Series and Binomial Expansion – 2023 June AS Math 9709

1. June/2023/Paper_9709/11/No.2

(a) Find the first three terms in the expansion, in ascending powers of x, of $(2 + 3x)^4$. [2]

(b) Find the first three terms in the expansion, in ascending powers of x, of $(1 - 2x)^5$. [2]

(c) Hence find the coefficient of x^2 in the expansion of $(2 + 3x)^4(1 - 2x)^5$. [2]

2. June/2023/Paper_9709/11/No.6

The first three terms of an arithmetic progression are $\frac{p^2}{6}$, $2p - 6$ and p.

(a) Given that the common difference of the progression is not zero, find the value of p. [3]

(b) Using this value, find the sum to infinity of the geometric progression with first two terms $\frac{p^2}{6}$ and $2p - 6$. [2]

3. June/2023/Paper_9709/12/No.2

The coefficient of x^4 in the expansion of $(x + a)^6$ is p and the coefficient of x^2 in the expansion of $(ax + 3)^4$ is q. It is given that $p + q = 276$.

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

4. June/2023/Paper_9709/12/No.9

The second term of a geometric progression is 16 and the sum to infinity is 100.

(a) Find the two possible values of the first term. [4]

(b) Show that the nth term of one of the two possible geometric progressions is equal to 4^{n-2} multiplied by the nth term of the other geometric progression. [4]

5. June/2023/Paper_9709/13/No.3

(a) Give the complete expansion of $\left(x+\frac{2}{x}\right)^5$. [2]

(b) In the expansion of $(a+bx^2)\left(x+\frac{2}{x}\right)^5$, the coefficient of x is zero and the coefficient of $\frac{1}{x}$ is 80.

Find the values of the constants a and b. [4]