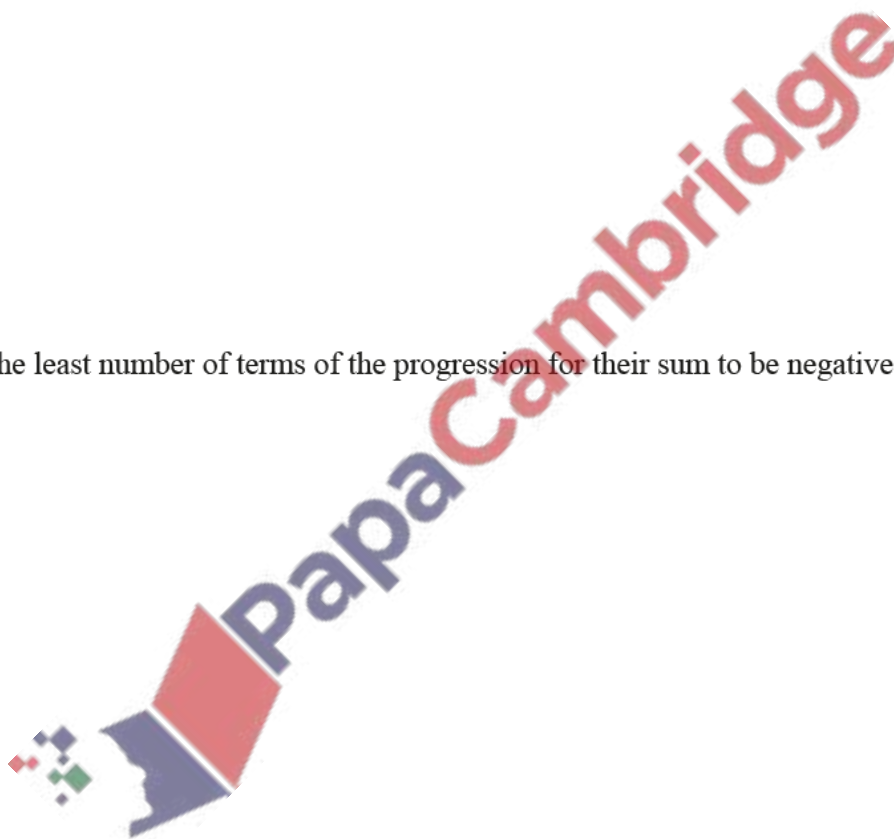1. Nov/2020/Paper_12/No.4

The 7th and 10th terms of an arithmetic progression are 158 and 149 respectively.

(a) Find the common difference and the first term of the progression. [3]

(b) Find the least number of terms of the progression for their sum to be negative. [3]
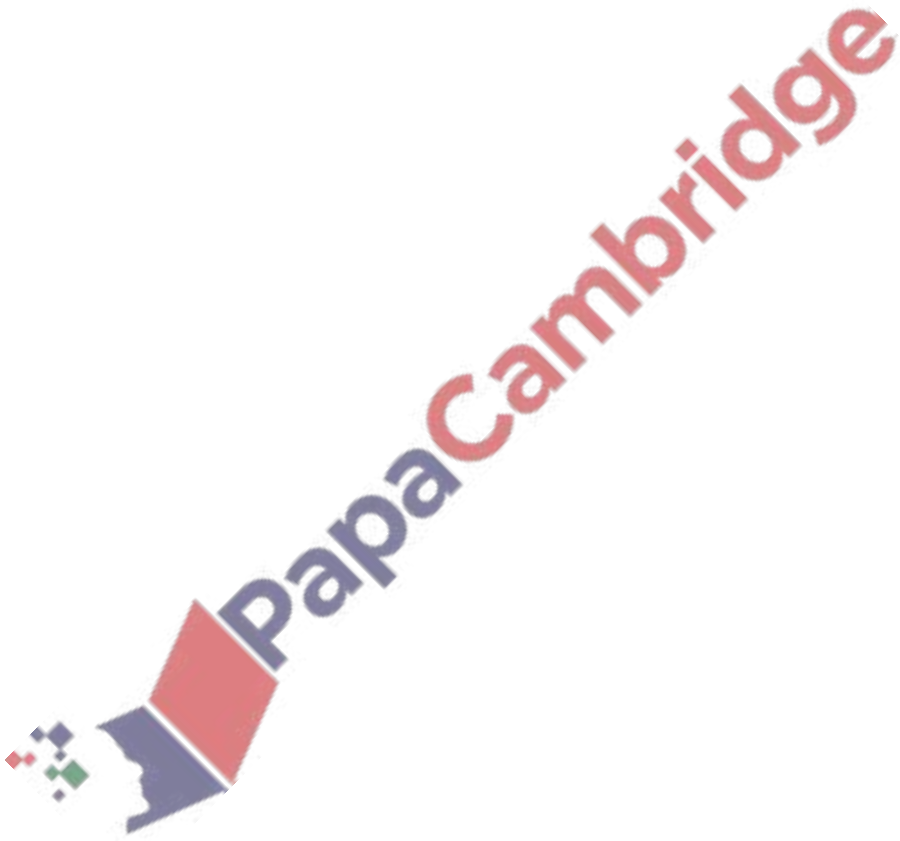
2.

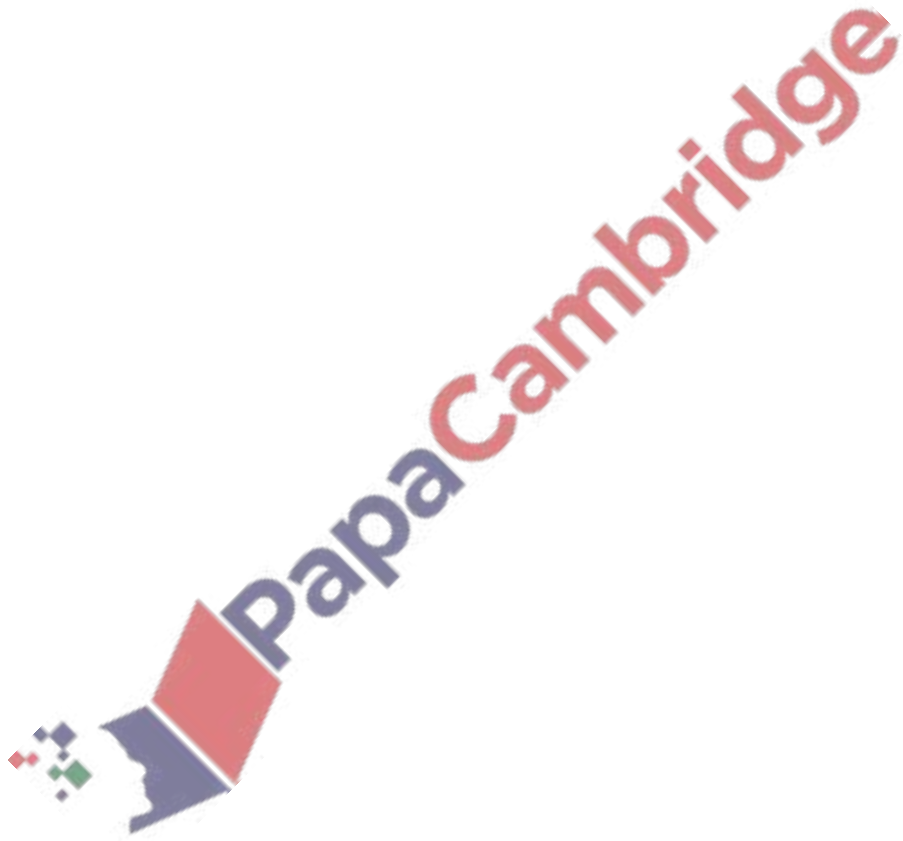Find the coefficient of x^2 in the expansion of $\left(x - \dfrac{3}{x}\right)\left(x + \dfrac{2}{x}\right)^5$. [5]

3.

Given that the coefficient of x^2 in the expansion of $(1+x)\left(1-\frac{x}{2}\right)^n$ is $\frac{25}{4}$, find the value of the positive integer n. [5]

4.

A geometric progression has a first term of 3 and a second term of 2.4. For this progression, find

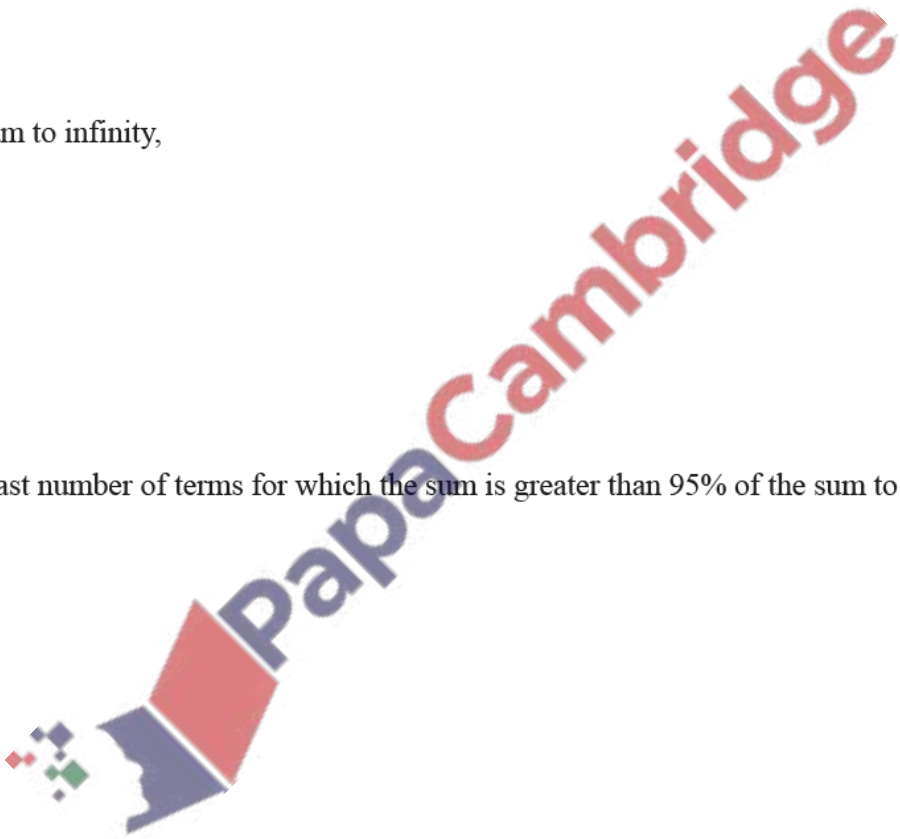**(a)** the sum of the first 8 terms, [3]

**(b)** the sum to infinity, [1]

(c) the least number of terms for which the sum is greater than 95% of the sum to infinity. [4]

(a) The sum of the first 4 terms of an arithmetic progression is 38 and the sum of the next 4 terms is 86. Find the first term and the common difference. [5]

(b) The third term of a geometric progression is 12 and the sixth term is -96. Find the sum of the first 10 terms of this progression. [6]
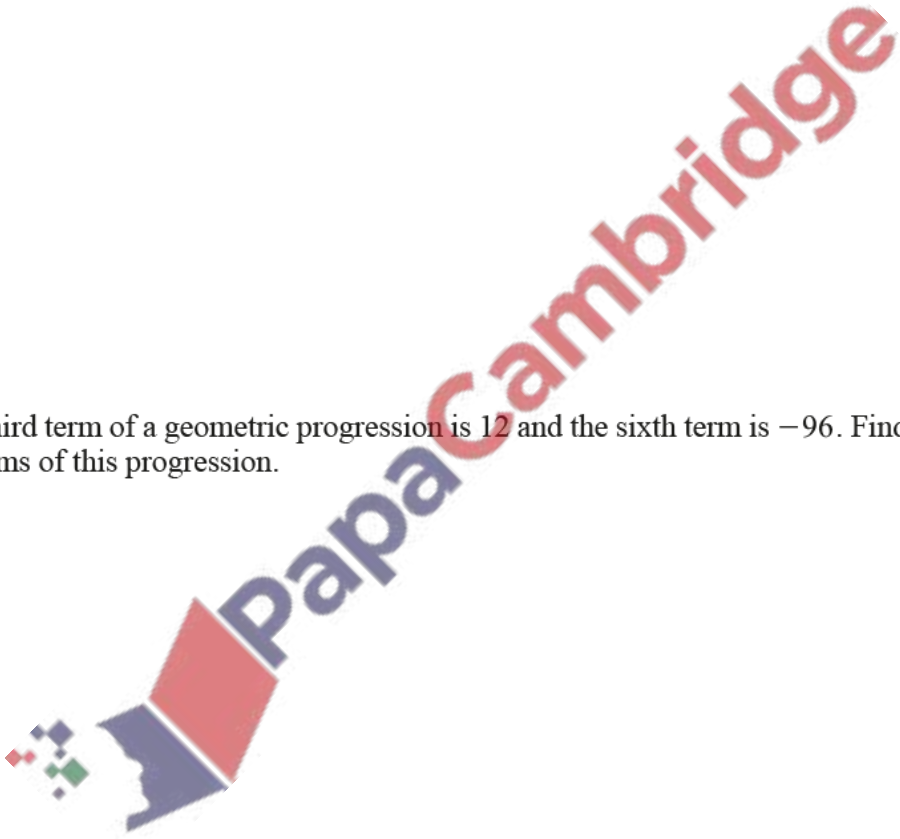
(a) An arithmetic progression has a second term of -14 and a sum to 21 terms of 84. Find the first term and the 21st term of this progression. [5]

(b) A geometric progression has a second term of $27p^2$ and a fifth term of p^5. The common ratio, r, is such that $0 < r < 1$.

    (i) Find r in terms of p. [2]
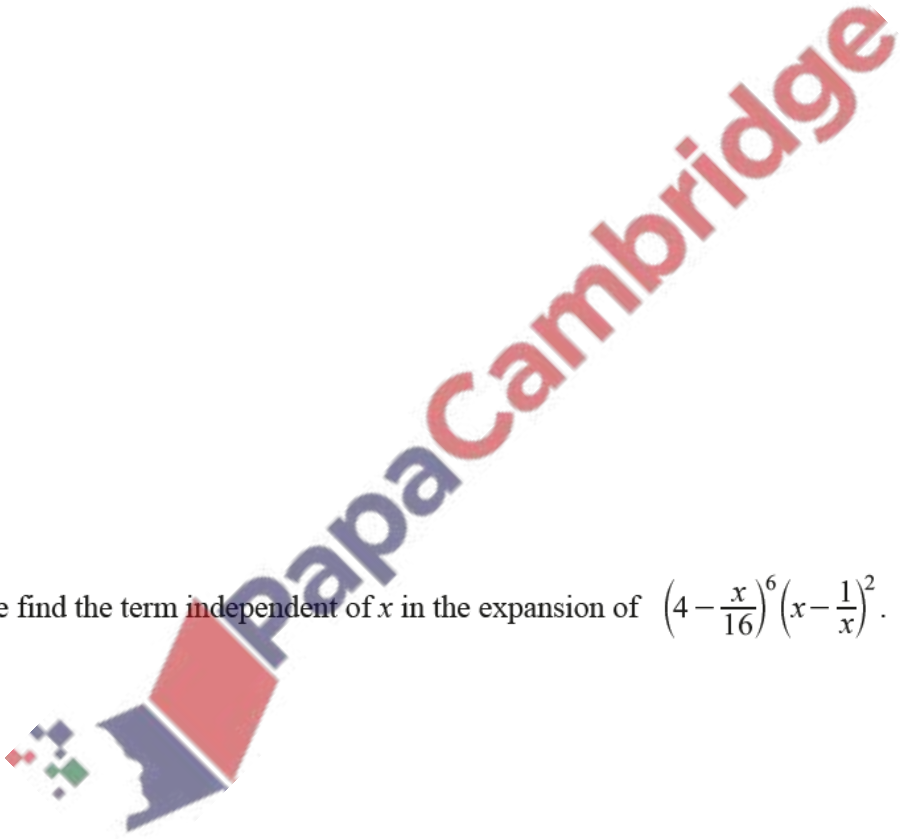
    (ii) Hence find, in terms of p, the sum to infinity of the progression. [3]

    (iii) Given that the sum to infinity is 81, find the value of p. [2]
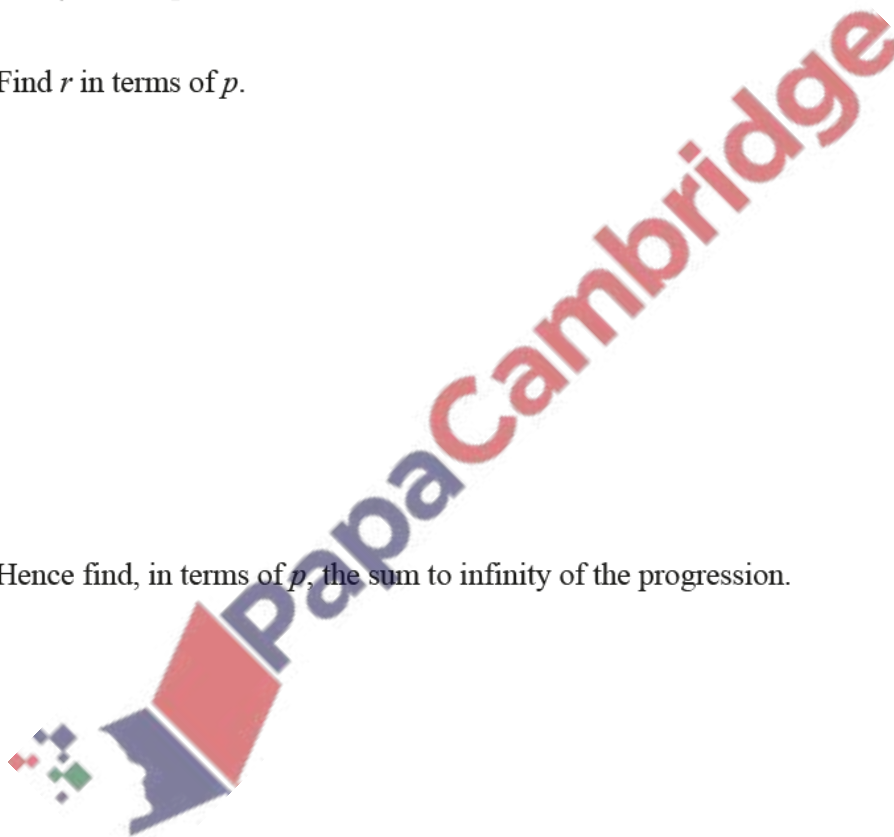
(a) Find the first 3 terms in the expansion of $\left(4 - \dfrac{x}{16}\right)^6$ in ascending powers of x. Give each term in its simplest form. [3]

(b) Hence find the term independent of x in the expansion of $\left(4 - \dfrac{x}{16}\right)^6 \left(x - \dfrac{1}{x}\right)^2$. [3]
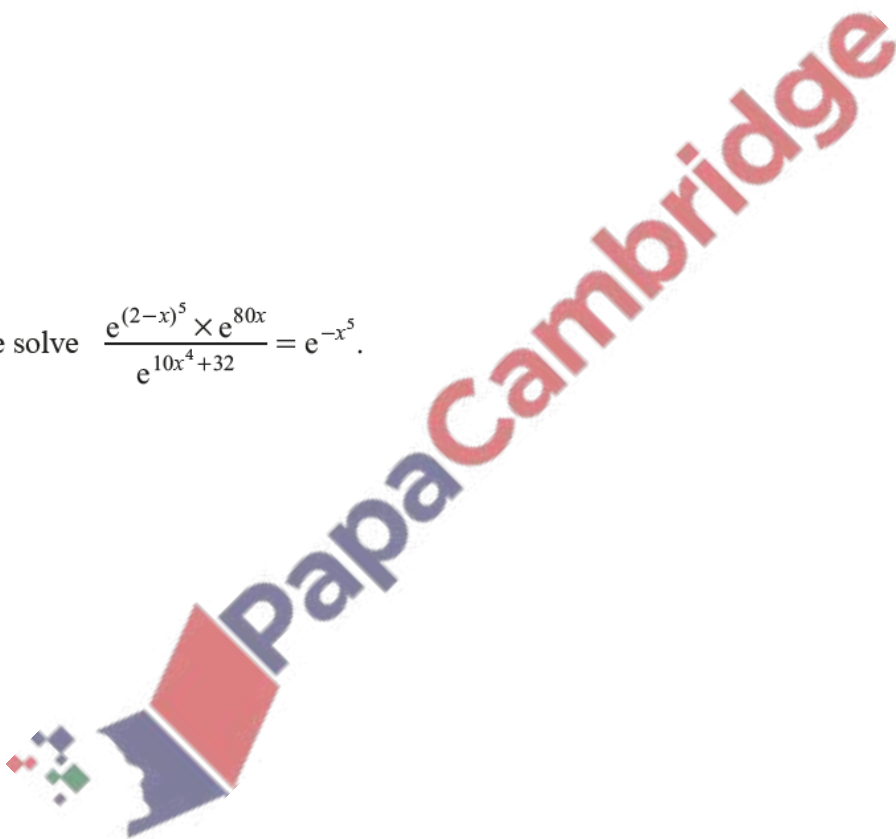
8.

(a) Expand $(2-x)^5$, simplifying each coefficient. [3]

(b) Hence solve $\dfrac{e^{(2-x)^5} \times e^{80x}}{e^{10x^4+32}} = e^{-x^5}$. [4]

(a) The first 5 terms of a sequence are given below.
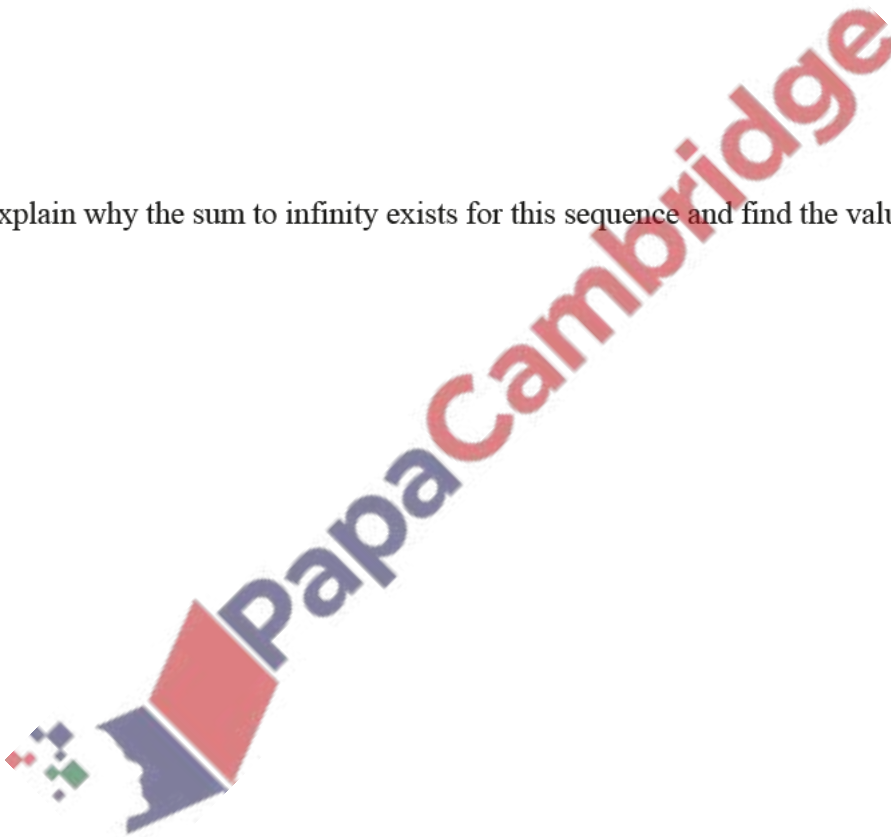
$$4 \qquad -2 \qquad 1 \qquad -0.5 \qquad 0.25$$

(i) Find the 20th term of the sequence. [2]

(ii) Explain why the sum to infinity exists for this sequence and find the value of this sum. [2]

(b) The tenth term of an arithmetic progression is 15 times the second term. The sum of the first 6 terms of the progression is 87.

(i) Find the common difference of the progression. [4]

(ii) For this progression, the nth term is 6990. Find the value of n. [3]