Examiners' Report/
Principal Examiner Feedback

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Pearson Edexcel International GCSE
Mathematics (4PM0)
Paper 01

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Introduction

The work submitted for these two papers was of a similar standard to that seen in recent examinations. However paper 2 in particular was found to be very straightforward with many candidates achieving a high score; consequently the grade boundaries were higher than usual.

There were many cases of candidates working in degrees when radians, if not absolutely necessary, would make the work easier. Far from all candidates give the general formula they are about to use but instead go straight to the substituted version. An error in the substitution will lose the M mark as examiners cannot read candidates' minds!

Candidates frequently have calculators which can solve quadratic equations. If this function is used all that is written down tends to be the equation and the answer(s) without any intermediate working. In such cases, both roots of the equation must be shown and must be correct for the question (not the candidate's equation) for the M mark to be awarded - an incorrect equation will automatically result in the loss of the M mark in such a case. Candidates must always bear in mind the instruction on the front of the paper that "Without sufficient working, correct answers may be awarded no marks". Every session there are many cases, particularly in "show that" questions, where steps are omitted in the working and marks are lost as a consequence.

Paper 1

Question 1

(a)
This is a question on basic technique and it was slightly surprising how few candidates managed all three marks for this part of the question. Most errors were due to an inability to deal with $\frac{4}{x^2}$ correctly and the subsequent sign change.

(b)
Surprisingly, a greater number of candidates coped better with integration here than in the differentiation in (a). Again, the main source of error was dealing with $\frac{4}{x^2}$, and far too many candidates lost the final B mark for omitting + c.

Question 2

The vast majority of candidates expanded the bracket and collected up like terms to achieve the correct 3TQ, and subsequently went on to find the correct critical values of $\frac{3}{4}$ and 4. Only a minority however, defined the correct region. Centres should encourage candidates to draw a simple sketch in these questions, as those who did very often defined the correct region. Candidates should note that defining an open region in the notation for a closed region, ie $\frac{3}{4} > x > 4$ will lose the final A mark.

Question 3

A pleasing number of completely correct solutions were seen here. With very few exceptions, most candidates' method was to differentiate the formula for the volume of a sphere, find the radius when $V = 2\pi r$, and then apply chain rule to find the correct final answer. Some candidates re-arranged V to find r, and proceeded on the same lines, but the neatest way seen (which is beyond the specification for this paper) was to differentiate the volume of a sphere V implicitly with respect to t and then just substitute r when the volume was 36 000πcm^3 ie.,

$$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt} \Rightarrow \frac{dr}{dt} = \frac{40}{4\pi r^2}$$

Too many candidates did not know the correct formula for the volume of a sphere.

Question 4

There were two distinct method of tackling this question. The first and simpler method involved just writing out and summing the first 3 terms of both the arithmetic and geometric series and equating them to form a 3TQ, which could easily be solved by using the formula, or by completing the square. The correct solution then dropped out in just a few lines.
It is good practice to write out the first few terms of any series to see where it is going; in this question that would have been especially useful.
Those who relied on the use of the summation formulae, obtained a cubic equation in r, which though simple to factorise into a linear and a quadratic factor (it was obvious by inspection that 1 was a root of the cubic equation) rarely managed to find the desired result.
Some left the answer as $\frac{-1 \pm \sqrt{21}}{2}$ thus losing the final mark needlessly, given that the required answer was given.

Question 5

(a)
Most candidates found the correct q, but very few candidates achieved the correct p. The most common answer by far was $p = 4$.
(b) (i)
The first two marks were given for a correct binomial expansion irrespective of the value of q. Centres must impress on their students of the need to write out formulae they intend to use first, so that if there are errors in substitution, examiners can be sure that correct methods are being used. It is also an important, yet possibly trivial point, that candidates who work neatly and carefully are far less likely to make errors, and they also make the examiner's job easier to award marks for correct work seen.
The number of fully correct expansions was in the minority.
Some candidates chose to expand $(4-x)^{-\frac{1}{2}}$, which provided it was correct obviously earned full marks.
(b) (ii)
A good number of candidates were able to define the validity correctly.
(c)

Credit was given in the first method mark for simply showing that candidates were multiplying their expansion by $2(1+x)$, and the second M mark was given for multiplying this by their binomial expansion, thereby minimising the loss of marks due to an incorrect q. Few fully correct final expansions were seen.

Question 6

In this question, rounding correctly was a significant issue throughout. Given that candidates at this level know how to round, then the only conclusion to be drawn is that they do not read questions carefully. Moreover, many worked in degrees rather than radians.

(a)

This part was only marginally more than what is expected in a GCSE paper and so the number of candidates who failed to achieve the correct answer was concerning. For those candidates who worked in degrees rather than the specified radians, the method mark was given for both correct angles so given.

(b)

This was a very poorly answered question, not least due to poor rounding. Those candidates, who gave the final correct two answers in the given range with no working, scored full marks, as we recognise that it is sometimes easier to leave ongoing calculations in calculators to avoid premature rounding errors. This strategy does however, run the risk of losing all marks due to a slip on the calculator.

The question stated clearly '3 decimal places', and yet some candidates were truncating answers to 2 or even 1 decimal place, for which no credit can be given as the answer is incorrect. Centres must impress on candidates that in these questions, the basic angles must be found FIRST, before processing the $2\theta + \frac{\pi}{4}$.

Question 7

This question is virtually a GCSE higher tier question, and yet it caused so many problems. Whilst the diagrams are **NOT** accurately drawn, putting in values of 141.3° into an obviously acute angle is clearly absurd, and yet so many candidates were writing and calculating on this basis as well as defining the obtuse angle *BDC* as 38.7°! Moreover, only a small minority recognised that triangle *ABD* was isosceles, and so could have saved themselves so much work because calculating all the other angles in the shape having found angle *BDA* was the work of a minute.

(a)

Most candidates worked out the acute of 38.7°, but less looked at the diagram correctly and found the supplement correctly which was the required angle.

(b)

Most candidates used either sine or cosine rule, (though the simplest method was to recognise that triangle *ABD* was isosceles and then find that *AD* was $2 \times 4\cos 38.7^\circ$).

(c)

Credit was given for the use of candidates' angles in a correct expression for the area of a triangle. It is worth noting that where candidates achieved correct numerical answers by incorrectly using the supplementary angles, method marks were withheld because of incorrect methods.

Question 8

Virtually every candidate knew that non constant rates of change involve calculus (in this case, integration) although those who earned full marks were in the minority mainly because they failed to deal with the constant of integration correctly if at all.

(a)

Very well answered with nearly every candidate achieving $6t - 2t^2$. Only a minority however, set $t = 0$ to find that the constant of integration = 0. Candidates who assumed that $c = 0$ lost the second A mark.

(b)

Again, many correct integrated expressions for the displacement, but many more used the fact that when $t = 0$, $s = 5$ and found the correct expression.

(c)

Well answered, with most equating their (usually correct) $v = 0$, to find that $t = 3$ seconds, and used this correctly in their expression for s.

Question 9

This was by far the best answered question in the paper, with a majority of candidates scoring full marks in parts (a), (b) and (c).

(d)

This was far less well understood, as the required region was the difference between two curves. Credit was only given for the correct difference with correct limits; no marks were available for integrating their incorrect region. Those candidates who used the given sketch in the question to draw the second curve and shade the region required were far more successful in this part.

It was pleasing to note that only a handful of candidates used a graphic calculator to write down the areas showing no working. Responses without calculus explicitly seen received no marks.

Question 10

(a)

This part centred round the ability to change the base of a logarithm, because once this was accomplished successfully, finding the 3TQ and subsequently factorising it were very straightforward. The most common error was to convert $2\log_x y = \dfrac{\log_y y}{2\log_y x} \Rightarrow \dfrac{1}{2\log_y x}$.

Given that the resulting 3TQ did not factorise, and candidates were asked to find a given result, more should have checked earlier work for errors. Notwithstanding this, part (a) was a very well answered part of the question. Many candidates were substituting x or y for $\log_y x$. Although these substitutions received full credit for correct work, candidates, should note that in order to avoid possible confusion, there are many other more sensible letters to choose from for substitution.

(b)

The crux of this part of the question was to convert the two logarithms to exponents. Some candidates proceeded to repeat the work from (a) all over again. Many only converted either $\log_y x = 2 \Rightarrow y^2 = x$ or $\log_y x = \frac{1}{2} \Rightarrow y^{\frac{1}{2}} = x$, but less converted both which were required to earn the first 2 marks. Once candidates had converted one of the logarithms, it was obvious that either $x = 3, y = 9$ or $x = 9, y = 3$, but the number of fully complete answers was not all that common.

Candidates who realised and wrote down that because $xy = 27$ then $x = 3, y = 9$ and/or $x = 9, y = 3$ without showing any log work received no marks.

Question 11

In this type of question a reasonable simple sketch would aid the thought process tremendously, and yet virtually no candidate drew one, and few earned full marks in this very approachable question.

(a)

Whilst this was not the easiest expression to complete the square on, the coefficient of x^2 is -1, and the coefficient of x is an odd number, some candidates found this very challenging indeed. Considering that completing the square is a higher tier GCSE skill, this was surprising.

(b)

Those candidates able to write down the maximum point from their expression in the form $P - Q(x + R)^2$, and those who differentiated and equated to zero, were in equal measure.

(c)

This part of the question was very well answered, helped by the fact that the numbers were straightforward. Virtually every candidate found the correct equation of l_1.

(d)

Candidates made far too many assumptions here, and as this is the last part of the last question, credit was only given for coordinates found using correct methods. Candidates needed to equate the gradient of the normal (-1) to the differentiated expression for the curve and find x, and use that to find y, and then use the formula for the equation of a straight line correctly in order to earn the first three marks here. Credit was given for equating their l_1 with their l_2, however they were obtained.

(e)

Nearly all knew how to apply the formula to find the length of *AB*.

(f)

The most popular way of finding the area of the triangle was by using discriminants (used correctly in virtually every case). Some used cosine rule to find the angle between *AB* and *BD*, and then $\frac{1}{2}ab\sin C$, although given that candidates were told these lines are perpendicular, a simple $\frac{1}{2}\times\text{base}\times\text{height}$ was all that was required.

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