Pearson

Examiners' Report
Principal Examiner Feedback

November 2018

Pearson Edexcel GCSE (9 – 1)
In Mathematics (1MA1)
Higher (Calculator) Paper 3H

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GCSE (9 – 1) Mathematics – 1MA1
Principal Examiner Feedback – Higher Paper 3

Introduction

The paper was accessible to students who had been prepared for a higher GCSE Mathematics paper. There were some questions that were not well answered especially towards the end of the paper but this can be expected from the cohort sitting the November paper.

It was pleasing to see that students were able to begin most of the questions this session but not all showed full working.

Reports on Individual Questions

Question 1

For part (a) many correct answers were seen and this should be expected from students sitting a higher paper.

Part (b) was also generally well answered by the students, many of whom gained full marks. The most popular incorrect answer was 0.7869... This came from a misunderstanding of the square root sign with the square root applied to the whole calculation and not just the numerator.

Question 2

Most students began this question and gained one mark. The initial calculation to find the increase in cost was fine but then they did not know how to find this as a percentage increase, often doing 638 ÷ 883 × 100. Many students calculated the overall increase by doing 883 ÷ 245 × 100 stopping there to give 360.4 as a popular incorrect answer rather than continuing to find the actual percentage increase. The answer of a percentage greater than 100% did challenge some students, and some, who even though they arrived at the correct answer in the working then just wrote 26% or even 2.6% as their final answer. Centres are advised to ensure that students know that it is possible to get percentages greater than 100% when finding percentage increases.

Question 3

This question was well answered by the majority of students. The most common error made was with the substitution of the negative value into the equation, the incorrect value of $y = -8$ for $x = -3$ was often seen.

In part b the plotting was usually accurate but occasional misreads of the scale were seen. It was pleasing to see freehand curves drawn with an appropriate turning point. A few graphs using line segments were seen, these will never score full marks.

Part c was not as well answered as the previous parts. Some blank responses were seen and a popular incorrect answer was -4 from reading the graph at $x = 0$ instead of at $y = 0$.

Many students who had correctly drawn the quadratic curve did not try to use their curve to identify the value of x when $y=0$. Centres should encourage their learners to use the curve rather than trying to solve a quadratic equation.

Question 4

The first part of this question was well answered. Most students were able to find the appropriate percentage. The most common incorrect answer seen was 2.5% from 100÷40.

Many fully correct answers were seen in part b, full working was required as this was a 'show that' question. However, a common error was to read off the vertical scale incorrectly sometimes using 10.8 instead of 11. Students should always look at the context of the question to see if their answers are sensible. As this is about the number of students buying books 10.8 is not a sensible number. In general most students received marks on this question for either the correct frequencies or the correct mid values.

Question 5

For this question most students scored at least one or two marks. Credit was given for the understanding the principles of speed is distance divided by time. This meant that the students who were unable to convert 1minute 54 seconds correctly could still get credit for using this concept. Incorrect conversions of time included 1.54 (minutes), 154 (seconds), and 104 (seconds).

For those who arrived at an answer of 2.8 hours there were a significant number who could not convert this successfully into minutes and seconds. Students continue to struggle using the fact that there are 60 seconds in a minute.

Part (b) required an explanation and many students were able to interpret the change in speed and the affect this would have on the time taken for the race.

Question 6

The initial ratio part at the beginning of this question allowed many students to achieve one mark on this question. For those who could not find the angle correctly there was another opportunity to achieve marks by using 'their' value for angle A or angle B in a correct equation using trigonometry.

Many students continue to make the use of trigonometry in a right-angled triangle more difficult than is necessary, by trying to use the cosine rule or sine rule but often misquoted incorrectly. Whilst this approach is acceptable and can lead to the correct answer few students are able to apply these rules correctly.

The use of a trigonometry in a right-angled triangle is usually a more successful approach. However, the most common error seen in this method was for the student to correctly write sin 54 = 14 ÷ *AB* but then to rearrange incorrectly to *AB* = 14 sin 54.

Question 7

Students should always check the plotting of their values carefully as marks were frequently lost due to plotting errors.

The usual errors seen on the question were points not plotted at mid-values, first point joined to last point to form a closed polygon, points plotted and not joined at all or points plotted and joined with a curve rather than line segments.

Question 8

Some fully correct answers were seen but this problem solving question was not well answered by the majority of students. Many students confused surface area and volume at some point within their working.

Some students failed to find the correct values of 9, 5, 3 for the dimensions of large cuboid, often just deciding to multiply 45, 27 and 15 together as the volume.

Although a good majority of the students did score one mark for using 2.5^3 as the volume of the smaller cube. But they then often used this with the surface area of the larger cuboid.

Question 9

The majority of students gained one mark in part (a) for the expansion of two brackets. Many went on to then try and expand the third bracket. The main error was the failure to obtain the correct number of terms for their second expansion; often students did not fully expand the third brackets and hence failed to score the second mark. Other students were more successful and did gain the second mark but inaccurate simplification cost them the final mark.

Unfortunately, some students attempted to expand all three brackets in one go and did not achieve any correct terms.

Part (b) was either totally correct or incorrect there was very little in the way of working shown by many students. When working was evident the main error seen was to multiply and divide the powers i.e. $4\times n\div 2 = -3$ which when solved gave rise to the incorrect value of -1.5.

The last part saw many students gain a mark for substitution into the formula, although a number of students had the incorrect formula. Some students made the error of using -4 for –b and this error was carried through which resulted in the values having the wrong signs at the end. If only one error was seen the

method marks could still be awarded as long as all steps were clearly shown. The use of calculators led to a number of students leaving their answers in surd form rather than evaluating the solutions as requested to 3 significant figures.

Question 10

In part (a) many correct answers were seen. However the main problem for students was around rounding. Many had the correct answer and then rounded incorrectly, some just rounding one digit, often the third decimal place. Others removed the decimal point from the number altogether. Centres are advised to revise rounding to a given number of significant figures with students prior to examination sessions.

The success rate for part (b) was lower than in part (a), errors seen included attempting to solve $34 = 2x - 3$ or finding sin(65) and then dividing by 4.

The last part of this question was not well answered by students. The concept of a positive and negative square root was missed by many. Although a few students did gain credit for stating that this quadratic should have two solutions or for actually solving the given quadratic to show that the other solution is -9.

Question 11

Students found this question difficult. Only a few fully correct answers were seen. There was no single misconception both sine and cosine curves were seen. However, so were cubics and quadratics. Some students drew lines which could have been asymptotes, but these often went through the curves drawn.

Question 12

The most common error seen was to assume that the diagonal length of the square was 5 cm. However, those who used Pythagoras's Theorem correctly to find the diagonal often then gained the second mark for the length of the half-diagonal. Some did use trigonometry appropriately but often errors were seen.

Question 13

Some students gained a mark for using the 400 correctly as 1.01×400 on its own or as part of a larger calculation. The final mark was often lost where students did not interpret the question and gave the answer as 408.04, or used the wrong number of years, frequently giving the number for the start of year 4.

Question 14

This question was not well answered by the majority of students. The main error seen would appear to be a lack of knowledge of inverse proportionality and how to express it algebraically. Of the students that did gain marks the modal mark was 2 marks. They often starting by writing down a correct equation but were then unable to substitute the given values correctly. However, the main error

then seen was to evaluate $(2a)^3$ incorrectly, often giving this as $8a$, thus not gaining the final mark.

Question 15

Many students did not score any marks for this question. A small minority of students were able to begin by writing down a general term for an odd number but those that did this then often lost the second mark through a lack of use of brackets. Squaring and subtracting expressions was not done well and little justification of results attained was seen.

Some students wrote $(2n+1)^2 - (2n+3)^2$ and $(4n^2 +4n +1) - (4n^2 +12n +9)$. This gained first the two marks as it is appropriate when finding a difference.

It is advisable for centres to remind students that a numerical approach only is insufficient for this type of question.

Question 16

Some fully correct answers were seen for this question. When attempted, the use of the sine rule or cosine rule was generally well done with students obtaining the correct value for length of *OD* and this gained two marks.

The calculations to find the length of the arc were often incorrect as many students found the area and not the length. Students who were successful up to this stage then often added the 6 instead of subtracting it or forgot to add the 14 so did not give a full and complete method.

Question 17

Many students were able to score on this question. Many tried to draw the correct histogram but plotting errors were often seen. Common errors include drawing the last bar at the correct height but to 250 or drawing verticals for bars at 25 instead of 20 or at 75 and 85 instead of 80. A significant number of students did not understand the need for a histogram and drew a bar chart.

Part (b) was not well answered. Some students did manage to identify the interval containing the median but few attempted to estimate within the interval.

Question 18

Some students gained one mark by giving one of the correct bounds for either the distance or the time. A few students did not convert the time into minutes before finding the bounds so could not gain any further marks, 2.5 hours and 3.5 hours were seen as incorrect bounds of time.

A minority of students were then able to combine the bounds in the correct way to obtain the values 2.7158… and 2.695…. Unfortunately, some of the students who obtained these results then averaged them and lost the final mark as this is not a valid method.

Question 19

This question was only partially successful for a small number of students. Many did not make any meaningful attempt to answer it and of those responses seen the main error was again inaccurate algebraic manipulation.

However, some students did gain a mark for the correct rearrangement and substitution into the quadratic equation. The expansion of the brackets was only sometimes successful particularly where the students substituted the value for *y*.

For the few students who obtained the correct quadratic equation and solved it by using the formula the final mark was not always awarded as their values of x and *y* were not paired correctly.

Question 20

A very small number of correct answers were seen for this question. Students who attempted the question often drew some or all of the transformations given. However they then gave the top of the triangle (-3.5 , 4) as the invariant point.

Summary

Based on their performance on this paper, students should

- spend time practising rounding to a given number of significant figures.
- learn to recognise routine questions and apply the most efficient approaches when answering these questions.
- read carefully the description of lengths and values within each question and use them appropriately.
- be aware that working with specific values is inappropriate when asked to carry out a proof.