Geometric Sequences and Series

What you'll Learn About

- Geometric Series : Multiplying by the same #

Determine if the following series is Geometric. If it is give the common ratio.

2) 3, 12, 48, 192, . . .

common ratio = $\frac{\text{next}}{\text{previous}}$

$r = 4$

4) 1, -2, 4, - 8, ...

$r = -2$

6) 5, 1, .2, .04, . . .

5, 1, .2, .04, ...

$r = \frac{1}{5}$

10) $\frac{1}{5}, \frac{2}{7}, \frac{3}{9}, \frac{4}{11} \ldots$

Not Geometric

Write the first 5 terms of the geometric sequence

12) $a_1 = 4 \quad r = 2$

4, 8, 16, 32, 64

16) $a_1 = 6 \quad r = -1/4$

$a_1 = 6 \quad r = -\frac{1}{4}$

$\frac{6}{1}, \frac{-6}{4}, \frac{6}{16}, \frac{-6}{64}, \frac{6}{256}$

18) $a_1 = 4 \quad r = \sqrt{3}$

$4, 4\sqrt{3}, 12, 12\sqrt{3}, 36$

12
$4 \cdot \sqrt{3}$
$4\sqrt{9}$
$4\sqrt{3} \cdot \sqrt{3}$

$a_n = a_1 + d(n-1)$

$A_n = a_1 r^{n-1}$ when n =1 or $A_n = a_1 r^n$ when n =0	Use the recursive rule to write the first five terms of the sequence. Then, write the sequence as a function of n.

Explicit Formula

20) $a_1 = 81$ $a_{k+1} = \frac{1}{3}a_k$

$a_n = 81\left(\frac{1}{3}\right)^{n-1}$

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Next term — multiply the previous by $\frac{1}{3}$

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

$81, 27, 9, 3, 1$

$a_2 = 5$ $r = 3$

$a_n = 5(3)^{n-2}$

$a_0 = 5$ $r = 3$

$a_n = 5(3)^{n-0}$

24) $a_1 = 30$ $a_{k+1} = \frac{-2}{3}a_k$

$a_n = 30\left(-\frac{2}{3}\right)^{n-1}$

$a_1 = 30$ $a_{k+1} = -\frac{2}{3}a_k$

$\frac{30}{1}, \frac{-60}{3}, \frac{120}{9}, \frac{-240}{27}, \frac{480}{81}$

Find the missing term of the geometric sequence

26. $a_1 = 5$ $r = \frac{3}{2}$ $n = 8$

$a_n = 5\left(\frac{3}{2}\right)^{n-1}$

$a_8 = 5\left(\frac{3}{2}\right)^{8-1}$ $\left(\frac{3}{a_1}\right)$, $\frac{9}{\ }$, $\frac{27}{\ }$, $\frac{81}{a_4}$, $\frac{\ }{\ }$, $\frac{\ }{\ }$, $\frac{2187}{a_8}$, $\frac{\ }{\ }$, $\frac{\ }{\ }$, $\frac{\ }{\ }$

Given 2 terms

$r = \sqrt[x]{\text{Divide the 2 terms}}$

x = Difference in term #'s

A) $a_4 = 81$ $a_7 = 2187$ $n = 10$

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x r x r x r

$\frac{81r^3}{81} = \frac{2187}{81}$

$r^3 = 27$

$r = \sqrt[3]{27}$

$r = 3$

32) $a_3 = \frac{16}{3}$ $a_5 = \frac{64}{27}$ $n = 7$

$a_3 = \frac{16}{3}$ $a_5 = \frac{64}{27}$ $a_7 = \frac{256}{243}$

$r = \sqrt{\frac{\left(\frac{64}{27}\right)}{\left(\frac{16}{3}\right)}} = \frac{2}{3}$

$a_n = \frac{16}{3}\left(\frac{2}{3}\right)^{n-3}$

34) 3, 36, 432,. . . n = 7

$a_n = 3(12)^{n-1}$