

$$2/ \quad 20 + 25 + 30 \dots$$

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

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

$$= 11 \cdot 45$$

$$= 495$$

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

$$a_n = 20 + 5(11-1)$$
$$= 20 + 50$$
$$= 70$$

GEOMETRIC SEQUENCES - multiply by the same value

1) What is a seq?
 " " " series?

$$a_1 = \quad d =$$

$$a_n = \quad n =$$

3, 12, 48, ... $r = \text{Common ratio}$

$$r = 4$$

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

81, 54, 36, 24, ...

$$r = \frac{54}{81} = \frac{2}{3} \quad \frac{36}{54} = \frac{2}{3}$$

5, -15, 45, -135, ...

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

a_1 a_2 a_3
 2, 6, 18, 54, ...
 $2 \cdot 3$ $2 \cdot 3$ $2 \cdot 3$
 $2 \cdot 3^1$ $2 \cdot 3^2$ $2 \cdot 3^3$

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

150, -60, 24, ...
 Find 8th term.

$$r = \frac{-60}{150} = -\frac{2}{5} \text{ or } -0.4$$

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

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

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

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

$$a_8 = a_1 \cdot r^{n-1}$$

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

$$\approx 1171 \text{ people}$$

$$\frac{2100 \cdot \cancel{1.08}}{0.09}, \text{ —}$$

$$r = 0.92$$

If gaining 8% per year, then $r = 1.08$

Geometric Series - Sum of terms

$$1S_4 = 2 + 10 + 50 + 250 \quad | \quad r=5 \quad S_n = 312$$

$$-5S_4 = \quad \quad \quad \underline{10 \quad 50 \quad 250 \quad 1250}$$

-1250

$$-4S_4 = 2$$

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

$$S_4 = 312$$

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

Know
a_n

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

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

Know
n

Find S_n .

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

↑ Know a_n

$$r = \frac{24}{6} = 4$$

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

$$S_n = \frac{6 - 6,291,456 \cdot 4}{1 - 4} = \boxed{8,388,606}$$

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

exponent = Geometric

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

ratio

$$\sum (3k-9)$$

Arithmetic

$$n = 9 - 2 + 1$$

$$n = 8$$

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

$$\frac{7 - 7 \cdot 3^8}{1 - 3} = 22,960$$

INFINITE GEOMETRIC SERIES

$$4 + 12 + 36 + 108 + \dots \quad r=3 \quad = \text{goes to } \infty \quad \text{Diverges } |r| > 1$$

$$4 + 2 + 1 + \frac{1}{2} + \dots \quad \text{Converges } 0 < |r| < 1$$

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

$r = \frac{1}{2}$ $(\frac{1}{2})^{1000}$

Sum of Infinite

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