Determining the nth term formula for various sequences and using the summation feature of the TI84

Not all sequences are Arithmetic or Geometric.

Thus, we must be able to describe such sequences by other means.

Those means are determining a function rule using established patterns of numbers (such as x^2 and $x!$)

Key patterns to remember:

$n = 1, 2, 3, 4, 5, \ldots$

$n^2 = 1, 4, 9, 16, 25, \ldots$

$n^3 = 1, 8, 27, 64, 125, \ldots$

$n! = 1, 2, 6, 24, 120, 720, \ldots$

Lastly, it is important to remember $\boxed{(-1)^n}$ or some variation of it.

$(-1)^n$ is used to make the sequence alternative signs, such as 1, -2, 3, -4, 5, -6, ...

Furthermore, if you wish to sum any finite number of terms for one of these sequences, use the "summation feature" of the TI84.

Select the following to do so:
MATH
SUMMATION
Enter the lower and upper bounds
Type in the formula for the n^{th} term inside the ( ).
Enter

Example 1: Write a formula for the n^{th} term of the sequence below. Then sum the 1st to 20th terms.

$$\begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \\ 6, & 9, & 14, & 21, & 30, \ldots \end{array}$$

$$a_n = n^2 + 5$$

$$\sum_{x=1}^{20} (x^2 + 5) = 2970$$

Example 2: Write a formula for the nth term of the sequence below. Then sum the 1st to 6th terms.

$$\frac{1}{1}, \frac{1}{8}, \frac{1}{27}, \frac{1}{64}, \ldots$$

$$a_n = \frac{1}{n^3}$$

$$\sum_{x=1}^{6} \left(\frac{1}{x^3} \right) = 1.19$$

Example 3: Write a formula for the n^{th} term of the sequence below. Then sum the 1st to 30th terms.

$$\frac{1}{4}, \frac{2}{5}, \frac{3}{6}, \frac{4}{7}, \frac{5}{8}, \ldots$$

$$a_n = \frac{n}{n+3}$$

$$\sum_{x=1}^{30} \left(\frac{n}{n+3} \right) = 23.234$$

Example 4: Write a formula for the nth term of the sequence below. Then sum the 1st to 10th terms.

$$\frac{2}{1}, \frac{5}{2}, \frac{10}{6}, \frac{17}{24}, \frac{26}{120}$$

$$a_n = \frac{n^2+1}{n!}$$

$$\sum_{x=1}^{10}\left(\frac{n^2+1}{n!}\right) = 7.15$$

Example 5: Write a formula for the n^{th} term of the sequence below. Then sum the 3rd to 12th terms.

$$\frac{-2}{7}, \frac{4}{14}, \frac{-8}{21}, \frac{16}{28}, \frac{-32}{35}, \ldots$$

$$a_n = \frac{(-1)^n \cdot 2^n}{7n}$$

$$\sum_{x=3}^{12} \left(\frac{(-1)^n \cdot 2^n}{7n} \right) = \frac{152444}{4851}$$

Homework: Complete the worksheet