Pearson Edexcel

Examiners' Report
Principal Examiner Feedback

October 2020

Pearson Edexcel International Advanced Level
In Further Pure1(WFM01/01)
Paper 1: Further Pure1

General

This paper proved very accessible for average candidates. Most coped well with 'standard' demands, but there were one or two more unusual questions which provided discrimination. Standards of algebra and arithmetic were generally good, so that careless mistakes were less common than is sometimes the case.
There were few blank responses to questions, suggesting that most candidates had sufficient time to complete the paper to the best of their ability.
The solution space provided on the paper was almost always more than adequate.
Most candidates realised the need to show their working clearly, but there were inevitably some who penalised themselves by providing insufficient evidence to justify marks, particularly in 'show that' questions.

Report on individual questions

Question 1

This was generally well done.
In part (a) the vast majority of candidates demonstrated an understanding that the root could be identified by a change in the sign of the function within the given interval. A mark was sometimes lost due to a missing conclusion.
Most candidates differentiated successfully in part (b), but a very common error was to have the wrong sign for the final term. This error was usually made when expressing $f(x)$ as separate terms rather than in the differentiation. Relatively few applied the quotient or product rule for the differentiation but if they did it was often successful.
In part (c), most candidates applied the Newton-Raphson procedure correctly, but a mark was often lost because of the error in part (b).

Question 2

It was evident that candidates knew how to use the properties of sum and product of roots, as there was no evidence of attempts to solve the equation, as has happened in the past.
In part (a) almost all candidates obtained the correct values for the sum and product.
In part (b)(i) nearly all candidates used the correct expression for the sum of the squares and most avoided careless errors to obtain the correct value. In part (ii), however, more errors were seen as the expression for the sum of the cubes was misremembered.
Part (c) was generally well done, the majority producing a fully correct solution. Most were able to find the sum and product of the roots with only a few careless errors. As always, a few candidates obtained the incorrect sign for the x term. Very few failed to produce integers in their final quadratic with only one or two forgetting the vital '= 0'.

Question 3

Responses to this question were generally very good.
In part (a) most candidates correctly identified the other two roots or correctly stated all four roots. For the Argand diagram in part (b) most sketches were convincing enough to score the marks, although more accuracy and clarity would have been desirable.
For part (c) the standard approach of using conjugate pairs to determine the quadratic factors was by far the most common and usually successful. Other methods (as described in the mark scheme) were rarer and more likely to introduce errors.

Question 4

Part (a) of this question was generally very well done. Most candidates were able to expand the expression and use the appropriate summation formulae. It was rare for the final term to be 1 rather than the correct n. There were occasional algebraic errors but these were not common. About 20% of candidates expanded completely and collected terms, which in this instance did not create any complications. Most did, however, take out a factor of $n/3$ early in their work.
Part (b) was poorly done, with only a minority of candidates scoring full marks. Most candidates either did not notice the reference to the odd numbers or did not connect this to the summation in part (a). The majority used limits of 500 and 200, but then sometimes failed to reduce the lower limit by one. There were some other combinations of limits, such as from 1 to 300, and other somewhat random uses of formulae, none of which gained any credit.

Question 5

Part (a) of this question, establishing the equation of the normal to the hyperbola, was generally very well done. Most answers scored full marks, achieving the given result with no difficulty.
In part (b), however, although many candidates achieved the first two marks by obtaining a correct three term quadratic equation, success was variable thereafter. Some of those who scored the remaining marks achieved them quickly by factorising correctly, using $(x - 8p)$ as a factor, and some applied the quadratic formula correctly and spotted that the discriminant was an exact square. Many were unable to cope with the required algebra.

Question 6

For part (i)(a), many candidates seemed to recognise the transformation represented by the given matrix, but the use of correct mathematical language such as 'stretch' (rather than 'enlargement') was expected. Descriptions indicating 'in the direction of the y axis' and 'scale factor 3' varied but could usually be correctly interpreted.

Although not penalised, quite a few candidates mentioned the origin, which is not relevant to this transformation.
In (i)(b) most candidates produced the correct form of matrix, but many used an incorrect angle, an anticlockwise rotation being a fairly popular choice.
In (i)(c) most had the correct idea and multiplied their **B** by **A** correctly, many obtaining the correct result. Only a small minority evaluated **AB** instead of **BA**.
Part (ii) of this question was generally better done than part (i). Many candidates were totally successful, usually using the determinant as an area multiple and working with the given trapezium. A minority of candidates chose to calculate the coordinates of the transformed shape and then used the '*shoelace*' method to obtain the area of the transformed shape. The majority of those that chose this approach were able to apply it correctly. The candidates who sketched the trapezium generally did better than those who did not. Some were only able to find the value of the determinant and made no more progress. Others found a negative value of k even though it was defined as a positive constant.

Question 7

This question proved challenging for many.
In part (a) there were two main possible methods. The first involved using the given equations to form an equation in one variable, then applying the discriminant condition for equal roots. Many candidates failed to apply the discriminant condition.
For the second method the approach was to differentiate the parabola equation and to equate gradients, leading to an x or y coordinate in terms of a, which could then be used to form an equation in a. Numerous slight variations were also seen, many of which involved parameters. Many candidates lost their way in part (a) and complete success was not common. Some effectively resorted to assuming the given value of a.
Part (b), however, was generally well done with many achieving both marks.
In part (c) most candidates achieved the first 2 marks indicating the focus and finding a y value at the directrix. Success in finding an appropriate method for the area of triangle PSA was more variable. A decent sized precise diagram was extremely helpful here. There were several correct valid methods for finding the required area, the most common of which are described in the mark scheme.

Question 8

Most candidates knew how to structure the standard induction proof in part (i). The majority did show convincingly that the result is true for $n = 1$.
The initial expression for the sum of $(k + 1)$ terms was usually correct, although a few candidates seemed unaware of how to proceed. The next stage was to collect terms over a common denominator, and here some struggled with the algebra, but most achieved a correct expression. Many did now work through carefully to obtain the correct quartic in the numerator, successfully obtaining the required expression. However, a substantial minority simply wrote down the final expression without

enough working to establish the result. Generally, candidates were able to produce a comprehensive induction statement.

Candidates seemed to be better prepared for the 'divisibility' type of induction proof in part (ii), and most had a sound approach, showing the statement is true for $n = 1$ and then proceeding to work with $f(k + 1)$ in one of the many possible ways..

As usual, however, a fair number of candidates got lost along the way, being unsure of their strategy. A majority did realise that the object of the exercise was to obtain a multiple of $f(k)$ combined with a multiple of 7. A few who worked with $f(k + 1) - mf(k)$ did forget to make $f(k + 1)$ the subject, but most did so without too much trouble. The most skilful candidates recognised that taking $m = 5$ or $m = 12$ provided a simple path to the solution.

There were occasional instances of candidates failing to complete this final question, possibly due to poor time management.