2-1 Series

2-1a: I can write a function for a geometric sequence
2-1b: I can write a series with sigma notation
2-1c: I can solve problems involving series

Geometric Sequence

geometric - sequence with a common factor between successive terms (repeated multiplication)

explicit: $f(n) = ar^{n-1}$

a=

r=

n=

Write a function using an explicit rule to represent the table

(A)

n		1	2	3	4	$\cdots$	$j-1$	j	$\cdots$
f(n)		6	12	24	48	$\cdots$	$ar^{(j-1)}$	ar^j	$\cdots$

Write a function using an explicit rule to represent the table

4.

n	0	1	2	3	4	5	6	$\cdots$
f(n)	$\frac{1}{27}$	$\frac{1}{9}$	$\frac{1}{3}$	1	3	9	27	$\cdots$

5.

n	1	2	3	4	5	6	7	$\cdots$
f(n)	0.001	0.01	0.1	1	10	100	1000	$\cdots$

You have 2 biological parents, 4 biological grandparents, and 8 biological great-grandparents. How many great-great-great-great grandparents (6th generation) do you have?

How many direct ancestors do you have if you trace your ancestry back 6 generations?

Series: sum of the terms in a sequence
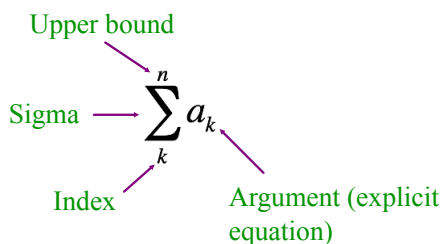**Sum:** usually a total of a finite number of items added together

Summation

$$a_1 + a_2 + a_3 + ... + a_n$$

(how do we write the sum of long lists of numbers?)

$\sum$ sigma means summation

Summation notation: $\displaystyle\sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + ... + a_n$

Vocabulary

Upper bound

Sigma $\longrightarrow$ $\displaystyle\sum_{k}^{n} a_k$

Index   Argument (explicit equation)

Read as:

The sum of a_k from k to n

Find the following sums:

a. $\displaystyle\sum_{k=1}^{5} 3k$

b. $\displaystyle\sum_{k=5}^{8} k^2$

c. 2+5+8+11+...+29

Formula for Finite Geometric Series

$$\sum_{k=1}^{n} a_k = a_1 + a_2 + a_3 + ... + a_n = \frac{a_1\left(1-r^n\right)}{1-r}$$

Find the sum of the series:

5+15+45+135+405+1215

Your turn: 1−2+4−8+16−32

8+16+32+...+512

$\dfrac{1}{2} - \dfrac{1}{4} + \dfrac{1}{8} + ... - \dfrac{1}{256}$

Niobe is saving for a down payment on a new car, which she intends to buy a year from now. At the end of each month, she deposits $200 from her paycheck into a dedicated savings account, which earns 3% annual interest that is applied to the account balance each month. After making 12 deposits, how much money will Niobe have in her savings account?

Sum of a Finite Arithmetic Sequence:

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

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

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

Find the sum of the arithmetic sequence

-8, -1, 6, 13, 20, 27

117, 110, 103, ...,33

After knee surgery, your trainer tells you to return to your jogging program slowly. He suggests jogging for 12 minutes the first week. Each week thereafter, he suggests you increase that time by 6 minutes. How many weeks will it be before you are up to jogging 60 minutes per week?

How many total minutes will you have run by the end of those weeks?