Section 11-4

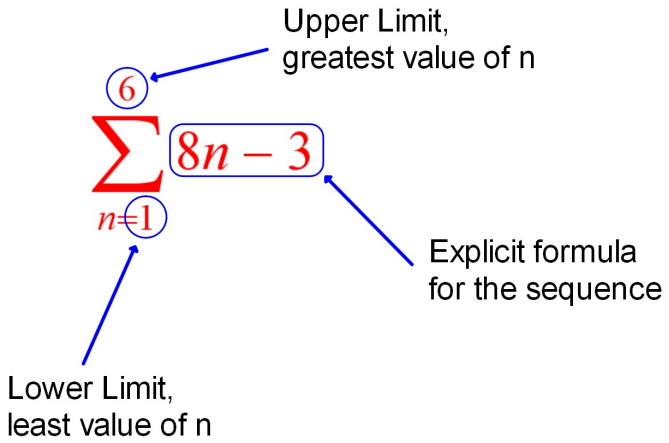
$\sum$ → Capital Greek letter Sigma

"sum of"

Summation Notation

$$\sum_{n=1}^{6} 8n - 3$$

"the sum of 8n-3 from 1 to 6"



$$\sum_{n=1}^{6} 8n - 3 = \underline{5} + \underline{13} + \underline{21} + \underline{29} + \underline{37} + \underline{45}$$

= 150

Evaluate each. Find the sum of each series.

$$\sum_{n=1}^{4} n^2 + 1$$

$2 + 5 + 10 + 17$

34

$$\sum_{n=1}^{5} 3n + 2$$

$5 + 8 + 11 + 14 + 17$

$\frac{3}{1}$

Evaluate.

$$\sum_{n=1}^{50} 5n + 3$$

Is this an Arithmetic Series? Yes

1. Find the first term 8
2. Find the last term 253
3. Find the number of terms 50
4. Use the formula for the sum of a Finite Arithmetic Series

$\frac{50}{2}(8 + 253) = 6525$

$$\sum_{n=1}^{30} 7 - 2n$$

$a_1 = 5$

$a_{30} = -53$

$n = 30$

$S_{30} =$ 30/2(5+ -53) = -720

Write this series in Summation Notation for the given number of terms.

$a_1 + (n-1)d$

13+17+21+25+... 10 terms

1. Write Explicit Formula
2. Find first value of n
3. Find last value of n
4. Write Summation Notation

$$\sum_{n=1}^{10} 13 + (n-1)4$$

Write this Arithmetic Series in Summation Notation.

9 + 15 + 21 + 27 + ... + 147

1. Write Explicit Formula
2. Find first value of n
3. Find last value of n (# of terms)
4. Write Summation Notation

$\sum_{n=1}^{24} 9+(n-1)6$

$147 = 9+(n-1)6$

$24 = n$

Write this Arithmetic Series in Summation Notation.

42 + 51 + 60 + ... + 186

$\sum_{n=1}^{17} 42+(n-1)9$

$186 = 42+(n-1)9$

$n = 17$

Find the number of terms in this Geometric Sequence

2.5, 10, 40, 160, ... 2621440

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

$2621440 = 2.5(4)^{n-1}$

$1048576 = 4^{n-1}$

$\log_4 1048576 = n-1$

$10 = n-1$

$n = 11$

Sec 11-5 Geometric Series

Sum of the terms in a Geometric Sequence

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

S_n = sum of the first n terms

a_1 = first term

r = common ratio

n = # of terms

Find the sum of this Finite Geometric Series.

4 + 12 + 36 + ... + 78732

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

$a_1 = 4$

$n = 10$

$r = 3$

$\frac{78732}{4} = \frac{4(3)^{n-1}}{4}$

$19683 = (3)^{n-1}$

$\log_3 19683 = n-1$

$9 = n-1$

$n = 10$

Find the sum of this Finite Geometric Series.

17,496 + 5832 + 1944 + ... + 8

Does each series have a sum?

16 + 19 + 22 + ... + 73 Yes

17 + 20 + 23 + 26 + ... NO

3.5 + 7 + 14 + 28 + ... + 229376 Yes

26 + 22 + 18 + 14 + ... NO

4 + 12 + 36 + 108 + ... NO

What series ALWAYS has a sum?

FINITE

Do Infinite Series have a sum?

Only some specific ones do.

Does this series have a sum?

Yes. Since the terms that are added become very small you are essentially adding zero.

144 + 72 + 36 + 18 + ... 9 + 4.5 + 2.25 + 1.125 +

Limit

Geometric Series: What is r?

144 + 72 + 36 + 18 + ...

r = .5

No Infinite Arithmetic Series have sums

Some Infinite Geometric Series have sums

if |r|<1

Sum of an Infinite Geometric Series

If |r|<1: $S = \frac{a_1}{1 - r}$

Find the sum of this Geomtric Series:

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots$$

$r = .5$

$S_n = \frac{1}{1 - .5} = 2$