45

$$\sum_{i=2}^{8} \frac{2}{i}$$

$$\sum 2^i$$

$$\sum \underline{4}i + 3$$

$$= \frac{2}{2} + \frac{2}{3} + \frac{2}{4} + \frac{2}{5} + \frac{2}{6} + \frac{2}{7} + \frac{2}{8}$$

$$1 + \frac{2}{3} + \frac{1}{2} + \frac{2}{5} + \frac{1}{3} + \frac{2}{7} + \frac{1}{4}$$

$$\frac{420}{420} + \frac{280}{420} + \frac{210}{420} + \frac{168}{420} + \frac{140}{420} + \frac{120}{420} + \frac{105}{420} = \frac{1443}{420}$$

$$\frac{481}{140}$$

$-3-140=-143$

$-3-4(35)$

50

$$\sum_{i=8}^{35} (-3-4i)$$

$$-3-\underset{-32}{4(8)} = -35$$

$35-8+1=28$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$S_n = \frac{28}{2}(-35 + -143)$$

$$= 14(-178)$$

$$= -2492$$

2/

Feb	Mar	Apr
20	25	30

$S_n = \frac{n}{2}(a_1 + a_n)$

$S_n = \frac{11}{2}(20 + 70)$

$= \frac{11}{2}(90)$

$= \$495$

$a_n = a_1 + d(n-1)$

$a_n = 20 + 5(\underbrace{11-1}_{10})$

$= 20 + 50$

$= 70$

Geometric Sequences - Multiply by the same value

$3, 12, 48, 192, \ldots$

Common ratio $= r$

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

$81, 54, 36, 24, \ldots$

$r = \frac{54}{81} = \frac{6}{9} = \frac{2}{3}$

$5, -15, 45, -135, \ldots$

$r = \frac{-15}{5} = -3$

$2, 6, 18, 54, \ldots$ $r = 3$

$2 \cdot 3 \quad 2 \cdot 9 \quad 2 \cdot 27$

$2 \cdot 3^1 \quad 2 \cdot 3^2 \quad 2 \cdot 3^3$

$$\boxed{a_n = a_1 \cdot r^{n-1}}$$

$150, -60, 24, \ldots$

Find a_8.

$r = \frac{-6\cancel{0}}{15\cancel{0}} = -\frac{2}{5}$

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

$a_8 = 150 \cdot \left(-\frac{2}{5}\right)^{8-1}$

$= -\frac{768}{3125}$

Population of Zeno is decreasing by 8% per year. The population is currently 2100. What will the population be in 7 years?

$\underbrace{2100, \; 1932}_{*0.92}$

$r = 100\% - 8\% = 92\%$

$r = 0.92$

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

$a_8 = 2100 \cdot (0.92)^{8-1}$

≈ 1171 people

Seneca is growing at 3% per year.

$100\% + 3\% = 103\%$

$r = 1.03$

Geometric Series

312

a_n

$1 S_4 = 2 + 10 + 50 + 250$ 0 $r = \frac{10}{2} = 5$

$-5 S_4 = \quad 10 \quad 50 \quad 250 \quad 1250$

$-4 S_4 = 2 \quad - 1250$

$\frac{-4 S_4}{-4} = \frac{-1248}{-4}$

$S_4 = 312$

$$\boxed{S_n = \frac{a_1 - \boxed{a_n} \cdot r}{1 - r}}$$

Know last term

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

$$\boxed{S_n = \frac{a_1 - a_1 \cdot r^{\boxed{n}}}{1 - r}}$$

Know # of terms

Find S_n.

$6 + 24 + 96 + \dots\dots + 6{,}291{,}456.$

$$S_n = \frac{a_1 - a_n \cdot r}{1-r} = \frac{6 - 6291456 \cdot 4}{1-4} = \underline{8388606}$$

$$\sum_{k=2}^{9} 7 \cdot 3^{k-2}$$

$r = 3$

$a_1 = 7 \cdot 3^{2-2}$
$= 7 \cdot 3^0 = 7 \cdot 1 = 7$

$p \cdot i^8$

$r = i$

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

$n = 9 - 2 + 1 = 8$

$$= \frac{7 - 7 \cdot 3^8}{1-3} = \boxed{22960}$$

Infinite Geometric Series

$4 + 12 + 36 + 108 + \cdots\cdots = \infty$ Diverges (heads off to ∞) $r > 1$ (# getting larger)

$r = 3$

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

6 7 7.5 7.75 7.875 + 7.9375 = 8

Converges (homes in on a #) $0 < r < 1$ (# in list getting smaller)

$r = \frac{2}{4} = \frac{1}{2}$ $\quad S = \frac{a_1}{1-r} = \frac{4}{1 - 1/2} = \frac{4}{1/2} = 8$

$$S_n = \frac{a_1 - a_1 \cdot r^n}{1-r} = \frac{a_1 - \cancel{a_1 (1/2)^{\infty}}}{1-r} = \frac{a_1}{1-r}$$

$$\boxed{S = \frac{a_1}{1-r}}$$