

Math Analysis and Approaches – Year 1
Binomial Theorem Exercises

1. Find the coefficient of x^5 in the expansion of $(3x - 2)^8$.

(Total 4 marks)

2. Find the coefficient of a^3b^4 in the expansion of $(5a + b)^7$.

(Total 4 marks)

3. Find the coefficient of a^5b^7 in the expansion of $(a + b)^{12}$.

(Total 4 marks)

4. Determine the constant term in the expansion of $\left(x - \frac{2}{x^2}\right)^9$.

(Total 4 marks)

5. Use the binomial theorem to complete this expansion.

$$(3x + 2y)^4 = 81x^4 + 216x^3y + \dots$$

(Total 4 marks)

6. Consider the binomial expansion $(1+x)^4 = 1 + \binom{4}{1}x + \binom{4}{2}x^2 + \binom{4}{3}x^3 + x^4$.

- (a) By substituting $x = 1$ into both sides, or otherwise, evaluate $\binom{4}{1} + \binom{4}{2} + \binom{4}{3}$.

- (b) Evaluate $\binom{9}{1} + \binom{9}{2} + \binom{9}{3} + \binom{9}{4} + \binom{9}{5} + \binom{9}{6} + \binom{9}{7} + \binom{9}{8}$.

(Total 4 marks)

7. Consider the expansion of $\left(3x^2 - \frac{1}{x}\right)^9$.

- (a) How many terms are there in this expansion?

- (b) Find the constant term in this expansion.

(Total 6 marks)

8. Find the coefficient of x^3 in the expansion of $(2 - x)^5$.

(Total 6 marks)

9. Find the term containing x^{10} in the expansion of $(5 + 2x^2)^7$.

(Total 6 marks)

10. Complete the following expansion.

$$(2 + ax)^4 = 16 + 32ax + \dots$$

(Total 6 marks)

11. When the expression $(2 + ax)^{10}$ is expanded, the coefficient of the term in x^3 is 414 720. Find the value of a .

(Total 6 marks)

12. Find the term containing x^3 in the expansion of $(2 - 3x)^8$.

(Total 6 marks)

13. Consider the expansion of $(x^2 - 2)^5$.

(a) Write down the number of terms in this expansion.

(b) The first four terms of the expansion in descending powers of x are

$$x^{10} - 10x^8 + 40x^6 + Ax^4 + \dots$$

Find the value of A .

(Total 6 marks)

14. Given that $(3 + \sqrt{7})^3 = p + q\sqrt{7}$ where p and q are integers, find

(a) p ;

(b) q .

(Total 6 marks)

15. Consider the expansion of the expression $(x^3 - 3x)^6$.

(a) Write down the number of terms in this expansion.

(b) Find the term in x^{12} .

(Total 6 marks)

16. One of the terms of the expansion of $(x + 2y)^{10}$ is ax^8y^2 . Find the value of a .

17. Find the term in x^3 in the expansion of $\left(\frac{2}{3}x - 3\right)^8$.