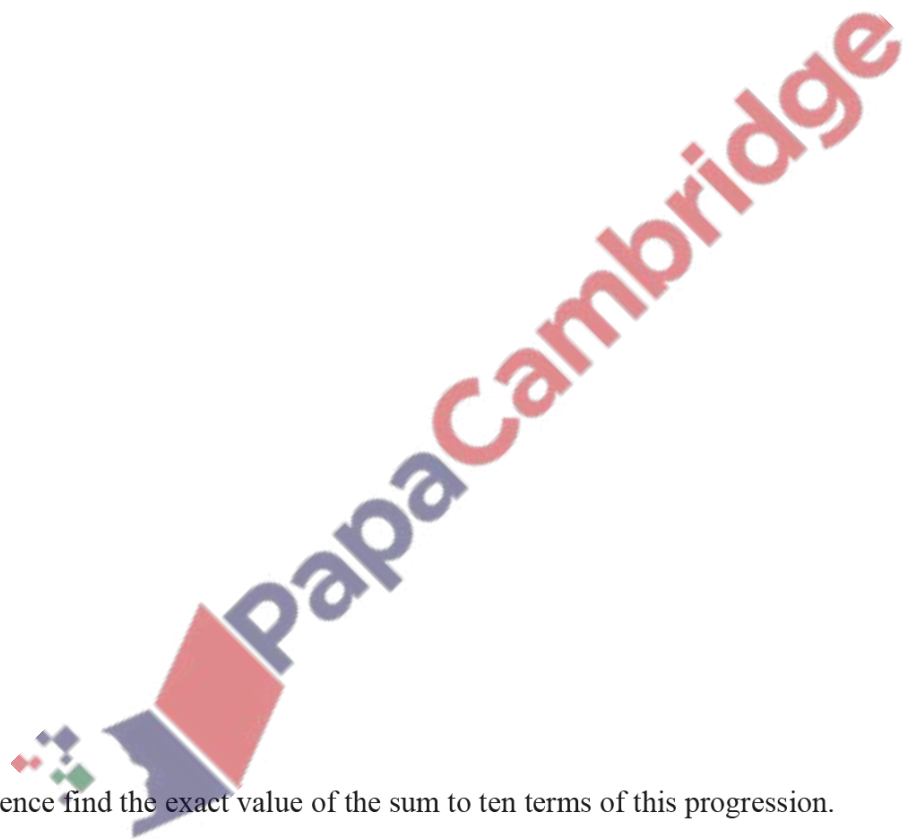


**1. Nov/2023/Paper\_0606/11/No.9**

(a) The first three terms of an arithmetic progression are  $-3 \tan \frac{\theta}{2}$ ,  $-\tan \frac{\theta}{2}$ ,  $\tan \frac{\theta}{2}$ ,  
where  $0 < \theta < \frac{\pi}{2}$ .

(i) Given that the 12th term of this progression is equal to  $\frac{19\sqrt{3}}{3}$ , find the exact value of  $\theta$ . [4]

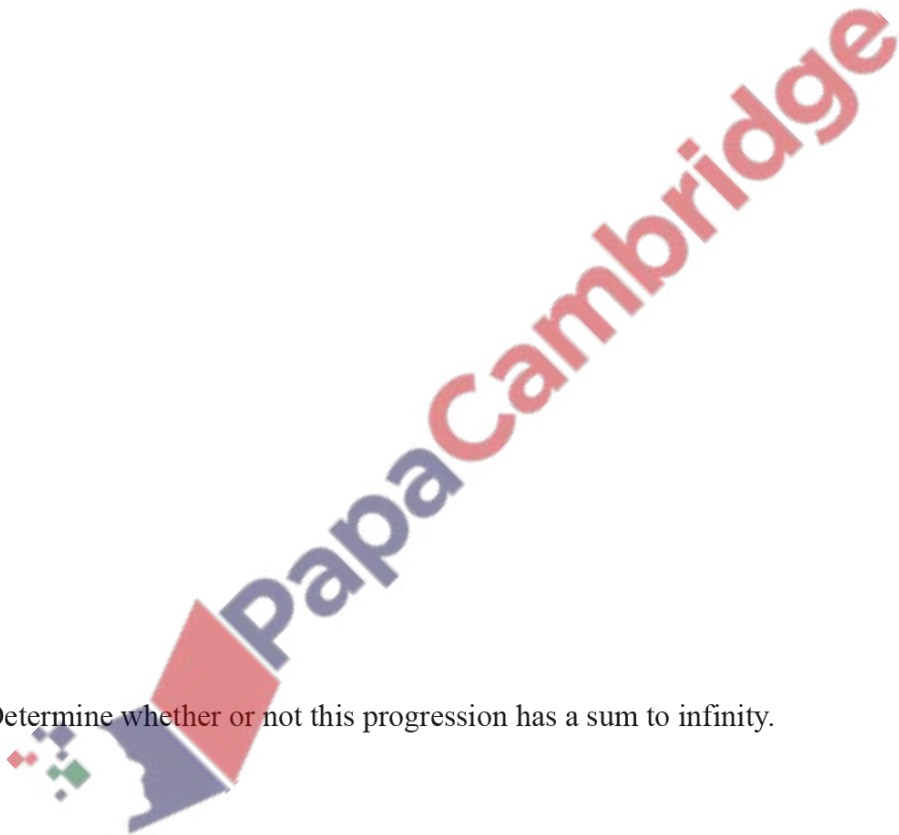
(ii) Hence find the exact value of the sum to ten terms of this progression. [2]



(b) The first three terms of a geometric progression are  $\frac{1}{16} \operatorname{cosec}^4 \phi$ ,  $\frac{1}{4} \operatorname{cosec}^2 \phi$ , 1, where  $-\frac{\pi}{2} < \phi < \frac{\pi}{2}$ .

(i) Given that the sum of the 3rd and 4th terms of this progression is equal to 4, find the possible values of  $\phi$ . [4]

(ii) Determine whether or not this progression has a sum to infinity. [2]

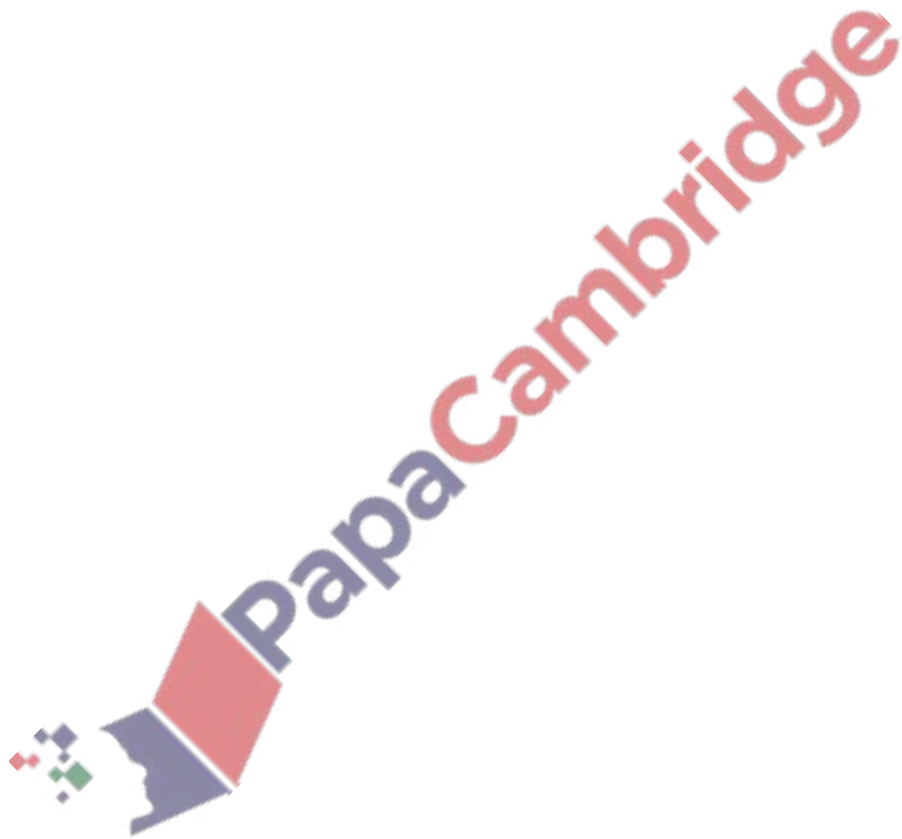


- (a) It is given that the first four terms, in ascending powers of  $x$ , in the expansion of  $\left(1 - \frac{x}{2}\right)^n$  can be written in the form  $1 - 8x + px^2 + qx^3$ , where  $n, p$  and  $q$  are integers. Find the values of  $n, p$  and  $q$ . [5]

- (b) Find the term independent of  $x$  in the expansion of  $\left(\frac{2}{x^2} + \frac{x}{3}\right)^6$ , giving your answer as a rational number. [2]

3. Nov/2023/Paper\_0606/13/No.8

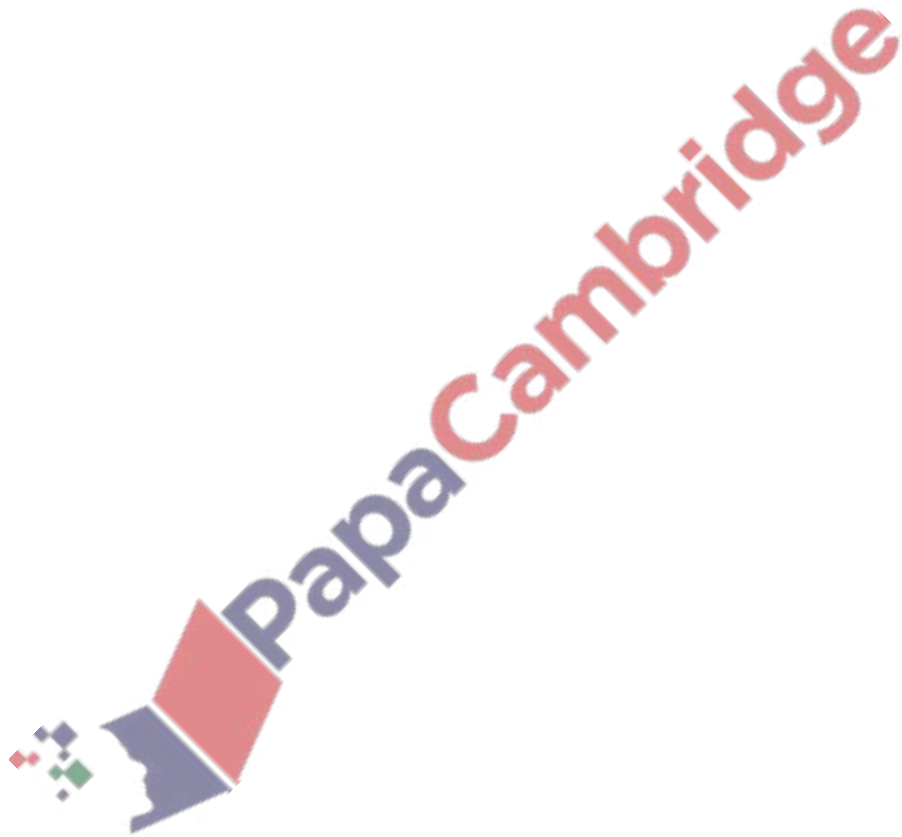
The first three terms, in descending powers of  $x$ , in the expansion of  $\left(2x^2 - \frac{1}{4x}\right)^n$  can be written in the form  $256x^{16} + ax^{13} + bx^c$ , where  $n, a, b$  and  $c$  are integers. Find the values of  $n, a, b$  and  $c$ . [6]



4. Nov/2023/Paper\_0606/21/No.4

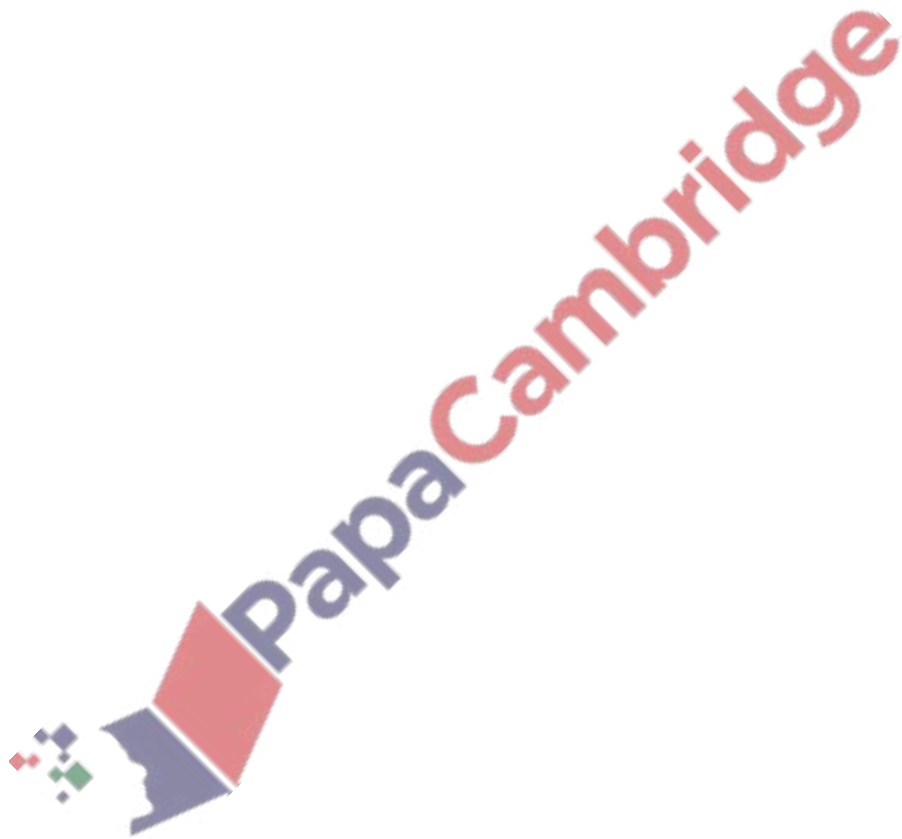
In this question  $a$  and  $b$  are integers.

Three terms in the expansion of  $(2 + ax)^5(1 + bx)$  are  $32 + 112x - 240x^2$ . Find the values of  $a$  and  $b$ .  
[7]

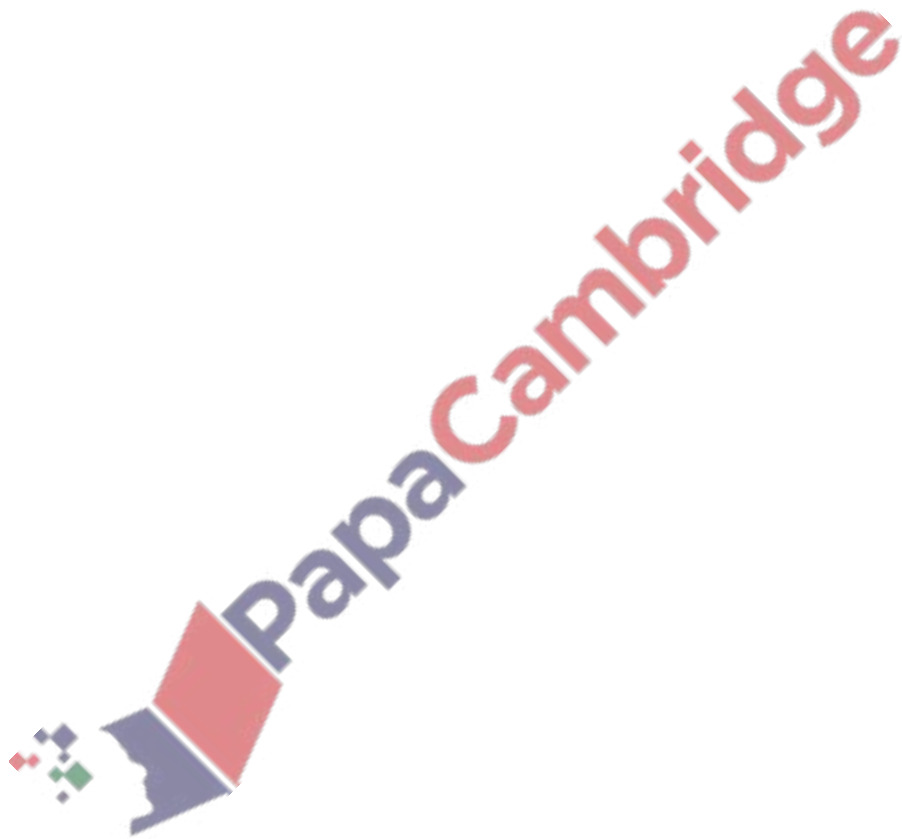


5. Nov/2023/Paper\_0606/22/No.9

- (a) An arithmetic progression has twelve terms. The sum of the first three terms is  $-36$  and the sum of the last three terms is  $72$ . Find the first term and the common difference. [5]



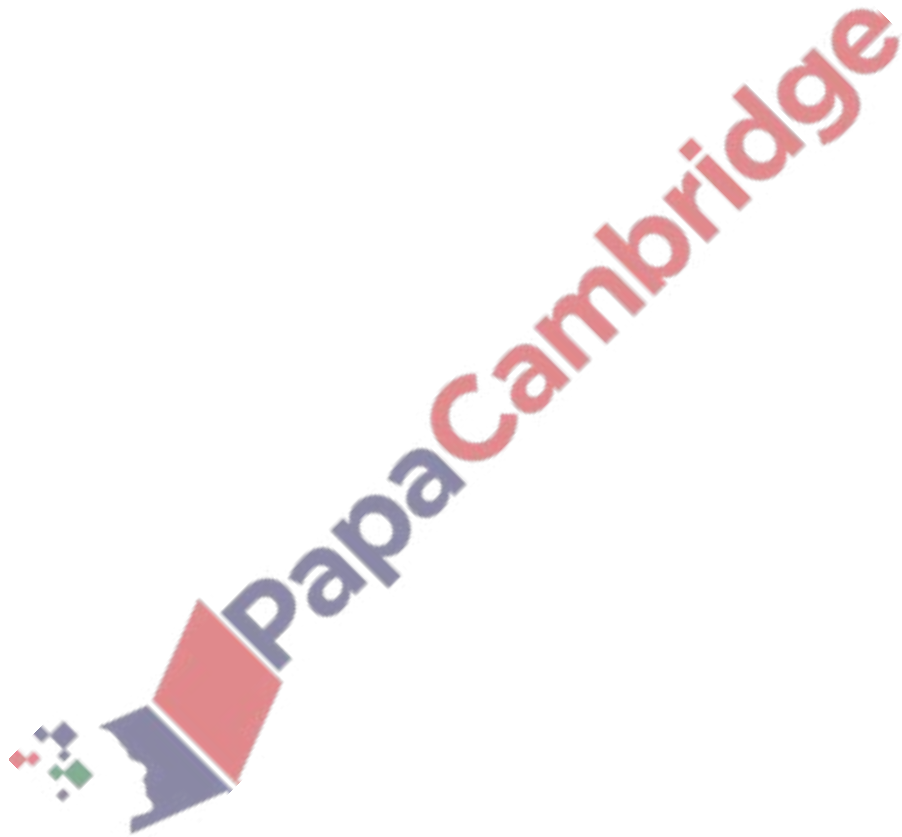
- (b) The first three terms of a geometric progression are 1, 1.2 and 1.44. Find the smallest value of  $n$  such that the sum of the first  $n$  terms is greater than 500. [5]



6. Nov/2023/Paper\_0606/23/No.10

- (a) In an arithmetic progression the 5th term is 11. The 7th term is three times the 2nd term. Find the 1st term and the common difference.

[4]



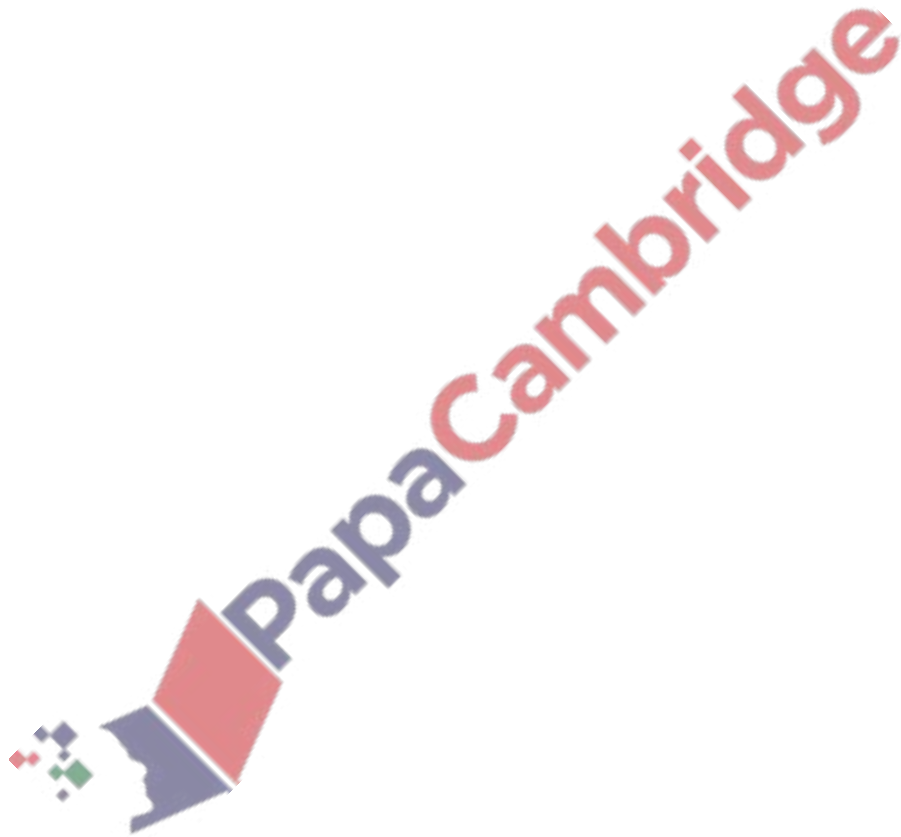


(b) A different arithmetic progression (AP) and a geometric progression (GP) have the following properties.

- The 1st terms of the AP and GP are both 3.
- The 2nd term of the AP is the same as the 3rd term of the GP.
- The 6th term of the AP is the same as the 5th term of the GP.
- The common ratio of the GP is greater than 1.

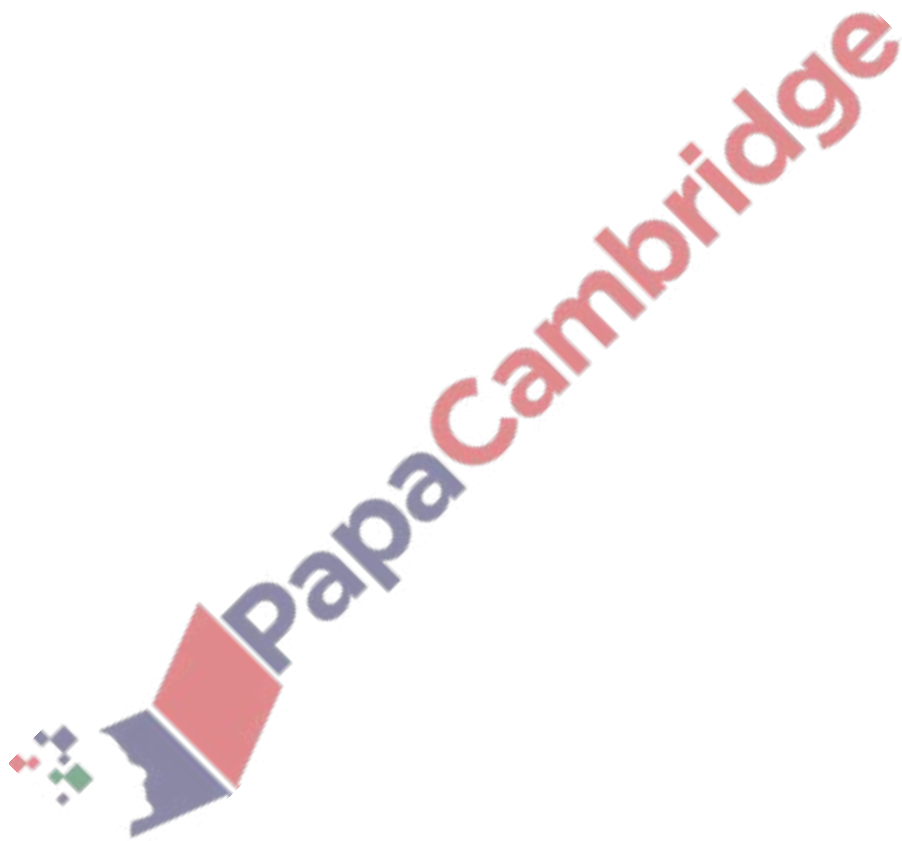
Find the common difference of the AP and the common ratio of the GP.

[6]



Find the coefficient of  $x^8$  in the expansion of  $(1-x^2)\left(2x-\frac{1}{x}\right)^{10}$ .

[5]



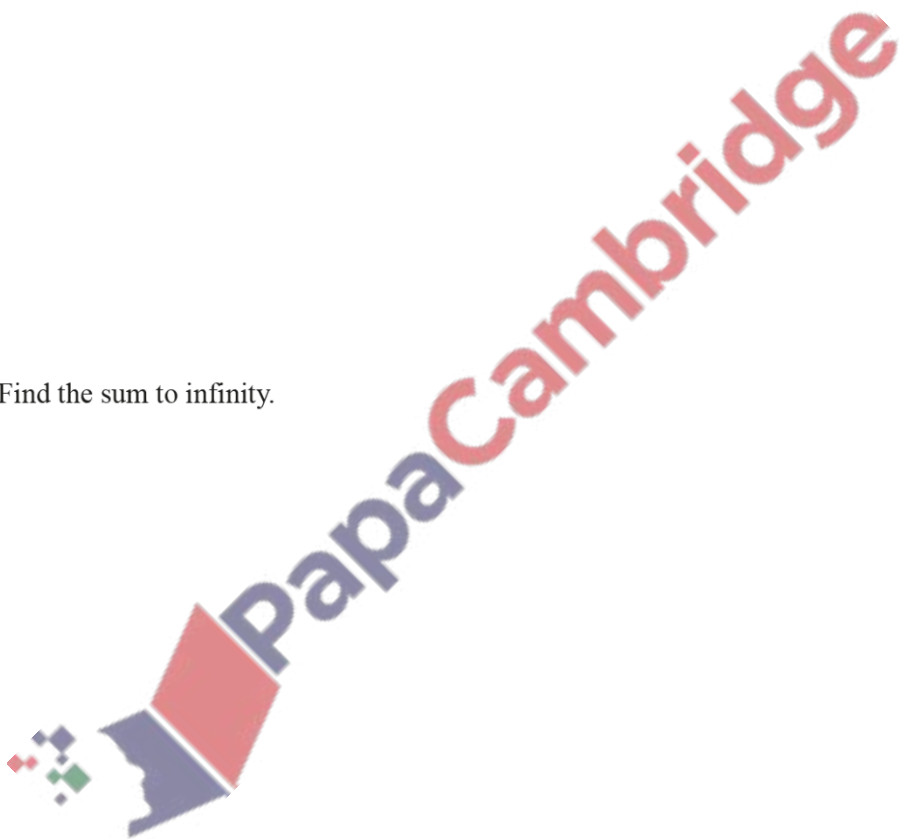
8. March/2023/Paper\_0606/22/No.6

(a) A geometric progression has first term 64 and common ratio 0.5.

(i) Find the 10th term. [2]

(ii) Find the sum of the first 10 terms. [2]

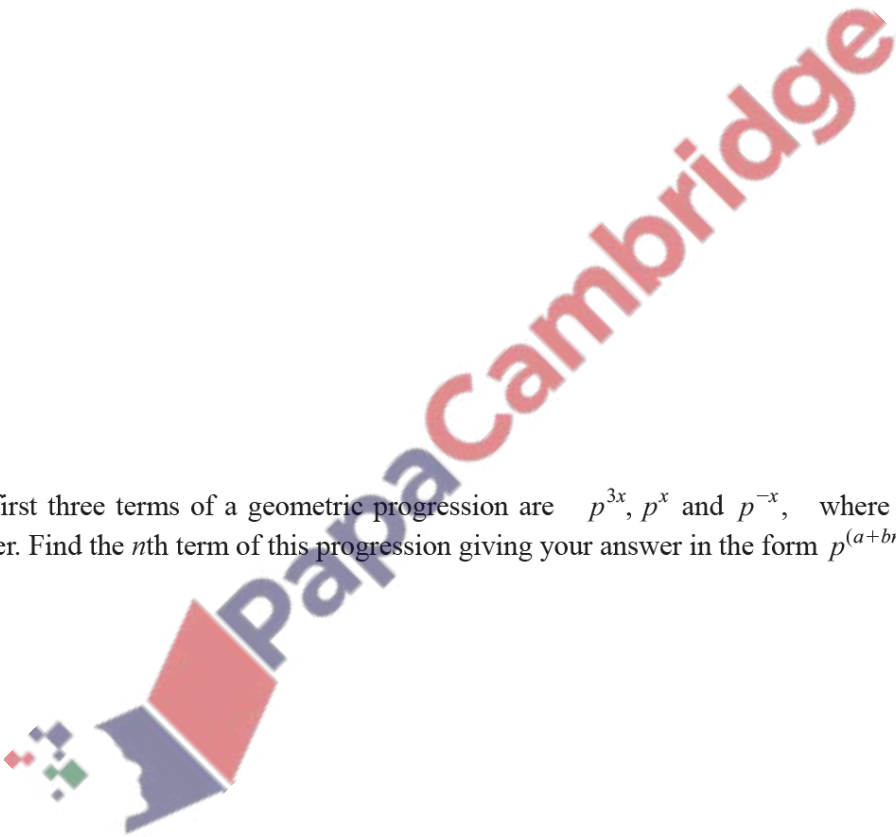
(iii) Find the sum to infinity. [1]



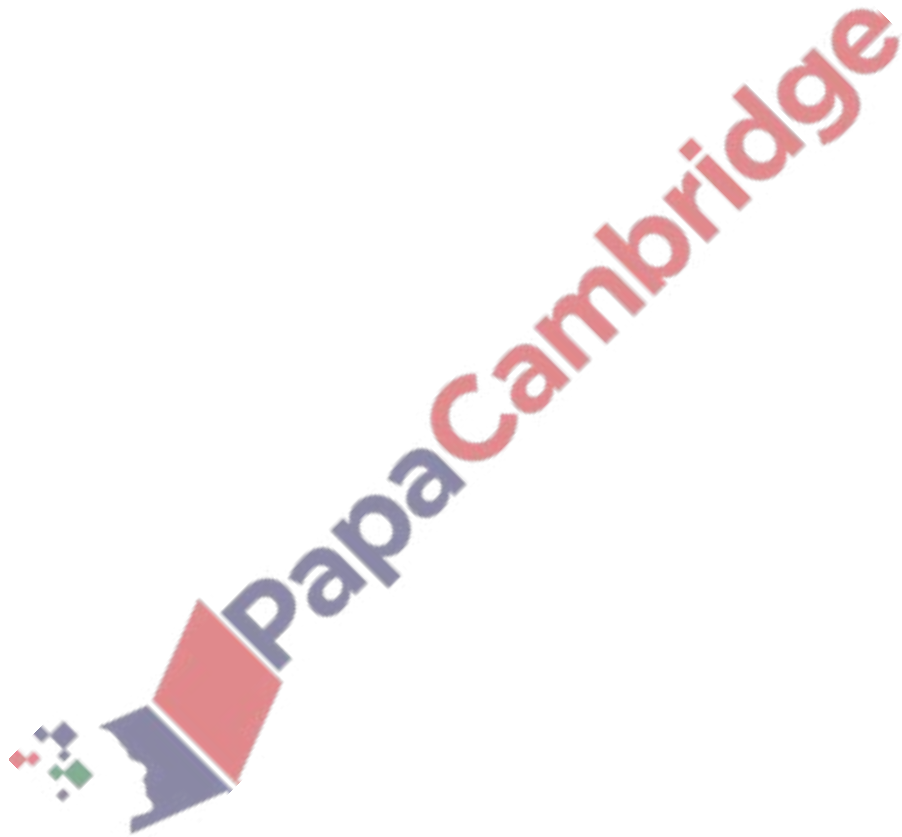
9. June/2023/Paper\_0606/11/No.9

- (a) The first three terms of an arithmetic progression are  $\ln q$ ,  $\ln q^4$  and  $\ln q^7$ , where  $q$  is a positive constant. The sum to  $n$  terms of this progression is  $4845 \ln q$ . Find the value of  $n$ . [3]

- (b) The first three terms of a geometric progression are  $p^{3x}$ ,  $p^x$  and  $p^{-x}$ , where  $p$  is a positive integer. Find the  $n$ th term of this progression giving your answer in the form  $p^{(a+bn)x}$ . [3]



- (c) The first three terms of a different geometric progression are  $\frac{4}{3}\cos^2 3\theta$ ,  $\frac{16}{9}\cos^4 3\theta$  and  $\frac{64}{27}\cos^6 3\theta$ , for  $0 < \theta < \frac{\pi}{3}$ . Find the set of values of  $\theta$  for which this progression has a sum to infinity. [5]



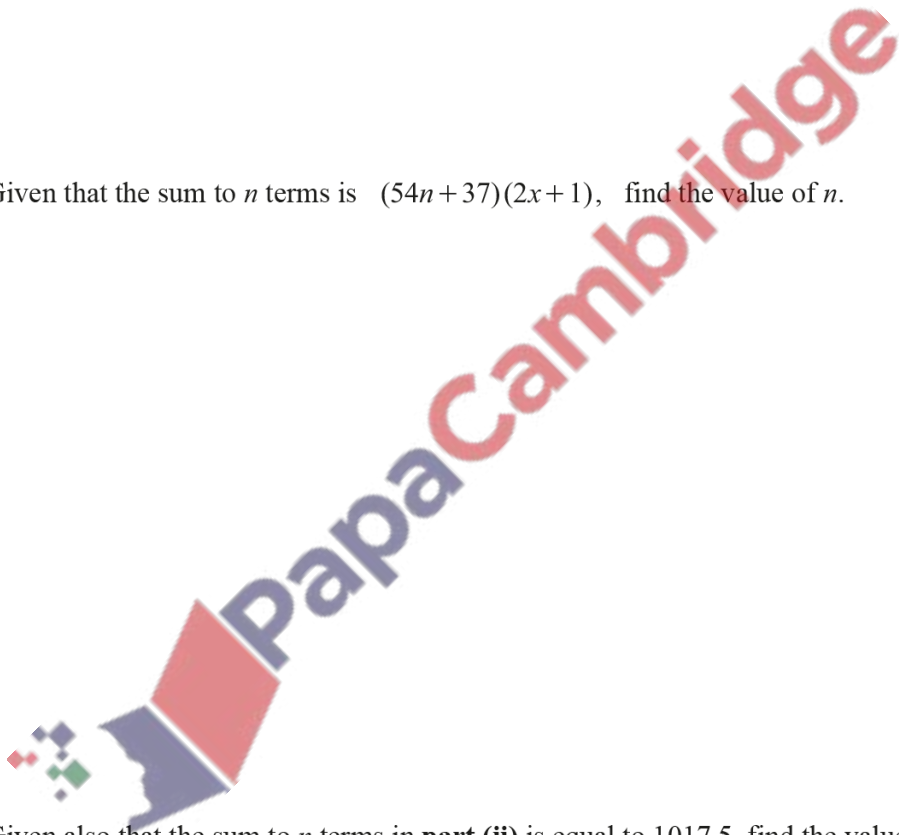
10. June/2023/Paper\_0606/12/No.10

(a) The first three terms of an arithmetic progression are  $(2x + 1)$ ,  $4(2x + 1)$  and  $7(2x + 1)$ , where  $x \neq -\frac{1}{2}$ .

(i) Show that the sum to  $n$  terms can be written in the form  $\frac{n}{2}(2x + 1)(An + B)$ , where  $A$  and  $B$  are integers to be found. [2]

(ii) Given that the sum to  $n$  terms is  $(54n + 37)(2x + 1)$ , find the value of  $n$ . [2]

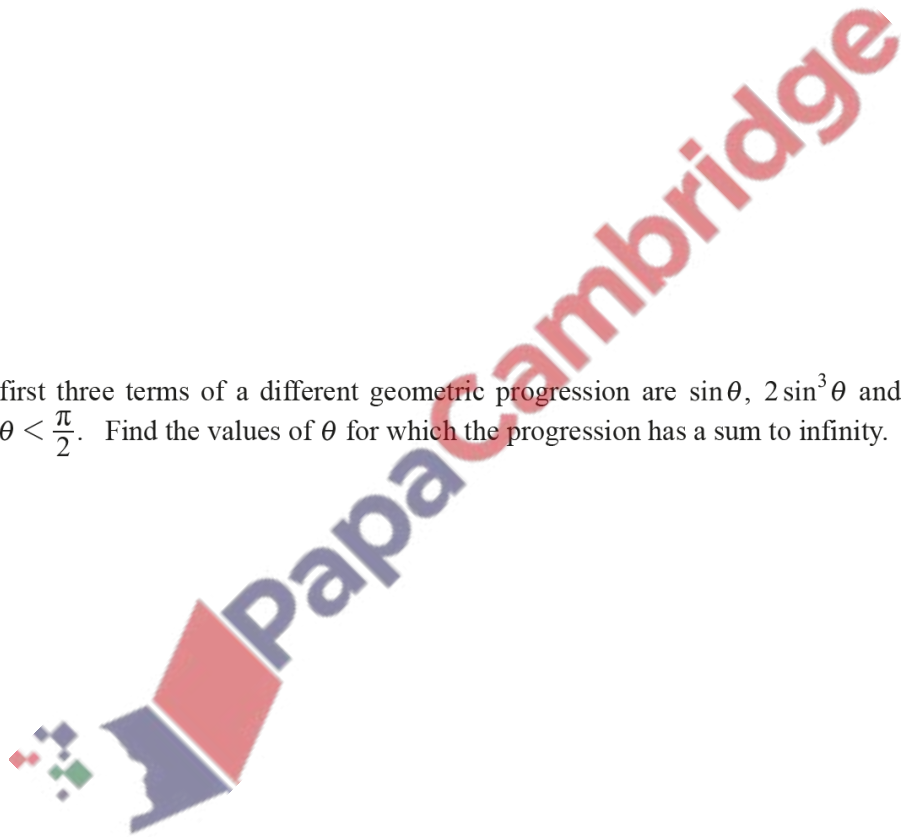
(iii) Given also that the sum to  $n$  terms in **part (ii)** is equal to 1017.5, find the value of  $x$ . [2]



- (b) The first three terms of a geometric progression are  $(2y+1)$ ,  $3(2y+1)^2$  and  $9(2y+1)^3$ , where  $y \neq -\frac{1}{2}$ .

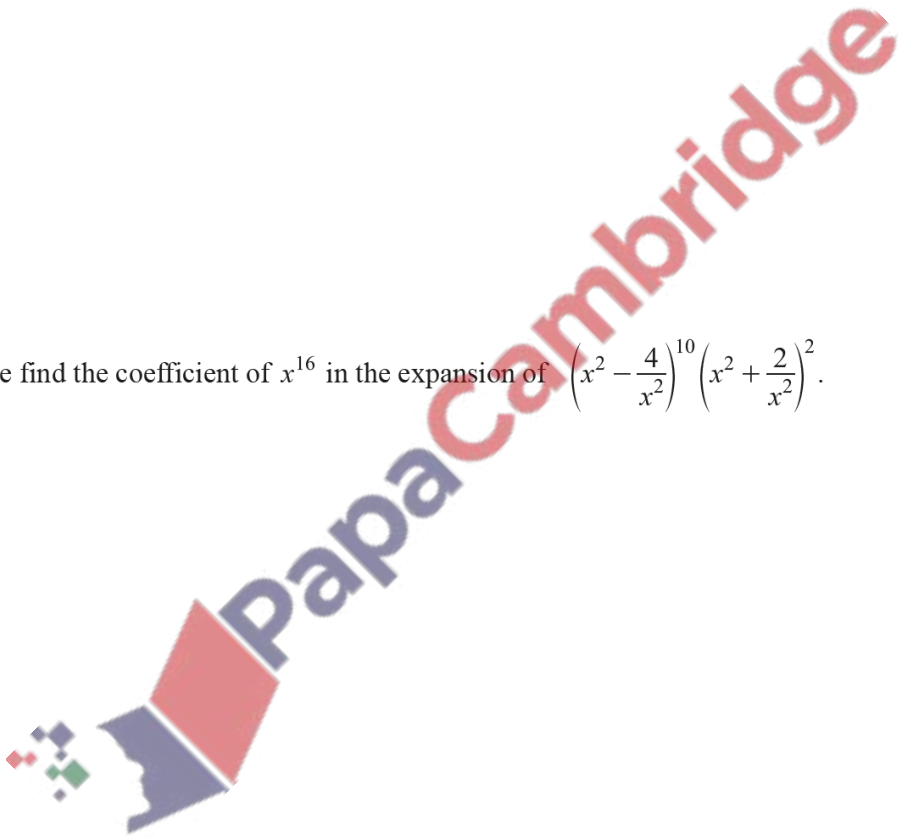
Given that the  $n$ th term of the progression is equal to 4 times the  $(n+2)$ th term, find the possible values of  $y$ , giving your answers as fractions. [4]

- (c) The first three terms of a different geometric progression are  $\sin \theta$ ,  $2 \sin^3 \theta$  and  $4 \sin^5 \theta$ , for  $0 < \theta < \frac{\pi}{2}$ . Find the values of  $\theta$  for which the progression has a sum to infinity. [3]



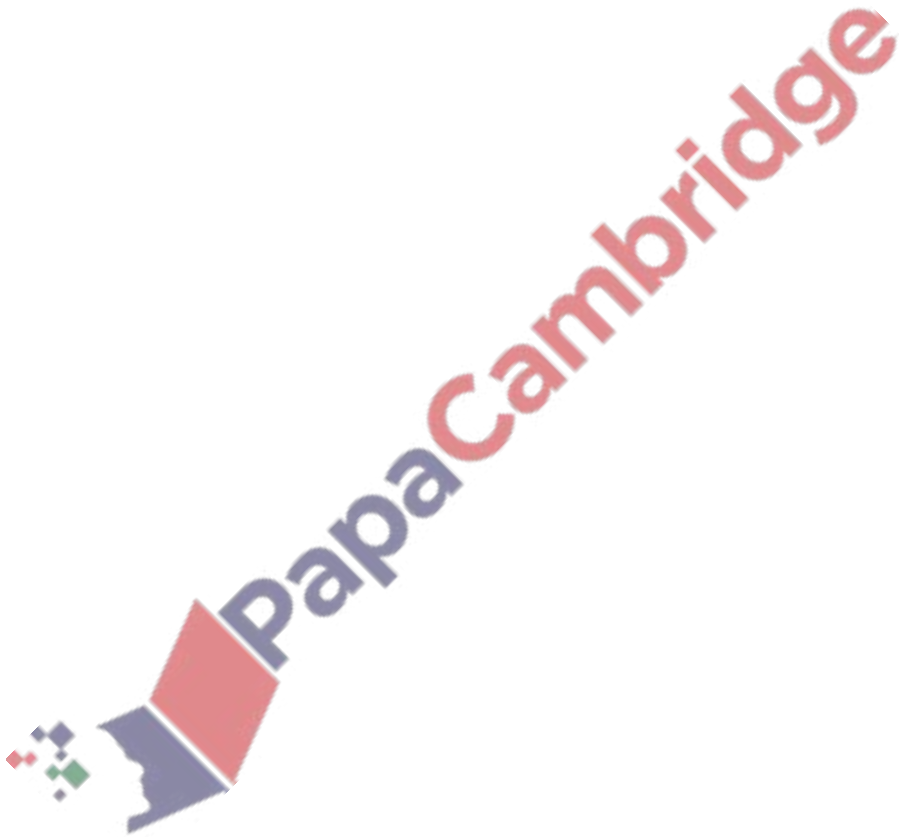
- (a) Find the first three terms in the expansion of  $\left(x^2 - \frac{4}{x^2}\right)^{10}$  in descending powers of  $x$ . Give each term in its simplest form. [3]

- (b) Hence find the coefficient of  $x^{16}$  in the expansion of  $\left(x^2 - \frac{4}{x^2}\right)^{10} \left(x^2 + \frac{2}{x^2}\right)^2$ . [3]



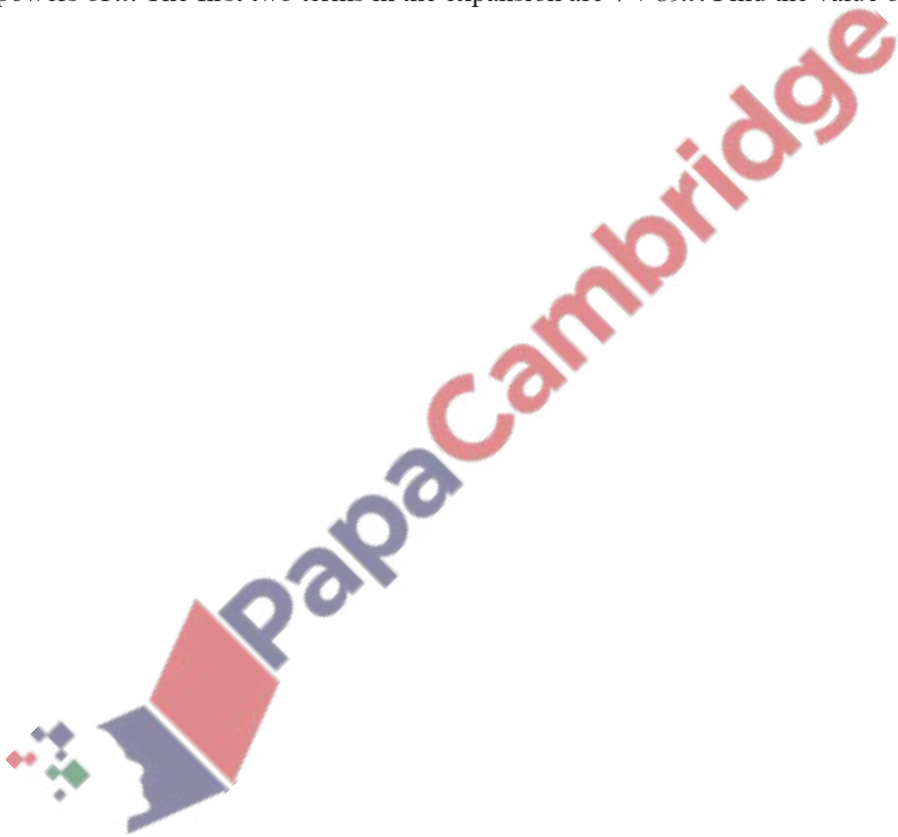


In the expansion of  $\left(ax + \frac{b}{x^2}\right)^9$ , where  $a$  and  $b$  are constants with  $a > 0$ , the term independent of  $x$  is  $-145\,152$  and the coefficient of  $x^6$  is  $-6912$ . Show that  $a^2b = -12$  and find the value of  $a$  and the value of  $b$ . [7]

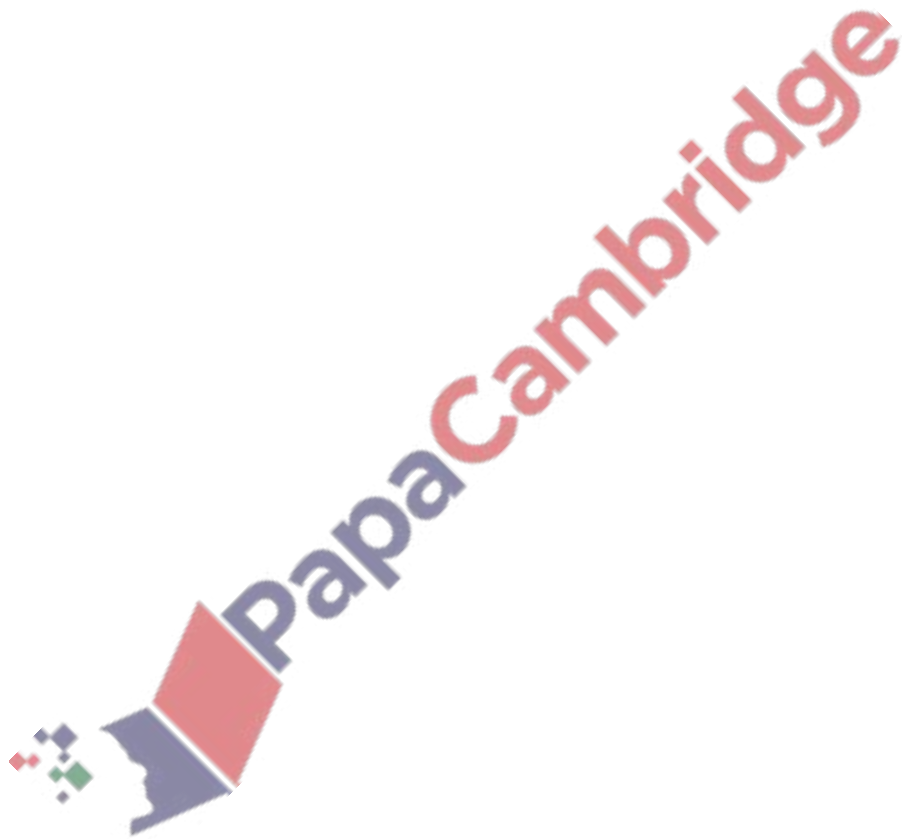


- (a) (i) Find the first three terms in the expansion of  $\left(1 + \frac{x}{7}\right)^5$ , in ascending powers of  $x$ . Simplify the coefficient of each term. [2]

- (ii) The expansion of  $7(1+x)^n\left(1 + \frac{x}{7}\right)^5$ , where  $n$  is a positive integer, is written in ascending powers of  $x$ . The first two terms in the expansion are  $7 + 89x$ . Find the value of  $n$ . [2]



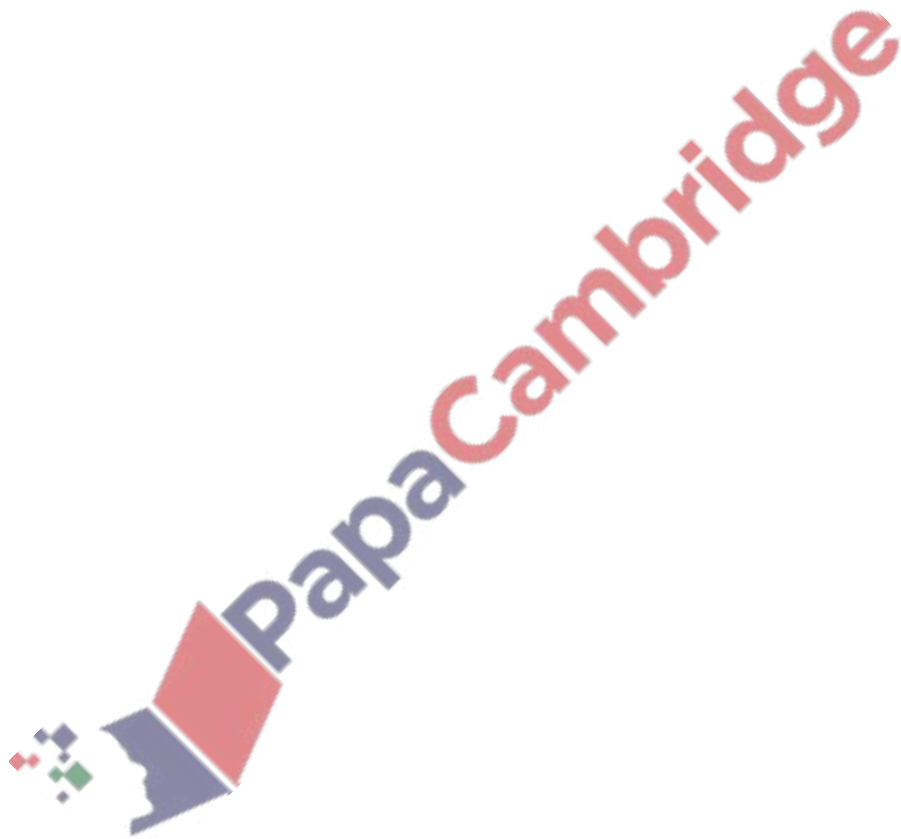
- (b) In the expansion of  $(k - 2x)^8$ , where  $k$  is a constant, the coefficient of  $x^4$  divided by the coefficient of  $x^2$  is  $\frac{5}{8}$ . The coefficient of  $x$  is positive. Form an equation and hence find the value of  $k$ . [5]



An arithmetic progression,  $A$ , has first term  $a$  and common difference  $d$ .

The 2nd, 14th and 17th terms of  $A$  form the first three terms of a convergent geometric progression,  $G$ , with common ratio  $r$ .

- (a) (i) Given that  $d \neq 0$ , find two expressions for  $r$  in terms of  $a$  and  $d$  and hence show that  $a = -17d$ . [6]



- (ii) Find the value of  $r$ .

[2]

(b) The first term of the geometric progression,  $G$ , is  $q$  and the sum to infinity is  $\frac{256}{3}$ .

Find the sum of the first 20 terms of the **arithmetic** progression,  $A$ .

[7]

