0.75 or 75. Candidates who gained no credit generally used either $\dfrac{180}{135}$ or 135×180, the former often leading to answers of 80 or 90 and the latter 24 300 or 405.

Question 3

The majority showed appropriate algebraic working and successfully solved the equation.

Question 4

Although many candidates gained full marks, not all those who found 1, 7, 7 correctly then found the range. Some left 1, 7, 7 as their answer while others gave the range as 7 or 1-7. Of those who did not obtain 1, 7, 7 many scored 1 mark for 0, 7, 8 or for three positive integers with either a sum of 15 or a median of 7. Some candidates' understanding of 'median' was flawed and lists such as 3, 7, 4 were not uncommon. Attempts to construct formal equations and solve them frequently ended in confused failure.

Question 5

The majority gained full marks for the correct line, usually with seven plotted points and often preceded by a table with values of x from −2 to 4. Some candidates just plotted and joined the points (−2, −9) and (4, 15), which scored full marks, although a third point would have been a sensible check. The scale on the y-axis was sometimes misinterpreted, leading to plotting errors, (2, −9) at (2, −9.5), for example.

Question 6

The first part was very well answered. Only two errors appeared with any regularity. The first was leaving the answer as 4, multiplication by 7 being omitted. The second, which was less frequent, was the use of 7, instead of 8, in 32 ÷ 7, for example. Some gave an answer of 4 : 28, with no clear indication of which value was the number of right-handed students; this scored 1 mark out of 2.

The second part proved more demanding but had a fair success rate. Candidates who scored full marks usually found the real length of the lorry $(45 \times 32 = 1400 \text{ cm})$ and then divided it by 72, although some successfully used a multiplier, either $\frac{72}{32}(2.25)$ or $\frac{32}{72}$. By far the most popular wrong answer was 101.25, the result of either $\frac{45}{32} \times 72$ or $45 \times \frac{72}{32}$. Occasionally, 33 and 73 were used instead of 32 and 72. Some attempts failed to use all of the data, for example, $\frac{45}{72} = 0.625$ or 45 × 72 = 3240; it seemed to be 32 that was missing each time.

Question 7

Most candidates were familiar with repeated division or factor trees and many scored full marks. A substantial number, however, lost a mark by giving their answer as a product of prime factors $(2 \times 2 \times 2 \times 5 \times 5)$, instead of as the product of *powers* of prime factors ($2^3 \times 5^2$). Other errors which were noted included giving the answer as $2^3 + 5^2$ or failing to factorise 25. There were various attempts to express 200 as products of pairs of factors but these generally failed to achieve a complete set of prime factors.

Question 8

Indices were well understood and the majority of candidates found the correct value of *n*. A variety of approaches was used, ranging from the formal construction and solution of equations to more informal inspection methods. A significant minority could not handle the indices; $y^3 \times y^n = y^{3n}$, for example, was not uncommon. Some candidates could not deal with the *y* in the denominator and this led to errors such as $y^{3+n} = y^5$ and $\frac{3+n}{1} = 6$.

Question 9

In part (a), many candidates found the area correctly, usually using either four or, less often, two triangles and a few combined pairs of triangles to form rectangles. Some used the formula "Area of a rhombus = $\frac{1}{2} \times$ product of diagonals". There was, however, a wide range of incorrect methods and answers. For example, 96 (24×4) appeared regularly and the length of a side of the rhombus was sometimes used. There was also occasional confusion between area and perimeter.

In part (b), the vast majority of candidates used Pythagoras' Theorem correctly and scored full marks. A few candidates, though, lost a mark for giving their answer to less than 3 significant figures.

Question 10

The quality of candidates' attempts to both parts ranged from completely correct to totally misconceived. The double ended inequality caused no problems for some but defeated others, who tried to manipulate it in a variety of ways, often involving 14, $4x \le 14$, for example. The common errors in the second part were the omission of 0 and the inclusion of decimal numbers in the list of integer solutions. Fewer candidates than usual recovered from an incorrect first part by making a fresh start in the second part and gaining credit for their list.

Question 11

Both parts were well answered. Most candidates who found the HCF, 15, in part (a) used either a factor tree or repeated division but a minority either used lists of factors or showed no working at all. Venn Diagrams were occasionally used, usually successfully, in both parts. 5 was a common wrong answer and, when repeated division was used, the final factor was sometimes lost. Some candidates could not extract the HCF, even after finding all the factors.

A range of approaches was also used to find the LCM in part (b). Expressing the LCM as $2 \times 3^2 \times 5^2$ or using lists of multiples were the usual methods but $\text{LCM} = \frac{75 \times 90}{\text{HCF}}$ was also seen occasionally. Several incorrect products were used to find the LCM, including $2 \times 3^3 \times 5^2$, $2 \times 3^2 \times 5^2$, $2 \times 3^3 \times 5^3$ and $3^2 \times 5^2$. Some candidates confused HCF and LCM and so their answers to the two parts were reversed.

Question 12

In part (a), many candidates gave completely correct descriptions of the transformation. If a mistake occurred, it was most likely to be giving ‘clockwise’ as the sense of the rotation, although a wide range of other errors and omissions was seen, the most surprising, perhaps, being the omission of ‘rotation’. Combinations of transformations, which receive no credit, appeared regularly, especially combinations of rotations and translations.
The translation in part (b) was often correct but proved by no means trivial. In particular, translation by the vector $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$ was not uncommon.
The types of error made in part (a) also featured in part (c) but there was the added demand that the centre of rotation was not the origin. Many candidates, though, correctly located the centre of rotation at (3, 1). Combinations of rotations and translations also seemed more common in part (c) than in part (a).

Question 13

Many candidates scored full marks on the first part. Most of these made y the subject of $3x + 4y = 10$ and extracted the correct gradient. Of the rest, the majority either made errors in their algebra or were unable to make a start. Some made a mistake with their initial rearrangement of $4y = 3x - 10$ but correct rearrangement did not necessarily lead to a correct gradient and answers such as $\frac{-3x}{4}$ and −3 appeared occasionally. There were a few attempts to differentiate but these were usually unsuccessful, often resulting in a gradient of −3. Those who tried to use two points on the line regularly used $\frac{\text{horizontal difference}}{\text{vertical difference}}$.
Candidates’ responses to the second part varied widely. Quite a number produced completely correct solutions but, on the other hand, many were unable to make any attempt. It may be that this was because they did not appreciate that they were, in effect, being asked to solve a pair of simultaneous equations. Between these extremes, most candidates made an error in algebra at some stage. Those who multiplied both equations to give the same coefficients of either x or y were more likely to gain some credit than those who used other methods. Substitution was used successfully but an initial incorrect rearrangement, especially $y = \frac{3x-10}{4}$, sometimes torpedoed these attempts.

Question 14

The majority of candidates fell into one of three categories. Firstly, there were many who scored full marks. Secondly, a significant number appeared to be unfamiliar with cumulative frequency, which appears regularly on Higher tier papers, and were unable to make a meaningful attempt even to complete the table. Thirdly, a large number of candidates fell at the last hurdle; having read the appropriate value from their graph, they failed to subtract it from 200 and so lost the final mark. Points were sometimes plotted in the middle of intervals and a few candidates drew only bar charts. The former incurred a penalty of only 1 mark but the latter, of course, received no credit.

Question 15

Only a minority gained full marks for the completely correct inequality $-4 < x < 4$. The majority scored 1 mark out of 2, usually for $x < 4$ and sometimes for $x < \pm 4$. This question was often not attempted and many candidates made no headway. Centres should note that, in this case, as with all questions on inequalities, a wrong answer on the answer line, '4' for example, takes precedence over anything in the working space, $x < 4$ for example, which would, on its own, have received credit.

Question 16

The majority scored full marks in the first part for calculating the sum of $\frac{3}{8}$ and $\frac{2}{8}$, although a significant minority found the product of these two fractions.
The quality of attempts at the second part varied widely. Many candidates demonstrated a clear understanding of probability and gained full marks but a substantial number achieved no success. In between, there were three main reasons for mark loss by candidates who had some understanding of probability. The first was treating the question as if it were 'with replacement'; a maximum of 2 marks out of 5 were available to candidates who made this error. The second was doubling the product $\frac{2}{8} \times \frac{1}{7}$ in part (i) and the third was omitting one of the two products in part (ii).

Question 17

In part (a), most candidates understood the notation f(10) and were able to find its value.
Many scored either full marks in part (b) for $x < 6$ or 1 mark out of 2 for an answer which showed some understanding of what was required, $x \leq 6$, for example, but a substantial number of candidates either made no attempt or did not appreciate that a restriction was needed on $x - 6$. A popular wrong answer was 6 on its own, even though 'values' appeared in the question. Some candidates attempted to list the actual integer values which had to be excluded but very often failed to indicate that negative values were unacceptable.
Many candidates successfully read from the graph to find g(2) in part (c), although there was a wide range of wrong answers as well.
In part (d), the order of functions was quite well understood and many candidates gained full marks for a correct answer, while others scored 1 mark out of 2 for stating 15, the value of g(0). This part was frequently not attempted, though.
Many candidates successfully found both solutions from the graph in part (e), although occasionally only one was found. Some of those who did not actually find a solution still scored 1 mark for stating the value of k or indicating it on the graph but a minority were unable to make an attempt.

In part (f), many did not appreciate that a tangent was required and were unable to make a start but those who did generally drew it accurately and went on to try to find its gradient using $\dfrac{\text{vertical difference}}{\text{horizontal difference}}$ for two points on the tangent. A mark was still awarded for this, even if a scale reading error (often by a factor of 10 on the y-axis) occurred, if the examiner could see where the candidate's numbers had come from. Those who assisted examiners by indicating on their tangent the triangle or points they were using had a greater chance of reward. The related division was, however, also required for the award of full marks. A minority tried to use $y = mx + c$ on their tangent, an approach which could have been productive but seldom was. Even if a tangent were not drawn, 1 mark was given for a clear attempt to find the gradient of a line joining two suitable points on the curve, that is, one point with an x-coordinate in the range $3 \le x \le 3.5$ and the other point with an x-coordinate in the range $3.5 \le x \le 4$. A few candidates tried to find the equation of the curve and use calculus but such attempts invariably failed.

Question 18

Many candidates successfully used the Cosine Rule to find the required angle, although others started with a statement of the rule which was either incorrect or related to an angle other than the required one. Those who started with $8^2 = 4^2 + 6^2 - 2 \times 4 \times 6 \cos x°$ rather than $\cos x° = \dfrac{4^2 + 6^2 - 8^2}{2 \times 4 \times 6}$ gave themselves more scope for subsequent error, the most likely ones being in rearranging $8^2 = 4^2 + 6^2 - 2 \times 4 \times 6 \cos x°$ to evaluate $\cos x°$ or 'collapsing' $36 + 16 - 48 \cos x°$ to $4 \cos x°$. Some took more circuitous, although mathematically correct, routes. This incurs no direct penalty but is more likely to lead to inaccuracy in the final answer. Some candidates assumed that the triangle was right-angled and used trigonometry based on this assumption.

Question 19

In part (a), many candidates either scored full marks by completing the Venn Diagram correctly or scored 1 mark out of 2 for two or three correct entries. A common error was to enter 37, which was n($\mathscr{E}$), as if it were $\mathrm{n}(A \cup B)'$. Those who failed to score often just used the numbers given in the question. .

Only a small minority of candidates gained full marks in part (b). Those who gained 1 mark out of 2 were more likely to answer part (i) correctly. 7 was a popular wrong answer for part (ii), presumably the result of confusion between $\mathrm{n}(A' \cup B')$ and $\mathrm{n}(A \cup B)'$.

Question 20

There was wide variation in the quality of responses. Many candidates produced completely correct solutions but some, having used $\pi \times r \times 9 = 100$ correctly to find the radius of the base, then either made an error when using Pythagoras' Theorem to find the vertical height or used the slant height instead of the vertical height, when finding the volume. Those who used $\frac{100}{\pi}$ as the radius sometimes encountered problems when using this value in their Pythagoras' Theorem calculation. Some lost accuracy by prematurely rounding intermediate values to fewer significant figures than the three required in the question, for example, giving the radius as 3.5 cm. Many of these candidates had a final answer of 109, which scored 4 marks out of 5. In general, candidates should be advised to give intermediate values to at least one more degree of accuracy than that expected in the final answer.

Question 21

In the first part, the majority of candidates either scored full marks for the correct answer, $8y^6$, or 1 mark out of 2 for a partly correct expression such as $12y^6$, $16y^6$ or $8y^5$.
The second part required a thorough understanding of indices and only a minority of candidates were able to demonstrate this. There were several common mistakes. Chief amongst these were writing $2^p \times 8^q$ as 16^{p+q} or 16^{pq} and writing 8^q as 2^{3+q}. These and other errors with indices led to some regular wrong answers, notably
$n = p + q + 3$, $n = p + q$ and $n = p \times 3q$. Attempts to substitute numbers for p, q and r and then spot a connection were occasionally successful.

Question 22

A large number of candidates gave three correct vector expressions in part (a). The other candidates generally scored no marks, although occasionally part (i) alone was correct and some candidates managed to get part (iii) right by starting again, having failed to get the mark in part (i). Some left expressions like OQ in their answers and others mixed vectors and scalars with answers such as $2\mathbf{a} + 3\mathbf{b} + \frac{1}{3}$.

In part (b), a fair number of candidates gained the first mark by finding either $\overrightarrow{DF} = 2\mathbf{a} + 4\mathbf{b}$ or $\overrightarrow{EF} = \mathbf{a} + 2\mathbf{b}$. Many of these went on to gain the second mark by stating either $\overrightarrow{DF} = 2\overrightarrow{DE}$ or $\overrightarrow{DE} = \overrightarrow{EF}$ and there were some very concise answers.

Writing $\overrightarrow{DEF}$ instead of $\overrightarrow{DF}$ was a common error of notation. There were plenty of blank spaces and some serious misconceptions, like dividing vectors or using Pythagoras with them. A common mistake was to assume that $\overrightarrow{DE} + \overrightarrow{EF} = \overrightarrow{DF} \Rightarrow DEF$ is a straight line.

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com
Order Code UG030748 January 2012

For more information on Edexcel qualifications, please visit
www.edexcel.com/quals

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning