

Adv. Functions - 1.3 WS: Arithmetic WP. WS.

1) $a_1 = 32000$ $d = 1250$ $n = 6$ $a_n = ?$

$$a_6 = 32000 + (6-1) \cdot 1250$$

$$a_6 = 38250 \rightarrow \boxed{\$38,250}$$

2) $a_1 = 26$, $d = 3$, $a_n = 101$ $n = ?$

$$101 = 26 + (n-1) \cdot 3$$

$$\frac{78}{3} = \frac{3n}{3}$$

$$101 = 26 + 3n - 3$$

$$101 = 23 + 3n$$

$$\underline{-23} \quad \underline{-23}$$

$$n = 26 \rightarrow \boxed{26 \text{ weeks}}$$

3) $a_3 = 28$ and $a_{18} = 88$ $a_{11} = ?$

$$\begin{cases} 88 = a_1 + 17d \\ 28 = a_1 + 2d \end{cases}$$

$$\frac{60}{15} = \frac{15d}{15}$$

$$d = 4$$

$$a_3 = 28$$

$$a_{11} = 20 + (11-1) \cdot 4$$

$$a_2 = 28 - 4 = 24$$

$$a_{11} = 60$$

$$a_1 = 24 - 4 = 20$$

$$\rightarrow \boxed{60 \text{ seats in 11th row}}$$

4) $a_1 = 15$, $a_{10} = 24$, $n = 10$, $d = 1$ $S_n = ?$

$$S_{10} = \frac{10}{2} (15 + 24)$$

$$S_{10} = 195 \rightarrow \boxed{195 \text{ logs}}$$

5) $a_1 = 1000$ $a_n = 565$ $n = 30$ (30 days in June), $d = ?$

$$565 = 1000 + (30-1) \cdot d$$

$$565 = 1000 + 29d$$

$$\underline{-1000} \quad \underline{-1000}$$

$$\underline{-435} = \underline{29d}$$

$$\frac{-435}{29} = \frac{29d}{29}$$

$$d = -15$$

lost \$15 each day in June

6) $a_1 = 12, a_2 = 18, a_n = 2\frac{1}{2} (150 \text{ min}) n = ?$

\checkmark
 $d = 18 - 12 = 6$

$$150 = 12 + (n-1) \cdot 6$$

$$150 = 12 + 6n - 6$$

$$150 = 6 + 6n$$

$$\begin{array}{r} 150 \\ -6 \\ \hline \end{array} \quad \begin{array}{r} 6n \\ -6 \\ \hline \end{array}$$

$$\frac{144}{6} = \frac{6n}{6}$$

$$n = 24 \rightarrow \boxed{24 \text{ weeks}}$$

7) $a_1 = 1, a_n = 20, d = 1, n = ?$ then $S_n = ?$

$$20 = 1 + (n-1) \cdot 1$$

$$20 = 1 + n - 1$$

$$20 = n$$

$$S_{20} = \frac{20}{2} (1 + 20)$$

$$S_{20} = 210 \rightarrow \boxed{210 \text{ towels}}$$

8) $a_5 = 23.85, a_{13} = 66.25, a_1 = ?$

$$\begin{cases} 66.25 = a_1 + 12d \\ 23.85 = a_1 + 4d \end{cases}$$

$$\begin{array}{r} 42.4 \\ 8 \\ \hline \end{array} = \frac{8d}{8}$$

$$d = 5.3$$

$$66.25 = a_1 + 12(5.3)$$

$$66.25 = a_1 + 63.6$$

$$\begin{array}{r} 66.25 \\ -63.6 \\ \hline \end{array} \quad \begin{array}{r} a_1 \\ -63.6 \\ \hline \end{array}$$

$$a_1 = 2.65 \rightarrow \boxed{2.65 \text{ ft in 1st second}}$$

9) $d = 500, a_{15} = 12000, n = 15, a_1 = ?$

$$12000 = a_1 + (15-1) \cdot 500$$

$$12000 = a_1 + 7000$$

$$\begin{array}{r} 12000 \\ -7000 \\ \hline \end{array} \quad \begin{array}{r} a_1 \\ -7000 \\ \hline \end{array}$$

$$a_1 = 5000 \rightarrow \boxed{\text{Jackpot started at } \$5000}$$

10) $a_1 = 1, a_2 = 3, a_3 = 5, S_n = 100, n = ?$

\checkmark
 $d = 3 - 1 = 2$

$$100 = \frac{n}{2} (a_1 + a_1 + (n-1) \cdot d)$$

$$100 = \frac{n}{2} (2(1) + (n-1) \cdot 2)$$

$$100 = \frac{n}{2} (2 + 2n - 2)$$

$$100 = \frac{n}{2} (2n)$$

$$100 = n^2$$

$$\sqrt{100} = \sqrt{n^2}$$

$$n = 10 \rightarrow$$

$$\boxed{10 \text{ rows}}$$

11) Company A $\rightarrow a_1 = 19000$ $d = 2600$

Company B $\rightarrow a_1 = 27000$ $d = 1200$

$n = 10$ so...

Company A

$$a_{10} = 19000 + (10-1) \cdot 2600$$

$$a_{10} = 42400$$

$$S_{10} = \frac{10}{2} (19000 + 42400)$$

$$S_{10} = 307,000$$

Company B

$$a_{10} = 27000 + (10-1) \cdot 1200$$

$$a_{10} = 37800$$

$$S_{10} = \frac{10}{2} (27000 + 37800)$$

$$S_{10} = 324,000$$

Company B will pay more over 10 year period by $\$17,000$

12) $a_1 = 1$, $a_{12} = 12$, $n = 12$, $d = 1$ $2 \cdot S_n = ?$

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

$$2(78) = \boxed{156 \text{ times}}$$

13) $a_1 = 4000$, $d = 1000$ $S_n = 60,000$, $n = ?$

$$60,000 = \frac{n}{2} (a_1 + a_n + (n-1) \cdot d)$$

$$60,000 = \frac{n}{2} (2(4000) + (n-1) \cdot 1000)$$

$$60,000 = \frac{n}{2} (8000 + 1000n - 1000)$$

$$2 \cdot 60,000 = \frac{n}{2} (7000 + 1000n) \cdot 2$$

$$120,000 = 7000n + 1000n^2$$

$$\frac{1000n^2}{1000} + \frac{7000n}{1000} - \frac{120,000}{1000} = 0$$

$$n^2 + 7n - 120 = 0$$

$$(n-8)(n+15) = 0$$

$$n-8=0 \quad n+15=0$$

$$n=8$$

$$n=-15$$

(n can't be negative)

\downarrow
 $\boxed{8 \text{ days}}$

14) $a_1 = 1.3$, $d = 1.3$, $n = 100$, $a_{100} = ?$

$$a_{100} = 1.3 + (100-1) \cdot 1.3$$

$$a_{100} = 130 \rightarrow \boxed{130 \text{ cm}}$$

15) $a_1 = 3750$ $S_n = 60,000$ $n = 10$ $a_{10} = ?$

$$60,000 = \frac{10}{2} (3750 + a_{10})$$

$$60,000 = 5(3750 + a_{10})$$

$$60,000 = 18750 + 5a_{10}$$

$$\frac{41250}{5} = \frac{5a_{10}}{5}$$

$$a_{10} = 8250$$

$\rightarrow \boxed{\$8250 \text{ on 10th date}}$