Precalculus 11 **Sec 1.x – Sigma (Σ) Notation**

Sigma notation is a method in which a Greek symbol is used to represent the sum of any series.

$$\sum_{k=a}^{b} = f(k)$$

- $f(k) =$ function of the any series
- $k =$ input variable of the function
- $a =$ value of input variable for first term
- $b =$ value of input variable for last term

For example,

- $\sum_{k=1}^{5} f(k) = f(1) + f(2) + f(3) + f(4) + f(5)$
- $\sum_{k=5}^{9} f(k) = f(5) + f(6) + f(7) + f(8) + f(9)$

Notice that the number of terms in each of the series is $n = 5$

- To determine the total number of terms in any series: $n = b - a + 1$

Example 1: Expand and evaluate the following series

a) $\sum_{k=2}^{6} 2^k =$
b) $\sum_{k=4}^{7} 4(-3)^{k-1} =$
c) $\sum_{k=2}^{5} \frac{3}{4^k} =$

It's important that you're able to recognize a geometric series and which formula to use when determining the geometric sum

- If there are a finite number of terms (value of r is flexible)

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

- If there are an infinite number of terms (only if $-1 < r < 1$)

$$S_n = \frac{a}{(1-r)}$$

Example 1: Determine the following sums.

a) $\sum_{k=5}^{60}\left(\frac{2}{3}\right)^k=\left(\frac{2}{3}\right)^5+\left(\frac{2}{3}\right)^6+\left(\frac{2}{3}\right)^7+\ldots+\left(\frac{2}{3}\right)^{60}$
b) $\sum_{k=3}^{23}6\left(-\frac{1}{2}\right)^{k-1}=$
c) $\sum_{k=-10}^{12}3(2)^k=$
d) $\sum_{k=4}^{\infty}6\left(\frac{2}{3}\right)^{k+2}$
e) $\sum_{k=1}^{\infty}2(-3)^k=$

Homework: