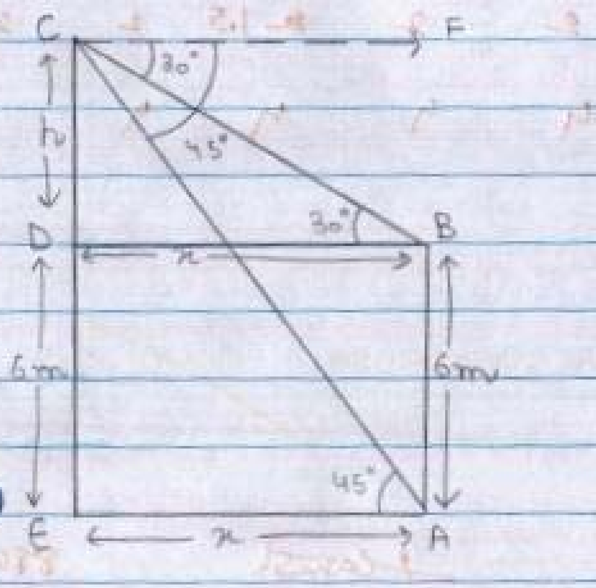
Class-X

Mathematics Basic (241)

Section-C



Here, AB represents a ~~towe~~ tall building of ht. 6m and CE ~~p~~ represents a multi-storeyed building.

Also, CF || DB

$\Rightarrow \angle FCB = \angle CBD = 30^\circ$ (Alt. Int. ∠'s)

CF || AE

$\Rightarrow \angle FCA = \angle CAE = 45^\circ$ (Alt. Int. ∠'s)

In rt. ΔCDB

$$\tan 30^\circ = \frac{CD}{DB} = \frac{h}{x}$$

$$\frac{1}{\sqrt{3}} = \frac{h}{x}$$

$$x = \sqrt{3}h \quad — (1)$$

In rt. ΔCEA

$$\tan 45^\circ = \frac{CE}{EA} = \frac{h+6}{x}$$

$1 = \dfrac{h+6}{\sqrt{3}h}$ (from eqn. 1)

$\sqrt{3}h = h+6$

$\sqrt{3}h - h = 6$

$h(\sqrt{3}-1) = 6$

$h = \dfrac{6}{\sqrt{3}-1} \times \dfrac{\sqrt{3}+1}{\sqrt{3}+1}$

$h = \dfrac{6(\sqrt{3}+1)}{3-1} = \dfrac{\overset{3}{\cancel{6}}(\sqrt{3}+1)}{\cancel{2}_1}$

$h = 3(1.73+1)$

$h = 3(2.73)$

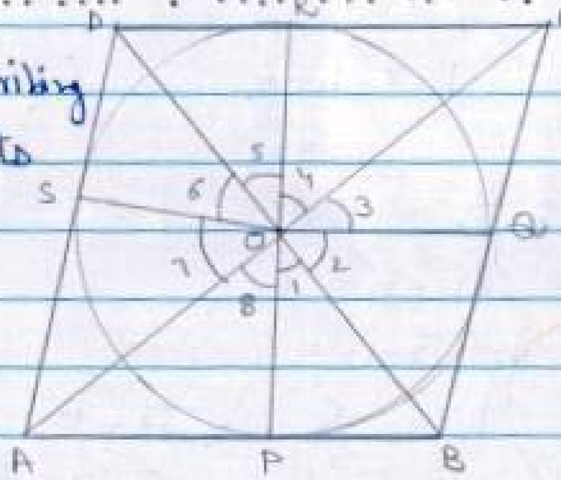
$h = 8.19\,m$

$\therefore$ ht. of multi storeyed building $= h+6 = 8.19+6$
$= 14.19\,m$

Also, Dist. between the 2 buildings, $x = \sqrt{3}h$
$= (1.73)(8.19)$
$= 14.1687\,m$
or $14.17\,m$

$$\begin{array}{r} 1.73 \\ \times 8.19 \\ \hline 1557 \\ 173\times \\ 1384\times\times \\ \hline 14.1687 \end{array}$$

12. (a) Given :- A quadrilateral ABCD circumscribing a circle with centre O at points P, Q, R, S.



To prove :- $\angle AOB + \angle COD = 180°$

~~Profe~~ Proof :- In $\triangle POB$ and $\triangle QOB$

$OP = OQ$ (Radii)

$OB = OB$ (Common)

$PB = QB$ [length of tangents from common ext pt. to a circle are equal]

$\therefore \triangle POB \cong \triangle QOB$ (by SSS)

$\Rightarrow \angle 1 = \angle 2$ (cpct)

Ully, $\angle 3 = \angle 4$

$\angle 5 = \angle 6$

$\angle 7 = \angle 8$

Now, In quardrilateral ABCD

$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$ (Complete angle)

$\angle 1 + \angle 1 + \angle 4 + \angle 4 + \angle 5 + \angle 5 + \angle 8 + \angle 8 = 360°$

$2\angle 1 + 2\angle 4 + 2\angle 5 + 2\angle 8 = 360°$

$2(\angle 1 + \angle 4 + \angle 5 + \angle 8) = 360°$

$(\angle 1+\angle 8)+(\angle 4+\angle 5) = 180°$

$\Rightarrow \angle AOB + \angle COD = 180°$

Hence proved

$210 \times 2 = 420$

$420 = 2 \times 210$, $210 = 2 \times 105$, $105 = 3 \times 35$, $35 = 5 \times 7$

13. a) Total no. of articles $= x$

Cost of one article $= 2x+1$

Cost of production of x articles $= 210$

But, $x(2x+1) = 210$

$2x^2 + x = 210$

$2x^2 + x - 210 = 0$

$\therefore$ The required eqn. is $2x^2 + x - 210 = 0$

b) Now, to find no. of articles we need to solve the above eqn.

$2x^2 + x - 210 = 0$

$\cancel{2x^2 + 21x - 20x - 210 = 0}$

$2x^2 - 20x + 21x - 210 = 0$

$2x(x-10) + 21(x-10) = 0$

$(2x+21)(x-10) = 0$

Either, $x = \frac{-21}{2}$

or $x = 10$

Since, no. of articles cannot be -ve.

$\Rightarrow x = 10$

$\therefore$ No. of articles = 10

Cost of one article $= 2x+1$

$= 2(10)+1 = 20+1$

$= ₹ 21$

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14. a) Vol. of water on roof = Vol. of water in pit

$l \times b \times h = 3 \times 3 \times 2$

$100 \times h = 3 \times 3 \times 2$

$h = \frac{3 \times 3 \times 2}{100}$

$h = \frac{18}{100}$

$h = 0.18 m$

$\therefore$ ht. of standing water on roof = 0.18 m

b) Vol. of cuboidal pit $= 3 \times 3 \times 2$

$= 18 m^3$

Vol. of cylindrical pit $= \pi r^2 h$

$= \frac{\cancel{22}^{11}}{7} \times \frac{3}{\cancel{2}_1} \times \frac{3}{\cancel{2}} \times \cancel{2}$

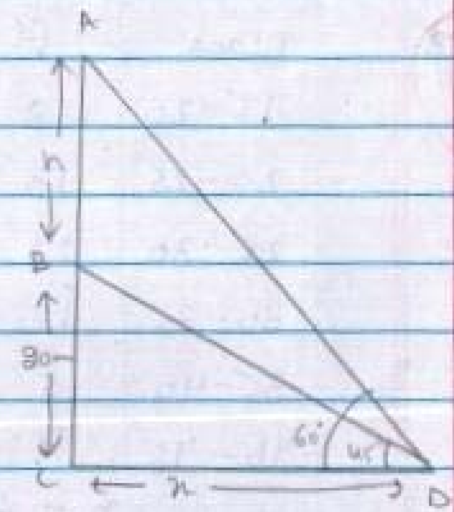
$= \frac{99}{7}$

$= 19.14 m^3$

Hence, cuboidal tank will hold more water.

Section-B

7. Here, AB is the transmission tower & BC is the building of ht. 20m



In rt. Δ BCD

$\tan 45° = \frac{20}{x}$

$1 = \frac{20}{x} \Rightarrow x = 20m$

In rt. ΔACD

$$\tan 60^\circ = \frac{h+20}{x}$$

$$\sqrt{3} = \frac{h+20}{20}$$

$$20\sqrt{3} = h + 20$$

$$h = 20\sqrt{3} - 20$$

$$h = 20(\sqrt{3}-1)\ m$$

$\therefore$ ht. of transmission tower $= 20(\sqrt{3}-1)\ m$

8.

Class	fi	cf
15-20	8	8
20-25	13	21
25-30	21	42
30-35	12	54
35-40	5	59
40-45	4	63
	n = 63	

$$\frac{n}{2} = \frac{63}{2} = 31.5$$

Median class $= 25-30$

$l = 25$

$cf = 21$

$f = 21$

$h = 5$

$$\text{Median} = l + \left[\frac{\frac{n}{2} - cf}{f}\right] h$$

$$= 25 + \left[\frac{31.5 - 21}{21}\right] 5$$

$$= 25 + \left[\frac{10.5}{21}\right] 5$$

$$= 25 + \left[\frac{105}{210}\right] 5$$

$$= 25 + \frac{5}{2}$$

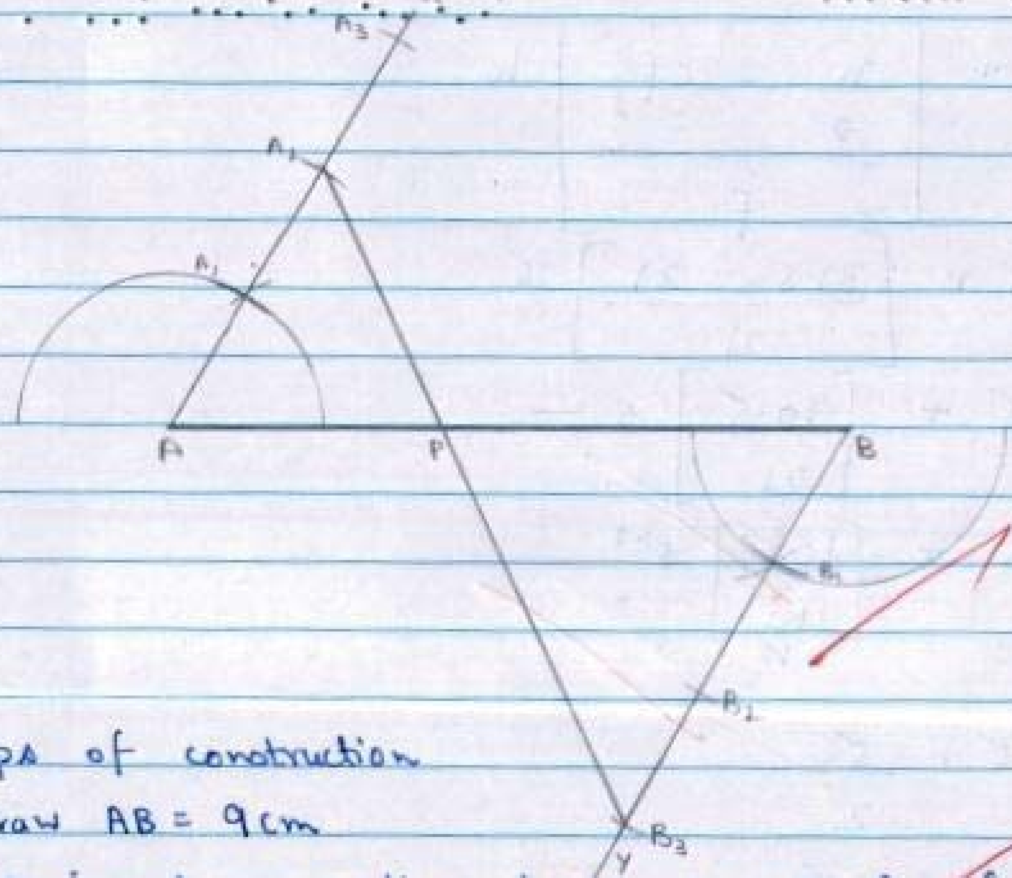
$$= 25 + 2.5$$

$$\therefore \text{Median} = 27.5$$

31.5
21.0
10.5

21
.5
10.5

9. (b)



Steps of construction

1. Draw AB = 9 cm
2. Keeping A as radius draw an angle of 60° ($\angle XAB$)
3. Again, Keeping B as radius draw an angle of 60° ($\angle YBA$) towards opp. side of line segment AB.
4. ~~Keeping~~ Taking a suitable radius divide line AX and BY into 3 equal parts.
5. Join A_2 and B_3.

Hence, AP : BP = 2:3

10.

Mileage	fi	xi	di	fidi
10-12	13	11	-4	-52
12-14	18	13	-2	-36
14-16	10	15 = a	0	0
16-18	7	17	2	14
18-20	2	19	4	8
	$\Sigma fi = 50$			$\Sigma fidi = -66$

Mean, $\bar{x} = a + \frac{\Sigma fidi}{\Sigma fi}$

$= 15 - \frac{66}{50}$

$= \frac{750 - 66}{50}$

$= \frac{684}{50}$

$\therefore$ Mean $= 13.68$

52
36
88

22
-66

750
-66
684

$\frac{684}{5}$

136.8

Section-A

1. (b) No. of cones = $\dfrac{\text{Vol. of sphere}}{\text{Vol. of 1 cone}}$

$$= \dfrac{\frac{4}{\cancel{3}}\cancel{\pi}r^3}{\frac{1}{\cancel{3}}\cancel{\pi}r^2h}$$

$$= \dfrac{4r^3}{r^2h}$$

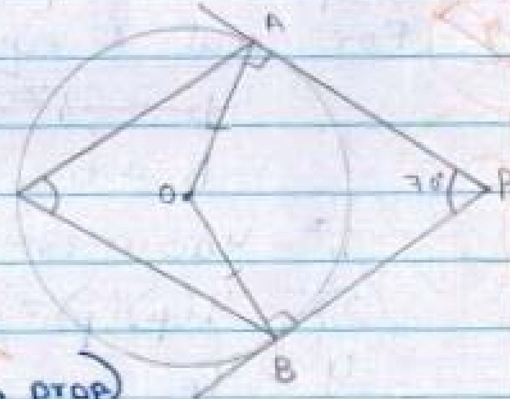
$$= \dfrac{\cancel{4}\times3\times3\times\cancel{3}}{\cancel{2}\times\cancel{2}\times\cancel{3}}$$

∴ No. of cones = 9 cones

2. $\angle APB = 70^\circ$

$\angle PAO = \angle PBO = 90^\circ$

[Tangent to a circle is perp. to the radius through pt. of contact]



In quadrilateral PAOB

$70^\circ + 90^\circ + 90^\circ + \angle AOB = 360^\circ$

(Angle Sum prop)

$250^\circ + \angle AOB = 360^\circ$

$\angle AOB = 360^\circ - 250^\circ$

$\angle AOB = 110^\circ$

Now,

$\angle AQB = \frac{1}{2} \angle AOB$

[by degree measure theorem i.e, the angle subtended at the centre is half the angle subtended ~~to~~ at any other part of the circle]

$\Rightarrow \angle AQB = \frac{1}{2} \times 110$

$\therefore \angle AQB = 55^\circ$

14

3. a) $px^2 + 2x + p = 0$

For real & equal roots

$$\cancel{D = b^2 - 4ac}$$

$$D = 0$$

$$b^2 - 4ac = 0$$

$$(2)^2 - 4(p)(p) = 0$$

$$4 - 4p^2 = 0$$

$$-4p^2 = -4$$

$$p^2 = 1$$

$$\therefore p = 1$$

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4. $S_{10} = 4S_5$

$$\frac{n}{2}[2a + (n-1)d] = 4\left[\frac{n}{2}\{2a + (n-1)d\}\right]$$

$$\frac{10}{2}[2a + 9(6)] = 4\left[\frac{5}{2}\{2a + 4(6)\}\right]$$

$$5(2a + 54) = 2[10a + 120]$$

$$10a + 270 = 20a + 240$$

$$20a - 10a = 270 - 240$$

$$\begin{array}{r} 24 \\ \times 5 \\ \hline 120 \end{array}$$

15

$$10a = 30$$
$$\therefore a = 3$$

$\overset{3}{4}\overset{14}{4}$
-17
27

5. $a_1 = 17$

$a_4 = 44$

$a + 3d = 44$

$17 + 3d = 44$

$3d = 44 - 17$

$3d = 27$

$d = 9$

$\therefore a_{15} = a + 14d$

$= 17 + 14(9)$

$= 17 + 126$

$\therefore a_{15} = 143$

16.

6. Modal class = 130 - 140

$$\text{Mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] h$$

$$= 130 + \left[\frac{11 - 8}{22 - 8 - 7}\right] 10$$

$$= 130 + \left[\frac{3}{7}\right] 10$$

$$= 130 + \frac{30}{7}$$

$$= \frac{910 + 30}{7}$$

$$= \frac{940}{7} = 134.285$$

$\therefore$ ~~Mean~~ Mode = 134.29 (approx.)

$$\begin{array}{r} 22 \\ -15 \\ \hline 7 \end{array}$$