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Principal Examiner Feedback

June 2011

GCSE Mathematics (2MB01)

Unit 2: 5MB2H
Higher (Non-Calculator)

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1. PRINCIPAL EXAMINER'S REPORT – HIGHER PAPER 2

1.1. GENERAL COMMENTS

1.1.1. Most candidates used the spaces provided to show their working. This enabled examiners to award marks for partially correct solutions.

1.1.2. In responding to questions where no answer line was provided, candidates usually showed reasons and conclusions at appropriate places in their working.

1.1.3. Where candidates were required to give reasons in geometry questions, they were rarely expressed clearly and accurately.

1.2. REPORT ON INDIVIDUAL QUESTIONS

1.2.1. Question 1

Over 80% of candidates were able to work out the area of the triangle though a significant minority of candidates evaluated 5×6 but did not divide by 2. One mark was awarded for stating correct units. Approximately 70% of candidates were awarded this mark. Where it was not awarded this was usually because units were omitted rather than wrong units were given, though "cm" was seen frequently. Centres are reminded to advise candidates that units are not always explicitly requested in a question but should be given where appropriate.

1.2.2. Question 2

Approximately two thirds of candidates gave the correct answer to part (a) of this question. Where a candidate's response was not correct, this was usually due to the presence of "$- 3$" or "$- 3x$". In part (b) almost 70% of candidates were able to identify at least one factor of $2x^2 - 4x$. However many attempts showed only partial factorisation or a lack of care and less than a half of candidates scored full marks.

Candidates are reminded that their answers may be checked by multiplying out the brackets. Fully correct answers to part (c) of this question were quite rare. 14% of candidates scored 2 marks here with a further 4% of candidates scoring 1 mark for a correct expansion of $- 3(x + 2)$ followed by an incorrect final answer. It is disappointing to report that many candidates did not appreciate the need to expand the brackets first. Many answers of "$8x + 16$" were seen.

Many candidates expanded the expression in the same way as they would for a quadratic expression, writing down 4 terms from an expansion of $(11 - 3)(x + 2)$ before collecting like terms. Those who did attempt to expand $- 3(x + 2)$ first, often gave "$- 3x + 6$" as their expansion. Expansion of the quadratic expression in part (d) was done more successfully, though there were many errors in signs and in evaluating 6 multiplied by 7. Some candidates tried to combine terms in "x" with terms in "x^2". About two fifths of candidates scored 2 marks for this part of the question and a further one quarter of candidates scored 1 mark for a partially correct expansion.

1.2.3. Question 3

This question was answered well. Well over a half of all candidates successfully expressed 48 as a product of its prime factors with candidates often giving the answer in the form $2^4 \times 3$. The most widely used and most successful method used by candidates was to construct a factor tree. The 20% of candidates who were awarded 1 mark included those who expressed their answer as a list "2, 2, 2, 2, 3" or a sum "2 + 2 + 2 + 2 + 3" together with those candidates who had not obtained a complete solution.

Some candidates listed pairs of factors of 48 but got no further. Part (b) of the question was also answered well. Nearly three quarters of candidates gave the correct time. Most candidates either listed multiples of 16 and 20 or drew up two timetables. Arithmetic errors were commonplace. Some candidates attempted to express 16 and 20 as a product of their prime factors but often did not know how to progress from there.

1.2.4. Question 4

The vast majority of candidates (90%) scored full marks here. About 5% of candidates subtracted £24 from £60 and gave £36 as their answer or added the £24 to give £84. In this functional maths question, examiners were unable to award full marks for this.

1.2.5. Question 5

Over 50% of candidates drew clear, accurate graphs and scored full marks in the first part of this question. Most candidates plotted two or more points which they then joined to form a straight line. Relatively few candidates constructed a table of values before plotting points. A significant minority of candidates tried to use the gradient-intercept method to draw the line. This approach proved less successful. Most candidates using this method drew lines passing through (0, 2) but with an incorrect gradient. There was little evidence to suggest that the different scales on the x and y axes had confused candidates.

In part (b)(i) nearly 60% of candidates gave a correct equation. Of those who were not successful, a few gave an expression rather than an equation. In part (b)(ii) correct answers were rare. A large number of candidates who demonstrated an understanding of the situation gave the equation of a perpendicular line rather than the gradient. This highlights the need for candidates to ensure they read the particular demands of a question carefully.

1.2.6. Question 6

This multi step question was generally well answered. Over 90% of candidates gained some marks for their answers. Well over 50% of candidates scored all 4 marks.

Much of the work seen was well presented. Nearly all candidates made a good attempt at working out the total floor area, though some candidates, in effect, planned to cover part of the floor twice by including a 2m by 2m square of the floor twice in their calculations. These candidates might have benefited from showing on the diagram how they could split up the compound shape or from drawing two or three constituent shapes before working out the area. Nearly all candidates realised the need to round up the number of packs of floor boards and gave an integer as their answer. Candidates often preferred to use repeated addition to work out $18 \div 2.5$. It was disappointing to see a significant number of candidates in this higher tier examination using perimeter as a basis for their calculations.

1.2.7. Question 7

Over 60% of candidates scored full marks in this question. A further 20% of candidates gained one mark, usually for getting the x coordinate correct. Very little evidence of a formal method was seen in the working space, but where there was some indication, incorrect approaches included finding the difference between the x coordinates and between the y coordinates, finding the average of the two coordinates for each point and attempts at finding the mean of 3.8 and 7.5

1.2.8. Question 8

This question was answered well. Parts (a) and (b) were answered correctly by well over 80% of candidates respectively.

In part (c) almost 70% of candidates were successful. The most common incorrect answer seen to this part of the question was "x^5".

1.2.9. Question 9

This question proved to be a good discriminator between those candidates who provided a confident, clear and concise approach and those who presented many calculations scattered around the working space apparently not being sure whether they were taking the right approach. Many approaches were possible and indeed many were seen. The most common, and probably the most successful approach was to compare the average speed, in mph, for each of the two days.

Centres are reminded that candidates were expected to communicate a clear decision about the day Mr Smith drove more quickly to work, a decision linked to their calculations. Without this link, full marks could not be given.

It is heartening to report that calculations were generally carried out accurately even though candidates did not have access to a calculator. However, less than one fifth of candidates scored full marks with a further 30% of candidates scoring at least one mark. Most of these candidates considered a common time period for each of the two days, usually one hour. When attempting to change between miles and kilometres, candidates used many different conversion factors.

Centres are reminded that the conversion factors that candidates are expected to know, in this case 8 km is roughly equivalent to 5 miles, are stated in the specification. It was not uncommon to see a candidate ignoring units and carrying out a direct comparison between a quantity given in km/h with a quantity given in mph.

1.2.10. Question 10

It is pleasing to report that over three quarters of candidates gave a correct expression for the n^{th} term of the sequence in part (a) of this question. "$2n + 4$" and "$n + 4$" were the most commonly seen incorrect answers. Responses to part (b) were hampered by candidates' inability to work out the correct value of $2n^2 - 4$ when $n = 3$.

Most candidates realised that they needed to carry out a substitution with $n = 3$ but the incorrect answer "32" ($(2 \times 3)^2 - 4$) was seen as frequently as the correct answer "14". Candidates are advised to show a substitution, without any evaluation, as the first step in their working. Less than 40% of candidates were awarded the two marks available here.

1.2.11. Question 11

Two common approaches were seen in answers to this question. Most candidates calculated the size of each exterior angle as a first step. The best candidates went on to produce concise and clear working leading to a correct answer while weaker candidates could not see how to complete the method or made errors along the way. A second approach started with the calculation of the size of each interior angle. This was not as successful as most of the candidates using this method needed to work out the sum of the interior angles by splitting the decagon into 8 triangles, often making mistakes with the arithmetic on the way.

Many candidates were confused between interior and exterior angles – a surprising number of candidates marked an angle on the diagram with 36° even though it should have been obvious that it was obtuse. Other candidates assumed a decagon had 8 sides despite a diagram being given. The diagram was not always fully utilised and annotation and working were not always clearly presented. Approximately 30% of candidates scored full marks. A further 30% of candidates were awarded 2 or 3 marks.

1.2.12. Question 12

The best candidates gave neat, clear and concise proofs. However, these were relatively rare and
$(n - 1)^2 + n^2 + (n + 1)^2 = n^2 + 1^2 + n^2 + n^2 + 1^2$ or equivalent was frequently seen on candidates scripts. Just under 20% of candidates gained credit for correctly expanding at least one of the two expressions $(n - 1)^2$ or $(n + 1)^2$. These candidates usually completed the proof successfully though the presentation of their argument was sometimes a bit "haphazard".

1.2.13. Question 13

Almost 70% of candidates gained some marks for their responses to this question. Most of these candidates were successful in finding the size of the angle, but fully correct reasons were rare.

Few candidates seemed able to express 2 reasons with sufficient clarity for examiners to award the communication mark available. For example, statements such as "the angle between the tangent and the circle is 90º" are not acceptable. Here a statement equivalent to "the tangent to a circle is perpendicular (90º) to the radius" is required. A common error was for candidates to mistakenly use "angle at the centre is twice the angle at the circumference" and give the answer "84º".

1.2.14. Question 14

In part (a) of this question approximately 10% of candidates could express $5\sqrt{27}$ as $15\sqrt{3}$, with a further 10% of candidates making some progress in breaking down $\sqrt{27}$ to $\sqrt{9\times 3}$, $\sqrt{9}\,\sqrt{3}$ or $3\sqrt{3}$.

In part (b) about one quarter of candidates knew that multiplying both the numerator and the denominator by $\sqrt{3}$ (or a multiple of $\sqrt{3}$) was the key to rationalising the denominator and most of these candidates were successful in expressing $\frac{21}{\sqrt{27}}$ as $7\sqrt{3}$ or an acceptable equivalent (e.g. $\frac{21\sqrt{3}}{3}$). A common error seen was multiplication of only the denominator by $\sqrt{3}$. Other candidates progressed as far as $\sqrt{27} = 3\sqrt{3}$, only to conclude their argument with "$5 + 3\sqrt{3} = 8\sqrt{3}$".

1.2.15. Question 15

One third of candidates knew that raising a number to power $\frac{1}{3}$ is equivalent to taking the cube root and so successfully evaluated $27^{\frac{1}{3}}$ in part (a) of this question.

Part (b) discriminated well between those candidates who understood negative indices, those who understood fractional indices and those who could combine both concepts. Over 40% of candidates made some progress in finding the value of $25^{-\frac{1}{2}}$ with just over 25% of candidates completing the question successfully. Most of the candidates who presented a partially correct solution were able to evaluate $25^{\frac{1}{2}}$. Fewer candidates were able to interpret a negative index as a reciprocal. Commonly seen incorrect answers include 5, − 5, − 12.5 and 12.5 .

1.2.16. Question 16

Almost a quarter of all candidates were able to give a fully correct simplification of the algebraic fraction in part (a) of this question. A further 13% of candidates appreciated the need to factorise the numerator and denominator and completed at least one of these factorisations successfully. Unfortunately many candidates failed to check their factorisation by multiplying out the brackets. For example $y^2 - 8y + 12$ was often expressed as $(y - 6)(y + 2)$ and an unnecessary loss of marks may have been avoided if a check had been carried out. A significant number of candidates attempted to cancel terms, for example "12" without any attempt to factorise first.

In part (b) of this question, full marks were awarded to the 12% of candidates who could accurately combine the two fractions given into a single fraction. Simplification of the fraction obtained was not required. Partial credit was given to a further 23% of candidates who made some progress with writing the fractions with a suitable common denominator.

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