Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel International Advanced Level
In Pure Mathematics P2 (WMA12) Paper 01A

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The May 2025 WMA12_01A paper had a variety of very accessible and familiar questions such as 1, 2, 3, 4i, 8 and 9 as well as ones that tested the high achieving candidate. Questions 4ii, 6i, 7 and 9 proved to be very discriminating. The paper was of an appropriate length with little evidence of students rushing to complete the paper.

Points to note for centres are

- Candidates often use calculators inappropriately in producing solutions. For example, there were a number of candidates who merely wrote down answers down Qu 5 b without any evidence
- Candidates should take care when reading a question. For example, in question 6(i) candidates were asked to use trigonometric identities to find the values of $\sin\theta$ and $\cos\theta$. Many just used their calculators.
- Candidates need to be careful to show all the stages of working in questions which demanded this. This was particularly true in question 7 where candidates struggled to write down equations in an appropriate form, never mind set up and solve the two simultaneous equations.

Question 1: Proof by exhaustion

This was a familiar context for a question and many candidates scored full marks. The solution merely required the sight of three correct rows and a minimal conclusion. Reasons for a loss of marks were:

- the addition of extra rows
- the omission of a conclusion
- a mix up between columns *b* and *c*

Question 2: Geometric Series

This was a relatively straight forward question for most candidates with the majority scoring full marks. Part (a) was a ‘show that’ and required some evidence for the solution $r = -\frac{1}{2}$. The easiest way to show this was via the equations $ar^2 = 64$ and $ar^5 = -8$, which, when divided gave $r^3 = \frac{-8}{64}$

Part (b) was also well done with many finding the value of the first term, *a*, before using the sum to infinity formula $S_\infty = \frac{a}{1-r}$ to produce the answer $\frac{512}{3}$. Reasons for the loss of marks in this question were;

- using incorrect formulae for the terms of a geometric sequence witnessed by use of $ar^3 = 64$ and $ar^6 = -8$
- confusion with the negative sign in $r = -\frac{1}{2}$ and finding $S_\infty = \frac{256}{1-\frac{1}{2}}$ rather than $S_\infty = \frac{256}{1+\frac{1}{2}}$

Question 3: Remainder theorem and Algebraic division

The first two parts of this question were standard and a good source of marks for many.

In part (a) candidates merely had to state that the remainder was -5. In part (b), another proof, setting $\mathrm{f}(-2) = 25$ produced an equation in *k* which was relatively straight forward to solve. Success in part (c) depended upon knowledge of what a quotient was. Many found $\mathrm{f}(x)$, divided by $(3x-1)$ but failed to fully answer the question, that is, find the quotient and remainder when $\mathrm{f}(x)$ is divided by $(3x-1)$. Some ignored the question altogether and found only the remainder.

There were some excellent solutions however and many very good candidates scored full marks.

The reasons why marks were lost in this question were:

- stating the remainder in part (a) was 5
- not fully showing all the steps in solving the equation in *k* in part (b)
- failing to state that the quotient was $x^2 + 3x - 6$ in (c)

Question 4 : Log laws and Trapezium rule

Part (a) was very accessible with many candidates scoring full marks. Use of the subtraction law led to the intermediate equation $\log_3\left(\frac{a+1}{a}\right)=4$ which could then be converted to $\left(\frac{a+1}{a}\right)=3^4=81$. From here it was a simple task of finding the value of a.

Part (b) was very much more demanding. It required a correct attempt at the trapezium rule followed by careful use of log laws to produce an answer of the form $\log_3 k$.

Whilst there were some excellent answers to part (c), others omitted this part suggesting that they had forgotten or never been taught this part of the topic.

Reasons for a loss of marks in Question 4 were;

- using a strip width of $\frac{4}{5}$ instead of 1 in part (b)
- omitting terms in $\frac{1}{2}\left\{\log_3\left(\frac{2}{1}\right)+\log_3\left(\frac{6}{5}\right)+2\left(\log_3\left(\frac{3}{2}\right)+\log_3\left(\frac{4}{3}\right)+\log_3\left(\frac{5}{4}\right)\right)\right\}$ or else failing to cancel down $\frac{1}{2}\log_3\left(\frac{2}{1}\times\frac{6}{5}\times\frac{3^2}{2^2}\times\frac{4^2}{3^2}\times\frac{5^2}{4^2}\right)$ to $\frac{1}{2}\log_3 15$ before writing $\log_3\sqrt{15}$ e

Question 5: Iterative and Arithmetic Sequences

Most candidates could start part (a) and find the values of u_2 and u_3. Two out of three marks were commonplace as many could not go on to prove that the sequence was periodic of order 3. To score the third mark, a reason must be offered, for example $u_4=u_1$. This was lacking in most scripts.

In part (b), the demand was to find the value of $\sum_{n=1}^{180}\left(5n+3+u_n\right)$ showing all working and without relying completely on calculator technology. The series consisted of two parts, $\sum_{n=1}^{180}\left(5n+3_n\right)$ which is arithmetic and $\sum_{n=1}^{180}(u_n)$ which is periodic of order 3. The two calculations must be shown as evidence of a correct method. For example, $\frac{180}{2}(8+903)+60\times\left(4+\frac{3}{4}+-\frac{1}{3}\right)=82255$

Reasons for loss of marks in Question 5 were;

- lack of a reason in part (a)
- failing to realise that the series in (b) was composed of two different series. Many treated the complete series as an iterative sequence of order 3

Question 6: Trigonometry

Part (i) was very discriminating with many candidates picking up 0 or only 2 of the 4 marks. Only the very best candidates managed all 4 marks. As with the previous question, evidence was required, this time, by way of a trigonometric identity. Part (a) could be solved using $\sin^2\theta+\cos^2\theta=1$ and part (b) via $\tan\theta=\frac{\sin\theta}{\cos\theta}$. The biggest loss of marks however was failing to use the fact that $180°<\theta<360°$ and so the signs of candidate's answers were rarely correct.

Part (ii) was set in context and many good answers were seen. In parts (a) and (b) it was necessary to understand that $\cos(30T-40)°$ had a minimum value when $(30T-40)°=180°$. In part (c), candidates were required to find the third positive solution to $\cos(30T-40)°=-\frac{1}{6}$

Reasons for a loss of marks in Question 6 were;

- using a calculator to generate answers in (i)
- not converting $t=\frac{22}{3}$ to a time of day in (ii)(b)
- using a calculator to solve $\cos(30T-40)°=-\frac{1}{6}$ without showing any intermediate work

Question 7: Binomial Expansion

Many candidates struggled to make a start with this question due to the fact that there were two unknowns, n and k, within the binomial expression $(1+kx)^n$. Hence candidates who used the more difficult expansion in the formula booklet could not deal with $\binom{n}{1}k = -24$ or $\frac{n!}{(n-2)!}k^2 = 540$ and made little progress. Candidates who used the expansion

$$(1 + x)^n = 1 + nx + \frac{n(n-1)}{1 \times 2}x^2 + \dots +$$

had little difficulty in producing the correct equations $kn = -24$ and $\frac{n(n-1)}{2}k^2 = 270$. Solving these two equations simultaneously required skill and care, and was only really achieved by higher achieving candidates. Too many candidates failed to heed the warning that all working must be shown and merely wrote down the solutions without any evidence.

If part (a) was done correctly, the marks in part (b) usually followed. Occasionally a mark was lost for a loss of sign or writing out the term, not the coefficient.

Question 8: Decreasing functions and Factors

Part (a) was well known and most candidates picked up the mark for finding the correct critical values. Many then went on to select the correct region although errors were common.

Part (b) was found more demanding than expected. If the curve cut the x-axis at $\frac{7}{2}$, then $(2x-7)$ should be the factor of the equation of the curve.

The method of finding $\mathrm{f}(x)$ in part (c) was generally well known. Correct expression were frequently seen but arithmetic slips led to the loss of at least two marks.

Common reasons for a loss of marks in Question 8 were:

- choosing the outside range $x < -5$ or $x > \frac{2}{3}$, in part (a)
- giving the factor as $\left(x - \frac{7}{2}\right)$ in (b). This is incorrect as integer values were required
- failing to find the constant of integration in part (c)
- failing to show evidence of intermediate factorisation in part (c), namely $(2x-7)(x^2+10x+25)$

<u>Question 9: Circles</u>

This was another unexpected question that candidates did not seem fully prepared for. There were some excellent solutions however, with highly developed problem- solving skills being shown. They key to solving part (b) was in realising the radius of the circle was the same value of the *x* coordinate of centre of the circle. Hence if both were set equal to '*a*' then solving $(x-a)^2 + y^2 = a^2$ with $(5, 6)$ led to a suitable solution for *a*.

Reasons for a loss of marks in Question 9 were;

- failure to draw a suitable diagram
- failure to start with a suitable equation, e.g. $(x-a)^2 + y^2 = a^2$

<u>Question 10: Turning points and Area under a curve</u>

The was familiar to candidates and most seemed well prepared to answer it.

Many fully correct solutions were seen to part (a), although a minority did not show sufficient working in going straight from their differentiated function to the minimum point. It is important that candidates read the instructions at the beginning of the question and show all the working required.

In part (b) most candidates were able to correctly integrate and identify the coordinates of points

P and Q. The most challenging part of the question proved to completing a full attempt at the area. There were a number of ways to do this but candidates would benefit from using the diagram that was provided to help. A common error was to omit the from the rectangle under the shaded region. Again, a small number of candidates failed to read the instructions and found the value of the integral using their calculator, thus scoring a maximum of one mark even if a correct answer was found.

Common reasons for a loss of marks in Question 10 were;

- poor differentiation and integration of the $\frac{64}{x^2}$ term
- failure to show sufficient working
- failure to establish a correct method of finding the area of R

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