

EXERCISE 20.3

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1. Find the sum of the following geometric progressions:**(i) 2, 6, 18, ... to 7 terms****(ii) 1, 3, 9, 27, ... to 8 terms****(iii) 1, -1/2, 1/4, -1/8, ...****(iv) $(a^2 - b^2)$, $(a - b)$, $(a-b)/(a+b)$, ... to n terms****(v) 4, 2, 1, 1/2 ... to 10 terms****Solution:****(i) 2, 6, 18, ... to 7 terms**We know that, sum of GP for n terms = $a(r^n - 1)/(r - 1)$

Given:

$$a = 2, r = t_2/t_1 = 6/2 = 3, n = 7$$

Now let us substitute the values in

$$\begin{aligned} a(r^n - 1)/(r - 1) &= 2(3^7 - 1)/(3 - 1) \\ &= 2(3^7 - 1)/2 \\ &= 3^7 - 1 \\ &= 2187 - 1 \\ &= 2186 \end{aligned}$$

(ii) 1, 3, 9, 27, ... to 8 termsWe know that, sum of GP for n terms = $a(r^n - 1)/(r - 1)$

Given:

$$a = 1, r = t_2/t_1 = 3/1 = 3, n = 8$$

Now let us substitute the values in

$$\begin{aligned} a(r^n - 1)/(r - 1) &= 1(3^8 - 1)/(3 - 1) \\ &= (3^8 - 1)/2 \\ &= (6561 - 1)/2 \\ &= 6560/2 \\ &= 3280 \end{aligned}$$

(iii) 1, -1/2, 1/4, -1/8, ...We know that, sum of GP for infinity = $a/(1 - r)$

Given:

$$a = 1, r = t_2/t_1 = (-1/2)/1 = -1/2$$

Now let us substitute the values in

$$\begin{aligned} a/(1 - r) &= 1/(1 - (-1/2)) \\ &= 1/(1 + 1/2) \\ &= 1/((2+1)/2) \end{aligned}$$

$$= 1/(3/2)$$

$$= 2/3$$

(iv) $(a^2 - b^2)$, $(a - b)$, $(a-b)/(a+b)$, ... to n terms

We know that, sum of GP for n terms $= a(r^n - 1)/(r - 1)$

Given:

$$a = (a^2 - b^2), r = t_2/t_1 = (a-b)/(a^2 - b^2) = (a-b)/(a-b)(a+b) = 1/(a+b), n = n$$

Now let us substitute the values in

$$a(r^n - 1)/(r - 1) =$$

$$= (a^2 - b^2) \left(\frac{1 - \left(\frac{1}{a+b}\right)^n}{1 - \left(\frac{1}{a+b}\right)} \right)$$

$$= (a^2 - b^2) \left(\frac{\left(\frac{(a+b)^n - 1}{(a+b)^n}\right)}{\frac{(a+b) - 1}{a+b}} \right)$$

$$= \frac{(a+b)(a-b)}{(a+b)^{n-1}} \left(\frac{(a+b)^n - 1}{(a+b) - 1} \right)$$

$$= \frac{(a-b)}{(a+b)^{n-2}} \left(\frac{(a+b)^n - 1}{(a+b) - 1} \right)$$

(v) 4, 2, 1, $\frac{1}{2}$... to 10 terms

We know that, sum of GP for n terms $= a(r^n - 1)/(r - 1)$

Given:

$$a = 4, r = t_2/t_1 = 2/4 = 1/2, n = 10$$

Now let us substitute the values in

$$\begin{aligned} a(r^n - 1)/(r - 1) &= 4 \left(\left(\frac{1}{2}\right)^{10} - 1 \right) / \left(\left(\frac{1}{2}\right) - 1 \right) \\ &= 4 \left(\left(\frac{1}{2}\right)^{10} - 1 \right) / \left(\frac{1-2}{2} \right) \\ &= 4 \left(\left(\frac{1}{2}\right)^{10} - 1 \right) / \left(-1/2 \right) \\ &= 4 \left(\left(\frac{1}{2}\right)^{10} - 1 \right) \times -2/1 \\ &= -8 \left[\frac{1}{1024} - 1 \right] \\ &= -8 \left[\frac{1 - 1024}{1024} \right] \\ &= -8 \left[\frac{-1023}{1024} \right] \\ &= 1023/128 \end{aligned}$$

2. Find the sum of the following geometric series :

(i) $0.15 + 0.015 + 0.0015 + \dots$ to 8 terms;

(ii) $\sqrt{2} + 1/\sqrt{2} + 1/2\sqrt{2} + \dots$ to 8 terms;

(iii) $2/9 - 1/3 + 1/2 - 3/4 + \dots$ to 5 terms;

(iv) $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$ to n terms ;

(v) $3/5 + 4/5^2 + 3/5^3 + 4/5^4 + \dots$ to $2n$ terms;

Solution:

(i) $0.15 + 0.015 + 0.0015 + \dots$ to 8 terms

Given:

$$a = 0.15$$

$$r = t_2/t_1 = 0.015/0.15 = 0.1 = 1/10$$

$$n = 8$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

$$\begin{aligned} a(1 - r^n)/(1 - r) &= 0.15 (1 - (1/10)^8) / (1 - (1/10)) \\ &= 0.15 (1 - 1/10^8) / (1 - (1/10)) \\ &= 1/6 (1 - 1/10^8) \end{aligned}$$

(ii) $\sqrt{2} + 1/\sqrt{2} + 1/2\sqrt{2} + \dots$ to 8 terms;

Given:

$$a = \sqrt{2}$$

$$r = t_2/t_1 = (1/\sqrt{2})/\sqrt{2} = 1/2$$

$$n = 8$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

$$\begin{aligned} a(1 - r^n)/(1 - r) &= \sqrt{2} (1 - (1/2)^8) / (1 - (1/2)) \\ &= \sqrt{2} (1 - 1/256) / (1/2) \\ &= \sqrt{2} ((256 - 1)/256) \times 2 \\ &= \sqrt{2} (255 \times 2)/256 \\ &= (255\sqrt{2})/128 \end{aligned}$$

(iii) $2/9 - 1/3 + 1/2 - 3/4 + \dots$ to 5 terms;

Given:

$$a = 2/9$$

$$r = t_2/t_1 = (-1/3) / (2/9) = -3/2$$

$$n = 5$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

$$\begin{aligned} a(1 - r^n)/(1 - r) &= (2/9) (1 - (-3/2)^5) / (1 - (-3/2)) \\ &= (2/9) (1 + (3/2)^5) / (1 + 3/2) \\ &= (2/9) (1 + (3/2)^5) / (5/2) \\ &= (2/9) (1 + 243/32) / (5/2) \\ &= (2/9) ((32+243)/32) / (5/2) \\ &= (2/9) (275/32) \times 2/5 \end{aligned}$$

$$= 55/72$$

(iv) $(x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$ to n terms;

Let $S_n = (x + y) + (x^2 + xy + y^2) + (x^3 + x^2y + xy^2 + y^3) + \dots$ to n terms

Let us multiply and divide by $(x - y)$ we get,

$$S_n = 1/(x - y) [(x + y)(x - y) + (x^2 + xy + y^2)(x - y) \dots \text{upto } n \text{ terms}]$$

$$(x - y) S_n = (x^2 - y^2) + x^3 + x^2y + xy^2 - x^2y - xy^2 - y^3 \dots \text{upto } n \text{ terms}$$

$$(x - y) S_n = (x^2 + x^3 + x^4 + \dots n \text{ terms}) - (y^2 + y^3 + y^4 + \dots n \text{ terms})$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

We have two G.Ps in above sum, so,

$$(x - y) S_n = x^2 [(x^n - 1)/(x - 1)] - y^2 [(y^n - 1)/(y - 1)]$$

$$S_n = 1/(x - y) \{ x^2 [(x^n - 1)/(x - 1)] - y^2 [(y^n - 1)/(y - 1)] \}$$

(v) $3/5 + 4/5^2 + 3/5^3 + 4/5^4 + \dots$ to $2n$ terms;

The series can be written as:

$$3 (1/5 + 1/5^3 + 1/5^5 + \dots \text{ to } n \text{ terms}) + 4 (1/5^2 + 1/5^4 + 1/5^6 + \dots \text{ to } n \text{ terms})$$

Firstly let us consider $3 (1/5 + 1/5^3 + 1/5^5 + \dots \text{ to } n \text{ terms})$

So, $a = 1/5$

$$r = t_2/t_1 = 1/5^2 = 1/25$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

$$3 \left(\frac{1}{5} + \frac{1}{5^3} + \frac{1}{5^5} + \dots n \text{ terms} \right) = 3 \cdot \frac{\frac{1}{5} \left(1 - \left(\frac{1}{25} \right)^n \right)}{1 - \frac{1}{25}}$$

$$= \frac{5}{8} \left(1 - \frac{1}{5^{2n}} \right)$$

Now, Let us consider $4 (1/5^2 + 1/5^4 + 1/5^6 + \dots \text{ to } n \text{ terms})$

So, $a = 1/25$

$$r = t_2/t_1 = 1/5^2 = 1/25$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(1 - r^n)/(1 - r)$$

$$4 \left(\frac{1}{5^2} + \frac{1}{5^4} + \frac{1}{5^6} + \dots n \text{ terms} \right) = 4 \cdot \frac{\frac{1}{25} \left(1 - \left(\frac{1}{25} \right)^n \right)}{1 - \frac{1}{25}}$$

$$= \frac{1}{6} \left(1 - \frac{1}{5^{2n}} \right)$$

Now,

$$\begin{aligned} \frac{3}{5} + \frac{4}{5^2} + \frac{3}{5^3} + \dots \text{ } 2n \text{ terms} &= \frac{5}{8} \left(1 - \frac{1}{5^{2n}} \right) + \frac{1}{6} \left(1 - \frac{1}{5^{2n}} \right) \\ &= \frac{19}{24} \left(1 - \frac{1}{5^{2n}} \right) \end{aligned}$$

3. Evaluate the following:

$$(i) \sum_{n=1}^{11} (2 + 3^n)$$

$$(ii) \sum_{k=1}^{10} (2^k + 3^{k-1})$$

$$(iii) \sum_{n=2} 4^n$$

Solution:

$$(i) \sum_{n=1}^{11} (2 + 3^n)$$

$$\begin{aligned} &= (2 + 3^1) + (2 + 3^2) + (2 + 3^3) + \dots + (2 + 3^{11}) \\ &= 2 \times 11 + 3^1 + 3^2 + 3^3 + \dots + 3^{11} \\ &= 22 + 3(3^{11} - 1)/(3 - 1) \text{ [by using the formula, } a(1 - r^n)/(1 - r)\text{]} \\ &= 22 + 3(3^{11} - 1)/2 \\ &= [44 + 3(177147 - 1)]/2 \\ &= [44 + 3(177146)]/2 \\ &= 265741 \end{aligned}$$

$$(ii) \sum_{k=1}^n (2^k + 3^{k-1})$$

$$\begin{aligned} &= (2 + 3^0) + (2^2 + 3) + (2^3 + 3^2) + \dots + (2^n + 3^{n-1}) \\ &= (2 + 2^2 + 2^3 + \dots + 2^n) + (3^0 + 3^1 + 3^2 + \dots + 3^{n-1}) \end{aligned}$$

Firstly let us consider,

$$(2 + 2^2 + 2^3 + \dots + 2^n)$$

Where, $a = 2$, $r = 2^2/2 = 4/2 = 2$, $n = n$

By using the formula,

$$\begin{aligned} \text{Sum of GP for } n \text{ terms} &= a(r^n - 1)/(r - 1) \\ &= 2(2^n - 1)/(2 - 1) \\ &= 2(2^n - 1) \end{aligned}$$

Now, let us consider

$$(3^0 + 3^1 + 3^2 + \dots + 3^n)$$

Where, $a = 3^0 = 1$, $r = 3/1 = 3$, $n = n$

By using the formula,

$$\begin{aligned} \text{Sum of GP for } n \text{ terms} &= a(r^n - 1)/(r - 1) \\ &= 1(3^n - 1)/(3 - 1) \\ &= (3^n - 1)/2 \end{aligned}$$

So,

$$\begin{aligned} \sum_{k=1}^n (2^k + 3^{k-1}) &= (2 + 2^2 + 2^3 + \dots + 2^n) + (3^0 + 3^1 + 3^2 + \dots + 3^n) \\ &= 2(2^n - 1) + (3^n - 1)/2 \\ &= \frac{1}{2} [2^{n+2} + 3^n - 4 - 1] \\ &= \frac{1}{2} [2^{n+2} + 3^n - 5] \end{aligned}$$

$$(iii) \sum_{n=2}^{10} 4^n$$

$$= 4^2 + 4^3 + 4^4 + \dots + 4^{10}$$

Where, $a = 4^2 = 16$, $r = 4^3/4^2 = 4$, $n = 9$

By using the formula,

$$\begin{aligned} \text{Sum of GP for } n \text{ terms} &= a(r^n - 1)/(r - 1) \\ &= 16(4^9 - 1)/(4 - 1) \\ &= 16(4^9 - 1)/3 \\ &= 16/3 [4^9 - 1] \end{aligned}$$

4. Find the sum of the following series :

(i) $5 + 55 + 555 + \dots$ to n terms.

(ii) $7 + 77 + 777 + \dots$ to n terms.

(iii) $9 + 99 + 999 + \dots$ to n terms.

(iv) $0.5 + 0.55 + 0.555 + \dots$ to n terms

(v) $0.6 + 0.66 + 0.666 + \dots$ to n terms.

Solution:

(i) $5 + 55 + 555 + \dots$ to n terms.

Let us take 5 as a common term so we get,

$$5 [1 + 11 + 111 + \dots n \text{ terms}]$$

Now multiply and divide by 9 we get,

$$5/9 [9 + 99 + 999 + \dots n \text{ terms}]$$

$$5/9 [(10 - 1) + (10^2 - 1) + (10^3 - 1) + \dots n \text{ terms}]$$

$$5/9 [(10 + 10^2 + 10^3 + \dots n \text{ terms}) - n]$$

So the G.P is

$$5/9 [(10 + 10^2 + 10^3 + \dots n \text{ terms}) - n]$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

Where, $a = 10$, $r = 10^2/10 = 10$, $n = n$

$$a(r^n - 1)/(r - 1) =$$

$$= \frac{5}{9} \left\{ 10 \times \frac{(10^n - 1)}{10 - 1} - n \right\}$$

$$= \frac{5}{9} \left\{ \frac{10}{9} (10^n - 1) - n \right\}$$

$$= \frac{5}{81} \{ 10^{n+1} - 9n - 10 \}$$

(ii) $7 + 77 + 777 + \dots$ to n terms.

Let us take 7 as a common term so we get,

$$7 [1 + 11 + 111 + \dots \text{ to } n \text{ terms}]$$

Now multiply and divide by 9 we get,

$$7/9 [9 + 99 + 999 + \dots n \text{ terms}]$$

$$7/9 [(10 - 1) + (10^2 - 1) + (10^3 - 1) + \dots + (10^n - 1)]$$

$$7/9 [(10 + 10^2 + 10^3 + \dots + 10^n)] - 7/9 [(1 + 1 + 1 + \dots \text{ to } n \text{ terms})]$$

So the terms are in G.P

Where, $a = 10$, $r = 10^2/10 = 10$, $n = n$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

$$7/9 [10 (10^n - 1)/(10 - 1)] - n$$

$$7/9 [10/9 (10^n - 1) - n]$$

$$7/81 [10 (10^n - 1) - n]$$

$$7/81 (10^{n+1} - 9n - 10)$$

(iii) $9 + 99 + 999 + \dots$ to n terms.

The given terms can be written as

$$(10 - 1) + (100 - 1) + (1000 - 1) + \dots + n \text{ terms}$$

$$(10 + 10^2 + 10^3 + \dots n \text{ terms}) - n$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

Where, $a = 10$, $r = 10$, $n = n$

$$a(r^n - 1)/(r - 1) = [10 (10^n - 1)/(10 - 1)] - n$$

$$= 10/9 (10^n - 1) - n$$

$$= 1/9 [10^{n+1} - 10 - 9n]$$

$$= 1/9 [10^{n+1} - 9n - 10]$$

(iv) $0.5 + 0.55 + 0.555 + \dots$ to n terms

Let us take 5 as a common term so we get,

$$5(0.1 + 0.11 + 0.111 + \dots \text{ n terms})$$

Now multiply and divide by 9 we get,

$$5/9 [0.9 + 0.99 + 0.999 + \dots \text{ to n terms}]$$

$$5/9 [9/10 + 9/100 + 9/1000 + \dots \text{ + n terms}]$$

This can be written as

$$5/9 [(1 - 1/10) + (1 - 1/100) + (1 - 1/1000) + \dots \text{ + n terms}]$$

$$5/9 [n - \{1/10 + 1/10^2 + 1/10^3 + \dots \text{ + n terms}\}]$$

$$5/9 [n - 1/10 \{1 - (1/10)^n\} / \{1 - 1/10\}]$$

$$5/9 [n - 1/9 (1 - 1/10^n)]$$

(v) $0.6 + 0.66 + 0.666 + \dots$ to n terms.

Let us take 6 as a common term so we get,

$$6(0.1 + 0.11 + 0.111 + \dots \text{ n terms})$$

Now multiply and divide by 9 we get,

$$6/9 [0.9 + 0.99 + 0.999 + \dots \text{ + n terms}]$$

$$6/9 [9/10 + 9/100 + 9/1000 + \dots \text{ + n terms}]$$

This can be written as

$$6/9 [(1 - 1/10) + (1 - 1/100) + (1 - 1/1000) + \dots \text{ + n terms}]$$

$$6/9 [n - \{1/10 + 1/10^2 + 1/10^3 + \dots \text{ + n terms}\}]$$

$$6/9 [n - 1/10 \{1 - (1/10)^n\} / \{1 - 1/10\}]$$

$$6/9 [n - 1/9 (1 - 1/10^n)]$$

5. How many terms of the G.P. $3, 3/2, 3/4, \dots$ Be taken together to make $3069/512$?

Solution:

Given:

$$\text{Sum of G.P} = 3069/512$$

$$\text{Where, } a = 3, r = (3/2)/3 = 1/2, n = ?$$

By using the formula,

$$\text{Sum of GP for n terms} = a(r^n - 1)/(r - 1)$$

$$3069/512 = 3 ((1/2)^n - 1)/(1/2 - 1)$$

$$3069/512 \times 3 \times 2 = 1 - (1/2)^n$$

$$3069/3072 - 1 = - (1/2)^n$$

$$(3069 - 3072)/3072 = - (1/2)^n$$

$$-3/3072 = - (1/2)^n$$

$$1/1024 = (1/2)^n$$

$$(1/2)^{10} = (1/2)^n$$

$$10 = n$$

∴ 10 terms are required to make 3069/512

6. How many terms of the series $2 + 6 + 18 + \dots$ Must be taken to make the sum equal to 728?

Solution:

Given:

$$\text{Sum of GP} = 728$$

$$\text{Where, } a = 2, r = 6/2 = 3, n = ?$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

$$728 = 2(3^n - 1)/(3 - 1)$$

$$728 = 2(3^n - 1)/2$$

$$728 = 3^n - 1$$

$$729 = 3^n$$

$$3^6 = 3^n$$

$$6 = n$$

∴ 6 terms are required to make a sum equal to 728

7. How many terms of the sequence $\sqrt{3}, 3, 3\sqrt{3}, \dots$ must be taken to make the sum $39 + 13\sqrt{3}$?

Solution:

Given:

$$\text{Sum of GP} = 39 + 13\sqrt{3}$$

$$\text{Where, } a = \sqrt{3}, r = 3/\sqrt{3} = \sqrt{3}, n = ?$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

$$39 + 13\sqrt{3} = \sqrt{3}(\sqrt{3}^n - 1)/(\sqrt{3} - 1)$$

$$(39 + 13\sqrt{3})(\sqrt{3} - 1) = \sqrt{3}(\sqrt{3}^n - 1)$$

Let us simplify we get,

$$39\sqrt{3} - 39 + 13(3) - 13\sqrt{3} = \sqrt{3}(\sqrt{3}^n - 1)$$

$$39\sqrt{3} - 39 + 39 - 13\sqrt{3} = \sqrt{3}(\sqrt{3}^n - 1)$$

$$39\sqrt{3} - 39 + 39 - 13\sqrt{3} = \sqrt{3}^n - \sqrt{3}$$

$$26\sqrt{3} + \sqrt{3} = \sqrt{3}^n$$

$$27\sqrt{3} = \sqrt{3}^n$$

$$\sqrt{3}^6 \sqrt{3} = \sqrt{3}^n$$

$$6 + 1 = n + 1$$

$$7 = n + 1$$

$$7 - 1 = n$$

$$6 = n$$

∴ 6 terms are required to make a sum of $39 + 13\sqrt{3}$

8. The sum of n terms of the G.P. 3, 6, 12, ... is 381. Find the value of n.

Solution:

Given:

$$\text{Sum of GP} = 381$$

$$\text{Where, } a = 3, r = 6/3 = 2, n = ?$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

$$381 = 3(2^n - 1)/(2 - 1)$$

$$381 = 3(2^n - 1)$$

$$381/3 = 2^n - 1$$

$$127 = 2^n - 1$$

$$127 + 1 = 2^n$$

$$128 = 2^n$$

$$2^7 = 2^n$$

$$n = 7$$

∴ value of n is 7

9. The common ratio of a G.P. is 3, and the last term is 486. If the sum of these terms be 728, find the first term.

Solution:

Given:

$$\text{Sum of GP} = 728$$

$$\text{Where, } r = 3, a = ?$$

Firstly,

$$T_n = ar^{n-1}$$

$$486 = a3^{n-1}$$

$$486 = a3^n/3$$

$$486(3) = a3^n$$

$$1458 = a3^n \dots \text{Equation (i)}$$

By using the formula,

$$\text{Sum of GP for } n \text{ terms} = a(r^n - 1)/(r - 1)$$

$$728 = a(3^n - 1)/2$$

$$1456 = a3^n - a \dots \text{equation (2)}$$

Subtracting equation (1) from (2) we get

$$1458 - 1456 = a.3^n - a.3^n + a$$

$$a = 2.$$

∴ The first term is 2

10. The ratio of the sum of the first three terms is to that of the first 6 terms of a G.P. is 125 : 152. Find the common ratio.

Solution:

Given:

Sum of G.P of 3 terms is 125

By using the formula,

Sum of GP for n terms = $a(r^n - 1)/(r - 1)$

$$125 = a(r^3 - 1)/(r - 1)$$

$$125 = a(r^3 - 1)/(r - 1) \dots \text{equation (1)}$$

Now,

Sum of G.P of 6 terms is 152

By using the formula,

Sum of GP for n terms = $a(r^n - 1)/(r - 1)$

$$152 = a(r^6 - 1)/(r - 1)$$

$$152 = a(r^6 - 1)/(r - 1) \dots \text{equation (2)}$$

Let us divide equation (i) by (ii) we get,

$$125/152 = [a(r^3 - 1)/(r - 1)] / [a(r^6 - 1)/(r - 1)]$$

$$125/152 = (r^3 - 1)/(r^6 - 1)$$

$$125/152 = (r^3 - 1)/[(r^3 - 1)(r^3 + 1)]$$

$$125/152 = 1/(r^3 + 1)$$

$$125(r^3 + 1) = 152$$

$$125r^3 + 125 = 152$$

$$125r^3 = 152 - 125$$

$$125r^3 = 27$$

$$r^3 = 27/125$$

$$r^3 = 3^3/5^3$$

$$r = 3/5$$

∴ The common ratio is 3/5