Examiners' Report
Principal Examiner Feedback

November 2024

Pearson Edexcel International GCSE
In Further Pure Mathematics (4PM1) Paper 01

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Question 1
The two lines to be drawn in part (a) were usually drawn well and accurately. Of the two, a small minority of candidates drew the line $3x + 4y = 24$ incorrectly. An even smaller number of candidates were too inaccurate with their coordinates, despite a significant degree of latitude being given.

The question was characterised by few candidates testing out values for x and y, to determine the region for the second inequality in part (b), meaning that a closed, rather than open region (bounded only by the space available on the grid) was frequently shaded.

Centres could advise candidates to shade inside the region, rather than outside, to avoid confusion.

Question 2
Part (a) was generally well answered. Most candidates successfully set up two linear simultaneous equations and solve. A minority of candidates successfully used the sums to four terms and the sum to seven terms to find a required equation. There were a small number of candidates who attempted to incorrectly use the sums to five, six and seven terms to form an equation.

Part (b) also saw many candidates' fully correct responses. But of the three parts of the question, we were most likely to see errors here. The candidates who were most successful, generally found the sum to sixty and the sum to fourteen terms. Some candidates unnecessarily did extra work to find an expression for the sum in terms of n. Some used a first and last term method or the sum of a forty-six-term series, both of which frequently contained more errors.

Part (c) was almost universally well done. Lost marks were usually only from use of incorrect values of a and d or from not discounting the non-integer solution.

Question 3
This question was completed well by a majority of candidates. However, there was still a significant minority who frequently, only gained 3 out of the 5 marks, as they failed to use the information that the angle *ABC* was obtuse.

Candidates who failed to draw a sketch were the ones who most frequently were making incorrect substitutions into the sine and cosine rule.

Question 4
A large number of candidates were able to identify the relevant angle.

A significant minority of candidates gained 3 marks from working out relevant sides and then used them to work out further sides in an irrelevant triangle, identifying the incorrect angle. A variety of methods were used, some often less efficient than they could have been e.g. using the cosine rule in a right-angled triangle caused more work, relatively frequently and also using Pythagoras rather than trigonometry in a right angled triangle.

A relatively small number of candidates lost marks due to premature rounding.

Question 5
Part (a) was almost universally completed well.

Part (b) caused more errors than anticipated. A significant minority of candidates used the values from part (a) to do a substitution or worked with an equation rather than an inequality throughout. Centres could encourage candidates to leave answers as exact fractions.

Part (c) saw a majority of candidates complete an integration successfully. Centres could emphasis the use of a definite integral within a given time period means there is no need to find a constant of integration, though the finding of erroneous constants was not penalised. A small minority, once having achieved the answer of – 42, did not appreciate the relevance of the word distance, though many did. Centres could remind candidates of the need in all questions, but particularly a five-mark question to show the steps in their working.

There were a small number of responses that confused if to integrate or differentiate for parts (b) and (c).

Question 6
Part (a) saw mixed responses. A surprising number of candidates were unable to show the minimum step required of factorising out the 4 or progressed to make errors after doing this.

Part (b) was generally very well completed. A very large majority of candidates scored full marks and solutions were generally well constructed. Centres should encourage candidates not to use binomial expansions not for any n, different to that given in the formula book. We were often able to award full marks for fully correct work, but not where there were errors.

Part (c) – most candidates who gained marks here realised they could simplify and not solve the equations simultaneously. Candidates who didn't realise this and made further algebraic substitutions were the most likely to go wrong. Almost all candidates gained the first mark with most then progressing to gain all three.

Centres could remind candidates the demand of such a show that question means they shouldn't use the given vales to show what has been demanded.

Part (d) – a surprisingly large proportion of candidates didn't realise they needed to equate the surd with the expression to find the required value of x. Those that did, frequently progressed to gain at least two and usually all three marks.

Question 7
Part (a) saw mixed responses. A significant proportion of candidates managed to construct correct expressions for the area and perimeter and make a successful substitution. There were some unusual, not obvious rearrangements for the area equation, but most were then successful to go on and attain further marks.

There were a small number of candidates who used incorrect formulas for the area of a sector and length of an arc, most frequently subbing the angle in degrees into the formula for use with an angle in radians.

Part (b) was generally well completed, with few responses not scoring all marks. The errors seen usually involved an incorrect rearrangement to find r, an incorrect second derivative or failing to state why the evaluation of their derivative inferred a minimum value.

Part (c) generally gained full marks, unless the candidate had found the incorrect value of r.

Question 8

Part (a) was generally well completed with a majority of candidates attaining full marks. Candidates using the addition formulas for sin2A and cos2A were the most likely to not show enough working to gain marks or to make errors in working.

Part (b) was generally not well completed with the algebraic manipulation required often poor. The most frequent error being when candidates had multiplied correctly throughout by a denominator and then incorrectly rearranged to form a cubic equation.

Part (c) saw a great proportion of candidates gain marks than part (b). Once candidates had realised they needed to use the addition formula and rearrangement, often all four marks or three marks were then attained.

Question 9

Responses to this question were variable. Many candidates realised they needed to find the intersection of the curve and line and many also that they needed to find the intersections with the x-axis. A significant number of these didn't find all three x-coordinates needed.

Reponses to finding the area were more varied, with only a minority of candidates attaining full marks from a completely correct answer. The most common errors involved ignoring x-coordinates found, subtraction of the curve and the line and using the two solutions to the equation solved at the beginning of the question.

Almost all candidates were able to attain some marks from integrating and substituting limits.

Question 10

Part (a) saw variable responses, but it is clear that a significant number of candidates struggle completing the square with a negative coefficient of x squared and, despite having the use of a calculator, when fractions are involved. Most candidates were able to attain the follow through mark for the maximum value in part (b).

In part (c), many candidates knew how to state the sum and product of roots, though there a significant minority forgot to make the sum negative, from the coefficients. Algebraic work was often good, the most common errors were insufficient bracketing for the new sum and incorrect simplifying for the product. Omitting = 0 also caused some candidates to lose the final mark.

Part (d) was generally well done, with the most efficient method to be to just use the binomial expansion, many candidates who chose to expand triple brackets also gained the mark. Predominantly, this was as we made a concession to allow missing brackets to be recovered in further fully correct, which would not be usual for a ‘show that’ question and centres could advise candidates, this cannot be an expectation.

Part (e) had very variable response. Many candidates were able to attain the first two marks for the new sum of roots, but only a minority were able to continue to gain the next two marks for the new product and hence the final two marks.

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