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Where Minds Pollinate

Class 11

Mathematics

Chapter 4

Exercise 4.4

Notes

National Book Foundation

Exercise # 4.4

Determine whether each sequence is geometric. If so, find the common ratio.

5, 20, 100, 500, ...

If sequence is geometric then ratio of every two consecutive is same but

$\frac{20}{5} \neq \frac{100}{20}$, hence is not geometric sequence.

2, 4, 6, 8, ...

If sequence is geometric then ratio of every two consecutive is same as:

$\frac{4}{2} \neq \frac{6}{4}$, hence is not geometric sequence.

$\frac{3}{2}, \frac{9}{4}, \frac{27}{8}, \frac{81}{16}, \ldots$

If sequence is geometric then ratio of every two consecutive no. is same as:

$\frac{9/4}{3/2} = \frac{27/8}{9/4} = \frac{81/16}{27/8}$, hence is geometric sequence

4. $7, 14, 21, 28, \ldots$

If sequence is geometric then common ratio of two consecutive no. is same but

$\frac{14}{7} \neq \frac{21}{14}$, hence is geometric sequence.

Find the first four terms of the geometric sequence

5. $a_1 = 3$, $r = -2$

Sol:-

As, $a_n = a_1 r^{n-1}$

for, $a_2 = (3)(-2)^{2-1}$

$a_2 = -6$

$a_3 = (3)(-2)^{3-1}$

$a_3 = 12$

$\therefore$ G.P $= 3, -6, 12, \ldots$

6. $a_1 = 27$, $r = -\frac{1}{3}$

Sol:-

As, $a_n = a_1 r^{n-1}$

for, $a_2 = (27)(-1/3)^{2-1}$

$a_2 = -9$

$a_3 = (27)(-1/3)^{3-1}$

$a_3 = 3$

$\therefore$ G.P $= 27, -9, 3, \ldots$

$a_1 = 12, \ r = \frac{1}{2}$

Sol:-

As, $a_n = a_1 r^{n-1}$

for, $a_2 = (12)(1/2)^{2-1}$

$a_2 = 6$

$a_3 = (12)(1/2)^{3-1}$

$a_3 = 3$

$\therefore$ G.P $= 12, 6, 3, \ldots$

Find the next two terms of each geometric sequence.

8. $90, 30, 10, \ldots$

Sol:-

Here, $a_1 = 90$, common ratio $= r = \frac{30}{90} = \frac{1}{3}$

$\therefore a_n = a_1 r^{n-1}$

$a_4 = (90)(1/3)^{4-1}$

$a_4 = \frac{10}{3}$

$a_5 = (90)(1/3)^{5-1}$

$a_5 = \frac{10}{9}$

$\therefore\ 90, 30, 10, \frac{10}{3}, \frac{10}{9}, \ldots$

9. $2, 6, 18, \ldots$

Sol:-

Here, $a_1 = 2$, $r = \frac{6}{2} \Rightarrow r = 3$

As, $a_n = a_1 r^{n-1}$

for $a_4 = (2)(3)^{4-1}$

$a_4 = 54$

$a_5 = (2)(3)^{5-1}$

$a_5 = 162$

$\therefore\ 2, 6, 18, 54, 162, \ldots$

10. $20, 30, 45, \ldots$

Sol:-

Here, $a_1 = 20$, $r = \frac{30}{20} = \frac{3}{2}$

As, $a_n = a_1 r^{n-1}$

for, $a_4 = (20)(3/2)^{4-1}$

$a_4 = \frac{135}{2}$

$a_5 = (20)(3/2)^{5-1}$

$a_5 = \frac{405}{4}$

$\therefore\ 20, 30, 45, \frac{135}{2}, \frac{405}{4}, \ldots$

$729, 243, 81, \ldots$

Sol:-

Here, $a_1 = 729$, $r = \frac{243}{729} = \frac{1}{3}$

As, $a_n = a_1 r^{n-1}$

for, $a_4 = (729)(1/3)^{4-1}$

$a_4 = 27$

$a_5 = (729)(1/3)^{5-1}$

$a_5 = 9$

$\therefore$ $729, 243, 81, 27, 9, \ldots$

$\frac{1}{27}, \frac{1}{9}, \frac{1}{3}, \ldots$

Sol:-

Here, $a_1 = \frac{1}{27}$, $r = \frac{1/9}{1/27} = 3$

$\therefore$ $a_4 = (1/27)(3)^{4-1}$

$a_4 = 1$

$a_5 = (1/27)(3)^{5-1}$

$a_5 = 3$

$\therefore$ $\frac{1}{27}, \frac{1}{9}, \frac{1}{3}, 1, 3, \ldots$

13. $\frac{1}{4}, \frac{1}{2}, +1, \ldots$

Sol:-

Here, $a_1 = \frac{1}{4}$, $r = \frac{1/2}{1/4} = 2$

As, $a_n = a_1 r^{n-1}$

for, $a_4 = (1/4)(2)^{4-1}$

$a_4 = +2$

$a_5 = (1/4)(2)^{5-1}$

$a_5 = 4$

$\therefore \frac{1}{4}, \frac{1}{2}, 1, 2, 4, \ldots$

Find the nth term of each geometric sequence.

14. $a_1 = 4, n = 3, r = 5$

$a_n = a_1 r^{n-1}$

$a_3 = (4)(5)^{3-1}$

$a_3 = 100$

15. $a_1 = 2, n = 5, r = 2$

$a_n = a_1 r^{n-1}$

$a_5 = (2)(2)^{5-1}$

$a_5 = 32$

16. $a_1 = 7,\ n = 4,\ r = 2$

$a_n = a_1 r^{n-1}$

$a_4 = (7)(2)^{4-1}$

$a_4 = 56$

17. $a_1 = 243,\ n = 5,\ r = -1/3$

$a_n = a_1 r^{n-1}$

$a_5 = (243)(-1/3)^{5-1}$

$a_5 = 3$

18. $a_1 = 32,\ n = 6,\ r = -1/2$

$a_n = a_1 r^{n-1}$

$a_6 = (32)(-1/2)^{6-1}$

$a_6 = -1$

19. $a_1 = 16,\ n = 8,\ r = 1/2$

$a_n = a_1 r^{n-1}$

$a_8 = (16)(1/2)^{8-1}$

$a_8 = 1/8$

20. A ping-pong ball is dropped from a height of 16 ft and always rebound one-fourth of the distance fallen. How high does it rebound at the 6th time.

Sol:-

We have, $a_1 = 16$; $r = \frac{1}{4}$

As. $a_n = a_1 r^{n-1}$

for $a_7 = (16)(1/4)^{7-1}$

$a_7 = \frac{1}{256}$

Therefore, at 6th time the ball will rebound a distance of $\frac{1}{256}$ ft

27. A city has current population of 100,000 and the population is increasing by 3% each year. What will be populatin in 15th year

Sol:-

Since population is increasin by 3%

we have exponential growth form:-

$$y = a(1+r)^t$$

where, $a = 100,000$

$r = 3\% = \frac{3}{100}$

$t = 15$ years,

$$\therefore \; y = 100,000\left(1+\frac{3}{100}\right)^{15}$$

$$y = 155796.74$$

$$y \approx 155797$$

Therefore, population in the 15^{th} year will 155,797.

6. A supper ball dropped from the tower (556 ft high) always rebound three-fourth of the distance fallen. How far the ball have travelled when it hits the ground for the 6^{th} time.

Sol:-
we have, $a_1 = 556$, $r = \frac{3}{4}$

For 6^{th} rebound, $n = 7$

$$\therefore \quad a_n = a_1 (r)^{n-1}$$
$$\Rightarrow \quad a_7 = (556)(3/4)^{7-1}$$
$$a_7 = 98.95$$
$$a_7 \approx 99 \text{ ft}$$

Therefore, at 6^{th} rebound ball will jump 99 ft.

7. The teaching staff of high school informs its member of school cancellation by telephone. The principle calls 2 teachers, each of whom in turns call two (2) others, and so on. In order to inform the entire staff. 6 rounds of call are made. Counting the principle how many staff at high school.

Sol:-

Let first person be informed $= a_1 = 1$

No. of people informed after 1 round call $= a_2 = 2$

No. of people informed after 2 round call $= a_3 = 4$

No. of people informed after 3 round call $= a_4 = 8$

So. at the 6^{th} round call i.e a_7.

We have, $r = \frac{4}{2} = 2$, $a_1 = 1$

As, $a_n = a_1 r^{n-1}$

$a_7 = 1(2)^{7-1}$

$a_7 = 64$

for $a_6 = 2(2)^{6-1}$

$a_6 = 32$

for $a_5 = 2(2)^{5-1}$

$a_5 = 16$

$\therefore$ Totall staff $= 1+2+4+8+16+32+64$

$= 127$

Q30. A 5-day rain caused the river to rise. After the first day, the river rose one inch. Each day rise in the river tripled. How much had the river risen after 5-days.

Sol:-

we have, $r = 3$

first day $= a_1 = 1$ inch

As, $a_n = a_1 (r)^{n-1}$

at 5^{th} day, $a_5 = (1)(3)^{5-1}$

$a_5 = 81$ inch.