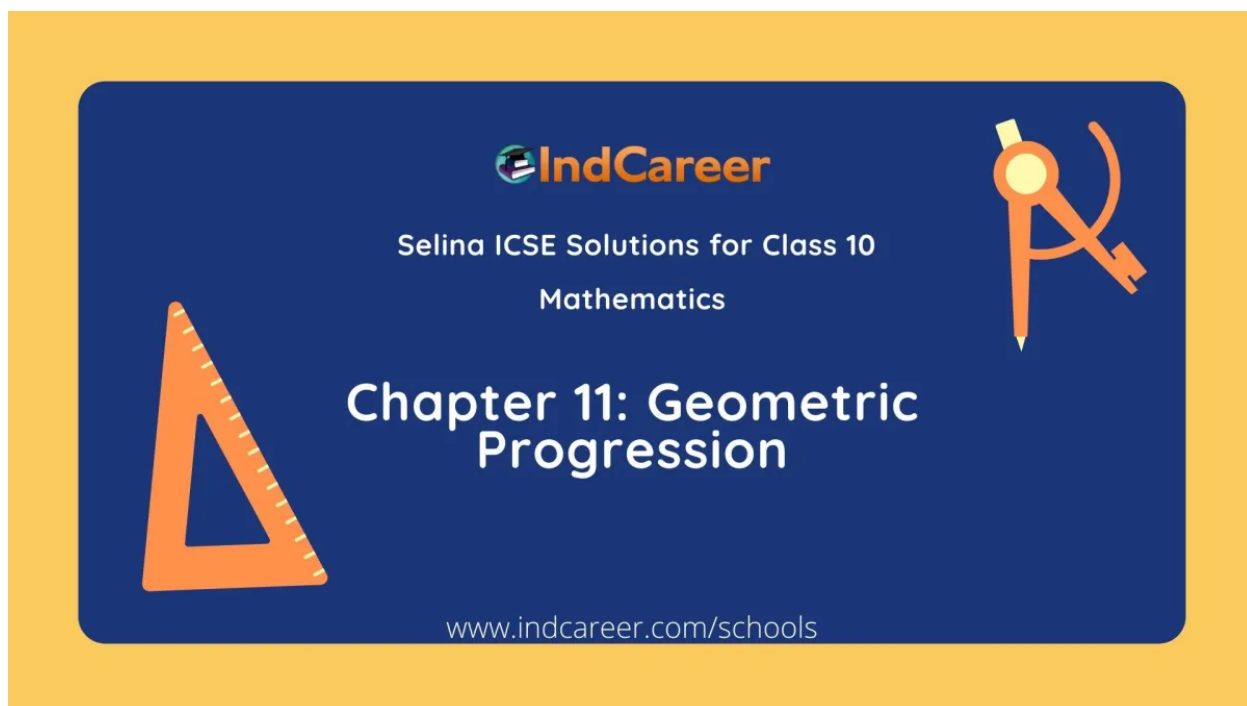


# Selina Class 10 ICSE Solutions Mathematics :

## Chapter 11- Geometric Progression



For any clarifications or questions you can write to **info@indcareer.com**

### Postal Address

IndCareer.com, 52, Shilpa Nagar, Somalwada Nagpur - 440015  
Maharashtra, India

**WhatsApp:** +91 9561 204 888, **Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>



# Selina Class 10 ICSE Solutions Mathematics :

## Chapter 11- Geometric Progression

Class 10: Maths Chapter 11 solutions. Complete Class 10 Maths Chapter 11 Notes.

### Selina Class 10 ICSE Solutions Mathematics : Chapter 11- Geometric Progression

Selina 10th Maths Chapter 11, Class 10 Maths Chapter 11 solutions

#### Exercise 11A

##### Question 1.

Find, which of the following sequence form a G.P. :

(i) 8, 24, 72, 216, .....

(ii) 18, 124, 172, 1216, .....

(iii) 9, 12, 16, 24, .....

##### Solution 1(i).

Given sequence: 8, 24, 72, 216.....

Now,

$$\frac{24}{8} = 3, \quad \frac{72}{24} = 3, \quad \frac{216}{72} = 3$$

Since  $\frac{24}{8} = \frac{72}{24} = \frac{216}{72} = \dots = 3$ , the given sequence is a G.P.  
with common ratio 3.

##### Solution 1(ii).

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given sequence:  $\frac{1}{8}, \frac{1}{24}, \frac{1}{72}, \frac{1}{216}, \dots$

Now,

$$\frac{\frac{1}{24}}{\frac{1}{8}} = \frac{1}{3}, \quad \frac{\frac{1}{72}}{\frac{1}{24}} = \frac{1}{3}, \quad \frac{\frac{1}{216}}{\frac{1}{72}} = \frac{1}{3}$$

Since  $\frac{\frac{1}{24}}{\frac{1}{8}} = \frac{\frac{1}{72}}{\frac{1}{24}} = \frac{\frac{1}{216}}{\frac{1}{72}} = \dots = \frac{1}{3}$ , the given sequence is a G.P.

with common ratio  $\frac{1}{3}$ .

**Solution 1(iii).**

Given sequence: 9, 12, 16, 24, .....

Now,

$$\frac{12}{9} = \frac{4}{3}, \quad \frac{16}{12} = \frac{4}{3}, \quad \frac{24}{16} = \frac{3}{2}$$

Since  $\frac{24}{8} = \frac{72}{24} \neq \frac{216}{72}$ , the given sequence is not a G.P.

**Question 2.**

**Find the 9th term of the series :**

**1, 4, 16, 64, .....**

**Solution:**

Given sequence: 1, 4, 16, 64.....

Now,

$$\frac{4}{1} = 4, \quad \frac{16}{4} = 4, \quad \frac{64}{16} = 4$$

Since  $\frac{4}{1} = \frac{16}{4} = \frac{64}{16} = \dots = 4$ , the given sequence is a G.P.

with first term,  $a = 1$  and common ratio,  $r = 4$ .

Now,  $t_n = ar^{n-1}$

$$\Rightarrow t_9 = 1 \times 4^8 = 65536$$

### Question 3.

**Find the seventh term of the G.P. :**

**1,  $3-\sqrt{3}$ ,  $3$ ,  $33-\sqrt{3}$  .....**

**Solution:**

Given G.P.: 1,  $\sqrt{3}$ , 3,  $3\sqrt{3}$ , ....

Here,

First term,  $a = 1$

$$\text{Common ratio, } r = \frac{\sqrt{3}}{1} = \sqrt{3}$$

Now,  $t_n = ar^{n-1}$

$$\Rightarrow t_7 = 1 \times (\sqrt{3})^6 = 27$$

### Question 4.

**Find the 8<sup>th</sup> term of the sequence :**

**34, 112 3, .....**

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given sequence:  $\frac{3}{4}, 1\frac{1}{2}, 3, \dots$

i.e.  $\frac{3}{4}, \frac{3}{2}, 3, \dots$

Now,

$$\frac{\frac{3}{2}}{\frac{3}{4}} = 2, \quad \frac{3}{\frac{3}{2}} = 2,$$

Since  $\frac{\frac{3}{2}}{\frac{3}{4}} = \frac{3}{\frac{3}{2}} = \dots = 2$ , the given sequence is a G.P.

with first term,  $a = \frac{3}{4}$  and common ratio,  $r = 2$ .

Now,  $t_n = ar^{n-1}$

$$\Rightarrow t_8 = \frac{3}{4} \times 2^7 = \frac{3}{4} \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 3 \times 2^5 = 96$$

#### Question 5.

Find the 10<sup>th</sup> term of the G.P. :

**Solution:**

Given G.P.:  $12, 4, 1\frac{1}{3}, \dots$

Here,

First term,  $a = 12$

Common ratio,  $r = \frac{4}{12} = \frac{1}{3}$

Now,  $t_n = ar^{n-1}$

$$\Rightarrow t_{10} = 12 \times \left(\frac{1}{3}\right)^9 = 12 \times \frac{1}{19683} = \frac{4}{6561}$$

#### Question 6.

Find the  $n^{\text{th}}$  term of the series :

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given series: 1, 2, 4, 8, .....

Now,

$$\frac{2}{1} = 2, \quad \frac{4}{2} = 2, \quad \frac{8}{4} = 2$$

Since  $\frac{2}{1} = \frac{4}{2} = \frac{8}{4} = \dots = 2$ , the given sequence is a G.P.

with first term,  $a = 1$  and common ratio,  $r = 2$ .

Now,  $t_n = ar^{n-1}$

$$\Rightarrow t_n = 1 \times 2^{n-1} = 2^{n-1}$$

#### Question 7.

Find the next three terms of the sequence :

$5-\sqrt{5}, 5, 5+\sqrt{5}, \dots$

**Solution:**

Given sequence:  $\sqrt{5}, 5, 5\sqrt{5}, \dots$

Now,

$$\frac{5}{\sqrt{5}} = \sqrt{5}, \quad \frac{5\sqrt{5}}{5} = \sqrt{5}$$

Since  $\frac{5}{\sqrt{5}} = \frac{5\sqrt{5}}{5} = \dots = \sqrt{5}$ , the given sequence is a G.P.

with first term,  $a = \sqrt{5}$  and common ratio,  $r = \sqrt{5}$ .

Now,  $t_n = ar^{n-1}$

$\therefore$  Next three terms:

$$4^{\text{th}} \text{ term} = \sqrt{5} \times (\sqrt{5})^3 = \sqrt{5} \times 5\sqrt{5} = 25$$

$$5^{\text{th}} \text{ term} = \sqrt{5} \times (\sqrt{5})^4 = \sqrt{5} \times 25 = 25\sqrt{5}$$

$$6^{\text{th}} \text{ term} = \sqrt{5} \times (\sqrt{5})^5 = \sqrt{5} \times 25\sqrt{5} = 125$$

#### Question 8.

Find the sixth term of the series :

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

$2^2, 2^3, 2^4, \dots$

**Solution:**

Given sequence:  $2^2, 2^3, 2^4, \dots$

Now,

$$\frac{2^3}{2^2} = 2, \quad \frac{2^4}{2^3} = 2$$

Since  $\frac{2^3}{2^2} = \frac{2^4}{2^3} = \dots = 2$ , the given sequence is a G.P.

with first term,  $a = 2^2 = 4$  and common ratio,  $r = 2$ .

Now,  $t_n = ar^{n-1}$

$$\therefore t_6 = 4 \times (2)^5 = 4 \times 32 = 128$$

**Question 9.**

**Find the seventh term of the G.P. :**

$\left[\sqrt{3}+1, 1, \frac{\sqrt{3}-1}{2}\right], \dots$

**Solution:**

Given G.P.:  $\sqrt{3} + 1, 1, \frac{\sqrt{3} - 1}{2}, \dots$

Here,

First term,  $a = \sqrt{3} + 1$

Common ratio,  $r = \frac{1}{\sqrt{3} + 1}$

Now,  $t_n = ar^{n-1}$

$$\begin{aligned}\Rightarrow t_7 &= (\sqrt{3} + 1) \times \left(\frac{1}{\sqrt{3} + 1}\right)^6 \\&= \left(\frac{1}{\sqrt{3} + 1}\right)^5 \\&= \left(\frac{1}{\sqrt{3} + 1} \times \frac{\sqrt{3} - 1}{\sqrt{3} - 1}\right)^5 \\&= \left(\frac{\sqrt{3} - 1}{2}\right)^5 \\&= \frac{1}{32}(\sqrt{3} - 1)^5\end{aligned}$$

**Question 10.**

**Find the G.P. whose first term is 64 and next term is 32.**

**Solution:**

First term,  $a = 64$

Second term,  $t_2 = 32$

$$\Rightarrow ar = 32$$

$$\Rightarrow 64 \times r = 32$$

$$\Rightarrow r = \frac{32}{64} = \frac{1}{2}$$

$\therefore$  Required G.P. =  $a, ar, ar^{n-1}, ar^{n-2}, \dots$

$$= 64, 32, 64 \times \left(\frac{1}{2}\right)^2, 64 \times \left(\frac{1}{2}\right)^3, \dots$$

$$= 64, 32, 16, 8, \dots$$

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**Question 11.**

Find the next three terms of the series:

227, 29, 23, .....

**Solution:**

Given sequence:  $\frac{2}{27}, \frac{2}{9}, \frac{2}{3}, \dots$

Now,

$$\frac{\frac{2}{9}}{\frac{2}{27}} = 3, \quad \frac{\frac{2}{3}}{\frac{2}{9}} = 3$$

Since  $\frac{\frac{2}{9}}{\frac{2}{27}} = \frac{\frac{2}{3}}{\frac{2}{9}} = \dots = 3$ , the given sequence is a G.P.

with first term,  $a = \frac{2}{27}$  and common ratio,  $r = 3$ .

Now,  $t_n = ar^{n-1}$

$\therefore$  Next three terms:

$$4^{\text{th}} \text{ term} = \frac{2}{27} \times (3)^3 = \frac{2}{27} \times 27 = 2$$

$$5^{\text{th}} \text{ term} = \frac{2}{27} \times (3)^4 = \frac{2}{27} \times 27 \times 3 = 6$$

$$6^{\text{th}} \text{ term} = \frac{2}{27} \times (3)^5 = \frac{2}{27} \times 27 \times 9 = 18$$

**Question 12.**

Find the next two terms of the series

2 – 6 + 18 – 54 .....

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given series:  $2 - 6 + 18 - 54, \dots$

Now,

$$\frac{-6}{2} = -3, \quad \frac{18}{-6} = -3, \quad \frac{-54}{18} = -3$$

Since  $\frac{-6}{2} = \frac{18}{-6} = \frac{-54}{18} = \dots = -3$ , the given sequence is a G.P.

with first term,  $a = 2$  and common ratio,  $r = -3$ .

Now,  $t_n = ar^{n-1}$

$\therefore$  Next two terms:

$$5^{\text{th}} \text{ term} = 2 \times (-3)^4 = 2 \times 81 = 162$$

$$6^{\text{th}} \text{ term} = 2 \times (-3)^5 = 2 \times (-243) = -486$$

### Exercise 11B

#### Question 1.

Which term of the G.P. :

$$-10, \frac{5}{\sqrt{3}}, -\frac{5}{6}, \dots \dots \dots \text{ is } -\frac{5}{72} ?$$

**Solution:**

For the given G.P.:

First term,  $a = -10$

$$\text{Common ratio, } r = \frac{5/\sqrt{3}}{-10} = -\frac{1}{2\sqrt{3}}$$

If  $-\frac{5}{72}$  is the  $n^{\text{th}}$  term of the given G.P., then

$$-\frac{5}{72} = ar^{n-1}$$

$$\Rightarrow -\frac{5}{72} = -10 \times \left(\frac{1}{2\sqrt{3}}\right)^{n-1}$$

$$\Rightarrow \frac{1}{144} = \left(\frac{1}{2\sqrt{3}}\right)^{n-1}$$

$$\Rightarrow \frac{1}{2 \times 2 \times 2 \times 2 \times \sqrt{3} \times \sqrt{3} \times \sqrt{3} \times \sqrt{3}} = \left(\frac{1}{2\sqrt{3}}\right)^{n-1}$$

$$\Rightarrow \left(\frac{1}{2\sqrt{3}}\right)^4 = \left(\frac{1}{2\sqrt{3}}\right)^{n-1}$$

$$\Rightarrow n-1 = 4$$

$$\Rightarrow n = 5$$

### Question 2.

The fifth term of a G.P. is 81 and its second term is 24. Find the geometric progression.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

$$5^{\text{th}} \text{ term} = 81 \Rightarrow ar^4 = 81$$

$$2^{\text{nd}} \text{ term} = 24 \Rightarrow ar = 24$$

$$\text{Now, } \frac{ar^4}{ar} = \frac{81}{24}$$

$$\Rightarrow r^3 = \frac{27}{8}$$

$$\Rightarrow r = \frac{3}{2}$$

$$ar = 24$$

$$\Rightarrow a \times \frac{3}{2} = 24$$

$$\Rightarrow a = 16$$

$$\therefore \text{G.P.} = a, ar, ar^2, ar^3, \dots$$

$$= 16, 24, 16 \times \left(\frac{3}{2}\right)^2, 16 \times \left(\frac{3}{2}\right)^3, \dots$$

$$= 16, 24, 36, 54, \dots$$

### Question 3.

Fourth and seventh terms of a G.P. are 118 and  $-1486$  respectively. Find the GP.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

$$4^{\text{th}} \text{ term} = \frac{1}{18} \Rightarrow ar^3 = \frac{1}{18}$$

$$7^{\text{th}} \text{ term} = -\frac{1}{486} \Rightarrow ar^6 = -\frac{1}{486}$$

$$\text{Now, } \frac{ar^6}{ar^3} = \frac{-\frac{1}{486}}{\frac{1}{18}}$$

$$\Rightarrow r^3 = -\frac{1}{27}$$

$$\Rightarrow r = -\frac{1}{3}$$

$$ar^3 = \frac{1}{18}$$

$$\Rightarrow a \times \left(-\frac{1}{3}\right)^3 = \frac{1}{18}$$

$$\Rightarrow a = -\frac{27}{18} = -\frac{3}{2}$$

$$\therefore \text{G.P.} = a, ar, ar^2, ar^3, \dots$$

$$= -\frac{3}{2}, -\frac{3}{2} \times \left(-\frac{1}{3}\right), -\frac{3}{2} \times \left(-\frac{1}{3}\right)^2, \frac{1}{18}, \dots$$

$$= -\frac{3}{2}, \frac{1}{2}, -\frac{1}{6}, \frac{1}{18}, \dots$$

#### Question 4.

If the first and the third terms of a G.P. are 2 and 8 respectively, find its second term.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

$$\therefore 1^{\text{st}} \text{ term} = a = 2$$

$$\text{And, } 3^{\text{rd}} \text{ term} = 8 \Rightarrow ar^2 = 8$$

$$\text{Now, } \frac{ar^2}{a} = \frac{8}{2}$$

$$\Rightarrow r^2 = 4$$

$$\Rightarrow r = \pm 2$$

When  $a = 2$  and  $r = 2$

$$2^{\text{nd}} \text{ term} = ar = 2 \times 2 = 4$$

When  $a = 2$  and  $r = -2$

$$2^{\text{nd}} \text{ term} = ar = 2 \times (-2) = -4$$

#### Question 5.

The product of 3rd and 8th terms of a G.P. is 243. If its 4<sup>th</sup> term is 3, find its 7<sup>th</sup> term.

**Solution:**

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

Now,

$$t_3 \times t_8 = 243$$

$$\Rightarrow ar^2 \times ar^7 = 243$$

$$\Rightarrow a^2 r^9 = 243 \quad \dots(i)$$

Also,

$$t_4 = 3$$

$$\Rightarrow ar^3 = 3$$

$$\Rightarrow a = \frac{3}{r^3}$$

Substituting the value of  $a$  in (i), we get

$$\left(\frac{3}{r^3}\right)^2 \times r^9 = 243$$

$$\Rightarrow \frac{9}{r^6} \times r^9 = 243$$

$$\Rightarrow r^3 = 27$$

$$\Rightarrow r = 3$$

$$\Rightarrow a = \frac{3}{3^3} = \frac{3}{27} = \frac{1}{9}$$

$$\therefore 7^{\text{th}} \text{ term} = t_7 = ar^6 = \frac{1}{9} \times (3)^6 = 81$$

#### Question 6.

Find the geometric progression with 4<sup>th</sup> term = 54 and 7<sup>th</sup> term = 1458.

**Solution:**

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

$$4^{\text{th}} \text{ term} = 54 \Rightarrow ar^3 = 54$$

$$7^{\text{th}} \text{ term} = 1458 \Rightarrow ar^6 = 1458$$

$$\text{Now, } \frac{ar^6}{ar^3} = \frac{1458}{54}$$

$$\Rightarrow r^3 = 27$$

$$\Rightarrow r = 3$$

$$ar^3 = 54$$

$$\Rightarrow a \times (3)^3 = 54$$

$$\Rightarrow a = \frac{54}{27} = 2$$

$$\begin{aligned} \therefore \text{G.P.} &= a, ar, ar^2, ar^3, \dots \\ &= 2, 2 \times 3, 2 \times (3)^2, 54, \dots \\ &= 2, 6, 18, 54, \dots \end{aligned}$$

#### Question 7.

Second term of a geometric progression is 6 and its fifth term is 9 times of its third term. Find the geometric progression. Consider that each term of the G.P. is positive.

**Solution:**

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

Now, 2<sup>nd</sup> term =  $t_2 = 6 \Rightarrow ar = 6$

Also,  $t_5 = 9 \times t_3$

$$\Rightarrow ar^4 = 9 \times ar^2$$

$$\Rightarrow r^2 = 9$$

$$\Rightarrow r = \pm 3$$

Since, each term of a G.P. is positive, we have  $r = 3$

$$ar = 6$$

$$\Rightarrow a \times 3 = 6 \Rightarrow a = 2$$

$$\begin{aligned}\therefore \text{G.P.} &= a, ar, ar^2, ar^3, \dots \\ &= 2, 6, 2 \times (3)^2, 2 \times (3)^3, \dots \\ &= 2, 6, 18, 54, \dots\end{aligned}$$

#### Question 8.

The fourth term, the seventh term and the last term of a geometric progression are 10, 80 and 2560 respectively. Find its first term, common ratio and number of terms.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

Now,

$$4^{\text{th}} \text{ term} = t_4 = 10 \Rightarrow ar^3 = 10$$

$$7^{\text{th}} \text{ term} = t_7 = 80 \Rightarrow ar^6 = 80$$

$$\frac{ar^6}{ar^3} = \frac{80}{10}$$

$$\Rightarrow r^3 = 8$$

$$\Rightarrow r = 2$$

$$ar^3 = 10$$

$$\Rightarrow a \times (2)^3 = 10$$

$$\Rightarrow a = \frac{10}{8} = \frac{5}{4}$$

Last term =  $l = 2560$

Let there be  $n$  terms in given G.P.

$$\Rightarrow t_n = 2560$$

$$\Rightarrow ar^{n-1} = 2560$$

$$\Rightarrow \frac{5}{4} \times (2)^{n-1} = 2560$$

$$\Rightarrow (2)^{n-1} = 2048$$

$$\Rightarrow (2)^{n-1} = (2)^{11}$$

$$\Rightarrow n - 1 = 11$$

$$\Rightarrow n = 12$$

Thus, we have

First term =  $\frac{5}{4}$ , Common ratio = 2 and Number of terms = 12

#### Question 9.

If the 4th and 9th terms of a G.P. are 54 and 13122 respectively, find the GP. Also, find its general term.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

Now,

$$4^{\text{th}} \text{ term} = t_4 = 54 \Rightarrow ar^3 = 54$$

$$9^{\text{th}} \text{ term} = t_9 = 13122 \Rightarrow ar^8 = 13122$$

$$\frac{ar^8}{ar^3} = \frac{13122}{54}$$

$$\Rightarrow r^5 = 243$$

$$\Rightarrow r = 3$$

$$ar^3 = 54$$

$$\Rightarrow a \times (3)^3 = 54$$

$$\Rightarrow a = \frac{54}{27} = 2$$

$$\begin{aligned} \therefore \text{Required G.P.} &= a, ar, ar^2, ar^3, \dots \\ &= 2, 2 \times 3, 2 \times (3)^2, 54 \\ &= 2, 6, 18, 54 \end{aligned}$$

$$\text{General term} = t_n = ar^{n-1} = 2 \times (3)^{n-1}$$

#### Question 10.

The fifth, eight and eleventh terms of a geometric progression are  $p$ ,  $q$  and  $r$  respectively. Show that :  $q^2 = pr$ .

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the first term of the G.P. be  $a$  and its common ratio be  $r$ .

$$5^{\text{th}} \text{ term} = t_5 = p$$

$$\Rightarrow ar^4 = p$$

$$8^{\text{th}} \text{ term} = t_8 = q$$

$$\Rightarrow ar^7 = q$$

$$11^{\text{th}} \text{ term} = t_{11} = r$$

$$\Rightarrow ar^{10} = r$$

Now,

$$pr = ar^4 \times ar^{10} = a^2 \times r^{14} = (a \times r^7)^2 = q^2$$

$$\Rightarrow q^2 = pr$$

### Exercise 11C

#### Question 1.

Find the seventh term from the end of the series :  $2-\sqrt{2}$ ,  $2$ ,  $22-\sqrt{2}$ , .....  $32$ .

**Solution:**

Given series:  $\sqrt{2}$ ,  $2$ ,  $2\sqrt{2}$ , ...,  $32$

$$\text{Now, } \frac{2}{\sqrt{2}} = \sqrt{2}, \frac{2\sqrt{2}}{2} = \sqrt{2}$$

So, the given series is a G.P. with common ratio,  $r = \sqrt{2}$

Here, last term,  $l = 32$

$$\therefore 7^{\text{th}} \text{ term from an end} = \frac{l}{r^6} = \frac{32}{(\sqrt{2})^6} = \frac{32}{8} = 4$$

#### Question 2.

Find the third term from the end of the GP.

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**227,29,23, ..... 162**

**Solution:**

Given G.P.:  $\frac{2}{27}, \frac{2}{9}, \frac{2}{3}, \dots, 162$

Here,

$$\text{Common ratio, } r = \frac{\frac{2}{9}}{\frac{2}{27}} = 3$$

Last term,  $l = 162$

$$\therefore 3^{\text{rd}} \text{ term from an end} = \frac{l}{r^2} = \frac{162}{(3)^2} = \frac{162}{9} = 18$$

**Question 3.**

**For the 127,19,13, ..... 81;**

**find the product of fourth term from the beginning and the fourth term from the end.**

**Solution:**

Given G.P.:  $\frac{1}{27}, \frac{1}{9}, \frac{1}{3}, \dots, 81$

Here,

$$\text{Common ratio, } r = \frac{\frac{1}{9}}{\frac{1}{27}} = 3$$

First term,  $a = \frac{1}{27}$  and Last term,  $l = 81$

$$\therefore 4^{\text{th}} \text{ term from the beginning} = ar^3 = \frac{1}{27} \times (3)^3 = \frac{1}{27} \times 27 = 1$$

$$\text{And, } 4^{\text{th}} \text{ term from an end} = \frac{l}{r^3} = \frac{81}{(3)^3} = \frac{81}{27} = 3$$

Thus, required product =  $1 \times 3 = 3$

**Question 4.**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

If for a G.P.,  $p^{\text{th}}$ ,  $q^{\text{th}}$  and  $r^{\text{th}}$  terms are  $a$ ,  $b$  and  $c$  respectively ; prove that :

$$(q - r) \log a + (r - p) \log b + (p - q) \log c = 0$$

**Solution:**

Let the first term of the G.P. be  $A$  and its common ratio be  $R$ .

Then,

$$p^{\text{th}} \text{ term} = a \Rightarrow AR^{p-1} = a$$

$$q^{\text{th}} \text{ term} = b \Rightarrow AR^{q-1} = b$$

$$r^{\text{th}} \text{ term} = c \Rightarrow AR^{r-1} = c$$

Now,

$$\begin{aligned} a^{q-r} \times b^{r-p} \times c^{p-q} &= (AR^{p-1})^{q-r} \times (AR^{q-1})^{r-p} \times (AR^{r-1})^{p-q} \\ &= A^{q-r} \cdot R^{(p-1)(q-r)} \times A^{r-p} \cdot R^{(q-1)(r-p)} \times A^{p-q} \cdot R^{(r-1)(p-q)} \\ &= A^{q-r+r-p+p-q} \times R^{(p-1)(q-r)+(q-1)(r-p)+(r-1)(p-q)} \\ &= A^0 \times R^0 \\ &= 1 \end{aligned}$$

Taking log on both the sides, we get

$$\log \{a^{q-r} \times b^{r-p} \times c^{p-q}\} = \log 1$$

$$\Rightarrow (q - r) \log a + (r - p) \log b + (p - q) \log c = 0 \quad \dots (\text{proved})$$

**Question 5.**

If  $a$ ,  $b$  and  $c$  in G.P., prove that :  $\log a^n$ ,  $\log b^n$  and  $\log c^n$  are in A.P.

**Solution:**

Here,  $a$ ,  $b$ ,  $c$  are in G.P.

$$\Rightarrow b^2 = ac$$

Taking log on both sides, we get

$$\log (b^2) = \log (ac)$$

$$\Rightarrow 2 \log b = \log a + \log c$$

$$\Rightarrow \log b + \log b = \log a + \log c$$

$$\Rightarrow \log b - \log a = \log c - \log b$$

$$\Rightarrow \log a, \log b \text{ and } \log c \text{ are in A.P.}$$

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**Question 6.**

If each term of a G.P. is raised to the power  $x$ , show that the resulting sequence is also a G.P.

**Solution:**

Let  $a_1, a_2, a_3, \dots, a_n, \dots$  be a G.P. with common ratio  $r$ .

$$\Rightarrow \frac{a_{n+1}}{a_n} = r \text{ for all } n \in \mathbb{N}$$

If each term of a G.P. is raised to the power  $x$ , we get the sequence

$$a_1^x, a_2^x, a_3^x, \dots, a_n^x, \dots$$

$$\text{Now, } \frac{(a_{n+1})^x}{(a_n)^x} = \left( \frac{a_{n+1}}{a_n} \right)^x = r^x \text{ for all } n \in \mathbb{N}$$

Hence,  $a_1^x, a_2^x, a_3^x, \dots, a_n^x, \dots$  is also a G.P.

**Question 7.**

If  $a, b$  and  $c$  are in A.P.  $a, x, b$  are in G.P. whereas  $b, y$  and  $c$  are also in G.P. Show that :  $x^2, b^2, y^2$  are in A.P.

**Solution:**

$a, b$  and  $c$  are in A.P.

$$\Rightarrow 2b = a + c$$

$a, x$  and  $b$  are in G.P.

$$\Rightarrow x^2 = ab$$

$b, y$  and  $c$  are in G.P.

$$\Rightarrow y^2 = bc$$

Now,

$$x^2 + y^2 = ab + bc$$

$$= b(a + c)$$

$$= b \times 2b$$

$$= 2b^2$$

$\Rightarrow x^2, b^2$  and  $y^2$  are in A.P.

#### Question 8.

If  $a, b, c$  are in G.P. and  $a, x, b, y, c$  are in A.P., prove that :

$$(i) \frac{1}{x} + \frac{1}{y} = \frac{2}{b} \quad (ii) \frac{a}{x} + \frac{c}{y} = 2$$

**Solution 8(i).**

a, b and c are in G.P.

$$\Rightarrow b^2 = ac$$

a, x, b, y and c are in A.P.

$$\Rightarrow 2x = a + b \Rightarrow x = \frac{a+b}{2}$$

$$2b = x + y \Rightarrow b = \frac{x+y}{2}$$

$$2y = b + c \Rightarrow y = \frac{b+c}{2}$$

Now,

$$\begin{aligned}\frac{1}{x} + \frac{1}{y} &= \frac{2}{a+b} + \frac{2}{b+c} \\&= \frac{2b + 2c + 2a + 2b}{ab + ac + b^2 + bc} \\&= \frac{2a + 2c + 4b}{ab + b^2 + b^2 + bc} \\&= \frac{2a + 2c + 4b}{ab + 2b^2 + bc} \\&= \frac{2(a + c + 2b)}{b(a + 2b + c)} \\&= \frac{2}{b}\end{aligned}$$

**Solution 8(ii).**

$a, b$  and  $c$  are in G.P.

$$\Rightarrow b^2 = ac$$

$a, x, b, y$  and  $c$  are in A.P.

$$\Rightarrow 2x = a + b \Rightarrow x = \frac{a+b}{2}$$

$$2b = x + y \Rightarrow b = \frac{x+y}{2}$$

$$2y = b + c \Rightarrow y = \frac{b+c}{2}$$

Now,

$$\begin{aligned}\frac{a}{x} + \frac{c}{y} &= \frac{2a}{a+b} + \frac{2c}{b+c} \\&= \frac{2a(b+c) + 2c(a+b)}{(a+b)(b+c)} \\&= \frac{2ab + 2ac + 2ac + 2bc}{ab + ac + b^2 + bc} \\&= \frac{2ab + 4ac + 2bc}{ab + b^2 + b^2 + bc} \\&= \frac{2(ab + 2ac + bc)}{ab + 2b^2 + bc} \\&= \frac{2(ab + 2ac + bc)}{ab + 2ac + bc} \\&= 2\end{aligned}$$

#### Question 9.

If  $a, b$  and  $c$  are in A.P. and also in G.P., show that:  $a = b = c$ .

**Solution:**

$a$ ,  $b$  and  $c$  are in A.P.

$$\Rightarrow 2b = a + c$$

$$\Rightarrow b = \frac{a + c}{2}$$

$a$ ,  $b$  and  $c$  are also in G.P.

$$\Rightarrow b^2 = ac$$

$$\Rightarrow \left(\frac{a + c}{2}\right)^2 = ac$$

$$\Rightarrow \frac{a^2 + c^2 + 2ac}{4} = ac$$

$$\Rightarrow a^2 + c^2 + 2ac = 4ac$$

$$\Rightarrow a^2 + c^2 - 2ac = 0$$

$$\Rightarrow (a - c)^2 = 0$$

$$\Rightarrow a - c = 0$$

$$\Rightarrow a = c$$

Now,  $2b = a + c$

$$\Rightarrow 2b = a + a$$

$$\Rightarrow 2b = 2a$$

$$\Rightarrow b = a$$

Thus, we have  $a = b = c$

#### Question 10.

The first term of a G.P. is  $a$  and its  $n^{\text{th}}$  term is  $b$ , where  $n$  is an even number. If the product of first  $n$  numbers of this G.P. is  $P$ ; prove that :  $p^2 = (ab)^n$ .

**Solution:**

For a G.P.,

First term =  $a$

Let the common ratio =  $r$

$n^{\text{th}}$  term =  $b$

$$\Rightarrow ar^{n-1} = b$$

$P$  = Product of first  $n$  numbers of the given G.P.

$$\Rightarrow P = a \times ar \times ar^2 \times ar^3 \times \dots \times ar^{n-1}$$

$$\Rightarrow P = a \times ar \times ar^2 \times ar^3 \times \dots \times b$$

$$\Rightarrow P = a \times ar \times ar^2 \times ar^3 \times \dots \times \frac{b}{r^2} \times \frac{b}{r} \times b$$

$$\Rightarrow P = (ab) \times \left( ar \times \frac{b}{r} \right) \times \left( ar^2 \times \frac{b}{r^2} \right) \times \dots \times \frac{n}{2} \text{ terms}$$

$$\Rightarrow P = (ab) \times (ab) \times (ab) \times \dots \times \frac{n}{2} \text{ terms}$$

$$\Rightarrow P = (ab)^{\frac{n}{2}}$$

$$\Rightarrow P = \sqrt{ab^n}$$

$$\Rightarrow P^2 = ab^n$$

#### Question 11.

If  $a$ ,  $b$ ,  $c$  and  $d$  are consecutive terms of a G.P. ; prove that :

$(a^2 + b^2)$ ,  $(b^2 + c^2)$  and  $(c^2 + d^2)$  are in GP.

**Solution:**

Let  $r$  be the common ratio of this G.P.

Given :  $a, b, c, d$  are in G.P.

$$\Rightarrow 1^{\text{st}} = a,$$

$$2^{\text{nd}} \text{ term} = b = ar,$$

$$3^{\text{rd}} \text{ term} = c = ar^2$$

$$4^{\text{th}} \text{ term} = d = ar^3$$

$$\begin{aligned}\text{Now, } (b^2 + c^2)^2 &= [(ar)^2 + (ar^2)^2]^2 \\ &= [a^2r^2 + a^2r^4]^2 \\ &= [a^2r^2(1 + r^2)]^2 \\ &= a^4r^4(1 + r^2)^2\end{aligned}$$

$$\begin{aligned}\text{And, } (a^2 + b^2) \times (c^2 + d^2) &= [a^2 + (ar)^2] \times [(ar^2)^2 + (ar^3)^2] \\ &= [a^2 + a^2r^2] \times [a^2r^4 + a^2r^6] \\ &= a^2(1 + r^2) \times a^2r^4(1 + r^2) \\ &= a^4r^4(1 + r^2)^2\end{aligned}$$

$$\Rightarrow (b^2 + c^2)^2 = (a^2 + b^2) \times (c^2 + d^2)$$

$$\text{i.e. } \frac{b^2 + c^2}{a^2 + b^2} = \frac{c^2 + d^2}{b^2 + c^2}$$

Hence,  $(a^2 + b^2)$ ,  $(b^2 + c^2)$  and  $(c^2 + d^2)$  are in G.P.

#### Question 12.

If  $a, b, c$  and  $d$  are consecutive terms of a G.P. To prove:

$$\frac{1}{a^2 + b^2}, \frac{1}{b^2 + c^2} \text{ and } \frac{1}{c^2 + d^2} \text{ are in G.P.}$$

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let  $r$  be the common ratio of this G.P.

Given :  $a, b, c, d$  are in G.P.

$$\Rightarrow 1^{\text{st}} = a,$$

$$2^{\text{nd}} \text{ term} = b = ar,$$

$$3^{\text{rd}} \text{ term} = c = ar^2$$

$$4^{\text{th}} \text{ term} = d = ar^3$$

$$\begin{aligned}\text{Now, } \left( \frac{1}{b^2 + c^2} \right)^2 &= \left[ \frac{1}{(ar)^2 + (ar^2)^2} \right]^2 \\ &= \left[ \frac{1}{a^2r^2 + a^2r^4} \right]^2 \\ &= \frac{1}{a^4r^4} \left[ \frac{1}{1+r^2} \right]^2 \\ &= \frac{1}{a^4r^4} \times \frac{1}{(1+r^2)^2}\end{aligned}$$

$$\begin{aligned}\text{And, } \left( \frac{1}{a^2 + b^2} \right) \times \left( \frac{1}{c^2 + d^2} \right) &= \left[ \frac{1}{a^2 + (ar)^2} \right] \times \left[ \frac{1}{(ar^2)^2 + (ar^3)^2} \right] \\ &= \left[ \frac{1}{a^2 + a^2r^2} \right] \times \left[ \frac{1}{a^2r^4 + a^2r^6} \right] \\ &= \frac{1}{a^2} \left( \frac{1}{1+r^2} \right) \times \frac{1}{a^2r^4} \left( \frac{1}{1+r^2} \right) \\ &= \frac{1}{a^4r^4} \times \frac{1}{(1+r^2)^2}\end{aligned}$$

$$\Rightarrow \left( \frac{1}{b^2 + c^2} \right)^2 = \left( \frac{1}{a^2 + b^2} \right) \times \left( \frac{1}{c^2 + d^2} \right)$$

Hence,  $\frac{1}{a^2 + b^2}, \frac{1}{b^2 + c^2}$  and  $\frac{1}{c^2 + d^2}$  are in G.P.

## Exercise 11D

### Question 1.

Find the sum of G.P. :

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

- (i)  $1 + 3 + 9 + 27 + \dots$  to 12 terms.  
(ii)  $0.3 + 0.03 + 0.003 + 0.0003 + \dots$  to 8 terms.

(iii)  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$  to 9 terms.

(iv)  $1 - \frac{1}{3} + \frac{1}{3^2} - \frac{1}{3^3} + \dots$  to  $n$  terms.

(v)  $\frac{x+y}{x-y} + 1 + \frac{x-y}{x+y} + \dots$  upto  $n$  terms.

(vi)  $\sqrt{3} + \frac{1}{\sqrt{3}} + \frac{1}{3\sqrt{3}} + \dots$  to  $n$  terms.

**Solution 1(i).**

Given GP :  $1 + 3 + 9 + 27 + \dots$

Here,

first term,  $a = 1$

common ratio,  $r = \frac{3}{1} = 3$  ( $r > 1$ )

number of terms to be added,  $n = 12$

$$\therefore S_n = \frac{a(r^n - 1)}{r - 1}$$

$$\Rightarrow S_{12} = \frac{1(3^{12} - 1)}{3 - 1} = \frac{3^{12} - 1}{2} = \frac{531441 - 1}{2} = \frac{531440}{2} = 265720$$

**Solution 1(ii).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P. :  $0.3 + 0.03 + 0.003 + 0.0003 + \dots$

Here,

first term,  $a = 0.3$

common ratio,  $r = \frac{0.03}{0.3} = 0.1$  ( $r < 1$ )

number of terms to be added,  $n = 8$

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_8 = \frac{0.3(1-(0.1)^8)}{1-0.1} = \frac{0.3(1-(0.1)^8)}{0.9} = \frac{1-(0.1)^8}{3} = \frac{1}{3} \left( 1 - \frac{1}{10^8} \right)$$

**Solution 1(iii).**

Given GP.:  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$

Here,

first term,  $a = 1$

common ratio,  $r = \frac{-1/2}{1} = -\frac{1}{2}$  ( $r < 1$ )

number of terms to be added,  $n = 9$

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_8 = \frac{1 \left( 1 - \left( -\frac{1}{2} \right)^9 \right)}{1 - \left( -\frac{1}{2} \right)}$$

$$= \frac{1 - \left( -\frac{1}{2} \right)^9}{1 + \frac{1}{2}}$$

$$= \frac{1 + \frac{1}{2^9}}{\frac{3}{2}}$$

$$= \frac{2}{3} \left( 1 + \frac{1}{2^9} \right)$$

$$= \frac{2}{3} \left( 1 + \frac{1}{512} \right)$$

$$= \frac{2}{3} \times \frac{513}{512}$$

$$= \frac{171}{256}$$

**Solution 1(iv).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P.:  $1 - \frac{1}{3} + \frac{1}{3^2} - \frac{1}{3^3} + \dots$  upto n terms

Here,

first term,  $a = 1$

common ratio,  $r = \frac{-\frac{1}{3}}{1} = -\frac{1}{3}$  ( $r < 1$ )

number of terms to be added = n

$$\begin{aligned}\therefore S_n &= \frac{a(1-r^n)}{1-r} \\ \Rightarrow S_n &= \frac{1\left(1 - \left(-\frac{1}{3}\right)^n\right)}{1 - \left(-\frac{1}{3}\right)} \\ &= \frac{1\left(1 - \left(-\frac{1}{3}\right)^n\right)}{1 + \frac{1}{3}} \\ &= \frac{\left[1 - \left(-\frac{1}{3}\right)^n\right]}{\frac{4}{3}} \\ &= \frac{3}{4}\left[1 - \left(-\frac{1}{3}\right)^n\right]\end{aligned}$$

**Solution 1(v).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P.:  $\frac{x+y}{x-y} + 1 + \frac{x-y}{x+y} + \dots$  upto n terms

Here,

$$\text{first term, } a = \frac{x+y}{x-y}$$

$$\text{common ratio, } r = \frac{1}{\frac{x+y}{x-y}} = \frac{x-y}{x+y} \quad (r < 1)$$

number of terms to be added = n

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_n = \frac{\frac{x+y}{x-y} \left( 1 - \left( \frac{x-y}{x+y} \right)^n \right)}{1 - \left( \frac{x-y}{x+y} \right)}$$

$$= \frac{\frac{x+y}{x-y} \left( 1 - \left( \frac{x-y}{x+y} \right)^n \right)}{\frac{x+y - x + y}{x+y}}$$

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

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

**Solution 1(vi).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P.:  $\sqrt{3} + \frac{1}{\sqrt{3}} + \frac{1}{3\sqrt{3}} + \dots$  upto n terms

Here,

first term,  $a = \sqrt{3}$

common ratio,  $r = \frac{\frac{1}{\sqrt{3}}}{\sqrt{3}} = \frac{1}{3}$  ( $r < 1$ )

number of terms to be added = n

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_n = \frac{\sqrt{3} \left( 1 - \left( \frac{1}{3} \right)^n \right)}{1 - \frac{1}{3}}$$

$$= \frac{\sqrt{3} \left( 1 - \frac{1}{3^n} \right)}{\frac{2}{3}}$$

$$= \frac{3\sqrt{3}}{2} \left( 1 - \frac{1}{3^n} \right)$$

#### Question 2.

How many terms of the geometric progression  $1 + 4 + 16 + 64 + \dots$  must be added to get sum equal to 5461?

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P.:  $1 + 4 + 16 + 64 + \dots$

Here,

first term,  $a = 1$

common ratio,  $r = \frac{4}{1} = 4$  ( $r > 1$ )

Let the number of terms to be added =  $n$

Then,  $S_n = 5461$

$$\Rightarrow \frac{a(r^n - 1)}{r - 1} = 5461$$

$$\Rightarrow \frac{1(4^n - 1)}{4 - 1} = 5461$$

$$\Rightarrow \frac{4^n - 1}{3} = 5461$$

$$\Rightarrow 4^n - 1 = 16383$$

$$\Rightarrow 4^n = 16384$$

$$\Rightarrow 4^n = 4^7$$

$$\Rightarrow n = 7$$

Hence, required number of terms = 7

### Question 3.

The first term of a G.P. is 27 and its 8<sup>th</sup> term is 181. Find the sum of its first 10 terms.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given,

First term,  $a = 27$

$$8^{\text{th}} \text{ term} = ar^7 = \frac{1}{81}$$

$n = 10$

Now,

$$\frac{ar^7}{a} = \frac{1/81}{27}$$

$$\Rightarrow r^7 = \frac{1}{2187}$$

$$\Rightarrow r^7 = \left(\frac{1}{3}\right)^7$$

$$\Rightarrow r = \frac{1}{3} \quad (r < 1)$$

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_{10} = \frac{27 \left(1 - \left(\frac{1}{3}\right)^{10}\right)}{1 - \frac{1}{3}}$$

$$= \frac{27 \left(1 - \frac{1}{3^{10}}\right)}{\frac{2}{3}}$$

$$= \frac{81}{2} \left(1 - \frac{1}{3^{10}}\right)$$

#### Question 4.

A boy spends ₹ 10 on first day, ₹ 20 on second day, ₹ 40 on third day and so on. Find how much, in all, will he spend in 12 days?

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Amount spent on 1<sup>st</sup> day = Rs. 10

Amount spent on 2<sup>nd</sup> day = Rs. 20

Amount spent on 3<sup>rd</sup> day = Rs. 40 and so on

$$\text{Now, } \frac{20}{10} = 2, \frac{40}{20} = 2,$$

Thus, 10, 20, 40, ..... is a G.P. with first term,  $a = 10$

and common ratio,  $r = 2$  ( $r > 1$ )

$\therefore$  Total amount spent in 12 days =  $S_{12}$

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

$$\Rightarrow S_{12} = \frac{10(2^{12} - 1)}{2 - 1} = 10(2^{12} - 1) = 10(4096 - 1) = 10 \times 4095 = 40950$$

Hence, the total amount spent in 12 days is Rs. 40950.

#### Question 5.

The 4th and the 7th terms of a G.P. are 127 and 1729 respectively. Find the sum of  $n$  terms of this G.P.

**Solution:**

For a G.P.,

$$4^{\text{th}} \text{ term} = ar^3 = \frac{1}{27}$$

$$7^{\text{th}} \text{ term} = ar^6 = \frac{1}{729}$$

$$\text{Now, } \frac{ar^6}{ar^3} = \frac{\frac{1}{729}}{\frac{1}{27}}$$

$$\Rightarrow r^3 = \frac{1}{27} = \left(\frac{1}{3}\right)^3$$

$$\Rightarrow r = \frac{1}{3} \quad (r < 1)$$

$$\Rightarrow a \times \frac{1}{27} = \frac{1}{27}$$

$$\Rightarrow a = 1$$

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

$$\Rightarrow S_n = \frac{1 \left( 1 - \left( \frac{1}{3} \right)^n \right)}{1 - \frac{1}{3}}$$

$$= \frac{\left( 1 - \frac{1}{3^n} \right)}{\frac{2}{3}}$$

$$= \frac{3}{2} \left( 1 - \frac{1}{3^n} \right)$$

**Question 6.**

A geometric progression has common ratio = 3 and last term = 486. If the sum of its terms is 728 ; find its first term.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

For a G.P.,

Common ratio,  $r = 3$  ( $r > 1$ )

Last term,  $l = 486$

$S = 728$

$$\Rightarrow \frac{lr - a}{r - 1} = 728$$

$$\Rightarrow \frac{486 \times 3 - a}{3 - 1} = 728$$

$$\Rightarrow \frac{1458 - a}{2} = 728$$

$$\Rightarrow 1458 - a = 1456$$

Hence, the first term is 2.

#### Question 7.

**Find the sum of G.P. : 3, 6, 12, ..... 1536.**

**Solution:**

Given G.P. : 3, 6, 12, ....., 1536

Here,

First term,  $a = 3$

Common ratio,  $r = \frac{6}{3} = 2$  ( $r > 1$ )

Last term,  $l = 1536$

$$\begin{aligned}\therefore \text{ Required sum} &= \frac{lr - a}{r - 1} \\ &= \frac{1536 \times 2 - 3}{2 - 1} \\ &= 3072 - 3 \\ &= 3069\end{aligned}$$

#### Question 8.

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

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**Solution:**

Given series:  $2 + 6 + 18 + \dots$

$$\text{Now, } \frac{6}{2} = 3, \quad \frac{18}{6} = 3$$

Thus, given series is a G.P. with first term,  $a = 2$   
and common ratio,  $r = 3$  ( $r > 1$ )

Let the number of terms to be added =  $n$

$$\text{Then, } S_n = 728$$

$$\Rightarrow \frac{a(r^n - 1)}{r - 1} = 728$$

$$\Rightarrow \frac{2(3^n - 1)}{3 - 1} = 728$$

$$\Rightarrow 3^n - 1 = 728$$

$$\Rightarrow 3^n = 729$$

$$\Rightarrow 3^n = 3^6$$

$$\Rightarrow n = 6$$

Hence, required number of terms = 6

**Question 9.**

In a G.P., the ratio between the sum of first three terms and that of the first six terms is  $125 : 152$ .

Find its common ratio.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let  $a$  be the first term and  $r$  be the common ratio of given G.P.

$$\text{Now, sum of first three terms} = S_3 = \frac{a(r^3 - 1)}{r - 1}$$

$$\text{Now, sum of first six terms} = S_6 = \frac{a(r^6 - 1)}{r - 1}$$

It is given that

$$\frac{\frac{a(r^3 - 1)}{r - 1}}{\frac{a(r^6 - 1)}{r - 1}} = \frac{125}{152}$$

$$\Rightarrow \frac{r^3 - 1}{r^6 - 1} = \frac{125}{152}$$

$$\Rightarrow \frac{r^3 - 1}{(r^3)^2 - (1)^2} = \frac{125}{152}$$

$$\Rightarrow \frac{r^3 - 1}{(r^3 - 1)(r^3 + 1)} = \frac{125}{152}$$

$$\Rightarrow \frac{1}{r^3 + 1} = \frac{125}{152}$$

$$\Rightarrow r^3 + 1 = \frac{152}{125}$$

$$\Rightarrow r^3 = \frac{152}{125} - 1 = \frac{152 - 125}{125} = \frac{27}{125}$$

$$\Rightarrow r^3 = \left(\frac{3}{5}\right)^3$$

$$\Rightarrow r = \frac{3}{5}$$

Hence, the common ratio is  $\frac{3}{5}$ .

#### Question 10.

Find how many terms of G.P.  $29-13+12 \dots\dots\dots$  must be added to get the sum equal to 5572?

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given G.P.:  $\frac{2}{9} - \frac{1}{3} + \frac{1}{2} \dots\dots\dots$

Here,

First term,  $a = \frac{2}{9}$

Common ratio,  $r = \frac{-\frac{1}{3}}{\frac{2}{9}} = -\frac{3}{2} < 1$

Let required number of terms be  $n$ .

$$\Rightarrow S_n = \frac{55}{72}$$

$$\Rightarrow \frac{a(1-r^n)}{1-r} = \frac{55}{72}$$

$$\Rightarrow \frac{\frac{2}{9} \left( 1 - \left( \frac{-3}{2} \right)^n \right)}{1 - \left( \frac{-3}{2} \right)} = \frac{55}{72}$$

$$\Rightarrow \frac{\frac{2}{9} \left( 1 - \left( \frac{-3}{2} \right)^n \right)}{\frac{5}{2}} = \frac{55}{72}$$

$$\Rightarrow \frac{2}{9} \left( 1 - \left( \frac{-3}{2} \right)^n \right) = \frac{55}{72} \times \frac{5}{2}$$

$$\Rightarrow 1 - \left( \frac{-3}{2} \right)^n = \frac{55}{72} \times \frac{5}{2} \times \frac{9}{2}$$

$$\Rightarrow 1 - \left( \frac{-3}{2} \right)^n = \frac{275}{32}$$

$$\Rightarrow 1 - \frac{275}{32} = \left( \frac{-3}{2} \right)^n$$

$$\Rightarrow -\frac{243}{32} = \left( \frac{-3}{2} \right)^n$$

$$\Rightarrow \left( \frac{-3}{2} \right)^5 = \left( \frac{-3}{2} \right)^n$$

$$\Rightarrow n = 5$$

$\therefore$  Required number of terms = 5

<https://www.indcareer.com/schools/seina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**Question 11.**

If the sum  $1 + 2 + 2^2 + \dots + 2^{n-1}$  is 255, find the value of  $n$ .

**Solution:**

Required series:  $1 + 2 + 2^2 + \dots + 2^{n-1}$

$$\text{Now, } \frac{2}{1} = 2, \frac{2^2}{2} = 2$$

Thus, given series is a G.P. with

first term,  $a = 1$

common ratio,  $r = 2$  ( $r > 1$ )

Last term,  $l = 2^{n-1}$

Let there be  $n$  terms in the series.

Then,  $S_n = 255$

$$\Rightarrow \frac{lr - a}{r - 1} = 255$$

$$\Rightarrow \frac{2^{n-1} \times 2 - 1}{2 - 1} = 255$$

$$\Rightarrow 2^{n-1} \times 2 - 1 = 255$$

$$\Rightarrow 2^{n-1} \times 2 = 256$$

$$\Rightarrow 2^{n-1} = 128$$

$$\Rightarrow 2^{n-1} = 2^7$$

$$\Rightarrow n - 1 = 7$$

$$\Rightarrow n = 8$$

**Question 12.**

Find the geometric mean between :

(i) 49 and 94

(ii) 14 and 732

(iii)  $2a$  and  $8a^3$

**Solution 12(i).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Geometric mean between 14 and  $\frac{7}{32} = \sqrt{14 \times \frac{7}{32}} = \sqrt{\frac{49}{16}} = \frac{7}{4} = 1\frac{3}{4}$

**Solution 12(ii).**

Geometric mean between  $\frac{4}{9}$  and  $\frac{9}{4} = \sqrt{\frac{4}{9} \times \frac{9}{4}} = \sqrt{1} = 1$

**Solution 12(iii).**

Geometric mean between  $2a$  and  $8a^3 = \sqrt{2a \times 8a^3} = \sqrt{16 \times a^4} = 4a^2$

**Question 13.**

The sum of three numbers in G.P. is 3910 and their product is 1. Find the numbers.

**Solution:**

Let the numbers be  $\frac{a}{r}$ ,  $a$  and  $ar$ .

$$\Rightarrow \frac{a}{r} \times a \times ar = 1$$

$$\Rightarrow a^3 = 1$$

$$\Rightarrow a = 1$$

$$\text{Now, } \frac{a}{r} + a + ar = \frac{39}{10}$$

$$\Rightarrow \frac{1}{r} + 1 + r = \frac{39}{10}$$

$$\Rightarrow \frac{1+r+r^2}{r} = \frac{39}{10}$$

$$\Rightarrow 10 + 10r + 10r^2 = 39r$$

$$\Rightarrow 10r^2 - 29r + 10 = 0$$

$$\Rightarrow 10r^2 - 25r - 4r + 10 = 0$$

$$\Rightarrow 5r(2r - 5) - 2(2r - 5) = 0$$

$$\Rightarrow (2r - 5)(5r - 2) = 0$$

$$\Rightarrow r = \frac{5}{2} \text{ or } r = \frac{2}{5}$$

Thus, required terms are:

$$\begin{aligned} \frac{a}{r}, a, ar &= \frac{1}{\frac{5}{2}}, 1, 1 \times \frac{5}{2} \quad \text{OR} \quad \frac{1}{\frac{2}{5}}, 1, 1 \times \frac{2}{5} \\ &= \frac{2}{5}, 1, \frac{5}{2} \quad \text{OR} \quad \frac{5}{2}, 1, \frac{2}{5} \end{aligned}$$

#### Question 14.

The first term of a G.P. is -3 and the square of the second term is equal to its 4<sup>th</sup> term.  
Find its 7<sup>th</sup> term.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

For a G.P.,

First term,  $a = -3$

It is given that,

$$(2^{\text{nd}} \text{ term})^2 = 4^{\text{th}} \text{ term}$$

$$\Rightarrow (ar)^2 = ar^3$$

$$\Rightarrow a^2 r^2 = ar^3$$

$$\Rightarrow a = r$$

$$\Rightarrow r = -3$$

$$\text{Now, } 7^{\text{th}} \text{ term} = ar^6 = -3 \times (-3)^6 = -3 \times 729 = -2187$$

#### Question 15.

Find the 5<sup>th</sup> term of the G.P. 52, 1, .....

**Solution:**

$$\text{First term (a)} = \frac{5}{2}$$

$$\text{And, common ratio (r)} = \frac{1}{5} = \frac{2}{5}$$

$$\text{Now, } t_n = ar^{n-1}$$

$$\Rightarrow 5^{\text{th}} \text{ term} = t_5 = \frac{5}{2} \times \left(\frac{5}{2}\right)^{5-1} = \frac{5}{2} \times \left(\frac{2}{5}\right)^4 = \left(\frac{2}{5}\right)^3 = \frac{8}{125}$$

#### Question 16.

The first two terms of a G.P. are 125 and 25 respectively. Find the 5th and the 6th terms of the G.P.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

First term (a) = 125

And, common ratio (r) =  $\frac{25}{125} = \frac{1}{5}$

Now,  $t_n = ar^{n-1}$

$$\Rightarrow 5^{\text{th}} \text{ term} = t_5 = 125 \times \left(\frac{1}{5}\right)^{5-1} = 125 \times \left(\frac{1}{5}\right)^4 = 125 \times \frac{1}{625} = \frac{1}{5}$$

$$\Rightarrow 6^{\text{th}} \text{ term} = t_6 = 125 \times \left(\frac{1}{5}\right)^{6-1} = 125 \times \left(\frac{1}{5}\right)^5 = 125 \times \frac{1}{3125} = \frac{1}{25}$$

**Question 17.**

Find the sum of the sequence -13, 1, -3, 9, ..... upto 8 terms.

**Solution:**

Here,

$$\frac{1}{-\frac{1}{3}} = \frac{-3}{1} = \frac{9}{-3} = -3$$

Thus, the given sequence is a G.P. with first term (a) =  $-\frac{1}{3}$  and common ratio (r) = -3 (r < 1).

Number of terms to be added, n = 8

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_8 = \frac{-\frac{1}{3}(1-(-3)^8)}{1+3} = \frac{-1+3^8}{12} = \frac{1}{12}(3^8-1)$$

**Question 18.**

The first term of a G.P. is 27. If the 8th term be 181, what will be the sum of 10 terms ?

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given,

First term,  $a = 27$

$$8^{\text{th}} \text{ term} = ar^7 = \frac{1}{81}$$

$$n = 10$$

Now,

$$\frac{ar^7}{a} = \frac{1/81}{27}$$

$$\Rightarrow r^7 = \frac{1}{2187}$$

$$\Rightarrow r^7 = \left(\frac{1}{3}\right)^7$$

$$\Rightarrow r = \frac{1}{3} \quad (r < 1)$$

$$\therefore S_n = \frac{a(1-r^n)}{1-r}$$

$$\Rightarrow S_{10} = \frac{27\left(1 - \left(\frac{1}{3}\right)^{10}\right)}{1 - \frac{1}{3}}$$

$$= \frac{27\left(1 - \frac{1}{3^{10}}\right)}{\frac{2}{3}}$$

$$= \frac{81}{2}\left(1 - \frac{1}{3^{10}}\right)$$

$$= \frac{81}{2}(1 - 3^{-10})$$

#### Question 19.

Find a G.P. for which the sum of first two terms is -4 and the fifth term is 4 times the third term.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let the five terms of the given G.P. be

$$\frac{a}{r^2}, \frac{a}{r}, a, ar, ar^2$$

Given, sum of first two terms = -4

$$\frac{a}{r^2} + \frac{a}{r} = -4$$

$$\Rightarrow \frac{a + ar}{r^2} = -4$$

$$\Rightarrow a + ar = -4r^2$$

$$\Rightarrow a(1 + r) = -4r^2$$

$$\Rightarrow a = -\frac{4r^2}{1 + r}$$

And, 5<sup>th</sup> term = 4(3<sup>rd</sup> term)

$$\Rightarrow ar^2 = 4(a)$$

$$\Rightarrow r^2 = 4$$

$$\Rightarrow r = \pm 2$$

When  $r = +2$ ,

$$a = -\frac{4(2)^2}{1 + 2} = -\frac{16}{3}$$

When  $r = -2$ ,

$$a = -\frac{4(-2)^2}{1 - 2} = 16$$

Thus, the required terms are  $\frac{a}{r^2}, \frac{a}{r}, a, ar, ar^2$ .

$$\text{i.e. } \frac{-\frac{16}{3}}{4}, \frac{-\frac{16}{3}}{2}, -\frac{16}{3}, -\frac{16}{3} \times 2, -\frac{16}{3} \times 4 \text{ OR } \frac{16}{4}, \frac{16}{-2}, 16, 16(-2), 16 \times 4$$

$$\text{i.e. } -\frac{4}{3}, -\frac{8}{3}, -\frac{16}{3}, -\frac{32}{3}, -\frac{64}{3} \text{ OR } 4, -8, 16, -32, 64$$

### Additional Questions

#### Question 1.

Find the sum of  $n$  terms of the series :

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

(i)  $4 + 44 + 444 + \dots$

(ii)  $0.8 + 0.88 + 0.888 + \dots$

**Solution 1(i).**

$$\begin{aligned}\text{Required sum} &= 4 + 44 + 444 + \dots \text{ upto } n \text{ terms} \\ &= 4(1 + 11 + 111 + \dots \text{ upto } n \text{ terms}) \\ &= \frac{4}{9}(9 + 99 + 999 + \dots \text{ upto } n \text{ terms}) \\ &= \frac{4}{9}[(10 - 1) + (100 - 1) + (1000 - 1) + \dots \text{ upto } n \text{ terms}] \\ &= \frac{4}{9} \left[ (10 + 10^2 + 10^3 + \dots \text{ upto } n \text{ terms}) \right. \\ &\quad \left. - (1 + 1 + 1 + \dots \text{ upto } n \text{ terms}) \right] \\ &= \frac{4}{9} \left[ \frac{10(10^n - 1)}{10 - 1} - n \right] \\ &= \frac{4}{9} \left[ \frac{10}{9}(10^n - 1) - n \right]\end{aligned}$$

**Solution 1(ii).**

$$\begin{aligned}
 \text{Required sum} &= 0.8 + 0.88 + 0.888 + \dots \text{ upto } n \text{ terms} \\
 &= 8(0.1 + 0.11 + 0.111 + \dots \text{ upto } n \text{ terms}) \\
 &= \frac{8}{9}(0.9 + 0.99 + 0.999 + \dots \text{ upto } n \text{ terms}) \\
 &= \frac{8}{9}[(1 - 0.1) + (1 - 0.01) + (1 - 0.001) + \dots \text{ upto } n \text{ terms}] \\
 &= \frac{8}{9} \left[ (1 + 1 + 1 + \dots \text{ upto } n \text{ terms}) - (0.1 + 0.01 + 0.001 + \dots \text{ upto } n \text{ terms}) \right] \\
 &= \frac{8}{9} \left[ (1 + 1 + 1 + \dots \text{ upto } n \text{ terms}) - \left( \frac{1}{10} + \frac{1}{100} + \frac{1}{1000} + \dots \text{ upto } n \text{ terms} \right) \right] \\
 &= \frac{8}{9} \left[ n - \frac{\frac{1}{10} \left( 1 - \frac{1}{10^n} \right)}{1 - \frac{1}{10}} \right] \quad \left[ \because r = \frac{1}{10} < 1 \right] \\
 &= \frac{8}{9} \left[ n - \frac{10}{9} \times \frac{1}{10} \left( 1 - \frac{1}{10^n} \right) \right] \\
 &= \frac{8}{9} \left[ n - \frac{1}{9} \left( 1 - \frac{1}{10^n} \right) \right]
 \end{aligned}$$

## Question 2.

Find the sum of infinite terms of each of the following geometric progression:

(i)  $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots$

(ii)  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$

$$(iii) \frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \dots$$

$$(iv) \sqrt{2} - \frac{1}{\sqrt{2}} + \frac{1}{2\sqrt{2}} - \frac{1}{4\sqrt{2}} + \dots$$

$$(v) \sqrt{3} + \frac{1}{\sqrt{3}} + \frac{1}{3\sqrt{3}} + \frac{1}{9\sqrt{3}} + \dots$$

**Solution 2(i).**

$$\text{Given GP. : } 1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots$$

Here,

First term,  $a = 1$

$$\text{Common ratio, } r = \frac{\frac{1}{3}}{1} = \frac{1}{3} \left( |r| = \left| \frac{1}{3} \right| = \frac{1}{3} < 1 \right)$$

$$\therefore \text{Required sum} = \frac{a}{1-r} = \frac{1}{1-\frac{1}{3}} = \frac{3}{2}$$

**Solution 2(ii).**

$$\text{Given GP. : } 1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots$$

Here,

First term,  $a = 1$

$$\text{Common ratio, } r = \frac{-\frac{1}{2}}{1} = -\frac{1}{2} \left( |r| = \left| -\frac{1}{2} \right| = \frac{1}{2} < 1 \right)$$

$$\therefore \text{Required sum} = \frac{a}{1-r} = \frac{1}{1-\left(-\frac{1}{2}\right)} = \frac{1}{1+\frac{1}{2}} = \frac{2}{3}$$

**Solution 2(iii).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Given GP. :  $\frac{1}{3} + \frac{1}{3^2} + \frac{1}{3^3} + \dots$

Here,

First term,  $a = \frac{1}{3}$

Common ratio,  $r = \frac{\frac{1}{3^2}}{\frac{1}{3}} = \frac{1}{3} \left( |r| = \left| \frac{1}{3} \right| = \frac{1}{3} < 1 \right)$

$\therefore$  Required sum  $= \frac{a}{1-r} = \frac{\frac{1}{3}}{1-\frac{1}{3}} = \frac{\frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$

**Solution 2(iv).**

Given GP. :  $\sqrt{2} - \frac{1}{\sqrt{2}} + \frac{1}{2\sqrt{2}} - \frac{1}{4\sqrt{2}} + \dots$

Here,

First term,  $a = \sqrt{2}$

Common ratio,  $r = \frac{-\frac{1}{\sqrt{2}}}{\sqrt{2}} = -\frac{1}{2} \left( |r| = \left| -\frac{1}{2} \right| = \frac{1}{2} < 1 \right)$

$\therefore$  Required sum  $= \frac{a}{1-r} = \frac{\sqrt{2}}{1-\left(-\frac{1}{2}\right)} = \frac{\sqrt{2}}{1+\frac{1}{2}} = \frac{2\sqrt{2}}{3}$

**Solution 2(v).**

Given GP. :  $\sqrt{3} + \frac{1}{\sqrt{3}} + \frac{1}{3\sqrt{3}} + \frac{1}{9\sqrt{3}} + \dots$

Here,

First term,  $a = \sqrt{3}$

Common ratio,  $r = \frac{\frac{1}{\sqrt{3}}}{\sqrt{3}} = \frac{1}{3} \left( |r| = \left| \frac{1}{3} \right| = \frac{1}{3} < 1 \right)$

$\therefore$  Required sum =  $\frac{a}{1-r} = \frac{\sqrt{3}}{1-\frac{1}{3}} = \frac{\sqrt{3}}{\frac{2}{3}} = \frac{3\sqrt{3}}{2}$

### Question 3.

The second term of a G.P. is 9 and sum of its infinite terms is 48. Find its first three terms.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let  $a$  be the first term and  $r$  be the common ratio of a G.P.

$$2^{\text{nd}} \text{ term, } t_2 = ar = 9$$

$$\Rightarrow r = \frac{9}{a}$$

Sum of its infinite terms,  $S = 48$

$$\Rightarrow \frac{a}{1-r} = 48$$

$$\Rightarrow \frac{a}{1-\frac{9}{a}} = 48$$

$$\Rightarrow \frac{a^2}{a-9} = 48$$

$$\Rightarrow a^2 = 48a - 432$$

$$\Rightarrow a^2 - 48a + 432 = 0$$

$$\Rightarrow a^2 - 36a - 12a + 432 = 0$$

$$\Rightarrow a(a-36) - 12(a-36) = 0$$

$$\Rightarrow (a-36)(a-12) = 0$$

$$\Rightarrow a = 36 \text{ or } a = 12$$

$$\text{When } a = 36, r = \frac{9}{36} = \frac{1}{4}$$

$$\Rightarrow 1^{\text{st}} \text{ term} = 36,$$

$$2^{\text{nd}} \text{ term} = ar = 36 \times \frac{1}{4} = 9$$

$$3^{\text{rd}} \text{ term} = ar^2 = 36 \times \frac{1}{16} = \frac{9}{4}$$

$$\text{When } a = 12, r = \frac{9}{12} = \frac{3}{4}$$

$$\Rightarrow 1^{\text{st}} \text{ term} = 12,$$

$$2^{\text{nd}} \text{ term} = ar = 12 \times \frac{3}{4} = 9$$

$$3^{\text{rd}} \text{ term} = ar^2 = 12 \times \frac{9}{16} = \frac{27}{4}$$

#### Question 4.

Find three geometric means between 13 and 432.

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

**Solution:**

Let  $G_1, G_2, G_3$  be three geometric means between  $a = \frac{1}{3}$  and  $b = 432$ .

Then,  $\frac{1}{3}, G_1, G_2, G_3, 432$  is a G.P.

Thus, we have

$$\text{First term} = a = \frac{1}{3}$$

$$5^{\text{th}} \text{ term of the G.P.} = ar^4 = 432$$

$$\Rightarrow \frac{1}{3} \times r^4 = 432$$

$$\Rightarrow r^4 = 1296$$

$$\Rightarrow r^4 = 6^4$$

$$\Rightarrow r = 6$$

$$\therefore G_1 = ar = \frac{1}{3} \times 6 = 2$$

$$G_2 = ar^2 = \frac{1}{3} \times 6 \times 6 = 12$$

$$G_3 = ar^3 = \frac{1}{3} \times 6 \times 6 \times 6 = 72$$

**Question 5.**

**Find :**

- (i) two geometric means between 2 and 16
- (ii) four geometric means between 3 and 96.
- (iii) five geometric means between 359 and 4012

**Solution 5(i).**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Let  $G_1, G_2$  be two geometric means between  $a = 2$  and  $b = 16$ .

Then,  $2, G_1, G_2, 16$  is a G.P.

Thus, we have

First term =  $a = 2$

4<sup>th</sup> term of the G.P. =  $ar^3 = 16$

$$\Rightarrow 2 \times r^3 = 16$$

$$\Rightarrow r^3 = 8$$

$$\Rightarrow r^3 = 2^3$$

$$\Rightarrow r = 2$$

$$\therefore G_1 = ar = 2 \times 2 = 4$$

$$G_2 = ar^2 = 2 \times 2 \times 2 = 8$$

**Solution 5(ii).**

Let  $G_1, G_2, G_3, G_4$  be four geometric means between  $a = 3$  and  $b = 96$ .

Then,  $3, G_1, G_2, G_3, G_4, 96$  is a G.P.

Thus, we have

First term =  $a = 3$

6<sup>th</sup> term of the G.P. =  $ar^5 = 96$

$$\Rightarrow 3 \times r^5 = 96$$

$$\Rightarrow r^5 = 32$$

$$\Rightarrow r^5 = 2^5$$

$$\Rightarrow r = 2$$

$$\therefore G_1 = ar = 3 \times 2 = 6$$

$$G_2 = ar^2 = 3 \times 4 = 12$$

$$G_3 = ar^3 = 3 \times 8 = 24$$

$$G_4 = ar^4 = 3 \times 16 = 48$$

**Solution 5(iii).**

Let  $G_1, G_2, G_3, G_4, G_5$  be five geometric means between

$$a = 3\frac{5}{9} = \frac{32}{9} \text{ and } b = 40\frac{1}{2} = \frac{81}{2}.$$

Then,  $\frac{32}{9}, G_1, G_2, G_3, G_4, G_5, \frac{81}{2}$  is a G.P.

Thus, we have

$$\text{First term} = a = \frac{32}{9}$$

$$7^{\text{th}} \text{ term of the G.P.} = ar^6 = \frac{81}{2}$$

$$\Rightarrow \frac{32}{9} \times r^6 = \frac{81}{2}$$

$$\Rightarrow r^6 = \frac{81}{2} \times \frac{9}{32}$$

$$\Rightarrow r^6 = \frac{729}{64}$$

$$\Rightarrow r^6 = \left(\frac{3}{2}\right)^6$$

$$\Rightarrow r = \frac{3}{2}$$

$$\therefore G_1 = ar = \frac{32}{9} \times \frac{3}{2} = \frac{16}{3}$$

$$G_2 = ar^2 = \frac{32}{9} \times \frac{9}{4} = 8$$

$$G_3 = ar^3 = \frac{32}{9} \times \frac{27}{8} = 12$$

$$G_4 = ar^4 = \frac{32}{9} \times \frac{81}{16} = 18$$

$$G_5 = ar^5 = \frac{32}{9} \times \frac{243}{32} = 27$$

#### Question 6.

The sum of three numbers in G.P. is 3910 and their product is 1. Find the numbers.

**Solution:**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Sum of three numbers in G.P. = 3910 and their product = 1

Let number be  $ar$ ,  $a$ ,  $ar$ , then

$$\frac{a}{r} \times a \times ar = 1 \Rightarrow a^3 = 1 = (1)^3$$

$$\therefore a = 1$$

$$\text{and } \frac{a}{r} + a + ar = \frac{39}{10}$$

$$\Rightarrow a \left( \frac{1}{r} + 1 + r \right) = \frac{39}{10}$$

$$\frac{1}{r} + 1 + r = \frac{39}{10} \times 1 = \frac{39}{10}$$

$$r + \frac{1}{r} = \frac{39}{10} - 1 = \frac{39-10}{10} = \frac{29}{10}$$

$$r^2 + 1 = \frac{29}{10}r$$

$$10r^2 + 10 = 29r \Rightarrow 10r^2 - 29r + 10 = 0$$

$$\Rightarrow 10r^2 - 4r - 25r + 10 = 0$$

$$\Rightarrow 2r(5r - 2) - 5(5r - 2) = 0$$

$$\Rightarrow (5r - 2)(2r - 5) = 0$$

$$\text{Either } 5r - 2 = 0, \text{ then } r = \frac{2}{5}$$

$$\text{or } 2r - 5 = 0, \text{ then } r = \frac{5}{2}$$

$$\therefore \text{Numbers are } \frac{2}{5}, 1, \frac{4}{25}, \text{ or } \frac{5}{2}, 1, \frac{25}{4}$$

**Question 7.**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

Find the numbers in G.P. whose sum is 52 and the sum of whose product in pairs is 624.

**Solution:**

Let the numbers be  $a$ ,  $ar$  and  $ar^2$ .

$$\Rightarrow a + ar + ar^2 = 52 \quad \dots(i)$$

$$\text{And, } (a \times ar) + (ar \times ar^2) + (ar^2 \times a) = 624$$

$$\Rightarrow a^2r + a^2r^3 + a^2r^2 = 624$$

$$\Rightarrow ar(a + ar^2 + ar) = 624$$

$$\Rightarrow ar \times 52 = 624 \quad \dots[\text{From (i)}]$$

$$\Rightarrow ar = 12$$

$$\Rightarrow a = \frac{12}{r}$$

Substituting in (i), we get

$$\frac{12}{r} + \frac{12}{r} \times r + \frac{12}{r} \times r^2 = 52$$

$$\Rightarrow \frac{12}{r} + 12 + 12r = 52$$

$$\Rightarrow \frac{12 + 12r + 12r^2}{r} = 52$$

$$\Rightarrow 12 + 12r + 12r^2 = 52r$$

$$\Rightarrow 12r^2 - 40r + 12 = 0$$

$$\Rightarrow 3r^2 - 10r + 3 = 0$$

$$\Rightarrow 3r^2 - 9r - r + 3 = 0$$

$$\Rightarrow 3r(r - 3) - 1(r - 3) = 0$$

$$\Rightarrow (3r - 1)(r - 3) = 0$$

$$\Rightarrow r = \frac{1}{3} \quad \text{or} \quad r = 3$$

$$\Rightarrow a = \frac{12}{\frac{1}{3}} = 36 \quad \text{or} \quad 4$$

Thus, required terms are:

$$\begin{aligned} a, ar, ar^2 &= 36, 36 \times \frac{1}{3}, 36 \times \frac{1}{9} \quad \text{OR} \quad 4, 4 \times 3, 4 \times 9 \\ &= 36, 12, 4 \quad \text{OR} \quad 4, 12, 36 \end{aligned}$$

**Question 8.**

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

The sum of three numbers in G.P. is 21 and the sum of their squares is 189. Find the numbers.

**Solution:**

Let the numbers be  $a$ ,  $ar$  and  $ar^2$ .

$$\Rightarrow (a)^2 + (ar)^2 + (ar^2)^2 = 189$$

$$\Rightarrow a^2 + a^2r^2 + a^2r^4 = 189$$

$$\text{And, } a + ar + ar^2 = 21$$

$$\Rightarrow (a + ar + ar^2)^2 = 21^2$$

$$\Rightarrow a^2 + a^2r^2 + a^2r^4 + 2a^2r + 2a^2r^3 + 2a^2r^2 = 441$$

$$\Rightarrow 189 + 2ar(a + ar^2 + ar) = 441$$

$$\Rightarrow 2ar \times 21 = 441 - 189$$

$$\Rightarrow 42ar = 252$$

$$\Rightarrow ar = 6$$

$$\Rightarrow r = \frac{6}{a}$$

$$\text{Now, } a + ar + ar^2 = 21$$

$$\Rightarrow a + a \times \frac{6}{a} + a \times \frac{36}{a^2} = 21$$

$$\Rightarrow a + 6 + \frac{36}{a} = 21$$

$$\Rightarrow a^2 + 6a + 36 = 21a$$

$$\Rightarrow a^2 - 15a + 36 = 0$$

$$\Rightarrow a^2 - 12a - 3a + 36 = 0$$

$$\Rightarrow a(a - 12) - 3(a - 12) = 0$$

$$\Rightarrow (a - 12)(a - 3) = 0$$

$$\Rightarrow a = 12 \text{ or } a = 3$$

$$\Rightarrow r = \frac{6}{12} = \frac{1}{2} \text{ or } r = \frac{6}{3} = 2$$

Thus, required terms are:

$$\begin{aligned} a, ar, ar^2 &= 12, 12 \times \frac{1}{2}, 12 \times \frac{1}{4} \quad \text{OR} \quad 3, 3 \times 2, 3 \times 4 \\ &= 12, 6, 3 \quad \text{OR} \quad 3, 6, 12 \end{aligned}$$



# Selina Publishers ICSE Solutions

## Class 10 Maths

- [Chapter 1 - GST \(Goods and Services Tax\)](#)
- [Chapter 2 - Banking \(Recurring Deposit Accounts\)](#)
- [Chapter 3 - Shares and Dividends](#)
- [Chapter 4 - Linear Inequations \(in one variable\)](#)
- [Chapter 5 - Quadratic Equations](#)
- [Chapter 6 - Solving Simple Problems \(Based on Quadratic Equations\)](#)
- [Chapter 7 - Ratio and Proportion \(Including Properties and Uses\)](#)
- [Chapter 8 - Remainder and Factor Theorems](#)
- [Chapter 9 - Matrices](#)
- [Chapter 10- Arithmetic Progression](#)
- [Chapter 11- Geometric Progression](#)
- [Chapter 12- Reflection](#)
- [Chapter 13 - Section and Mid-Point Formula](#)
- [Chapter 14- Equation of a Line](#)
- [Chapter 15- Similarity](#)
- [Chapter 16- Loci \(Locus and Its Constructions\)](#)
- [Chapter 17- Circles](#)
- [Chapter 18- Tangents and Intersecting Chords](#)
- [Chapter 19- Constructions \(Circles\)](#)
- [Chapter 20- Cylinder, Cone and Sphere](#)
- [Chapter 21- Trigonometrical Identities](#)
- [Chapter 22- Heights and Distances](#)
- [Chapter 23- Graphical Representation](#)
- [Chapter 24- Measures of Central Tendency](#)
- [Chapter 25- Probability](#)

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

## About About Selina Publishers ICSE

Selina Publishers has been serving the students since 1976 and is one of the quality ICSE school textbooks publication houses. Mathematics and Science books for classes 6-10 form the core of our business, apart from certain English and Hindi literature as well as a few primary books. All these books are based upon the syllabus published by the Council for the I.C.S.E. Examinations, New Delhi. The textbooks are composed by a panel of subject experts and vetted by teachers practising in ICSE schools all over the country. Continuous efforts are made in complying with the standards and ensuring lucidity and clarity in content, which makes them stand tall in the industry.

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>

## About IndCareer

IndCareer.com is a leading developer of online career guidance resources for the Indian marketplace. Established in 2007, IndCareer.com is currently used by over thousands of institutions across India, including schools, employment agencies, libraries, colleges and universities.

IndCareer.com is designed to assist you in making the right career decision - a decision that meets your unique interests and personality.

For any clarifications or questions you can write to **info@indcareer.com**

### Postal Address

IndCareer.com  
52, Shilpa Nagar,  
Somalwada  
Nagpur - 440015  
Maharashtra, India

**WhatsApp:** +91 9561 204 888

**Website:** <https://www.indcareer.com>

<https://www.indcareer.com/schools/selina-class-10-icse-solutions-mathematics-chapter-11-geometric-progression/>