1. Question part 1/2 | 0606 Feb-March 2025 P2 V2 Q10

10 The expansion of $(ax-2)^4\left(1+\frac{b}{x}\right)^3$ is written in descending powers of x.

The first 3 terms of this expansion are $81x^4+999x^3+cx^2$.
It is given that a, b and c are positive integers.

Find the values of a, b and c. [10]

1. Question part 2/2 | 0606 Feb-March 2025 P2 V2 Q10

Continuation of working space for Question 10.

Question 11 is printed on the next page.

2. Question | 0606 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]

3. Question | 0606 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]

4. Question part 1/2 | 0606 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]

4. Question part 2/2 | 0606 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]

5. Question | 0606 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]

6. Question | 0606 May-June 2025 P2 V3 Q7

7 **(a)** Find the term independent of x in the expansion of $\left(x^2 - \frac{3}{x^4}\right)^{15}$. [2]

(b) In the expansion of $(1+ax)^9$ the coefficient of x^3 is 7 times the coefficient of x^2.

Given that a is a positive constant, find the value of a. [3]

7. Question part 1/2 | 0606 May-June 2025 P2 V3 Q9

9 **(a)** The 1st term of an arithmetic progression is 9.
The last term of this progression is 159.
The sum of all the terms is 2604.

The 12th term of this arithmetic progression is the 1st term of a geometric progression.
The 8th term of this arithmetic progression is the 2nd term of the geometric progression.

Find the sum of the first 6 terms of the geometric progression. [7]

7. Question part 2/2 | 0606 May-June 2025 P2 V3 Q9

(b) A different geometric progression has 1st term $\sin\theta$.
The common ratio of this progression is $\cos\theta$ where $45° \leqslant \theta \leqslant 135°$.

(i) Show that this progression has a sum to infinity. [1]

(ii) Show that this sum to infinity can be written as $\operatorname{cosec}\theta + \cot\theta$. [4]

8. Question | 0606 Oct-Nov 2025 P2 V1 Q10

10 In this question a, b and n are constants.

When $5(2+ax)^n$ is written in ascending powers of x, the first three terms are $640+b^2x+30\,240x^2$.

Find the value of a and the possible values of b. [5]

9. Question | 0606 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]

10. Question | 0606 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]

11. Question part 1/2 | 0606 Specimen 2025 P2 Q10

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]

12. Question | 0606 Feb-March 2026 P2 V2 Q11

11 **(a)** Find, in descending powers of x, the first three terms in the expansion of $(x^2 + \frac{1}{2x})^9$.
Give each term in its simplest form. [3]

(b) The expansion of $(x^2 + \frac{1}{2x})^n$, where n is a positive integer, has a term that is independent of x.
Show that n is divisible by 3. [4]

13. Question | 0606 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]

14. Question | 0606 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]

15. Question | 0606 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]