$-6 \overset{+4}{,} -2 \overset{+4}{,} 2, 6, 10$

a. common diff: 4

b. 10^{th} term: $a_{10} = -6 + 4(9) = 30$

c. recursive: $a_1 = -6$

$a_n = a_{n-1} + 4$

d. explicit rule: $a_n = a_1 + d(n-1)$

$a_n = -6 + 4(n-1) = 4n - 10$

Apr 17-9:26 AM

$6, 9, 12, 15, \ldots$

a. $d = a_2 - a_1 = 9 - 6 = 3$

b. $a_{10} = 6 + 3(9) = 33$

c. $a_1 = 6$

$a_n = a_{n-1} + 3$

d. $a_n = 6 + 3(n-1)$

$= 6 + 3n - 3 = 3n + 3$

Apr 17-9:29 AM

Geometric Sequence

$$\{a_1, a_1 \cdot r, a_1 \cdot r^2, a_1 \cdot r^3, \ldots\}$$

r: common ratio

Recursive

$a_1 =$

$a_n = a_{n-1} \cdot r$

Explicit

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

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$3, 6, 12, 24, 48, \ldots$

a. common ratio: $\frac{a_2}{a_1} = \frac{6}{3} = 2$

b. $a_{10} = 3 \cdot 2^9 = 1536$

c. recursive: $a_1 = 3$

$a_n = a_{n-1} \cdot 2$

d. explicit: $a_n = 3 \cdot 2^{n-1}$

Apr 17-9:38 AM

9.5 Series

Obj: 1. Use sigma notation & find sums of sequences.

2. Find sums of convergent geometric series.

Seq: $\left\{ \frac{1}{K} : K = 1, 2, 3, 4 \ldots \right\}$

$1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\ldots$

Series: $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \ldots\ldots$

Apr 17-10:05 AM

Summation/Sigma Notation

The sum of the terms of the sequence

$\{a_1, a_2, a_3, \ldots\ldots, a_n\}$

is: $$\sum_{K=1}^{n} a_K$$

"the sum of a_K from $K=1$ to n"

K: index of summation.

Apr 17-10:08 AM

Find the sum:

$$\sum_{K=1}^{5} 3K = 3+6+9+12+15 = 45$$

$$\sum_{K=5}^{8} K^2 = 25+36+49+64 = 174$$

Apr 17-10:10 AM

Let $\{a_1, a_2, a_3, \ldots, a_n\}$ be a finite arithmetic sequence with common dif. d

$$\text{Sum} = \sum_{K=1}^{n} a_K = a_1 + a_2 + a_3 + \ldots + a_n$$

$$\overset{*}{=} n\left(\frac{a_1 + a_n}{2}\right)$$

$$= \frac{n}{2}\left(2a_1 + (n-1)d\right)$$

n: # of terms

a_1: 1st term

a_n: last term

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Find the sum: $-8, \ldots, 27$
(arithmetic) $d = 7$

Sum: $n\left(\frac{a_1 + a_n}{2}\right) = 6\left(\frac{-8+27}{2}\right) = 57$

$a_1 = -8$

$a_n = 27$

$\cancel{a_n = a_{n-1} + d}$

explicit

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

$27 = -8 + d(n-1)$

$27 = -8 + 7(n-1)$

$n = 6$

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Let $\{a_1, a_2, a_3, \ldots, a_n\}$ be a finite geometric sequence. common ratio : r

$$\text{Sum} = \sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + \ldots + a_n$$

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

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Find the sum: 5, 15, 45, ..., 98415

Sum: $\frac{a_1(1-r^n)}{1-r}$

$a_1 = 5$

$r = 3$

$n =$

explicit: $a_n = a_1 \cdot r^{n-1}$

$\frac{98415}{5} = \frac{\cancel{5} \cdot 3^{n-1}}{\cancel{5}}$

$\ln 19683 = \ln 3^{n-1}$

$\frac{\ln 19683}{\ln 3} = \frac{(n-1)\cancel{\ln 3}}{\cancel{\ln 3}}$

$9 = n-1$

$n = 10$

Sum $= \frac{5(1-3^{10})}{1-3}$

$= 147620$

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<u>Infinite Series</u>

$$\sum_{n=1}^{\infty} a_n = a_1 + a_2 + a_3 + \cdots\cdots$$

Sometimes the sum can approach a finite limit.

The geometric series $\sum_{k=1}^{\infty} a \cdot r^{k-1}$ converges iff $|r| < 1$

* If it converges:

Sum $= \frac{a_1}{1-r}$

Apr 17-10:32 AM

Determine if it conv. If so, find sum

$$\sum_{k=1}^{\infty} 3(\underbrace{.75}_{r})^{k-1}$$

$r < 1 \rightarrow$ conv.

Sum: $\dfrac{a_1}{1-.75} = \dfrac{3}{1-.75} = 12$

Apr 17-10:36 AM