Bellwork: Write the series in sigma notation

$$10+13+16+...+28$$

$$\boxed{\sum_{k=1}^{7} 3k+7}$$

$3k+7=28$
$-7 \quad -7$

$3k=21$
$\frac{\cancel{3}k}{\cancel{3}} = \frac{21}{3}$

$k=7$

10) $1+4+9+16+25+36+49$

$1^2 \quad 2^2 \quad 3^2 \quad 4^2 \quad 5^2 \quad 6^2 \quad 7^2$

$$\boxed{\sum_{k=1}^{7} k^2}$$

12) a_1 $\frac{3}{4} \xrightarrow{+1} \frac{4}{9} + \frac{5}{16} + \dots + \frac{9}{64}$

$k=1$ $\quad 2^2 \quad 3^2 \quad 4^2 \quad 8^2$

$$\boxed{\sum_{k=1}^{7} \frac{k+2}{(k+1)^2}}$$

Homework 9.1 Solutions

Lesson 9.2 Objectives

I can find the sum of geometric and arithmetic series

A **geometric** series is the sum of the terms of a geometric sequence, $S = \underline{a} + \underline{ar} + ar^2 + ar^3 + ... + ar^n + ...$, where a is the first term and r is the common ratio.

$3 + 6 + 12 + 24 + 48 + 96$

$a = 3$
$r = 2$
$n = 6$

An **arithmetic** series is the sum of the terms of an arithmetic sequence, $a_n = a_1 + (n-1)d$, where a_1 is the first term and d is the common difference.

$2 + 6 + 10 + 14 + 18$

$a_1 = 2$
$n = 5$
$d = 4$

Sum of a finite geometric series:

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

where a is the first term, r is the common ratio and n is the number of terms

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

Evaluate the sum of the finite geometric series

$$1+3+9+27+81+243+729$$

$a = 1$

$r = 3$

$n = 7$

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

$$S = \frac{1(1-3^7)}{(1-3)} = 1093$$

2. $\sum_{k=1}^{10} 5\left(\frac{1}{2}\right)^{k-1} = 5 + 5\left(\frac{1}{2}\right) + 5\left(\frac{1}{2}\right)^2 + \ldots + 5\left(\frac{1}{2}\right)^9$

$r = \frac{1}{2}$

$a_1 = 5$

$n = 10$

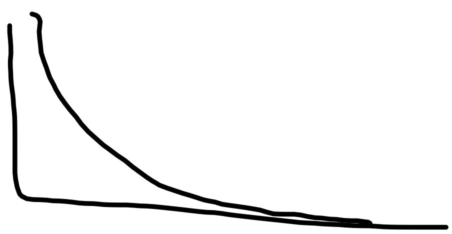
$$S = \frac{5\left(1-\left(\frac{1}{2}\right)^{10}\right)}{\left(1-\frac{1}{2}\right)} = \boxed{9.99}$$

Sum of an infinite geometric series:

$$S = \frac{a}{1-r}$$

if $|r| \geq 1$, sum is ∞

if $|r| < 1$, use formula



3. $\frac{5}{6} + \frac{25}{36} + \frac{125}{216} + \cdots$

$a = \frac{5}{6}$

$r = \frac{5}{6} < 1$

$S = \frac{a}{1-r} = \frac{5/6}{(1 - 5/6)} = \boxed{5}$

4. $\sum_{k=1}^{\infty} \left(\frac{4}{\pi}\right)^k = \frac{4}{\pi} + \left(\frac{4}{\pi}\right)^2 + \left(\frac{4}{\pi}\right)^3$

$a = \frac{4}{\pi}$

$r = \frac{4}{\pi} > 1$

$\boxed{\infty}$

Sum of a finite arithmetic series: $a_2 - a_1$

$a_1 + a_2 + a_3 + \ldots$ $a_3 - a_2$

$$S_n = \frac{n}{2}(a_1 + a_n) \quad \text{or} \quad S_n = \frac{n}{2}(2a_1 + (n-1)d)$$

last term

common difference

$\frac{a_2}{a_1} = \frac{a_3}{a_2}$

5. $\overset{-6}{\frown}\ \overset{-6}{\frown}$ $-5 - 11 - 17 - 23 - \cdots - 71$

$a_1 = -5$

$a_n = -71$

$n = 12$

$S = \frac{n}{2}(a_1 + a_n) = \frac{12}{2}(-5 + -71)$ $d = -6$

$\sum_{k=1}^{12} -6k + 1$ $6(-76) = \boxed{-456}$

6) $\sum_{k=1}^{8} 4k+3$

$n=8$
$a_1=7$
$a_n=35$

$S=\frac{n}{2}(a_1+a_n) = \frac{8}{2}(7+35) = \boxed{168}$

$S=\frac{n}{2}(2a_1+(n-1)d) = \frac{8}{2}(2(7)+(7)4) = \boxed{168}$

7. A professional baseball player signs a contract with a beginning salary of \$2,250,000 for the first year and an annual increase of 5% per year beginning in the second year. How much money in total will the athlete make if his contract is for 6 years? Round to the nearest dollar.

$a = 2,250,000$
$n = 6$ yrs
$r = 1.05$

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

$\frac{2250000(1-1.05^6)}{(1-1.05)} = 15,304,304$