Arithmetic Seq/series WP WS

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

$$a_6 = 32000 + (6-1)\cdot 1250$$
$$a_6 = 38250 \rightarrow \boxed{\$38,250}$$

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

$$101 = 26 + (n-1)\cdot 3$$
$$101 = 26 + 3n - 3$$
$$101 = 23 + 3n$$
$$\underline{-23} \quad \underline{-23}$$
$$\frac{78}{3} = \frac{3n}{3}$$
$$n = 26 \rightarrow \boxed{26 \text{ weeks}}$$

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

$$-\begin{cases} 88 = \cancel{a_1} + 17d \\ 28 = \cancel{a_1} + 2d \end{cases}$$
$$\frac{60}{15} = \frac{15d}{15}$$
$$d = 4$$

$$a_3 = 28$$
$$a_2 = 28 - 4 = 24$$
$$a_1 = 24 - 4 = 20$$

$$a_{11} = 20 + (11-1)\cdot 4$$
$$a_{11} = 60$$
$$\rightarrow \boxed{\text{60 seats in 11th row}}$$

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

$$S_{10} = \frac{10}{2}(15 + 24)$$
$$S_{10} = 195 \rightarrow \boxed{195 \text{ logs}}$$

5) $a_1 = 1000 \quad a_n = 565 \quad n = 30 \left(\begin{smallmatrix}\text{30 days}\\\text{in June}\end{smallmatrix}\right), \; d = ?$

$$565 = 1000 + (30-1)\cdot d$$
$$565 = 1000 + 29d$$
$$\underline{-1000} \quad \underline{-1000}$$
$$\frac{-435}{29} = \frac{29d}{29}$$
$$d = -15 \rightarrow \boxed{\text{lost \$15 each day in June}}$$

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

$d = 18 - 12 = 6$

$$150 = 12 + (n-1)\cdot 6$$
$$150 = 12 + 6n - 6$$
$$150 = 6 + 6n$$
$$-6 \quad\quad -6$$
$$\frac{144}{6} = \frac{6n}{6}$$
$n = 24 \rightarrow \boxed{24 \text{ weeks}}$

7) $a_1 = 1 \quad a_n = 20 \quad d = 1 \quad n = ?$ 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) $a_5 = 23.85 \quad a_{13} = 66.25$, $a_1 = ?$

$$-\begin{cases} 66.25 = \cancel{a_1} + 12d \\ 23.85 = \cancel{a_1} + 4d \end{cases}$$
$$\frac{42.4}{8} = \frac{8d}{8}$$
$$d = 5.3$$

$$66.25 = a_1 + 12(5.3)$$
$$66.25 = a_1 + 63.6$$
$$-63.6 \quad\quad -63.6$$
$a_1 = 2.65 \rightarrow \boxed{2.65 \text{ seconds in 1st second}}$

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

$$12000 = a_1 + (15-1)\cdot 500$$
$$12000 = a_1 + 7000$$
$$-7000 \quad\quad -7000$$
$a_1 = 5000 \rightarrow \boxed{\text{Jackpot started at \$5000}}$

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

$d = 3 - 1 = 2$

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

$$100 = n^2$$
$$\sqrt{100} = \sqrt{n^2}$$
$n = 10 \rightarrow$

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

11) Company A → $a_1 = 19000$ $d = 2600$
Company B → $a_1 = 27000$ $d = 1200$
$n = 10$ so...

<u>Company A</u>

$a_{10} = 19000 + (10-1) \cdot 2600$
$a_{10} = 42400$
$S_{10} = \frac{10}{2}(19000 + 42400)$
$S_{10} = 307{,}000$

<u>Company B</u>

$a_{10} = 27000 + (10-1) \cdot 1200$
$a_{10} = 37800$
$S_{10} = \frac{10}{2}(27000 + 37800)$
$S_{10} = 324{,}000$

$\boxed{\text{Company B will pay more over 10 year period by \$17,000}}$

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

$60{,}000 = \frac{n}{2}(a_1 + a_1 + (n-1) \cdot d)$
$60{,}000 = \frac{n}{2}(2(4000) + (n-1) \cdot 1000)$
$60{,}000 = \frac{n}{2}(8000 + 1000n - 1000)$
$2 \cdot 60{,}000 = \frac{n}{2}(7000 + 1000n) \cdot 2$
$120000 = 7000n + 1000n^2$

$\frac{1000n^2}{1000} + \frac{7000n}{1000} - \frac{120{,}000}{1000} = \frac{0}{1000}$
$n^2 + 7n - 120 = 0$
$(n-8)(n+15) = 0$
$n - 8 = 0$ $n + 15 = 0$
$n = 8$ $n = -15$
$\boxed{8 \text{ days}}$ (n can't be negative)

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

$60{,}000 = \frac{10}{2}(3750 + a_{10})$
$60000 = 5(3750 + a_{10})$
$60000 = 18750 + 5a_{10}$

$\frac{41250}{5} = \frac{5a_{10}}{5}$
$a_{10} = 8250 \rightarrow \boxed{\$8250 \text{ on 10th hafe}}$