22nd Oct.'18

10^{th} - CBSE

PT-4M- Solution

Section : A

1) $a = 8$, $d = 2$

$a_n = 126$

$a + (n-1)d = 126$

$8 + 2n - 2 = 126$

$2n = 120$

$n = 60$

$\therefore$ There are 60 total terms in A.P.

$\rightarrow$ 10^{th} term from last $= 51^{th}$ term

$\therefore$ $a_{51} = a + 50d$

$= 8 + 50(2)$

$\therefore \boxed{a_{51} = 108}$

2) Suppose, n^{th} term of A.P. is zero.

$a = 21$
$d = -3$

$a_n = 0$

$a + (n-1)d = 0$

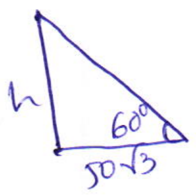
$21 + (n-1)(-3) = 0$

$3(n-1) = 21$

$n-1 = 7$

$\therefore \boxed{n = 8}$

3)



$\tan 60° = \dfrac{h}{50\sqrt{3}}$

$\sqrt{3} = \dfrac{h}{50\sqrt{3}}$

$\therefore \boxed{h = 150 \text{ units}}$

Section : B

4) $12, 15, 18, \ldots\ldots, 99$

Suppose m^{th} term is 99. which is last term.

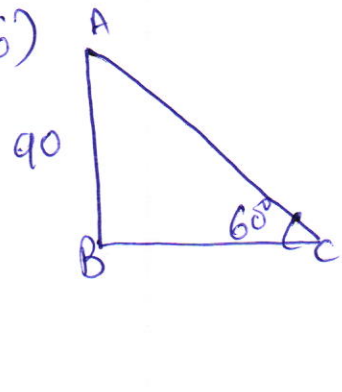
$$a_m = 99$$
$$a + (m-1)d = 99$$
$$12 + (m-1)\,3 = 99$$
$$12 + 3m - 3 = 99$$
$$\therefore 3m = 90$$
$$\therefore \boxed{m = 30}$$

$\therefore$ There are 30 numbers in giv. A.P.

5) $$S_n = 150$$
$$\frac{n}{2}(a + l) = 150$$
$$\frac{n}{2}(-4 + 29) = 150$$
$$\frac{25n}{2} = 150$$
$$\therefore \boxed{n = 12}$$

$\rightarrow$ $$a_{12} = 29$$
$$a + 11d = 29$$
$$-4 + 11d = 29$$
$$11d = 33$$
$$\therefore \boxed{d = 3}$$

6)



$$\cancel{\tan 60} \; \sin 60° = \frac{AB}{AC}$$
$$\therefore AC = \frac{AB}{\sin 60°}$$
$$= \frac{90}{\sqrt{3}} \times 2$$
$$\therefore \boxed{AC = 103.92\,m}$$

Section: C

7) $a_n = S_n - S_{n-1}$

$= 3n^2 - n - (3(n-1)^2 - (n-1))$

$= \cancel{3n^2} - n - \cancel{3n^2} + 6n - 3 + n - 1$

$\boxed{a_n = 6n - 4}$

→ $a_{25} = 6(25) - 4$

$= 150 - 4$

$\boxed{a_{25} = 146}$

→ A.P. $= 2, 8, 14, 20, \ldots$

8) → $a_5 + a_7 = 52$

$a + 4d + a + 6d = 52$

$2a + 10d = 52$

$\therefore a + 5d = 26$ —(i)

→ $a_{10} = 46$

$a + 9d = 46$ —(ii)

→ By solving (i) & (ii)

$a + 9d = 46$

$a + 5d = 26$

$-\quad -\quad -$

$4d = 20$

$\therefore \boxed{d = 5}$

$\therefore \boxed{a = 1}$

→ A.P. : $1, 6, 11, 16, \ldots$

9) $\dfrac{S_p}{S_q} = \dfrac{p^2}{q^2}$

$$\frac{\frac{p}{2}\left[2a+(p-1)d\right]}{\frac{q}{2}\left[2a+(q-1)d\right]} = \frac{p^2}{q^2}$$

$$\frac{2a+(p-1)d}{2a+(q-1)d} = \frac{p}{q} \quad \text{—(i)}$$

→ Now, $\dfrac{a_p}{a_q} = \dfrac{a+(p-1)d}{a+(q-1)d}$

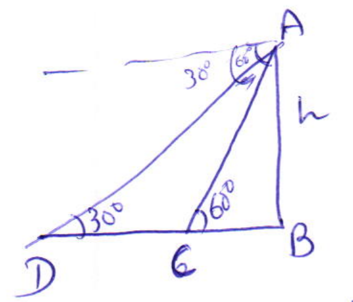
$$= \frac{2a+(2p-2)d}{2a+(2q-2)d}$$

$$= \frac{2a+((2p-1)-1)d}{2a+((2q-1)-1)d} \quad \text{—(ii)}$$

Subs. $(2p-1)$ in place of p & $(2q-1)$ in place of q,

$$\frac{2a+[(2p-1)-1]d}{2a+[(2q-1)-1]d} = \frac{2p-1}{2q-1} \quad \text{—(iii)}$$

$$\therefore \boxed{\frac{a_p}{a_q} = \frac{2p-1}{2q-1}} \quad \text{—// from (ii) \& (iii).}$$

10) 

dist. = speed × time

∵ | v m/s speed.

∴ $CD = 6v$

$BD = BC + CD$
$= 6v + vt$

→ $\tan 60^\circ = \dfrac{h}{BC}$

$h = \sqrt{3}\, BC$

$h = \sqrt{3}\, vt$ —(i)

$\tan 30^\circ = \dfrac{h}{6v+vt}$

$\dfrac{1}{\sqrt{3}} = \dfrac{h}{6v+vt}$

$\sqrt{3}h = 6v + vt$ —(ii)

$\therefore$ By (i) & (ii)

$3vt = 6v + vt$

$2vt = 6v$

$\therefore t = \frac{6v}{2v}$

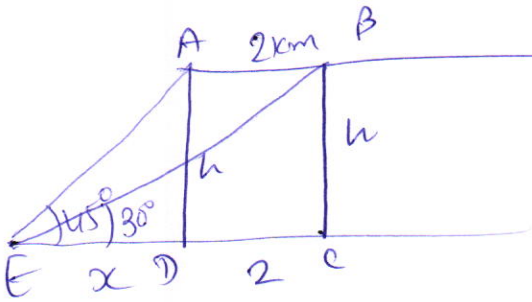
$\therefore \boxed{t = 3 \text{ seconds}}$

11) Speed = 360 km/hr

i.e. in 1 sec. dist. covered by aircraft

$= \frac{360}{3600} = \frac{1}{10}$ km

$\therefore$ In 20 secs. dist. covered = 2 km



$\tan 45° = \frac{h}{x}$

$\therefore h = x$ —(i)

$\tan 30° = \frac{h}{x+2}$

$\frac{1}{\sqrt{3}} = \frac{h}{h+2}$ $\because h = x$

$h + 2 = \sqrt{3}h$

$(\sqrt{3}-1)h = 2$

$h = \frac{2}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{2(\sqrt{3}+1)}{3-1}$

$\therefore \boxed{h = \sqrt{3}+1 \text{ km}}$