Markerboard or Stations Activity
Geometric & Arithmetic Series

Write each series in summation (sigma) notation.

1. $2 + 4 + 6 + \cdots + 36$

2. $1 + 2 + 4 + \cdots + 2048$

3. $1 - 3 + 9 - 27 + \cdots - 2187$

4. $-3 - 7 - 11 + \cdots - 95$

Evaluate the series (using your calculator).

1.
$$\sum_{k=1}^{10} \frac{1}{2}(3)^{k-1}$$

2. $2 + 5 + 8 + \cdots + 74$

3.
$$\sum_{k=5}^{12} (3k - 8)$$

4. $-64 + 32 - 16 + 8 + \cdots$

Evaluate the series (without your calculator).

1.
$$\sum_{k=1}^{5} 3\left(\frac{1}{2}\right)^{k-1}$$

2. $-5 - 25 - 45 - \cdots - 165$

3.
$$\sum_{k=1}^{\infty} 5\left(\frac{1}{3}\right)^{k-1}$$

4. $\frac{5}{2} + 1 - \frac{1}{2} - 2 - \cdots - a_8$

Determine whether the series converges or diverges. If the series converges, find the sum.

1.

$$\sum_{k=1}^{\infty} (2k + 5)$$

2.

$$\sum_{k=1}^{\infty} \frac{16}{9} \left(\frac{3}{2}\right)^{k-1}$$

3.

$$\sum_{k=1}^{\infty} 3\left(-\frac{1}{4}\right)^{k-1}$$

4. $3 + \frac{9}{4} + \frac{27}{16} + \frac{81}{64} + \cdots$

Real-life applications

1. If you had $145 in your account at the beginning of week 13 and $205 at the beginning of week 18, how much are you depositing weekly? Assume no withdrawals are made and no interest paid.

2. You throw a SuperBall on the cement as hard as you can and watch it bounce until it stops. You notice the first bounce reaches a height of 200ft, but the second bounce reaches only half of that height. How high will the 7th bounce reach? How far (total distance) has the ball traveled before the 8th bounce?

3. You decide you are going to open a savings account. Each week, you are going to deposit $3 more than the previous week. The first week, you deposit $10. How much money will you deposit during the 25th week?

4. You deposit $100 at the end of each month into an account that pays 8% interest compounded monthly. Write the sum of the amount of money you have in the account after 10 years as a geometric series. Find the balance of the account after 10 years.

(Recall: $A = P\left(1 + \frac{r}{n}\right)^{nt}$)

Solutions:

Write each series in summation (sigma) notation.

1.

$$\sum_{k=1}^{18} 2k$$

3.

$$\sum_{k=1}^{8} (-3)^{k-1}$$

2.

$$\sum_{k=1}^{12} 2^{k-1}$$

4.

$$\sum_{k=1}^{24} (-4k+1)$$

Evaluate the series (using your calculator).
1. 14762
2. 950
3. 140
4. $-\dfrac{128}{3}$ *or* -42.667

Evaluate the series (without your calculator).
1. $\dfrac{93}{16}$
2. -765
3. $\dfrac{15}{2}$
4. -22

Determine whether the series converges or diverges. If the series converges, find the sum.
1. Diverges (infinite arithmetic)
2. Diverges
3. The series converges to $\dfrac{12}{5}$.
4. The series converges to 12.

Real life applications
1. $12
2. The 7th bounce reaches 3.125 ft.
     The ball traveled 793.75 ft before the 8th bounce.
3. $82
4. $100\left(1 + \frac{.08}{12}\right)^0 + 100\left(1 + \frac{.08}{12}\right)^1 + 100\left(1 + \frac{.08}{12}\right)^2 + \cdots + 100\left(1 + \frac{.08}{12}\right)^{119}$

$$\sum_{k=1}^{120} 100\left(1 + \frac{.08}{12}\right)^{k-1} = \$18294.60$$