

Let's look at some common patterns in sequences:

n :	1, 2, 3, 4, 5, 6, ...	(Note: can add 1 to get next term)
$2n$:	2, 4, 6, 8, 10, 12, ...	(Note: can add 2 to get next term)
$3n$:	3, 6, 9, 12, 15, ...	(Note: can add 3 to get next term)
$5n$:	5, 10, 15, 20, 25, ...	(Note: can add 5 to get next term)
$5n + 1$:	6, 11, 16, 21, 26, ...	(Note: can still add 5 to get next term)
$5n - 3$:	2, 7, 12, 17, 22, ...	(Note: can still add 5 to get next term)
$-2n$:	-2, -4, -6, -8, -10, ...	(Note: can subtract 2 to get next term)
n^2 :	1, 4, 9, 16, 25, 36, ...	
n^3 :	1, 8, 27, 64, 125, ...	
2^n :	2, 4, 8, 16, 32, 64, ...	(Note: can multiply by 2 to get next term)
3^n :	3, 9, 27, 81, 243, ...	(Note: can multiply by 3 to get next term)
3^{n+1} :	9, 27, 81, 243, 729, ...	(Note: can still multiply by 3 to get next term)
3^{n-1} :	1, 3, 9, 27, 81, 243, ...	(Note: can still multiply by 3 to get next term)
$(-1)^n$:	-1, 1, -1, 1, -1, 1, ...	
$(-1)^{n+1}$:	1, -1, 1, -1, 1, -1, ...	

1. Find a formula for the n th term of the sequence $1, -\frac{1}{4}, \frac{1}{9}, -\frac{1}{16}, \frac{1}{25}, \dots$

$$a_n = \frac{(-1)^{n+1}}{n^2} \quad \left(\overset{\text{OR}}{a_n} = \frac{(-1)^{n-1}}{n^2} \right)$$

2. Find a formula for the n th term of the sequence $-\frac{1}{5}, \frac{2}{8}, -\frac{4}{11}, \frac{8}{14}, -\frac{16}{17}, \frac{32}{20}, \dots$

$$a_n = \frac{(-1)^n \cdot 2^{n-1}}{3n+2}$$

3. Find a formula for the n th term of the sequence $9, -\frac{27}{\sqrt{3}}, \frac{81}{\sqrt{5}}, -\frac{243}{\sqrt{7}}, \dots$

$$a_n = \frac{(-1)^{n+1} 3^{n+1}}{\sqrt{2n-1}} \quad (\text{OR } a_n = \frac{(-3)^{n+1}}{\sqrt{2n-1}})$$

4. Find a formula for the n th term of the sequence $\frac{5}{4}, \frac{2}{9}, -\frac{1}{16}, -\frac{4}{25}, -\frac{7}{36}, \dots$

$$a_n = \frac{8-3n}{(n+1)^2}$$

5. Write the sum using sigma notation.

$$1 - \frac{7}{9} + \frac{11}{27} - \frac{15}{81} + \frac{19}{243} + \dots$$

$\frac{3}{3}$

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1} (4n-1)}{3^n}$$

6. Write the sum using sigma notation.

$$-9 - \frac{3}{2} + \frac{3}{4} + \frac{9}{8} + \frac{15}{16} + \frac{21}{32} + \frac{27}{64} + \dots$$

$-\frac{9}{1}$

$$\sum_{n=1}^{\infty} \frac{6n-15}{2^{n-1}}$$

7. Write the sum using sigma notation.

$$\frac{1}{2} - \frac{8}{7} + \frac{27}{12} - \frac{64}{17} + \frac{125}{22} + \dots$$

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1} \cdot n^3}{5n-3}$$