

Binomial theorem - revision questions (TL) [53 marks]

1. [Maximum mark: 6] 23N.1.AHL.TZ1.5

The binomial expansion of $(1 + kx)^n$ is given by
 $1 + 12x + 28k^2x^2 + \dots + k^n x^n$ where $n \in \mathbb{Z}^+$ and $k \in \mathbb{Q}$.

Find the value of n and the value of k . [6]

2. [Maximum mark: 7] 23M.2.SL.TZ1.6

The coefficient of x^6 in the expansion of $(ax^3 + b)^8$ is 448.

The coefficient of x^6 in the expansion of $(ax^3 + b)^{10}$ is 2880.

Find the value of a and the value of b , where $a, b > 0$. [7]

3. [Maximum mark: 6] 22N.2.SL.TZ0.6

Consider the expansion of $\frac{(ax+1)^9}{21x^2}$, where $a \neq 0$. The coefficient of the term in x^4 is $\frac{8}{7}a^5$.

Find the value of a . [6]

4. [Maximum mark: 7] 22M.1.SL.TZ2.6

Consider the binomial expansion

$$(x + 1)^7 = x^7 + ax^6 + bx^5 + 35x^4 + \dots + 1 \text{ where } x \neq 0 \text{ and } a, b \in \mathbb{Z}^+.$$

(a) Show that $b = 21$. [2]

(b) The third term in the expansion is the mean of the second term and the fourth term in the expansion.

Find the possible values of x . [5]

5. [Maximum mark: 5] 22M.1.AHL.TZ1.6

Consider the expansion of $\left(8x^3 - \frac{1}{2x}\right)^n$ where $n \in \mathbb{Z}^+$. Determine all possible values of n for which the expansion has a non-zero constant term. [5]

6. [Maximum mark: 5] 21M.1.SL.TZ2.4

In the expansion of $(x + k)^7$, where $k \in \mathbb{R}$, the coefficient of the term in x^5 is 63.

Find the possible values of k . [5]

7. [Maximum mark: 5] 21M.2.SL.TZ1.6

Consider the expansion of $(3 + x^2)^{n+1}$, where $n \in \mathbb{Z}^+$.

Given that the coefficient of x^4 is 20412, find the value of n . [5]

8. [Maximum mark: 6]

20N.2.SL.TZ0.S_5

Consider the expansion of $\left(3x^2 - \frac{k}{x}\right)^9$, where $k > 0$.

The coefficient of the term in x^6 is 6048. Find the value of k . [6]

9. [Maximum mark: 6]

20N.2.AHL.TZ0.H_4

Find the term independent of x in the expansion of $\frac{1}{x^3} \left(\frac{1}{3x^2} - \frac{x}{2}\right)^9$. [6]