1.

   Find the term independent of x in each of the following expansions.

   (a) $\left(3x + \dfrac{2}{x^2}\right)^6$ [3]

   (b) $\left(3x + \dfrac{2}{x^2}\right)^6 (1 - x^3)$ [3]

The first term of a geometric progression and the first term of an arithmetic progression are both equal to a.

The third term of the geometric progression is equal to the second term of the arithmetic progression.

The fifth term of the geometric progression is equal to the sixth term of the arithmetic progression.

Given that the terms are all positive and not all equal, find the sum of the first twenty terms of the arithmetic progression in terms of a. [6]

The thirteenth term of an arithmetic progression is 12 and the sum of the first 30 terms is −15.

Find the sum of the first 50 terms of the progression. [5]

4.

The coefficient of x^4 in the expansion of $\left(2x^2 + \dfrac{k^2}{x}\right)^5$ is a. The coefficient of x^2 in the expansion of $(2kx - 1)^4$ is b.

(a) Find a and b in terms of the constant k. [3]

(b) Given that $a + b = 216$, find the possible values of k. [3]

5.

The coefficient of x^4 in the expansion of $(3 + x)^5$ is equal to the coefficient of x^2 in the expansion of $\left(2x + \dfrac{a}{x}\right)^6$.

Find the value of the positive constant a. [4]

The second and third terms of a geometric progression are 10 and 8 respectively.

Find the sum to infinity. [4]

7.

The first, second and third terms of an arithmetic progression are k, $6k$ and $k + 6$ respectively.

(a) Find the value of the constant k. [2]

(b) Find the sum of the first 30 terms of the progression. [3]

The coefficient of x^3 in the expansion of $\left(p + \dfrac{1}{p}x\right)^4$ is 144.

Find the possible values of the constant p. [4]

An arithmetic progression has first term 4 and common difference d. The sum of the first n terms of the progression is 5863.

(a) Show that $(n-1)d = \dfrac{11726}{n} - 8$. [1]

....

....

....

....

....

....

....

(b) Given that the nth term is 139, find the values of n and d, giving the value of d as a fraction. [4]

....

....

....

....

....

....

....

....

....

....