

Example 10

Find the 10th term of the progression $1, \sqrt{3}, 3$.

Solution :

$1, \sqrt{3}, 3$ is in G. P.

So

$$\begin{aligned}a &= 1, r = \sqrt{3} \\T_{10} &= ar^{n-1} \\&= 1 \times (\sqrt{3})^{10-1} \\&= 1 \times (\sqrt{3})^9 \\&= 81\sqrt{3}\end{aligned}$$

Exercise 2(A)

Type I

1. Which term of G. P. $1, \sqrt{3}, 3, \dots$ will be 81?
2. Write down the 9th term of G. P. $\sqrt{3}, \frac{1}{\sqrt{3}}, \frac{1}{3\sqrt{3}}, \dots$
3. How many terms are there in the G. P. $5, 20, 80, \dots, 5,120$?
4. Which term of G. P. $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$ will be $\frac{1}{512}$?
5. Find the seventh term of the G. P. $2^2, 2^3, 2^4, \dots$
6. If the fifth term of a G. P. is 81 and second term is 24, find the G. P.
7. The first terms of a G. P. is 5 and the common ratio is -2 . What is the 6th term?
8. If 5th and 8th terms of a G. P. be 48 and 384 respectively. Find the G. P.
9. Fourth term of a G. P. is 40 and the tenth term is 2,560. Find the seventh term.
10. The 4th and 8th terms of a G. P. are 24 and 384 respectively. find the 1st term and the common ratio.
11. The second term of a G. P. is 27 and 7th term is $1/9$. Find the first term and the common ratio.
12. The 7th term of a G. P. is 8 times of the 4th term then find the series if its 5th term is 48.
13. Find the value of k if $3, k, 48$ are in G. P.
14. Quantities $x, 8, y$ ($x \neq y$) are in G. P. and $x, y, -8$ in A. P. Find the value of x and y .

Type II

15. Three numbers whose sum is 15 are in A. P. If 1, 4, 19 be added to them respectively the resulting numbers are in G. P. Find the numbers.
16. The product of three terms in G. P. is 216 and their sum is 21. Find the terms.
17. If the continued product of three numbers in G. P. is 216 and the sum of their products in pair is 156. Find the numbers. (J. A. C., 2011)
18. If for a G. P. $S_2 = 8$ and $S_4 = 80$, find its first term and the common ratio.

19. The ratio of the fourth and 12th term of a G. P. with positive common ratio is 1 : 256. If the difference of two terms be 61.2, find the sum of 8 terms of the series.
20. The sum of three consecutive numbers in G. P. is 35 and their product is 1,000. Find the numbers.
21. For what value of x the numbers $x - 2, x, x + 3$ are in G. P.
22. If the 4th term of a G. P. be 8 and 9th term be 256, find the n th term. Also determine which term of the progression is 64.

Answers

- | | | | | |
|-----------------------------------|-----------------------------|------------------|---------------------------|----------------------|
| 1. 9th term, | 2. $\frac{\sqrt{3}}{3^8}$, | 3. 6, | 4. 10th item, | 5. 256, |
| 6. 16, 24, 36, 54, | 7. - 160 | 8. 3, 6, 12, 24, | 9. 320, | 10. $a = 3, r = 2$, |
| 11. $a = 81, r = 1/3$ | 12. 3, 6, 12, | 13. ± 12 , | 14. 16 and 4 | |
| 15. 2, 5, 8 or 26, 5, - 16 | 16. 3, 6, 12 or 12, 6, 3, | 17. 2, 6, 18, | 18. $a = 2, r = 3$, | |
| 19. $r = 2, a = 0.03, S_8 = 7.65$ | 20. 5, 10, 20, | 21. 6 | 22. $r = 2, a = 1, n = 7$ | |

(2.4) TO FIND THE SUM OF n TERMS OF A G. P.

For the G.P. let

$$\text{first term} = a$$

and

$$\text{c.r.} = r$$

and S_n denotes the sum of first n terms of G.P.

$$S_n = a + ar + ar^2 + ar^3 + \dots + ar^{n-2} + ar^{n-1} \quad \dots(i)$$

Now multiplying both sides by r ,

$$rS_n = ar + ar^2 + ar^3 + \dots + ar^{n-1} + ar^n \quad \dots(ii)$$

Subtracting eq. (ii) from (i),

$$S_n - rS_n = a - ar^n$$

or

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

$$S_n = \frac{a(1 - r^n)}{1 - r}, \text{ when } r < 1$$

Formula 1

Multiplying the numerator and denominator by (-1) ,

$$S_n = \frac{a(1 - r^n)}{1 - r}, \text{ when } r > 1$$

Formula 3

To find the sum of infinite terms of a G. P. when the value of the common ratio is less than one

For the G.P. let

$$\text{first term} = a \text{ and c.r.} = r \text{ where}$$

$$|r| < 1$$

Let S_n denotes the sum of first n terms,

then

$$S_n = a + ar + ar^2 + ar^3 + \dots + ar^{n-2} + ar^{n-1} \quad \dots(i)$$

\therefore

$$rS_n = ar + ar^2 + ar^3 + \dots + ar^{n-1} + ar^n \quad \dots(ii)$$

Subtracting (ii) from (i),

$$S_n(1 - r) = a - ar^n$$

or

$$S_n = \frac{a - ar^n}{1 - r}$$

or

$$S_n = \frac{a}{1 - r} - \frac{ar^n}{1 - r}$$

$\dots(iii)$

Que Find the 10th terms of series
1, 2, 4, 8 - - - -

Ans $a = 1$, $r = \frac{4}{2} = 2$ $n = 10$

$$\begin{aligned}t_{10} &= ar^{(n-1)} \\&= 1 \cdot 2^{(10-1)} \\&= 1 \times 2^9 \\&= 512 \quad \underline{\underline{Ans}}\end{aligned}$$

Que The first term of G.P is 5 and common ratio is -2, what is $t_6 = ?$

Ans $a = 5$, $r = -2$, $n = 6$

$$\begin{aligned}t_6 &= ar^{(n-1)} \\t_6 &= 5 \cdot (-2)^{(6-1)} \\t_6 &= 5 \times (-2)^5 \\&= 5 \times -32 \\&= -160 \quad \underline{\underline{Ans}}\end{aligned}$$