

# Algebra II

11-4

## Series and Sigma Notation

Series - Sum of a sequence.

Sigma notation -

The diagram shows the sigma notation  $\sum_{n=1}^5 (2n-1)$  with several annotations: a green arrow labeled "bump up" points to the summation symbol  $\Sigma$ ; a green arrow labeled "end number" points to the 5 in the upper limit; a red arrow labeled "compare" points to the minus sign in the expression  $2n-1$ ; and the index  $n$  is written below the summation symbol with the values 1, 2, 3, 4, and 5 written in blue, green, red, blue, and red respectively. Below the sigma notation, the expression is expanded as  $[2(1)-1] + [2(2)-1] + [2(3)-1] + [2(4)-1] + [2(5)-1]$ . Below this, the sum is calculated as  $= 1 + 3 + 5 + 7 + 9$ , and the final result  $= 25$  is enclosed in a hand-drawn box.

$$\sum_{n=1}^5 (2n-1) = [2(1)-1] + [2(2)-1] + [2(3)-1] + [2(4)-1] + [2(5)-1]$$
$$= 1 + 3 + 5 + 7 + 9$$
$$= 25$$

Write each series in expanded form (and evaluate).

$$\begin{aligned} 1) \quad \sum_{n=1}^6 n + 10 &= [1+10] + [2+10] + [3+10] + [4+10] + [5+10] + [6+10] \\ &= 11 + 12 + 13 + 14 + 15 + 16 \\ &= \boxed{81} \end{aligned}$$

Write each series using sigma notation.

$$11) \quad 1^3 + 2^3 + 3^3 + \dots + 20^3 \rightarrow a_n = n^3$$
$$\sum_{n=1}^{20} n^3$$

Write each series using sigma notation.

21)  $-9 + 3 - 1 + \frac{1}{3} + \dots$

$n=1$  2 3 4

geometric  
 $r = -\frac{1}{3}$   
 $a_n = a_1 r^{n-1}$   
 $= -9 \left(-\frac{1}{3}\right)^{n-1}$

$$\sum_{n=1}^{\infty} -9 \left(-\frac{1}{3}\right)^{n-1}$$

Assignment:  
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2-30 even