1. Question | 4037 May-June 2025 P2 V1 Q6

6 **(a)** Using an appropriate quadratic factorisation, find the first three terms in the binomial expansion of $(9x^2 + 12x + 4)^5$, in ascending powers of x.
You must simplify your coefficients. [4]

(b) Find the term independent of x in the expansion of $\left(\frac{6}{x^2} + \frac{x^4}{2}\right)^{12}$. [2]

2. Question | 4037 May-June 2025 P2 V1 Q11

11 A geometric progression has first term a and common ratio r, where $r > 0$.
The sum of the 2nd and 3rd terms of the progression is 168.
The sum of the 4th and 5th terms of the progression is 94.5.

(a) Find the 6th term of the progression. [7]

(b) Find the sum to infinity of the progression. [1]

3. Question part 1/2 | 4037 May-June 2025 P2 V2 Q7

7 The first three terms of an arithmetic progression can be written as

$$2\ln\left(x^3\right), \quad 5\ln\left(x^2\right), \quad 2\ln\left(x^7\right).$$

(a) Given that $x > 1$, find the least number of terms for the sum of this progression to be greater than $43\ln\left(x^{24}\right)$. [6]

3. Question part 2/2 | 4037 May-June 2025 P2 V2 Q7

(b) Given that the 25th term of this progression is equal to 408, find the exact value of x. [3]

4. Question | 4037 May-June 2025 P2 V2 Q10

10 The first three terms, in descending powers of x, in the expansion of $\left(3x^2 - a\right)^n \left(1 + \frac{1}{x^2}\right)^2$ can be written as $729x^{12} + 972x^{10} + bx^8$, where a, b and n are constants.

Find the values of a, b and n. [9]

5. Question | 4037 Oct-Nov 2025 P2 V2 Q3

3 Find the exact value of the term independent of x in the expansion of $\left(2+\frac{3}{x^2}\right)^{10}\left(1-4x^2\right)^2$. [6]

6. Question | 4037 Oct-Nov 2025 P2 V2 Q8

8 An arithmetic progression has first term t and common difference 1.5.
The 4th, 8th and 20th terms of this arithmetic progression form the 1st, 2nd and 3rd terms of a geometric progression.

(a) Find the value of t. [5]

(b) Find the common ratio of the geometric progression. [2]

10 **(a)** In the expansion of $\left(2k - \frac{x}{k}\right)^5$, where k is a constant, the coefficient of x^2 is 160.

Find the value of k. [3]

(b) **(i)** Find the first 3 terms in the expansion of $(1 + 3x)^6$, in ascending powers of x.
Simplify the coefficient of each term. [2]

(ii) When the expansion of $(1 + 3x)^6(a + x)^2$ is written in ascending powers of x, the first three terms are $4 + 68x + bx^2$, where a and b are constants.

Find the value of a and the value of b. [3]

8. Question | 4037 Specimen 2025 P2 V2 Q5

5 The first four terms, in ascending powers of x, in the expansion of $(2 + ax)^7$ can be written as

$$128 + bx + cx^2 - 15\,120x^3.$$

Find the values of a, b and c. [6]

9. Question part 1/2 | 4037 Specimen 2025 P2 V2 Q9

9 **(a)** A geometric progression has first term 3 and common ratio 1.25.

Find the sum of twelve terms of the progression, starting with the twentieth term.
Give your answer to the nearest integer. [4]

(b) An arithmetic progression has first term 5 and common difference 3.
The sum of the first $5n$ terms is 23 times the sum of the first n terms.

Find the value of the positive integer n. [4]

10. Question | 4037 May-June 2026 P2 V1 Q3

3 An arithmetic progression has first term a and common difference d.

The 6th term is 1.5 times the 3rd term.

The sum of the first ten terms is 255.

(a) Find the values of a and d. [4]

(b) Using your values of a and d, find the least number of terms for the sum of this arithmetic progression to be greater than 40 000. [4]

11. Question | 4037 May-June 2026 P2 V1 Q7

7 Find the term independent of x in the expansion of $(2-3x)^6\left(1+\frac{1}{4x}\right)^2$. [6]

12. Question | 4037 May-June 2026 P2 V2 Q6

6 In this question, a, b and c are integers.

When the expansion of $(a+x)^4(1+ax)^5$ is written in ascending powers of x, the first three terms are $16+bx+cx^2$.

Find all the possible values of a, b and c. [8]