

Questions from Homework

① Find a , d , and t_n

$$\begin{array}{l}
 t_2 = -12 \\
 t_2 = a + (2-1)d \\
 \underline{t_2 = a + d} \\
 -12 = a + d
 \end{array}
 \quad \left| \quad
 \begin{array}{l}
 t_5 = 9 \\
 t_5 = a + (5-1)d \\
 \underline{t_5 = a + 4d} \\
 9 = a + 4d
 \end{array}
 \right.
 \Leftrightarrow
 \begin{array}{l}
 a + 4d = 9 \\
 \underline{a + d = -12} \\
 3d = 21 \\
 \boxed{d = 7}
 \end{array}
 \begin{array}{l}
 a + d = -12 \\
 \underline{a + (7) = -12} \\
 \boxed{a = -19}
 \end{array}$$

$$t_n = a + (n-1)d$$

$$t_n = -19 + (n-1)(7)$$

$$\dots t_n = -19 + 7n - 7$$

$$\boxed{t_n = 7n - 26}$$

② $a = 12$

$$d = -1$$

$$n = 12$$

$$t_{12} = ?$$

$$S_{12} = ?$$

$$S_{12} = \frac{12}{2} [2(12) + (12-1)(-1)]$$

$$= 6[24 - 11]$$

$$= 6(13)$$

$$= 78$$

or

$$S_{12} = \frac{12}{2} (12 + 1)$$

$$= 6(13)$$

$$= 78$$

③ $S_5 = ?$

$$a = 52$$

$$n = 5$$

$$r = 0.8 \text{ (decrease of 20\%)}$$

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

$$S_5 = \frac{52[(0.8)^5 - 1]}{0.8 - 1}$$

$$= \frac{52(0.32768 - 1)}{-0.2}$$

$$= \frac{52(-0.67232)}{-0.2}$$

$$= 174.8$$

$$\approx 175 \text{ deaths}$$

Questions from Homework

$$\textcircled{4} \quad \begin{array}{l} t_4 = 8x^3 \\ t_n = ar^{n-1} \\ t_4 = ar^3 \\ 8x^3 = ar^3 \end{array} \quad \left| \quad \begin{array}{l} t_9 = 256x^8 \\ t_n = ar^{n-1} \\ t_9 = ar^8 \\ 256x^8 = ar^8 \end{array} \right.$$

Elimination by
division

$$\frac{256x^8 = ar^8}{8x^3 = ar^3}$$

$$32x^5 = r^5$$

$$(32x^5)^{1/5} = r$$

$$\text{or } \sqrt[5]{32x^5} = r$$

$$\boxed{2x = r}$$

$$\begin{array}{l} 8x^3 = ar^3 \\ 8x^3 = a(2x)^3 \end{array}$$

$$\frac{8x^3}{8x^3} = \frac{a(8x^3)}{8x^3}$$

$$\boxed{1 = a}$$

$$t_n = ar^{n-1}$$

$$t_n = (1)(2x)^{n-1}$$

$$t_n = (2x)^{n-1}$$

Questions from Homework

$$\textcircled{6} \quad S_n = \frac{n}{2} [2a + (n-1)d]$$

Given.

$$a = 24000$$

$$d = 800$$

$$S_6 = ?$$

$$S_6 = \frac{6}{2} [2(24000) + (6-1)(800)]$$

$$S_6 = 3[48000 + 4000]$$

$$S_6 = 3(52000)$$

$$S_6 = 156000$$

Questions from Homework

8.

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

Given:

$$a = 10000$$

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

$$S_6 = \frac{(10000) \left[\left(\frac{1}{2} \right)^6 - 1 \right]}{\left(\frac{1}{2} \right) - 1}$$

$$S_6 =$$

$$S_6 = \frac{10000 \left[\frac{1}{64} - \frac{64}{64} \right]}{\frac{1}{2} - \frac{2}{2}}$$

$$S_6 = \frac{10000 \left[\frac{-63}{64} \right]}{-\frac{1}{2}}$$

$$S_6 = \cancel{10000}^{\cancel{625}} \left[\frac{-63}{\cancel{64}} \right] \left(\frac{-\cancel{2}}{\cancel{1}} \right)$$

$\frac{32}{2}$

$$S_6 = \$19687.50$$

Sigma Notation

For the *sequence* 1, 2, 4, 8, 16, 32, 64 there is an associated sum called a *series*.

The Greek symbol Σ (**sigma**) is used to write the series in compact form.

$$1 + 2 + 4 + \dots + 64 =$$

$$\sum_{n=1}^7 2^{n-1}$$

the terms form a geometric sequence with $a = 1$, $r = 2$, $t_n = 1(2)^{n-1}$

This symbol is read as "the sum of the terms of the sequence given by $t_n = 2^{n-1}$ from $n = 1$ to $n = 7$ "

We can also say:

$$S_7 = \sum_{n=1}^7 2^{n-1}$$

Find each sum:

general term:
 $t_n = n^2$

$$S_4 = \sum_{n=1}^4 n^2$$

$$= (1)^2 + (2)^2 + (3)^2 + (4)^2$$

$$= 1 + 4 + 9 + 16$$

$$= 30$$

$$S_5 = \sum_{n=1}^5 3n + 2$$

$$= 5 + 8 + 11 + 14 + 17$$

$$= 55$$

$$3n + 2$$

$$= 3(4) + 2$$

$$= 14$$

$$\sum_{n=3}^5 (3)\left(\frac{1}{4}\right)^{n-1}$$

$$= (3)\left(\frac{1}{4}\right)^{3-1} + (3)\left(\frac{1}{4}\right)^{4-1} + (3)\left(\frac{1}{4}\right)^{5-1}$$

$$= (3)\left(\frac{1}{16}\right) + 3\left(\frac{1}{64}\right) + 3\left(\frac{1}{256}\right)$$

$$= \frac{3}{16} + \frac{3}{64} + \frac{3}{256}$$

$$= \frac{48}{256} + \frac{12}{256} + \frac{3}{256}$$

$$= \frac{63}{256}$$

Write the following series in ***Sigma Notation***

$$2+5+8+11+14.$$

What type of series is it?
Find t_n

$$a = 2$$

$$d = 3$$

$$\begin{aligned}t_n &= 2 + (n-1)(3) \\ &= 2 + 3n - 3 \\ &= 3n - 1\end{aligned}$$

Sigma Notation

$$\sum_{n=1}^5 3n - 1$$

Homework