SOLUTIONS

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SOLUTIONS FOR UTS-15

CBSE SAMPLE PAPERS

(Umang Test Series)

A TEAM EFFORT FROM

O.P. GUPTA

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UTS-15

CBSE Sample Papers

(Umang Test Series)

By O.P. Gupta, Sachin Pandey, Vishal Minocha

Section - A

1.	(c) 12	11.	(b) 17
2.	(d) both b & c	12.	(a) 7/2
3.	(d) $x = 5, y = 3$	13.	(c) 12
4.	(c) 3	14.	(b) 44 cm
5.	(d) −18	15.	(c) −2
6.	(b) 17/6	16.	(a) 0
7.	(b) 6	17.	(b) 128 cm^2
8.	(d) class mark	18.	(b) 5 cm
9.	(d) 1/6	19.	(d) A false R true
10.	(a) 2	20.	(d) A false R true

Section - B

21. $x = a,\ y = b$

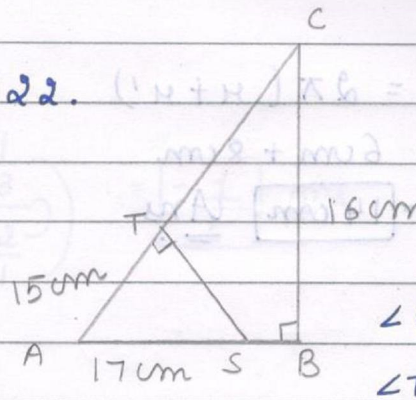
$x - y = 2$
$x + y = 4$

$a - b = 2$
$a + b = 4$
$2a = 6$

$\boxed{a = 3}$

$3 - b = 2$
$-b = -1$
$\boxed{b = 1}$ Ans

22.



$TC = ?$

$\Delta ATS \sim \Delta ABC$ (A A)

$\angle A = \angle A$ {common}

$\angle T = \angle B$ (given)

$\frac{AT}{AB} = \frac{TS}{BC}$ {corres. sides of ~ ∆s}

$\frac{15}{AB} = \frac{8}{16}$

$8AB = 240$

$AB = 30 cm$

ΔABC,

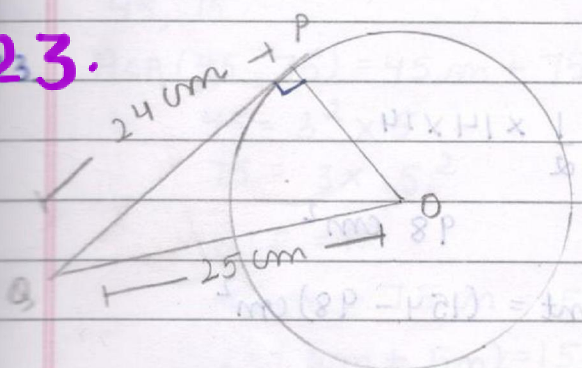
$AC^2 = (30)^2 + 256$

$AC = 34$ cm

$TC = AC - TA = (34 - 15)$ cm

$\boxed{19 \text{ cm}}$ Ans

23.



$OP = ?$

$OP \perp PQ$ {r ⊥ tangent at pt. of contact}

In ΔOPQ,

$(25)^2 = (OP)^2 + 576$

$625 - 576 = (OP)^2$

$49 = (OP)^2$

$OP = 7$ cm

radius $= \boxed{7 \text{ cm}}$ Ans

24. $2\pi R = 2\pi r + 2\pi r'$ (given)

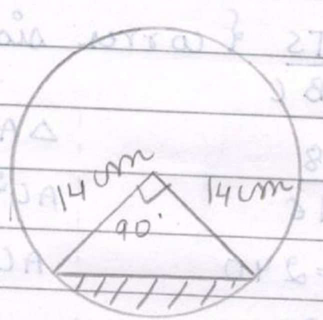
$2\pi R = 2\pi(r + r')$

$R = 6\,cm + 8\,cm$

$R = \boxed{14\,cm}$ Ans

OR

area of segment = area of sector − area of △



$\theta/360\ \pi r^2$

(I) area of sector $= \frac{90}{360} \times \frac{22}{7} \times 14 \times 14$

$\frac{1}{4} \times \frac{22}{7} \times 14 \times 14$

$154\,cm^2$

(II) area of △ $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 14 \times 14$

$98\ cm^2$

∴ area of segment $= (154 - 98)\,cm^2$

$\boxed{56\ cm^2}$ Ans

25. $\dfrac{\tan^2 30^\circ}{1-\tan^2 60^\circ}$

$$\frac{\left(\frac{1}{\sqrt{3}}\right)^2}{1-(\sqrt{3})^2} = \frac{\frac{1}{3}}{\frac{1-3}{1}} = \left(\frac{\frac{1}{3}}{\frac{-2}{1}}\right) = \boxed{-\frac{1}{6}} \text{ Ans.}$$

OR

$\tan A + \cot A = 3$; $\tan^2 A + \cot^2 A = ?$

s.b.s

$(\tan A + \cot A)^2 = 9$

$\tan^2 A + \cot^2 A + 2\tan A \frac{1}{\tan A} = 9$

$\tan^2 A + \cot^2 A = \boxed{7}$ Ans.

Section-C

26. 45, 75

$HCF(45, 75) = 45m + 75n$

$45 = 3^2 \times 5$

$75 = 3 \times 5^2$

$HCF = 15$

$45m + 75n = 15$

$15(3m + 5n) = 15$

$3m + 5n = 1$

$m = \dfrac{1-5n}{3}$

Ans :-

m	−3	−8	2
n	2	5	−1

5

27. product $= \alpha\beta = \frac{-1}{6}$

sum $= \alpha + \beta = \frac{+1}{6}$

$p(x) = k(x^2 - Sx + P)$

$k(x^2 - \frac{1}{6}x - \frac{1}{6})$

$k(\frac{6x^2 - x - 1}{6})$

$\frac{k}{6}(6x^2 - x - 1)$

$\frac{k}{6}[6x^2 - 3x + 2x - 1]$

$\frac{k}{6}[3x(2x-1) + 1(2x-1)]$

$\alpha = \boxed{\frac{-1}{3}, \frac{1}{2}}$ Ans

28. Let the no's be x and y

ATQ $\quad \frac{x}{y} = \frac{5}{6} \quad - (1)$

$$\frac{x-8}{y-8} = \frac{4}{5}$$

$$5(x-8) = 4(y-8)$$

$$5x - 40 = 4y - 32$$

$$5x - 4y = -32 + 40$$

$$5x - 4y = 8$$

$$5x = 8 + 4y$$

$$x = \frac{8+4y}{5} \quad - (2)$$

equating x in (1)

$$\frac{\frac{8+4y}{5}}{\frac{y}{1}} = \frac{5}{6}$$

$$\frac{8+4y}{5y} = \frac{5}{6}$$

$$25y = 6(8+4y)$$

$$25y - 24y = 48$$

$$\boxed{y = 48}$$

$$\boxed{x = 40} \quad \text{Ans}$$

OR.

Let no. of students in hall A $= x$
" " " $B = y$

ATQ.

$(x-10) = (y+10)$
$(x+20) = 2(y-20)$

$x - 10 = y + 10$
$x - y = 20$ — (1)

$x + 20 = 2y - 40$
$x - 2y = -60$ — (2)

$$\begin{array}{r} x - y = 20 \\ (-)\ x - 2y = -60 \\ -\quad +\quad\ + \\ \hline y = 80 \end{array}$$

$x - 80 = 20$
$\boxed{x = 100}$ $\boxed{y = 80}$

Ans- ∴ there are 100 students in hall A & 80 students in hall B.

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29. $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = \tan^2\theta + \cot^2\theta + 7$

LHS

$\sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta\frac{1}{\sin\theta} + \cos^2\theta + \sec^2\theta + 2\cos\theta\frac{1}{\cos\theta}$

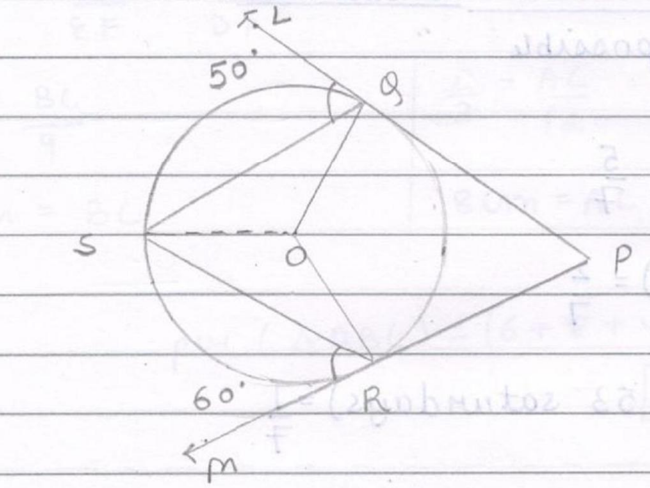
$1 + 2 + 2 + (1 + \tan^2\theta) + (1 + \cot^2\theta)$

$7 + \tan^2\theta + \cot^2\theta$

∴ LHS = RHS

Hence, proved Ans.

30.



$\angle QSR = ?$

$OQ \perp PL$

{r ⊥ tangent at pt. of contact}

$OR \perp PM$ { " }

Now, $\angle OQL = \angle OQS + \angle SQL$

$90° = \angle OQS + 50°$

$\angle OQS = 40°$ — (1)

||ly $\angle ORM = 60° + \angle ORS$

$90° - 60° = \angle ORS$

$30° = \angle ORS$ — (2)

$\angle OQS = \angle OSQ$ {∠s opp. to equal sides}

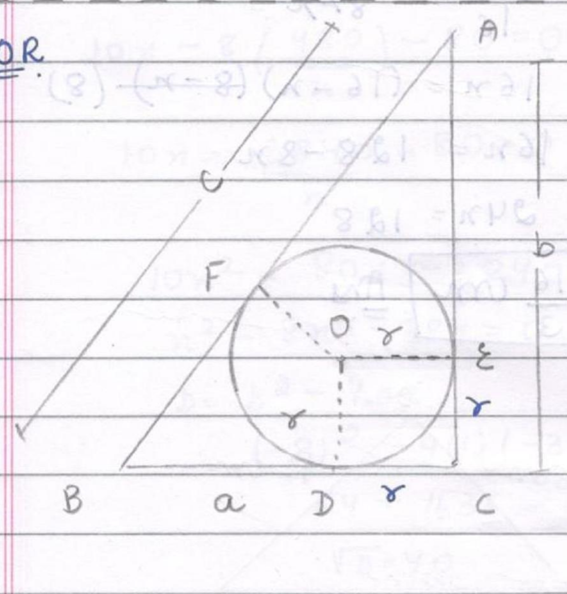
||ly $\angle ORS = \angle OSR$

Also, $\angle QSR = \angle OSQ + \angle OSR$

$30° + 40°$

$= \boxed{70°}$ Ans

OR



T.P => $r = \dfrac{a+b-c}{2}$

Proof :- OEDC is a sq.

∴ $CE = DC = r$ {tangents from same ext. pt}

∴ $AE = b - r$

||ly $BD = a - r$

also, $AE = AF$ {tangents from same ext pt}

$BF = BD =$ { " }

$AB = AF + BF$

$c = b - r + a - r$

$c = b + a - 2r$ → $r = \dfrac{a+b-c}{2}$

Hence, proved

Ans

31. $P(E) = \dfrac{\text{No. of favourable outcomes}}{\text{" possible "}}$

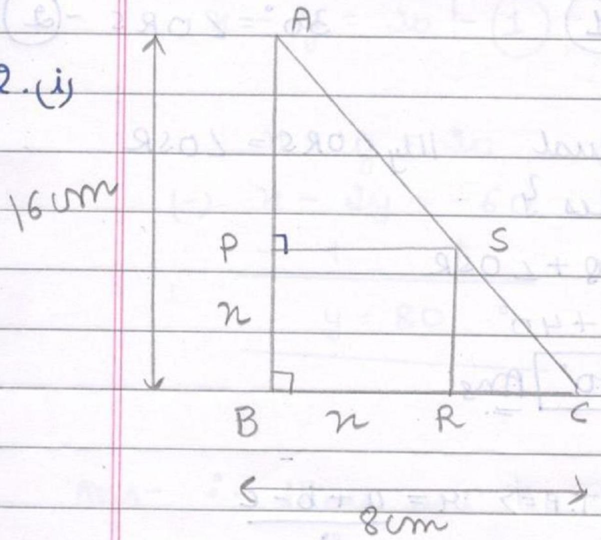
(i) $P(52 \text{ sundays}) = \dfrac{5}{7}$

(ii) $P(53 \text{ sundays}) = \dfrac{2}{7}$

(iii) $P(52 \text{ sundays } 53 \text{ saturdays}) = \dfrac{1}{7}$

Section - D

32. (i)



$\triangle APS \sim \triangle ABC \{AA\}$

$\angle A = \angle A$ (common)

$\angle APS = \angle ABC$ (each $90°$)

$\dfrac{AP}{AB} = \dfrac{PS}{BC}$ (corres. sides of $\sim \triangle s$)

$\dfrac{16-x}{16} = \dfrac{x}{8}$

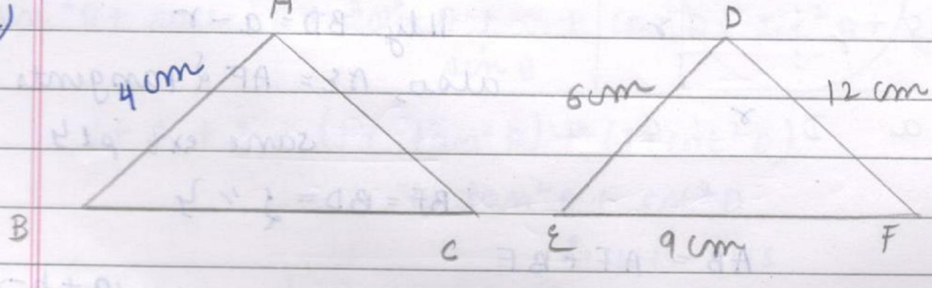
$16x = (16-x)\cancel{(8-x)}(8)$

$16x = 128 - 8x$

$24x = 128$

$x = \boxed{\dfrac{16}{3}\text{ cm}}$ Ans

(ii)



$\triangle ABC \sim \triangle DEF$

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ { corres sides of ~Δs }

$\frac{2}{3} = \frac{BC}{9}$	$\frac{2}{3} = \frac{AC}{12}$
$6cm = BC$	$8cm = AC$

per (Δ ABC) = (6 + 8 + 4) cm
= $\boxed{18 \text{ cm}}$ Ans

33. No. of students = x
cost / student = y

$xy = 480$
$y = \frac{480}{x}$ — (1)

$(x-8)(y+10) = xy$
$xy + 10x - 8y - 80 = xy$

$10x - 8y - 80 = 0$
$10x - 8\left(\frac{480}{x}\right) - 80 = 0$

$10x - \frac{3840}{x} - 80 = 0$

$10x^2 - 80x - 3840 = 0$
$x^2 - 8x - 384 = 0$
$D = b^2 - 4ac$
$(-8)^2 - 4(1)(-384)$
$64 + 1536$
$\sqrt{D} = 40$
$\alpha = \frac{-b+\sqrt{D}}{2a} = \frac{8+40}{2} = 24$ $\quad \beta = -ve \rightarrow$ rejected

no. of students who attended $= 24 - 8 = \boxed{16}$ Ans

OR

$(1+m^2)x^2 + 2mcx + c^2 - a^2 = 0$

T.P $\Rightarrow$ $c^2 = (1+m^2)a^2$

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

$(2mc)^2 - 4(1+m^2)(c^2 - a^2) = 0$

$4m^2c^2 - 4[c^2 - a^2 + c^2m^2 - a^2m^2] = 0$

$\cancel{4m^2c^2} - 4c^2 + 4a^2 - \cancel{4c^2m^2} + 4a^2m^2 = 0$

$-4c^2 + 4a^2 + 4a^2m^2 = 0$

$-4[c^2 - a^2 - a^2m^2] = 0$

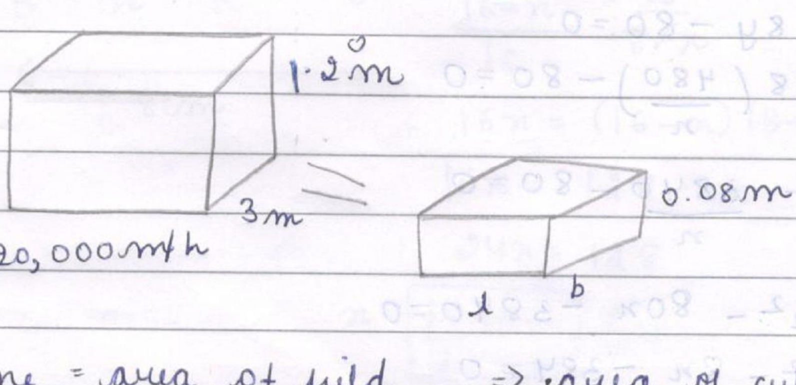
$c^2 - a^2 - a^2m^2 = 0$

$c^2 = a^2 + a^2m^2$

$c^2 = a^2(1+m^2)$

Hence, proved Ans

34.



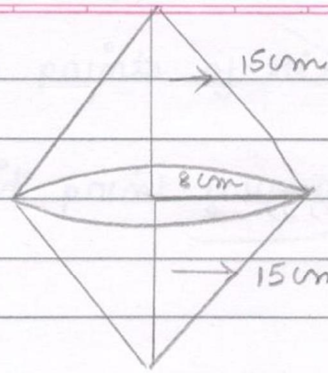
time = $\frac{\text{area of field}}{\text{area of canal}}$ $\Rightarrow$ area of cuboid = lbh

$\frac{1}{\cancel{3}} = \frac{lb \times 0.0\cancel{8}}{20,000 \times \cancel{3} \times \cancel{1.20}\ 60\ \cancel{30}\ 15}$ 4 2

$\boxed{300,000\ m^2}$

Ans

OR



TSA = $2 \times$ CSA of cone

$2 \times \pi r l$

$l^2 = r^2 + h^2$

$l^2 = 225 + 64$

$l = 17$ cm

$$2 \times \frac{22}{7} \times 8 \times 17 = \frac{5984}{7} \text{ cm}^2$$

volume = $2 \times \frac{1}{3} \pi r^2 h$

$$2 \times \frac{1}{3} \times \frac{22}{7} \times 8 \times 8 \times 15 = \frac{14080}{7} \text{ cm}^3$$

Ans

35.

	f	cf
0-5	12	12
5-10	a	12 + a
10-15	12	24 + a
15-20	15	39 + a
20-25	b	39 + a + b
25-30	6	45 + a + b
30-35	6	51 + a + b
35-40	4	55 + a + b
	70	

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

Median class = 15 - 20

$l = 15$

$n/2 = 35$

$cf = 24 + a$

$f = 15$

$h = 5$

$55 + a + b = 70$

$a + b = 15$ — (1)

$$16 = 15 + \left[\frac{35 - 24 - a}{\cancel{15}\ 3}\right] \times \cancel{5}$$

$3 = 11 - a$

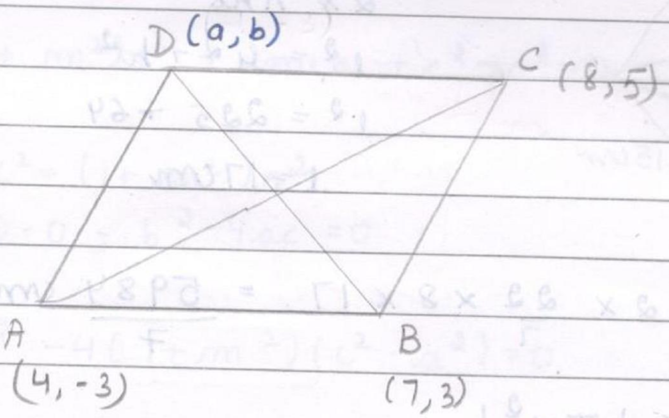
$-8 = -a$

$\boxed{a = 8}$

$b = 15 - 8 = 7$ $\boxed{b = 7}$ Ans

Section-E

3.6.



(i) AC = ?

distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\sqrt{(8-4)^2 + (5+3)^2}$

$\sqrt{80}$ units $= 4\sqrt{5}$ units

(ii) BD = ?

$\sqrt{(-1-7)^2 + (-1-3)^2} = \sqrt{(-8)^2 + (-4)^2}$

$4\sqrt{5}$ units

~~(iii) mid points of diagnols are same in a ||gm~~

~~Mid point formula =~~ $\cancel{\left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, m_1 y_2 + m_2 y_1 \right.}$

(iii) mid points of diagnols are same in a ||gm

Mid point formula = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

$(3,1) = \left(\frac{a+7}{2}, \frac{b+3}{2} \right)$

$\frac{a+7}{2} = 3$ $\quad\quad$ $\frac{b+3}{2} = 1$

$a + 7 = 6$ $\quad\quad$ $b = -1$

$a = -1$

$D\ (a, b) = \boxed{(-1, -1)}$ Ans

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37. $\pi[0.5, 1.0, 1.5 \ldots]$

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

(i) $a_7 = a_1 + 6d$

$0.5 + 6(0.5)$

$0.5 + 3$

3.5

$\frac{22}{7} \times \frac{35}{10} = \boxed{11m}$

(ii) $a_{28} = a_1 + 27d$

$0.5 + 27(0.5)$

$0.5 + 13.5$

$\frac{22}{7} \times 14$

$= \boxed{44m}$

(iii) $S_{28} = 14[1 + 13.5]$

$\frac{22}{7} \times 14 \times 14.5$

$\boxed{638m}$

(iv) $S_6 = \frac{6}{2}[2(0.5) + 5(0.5)]$

$3[3.5]$

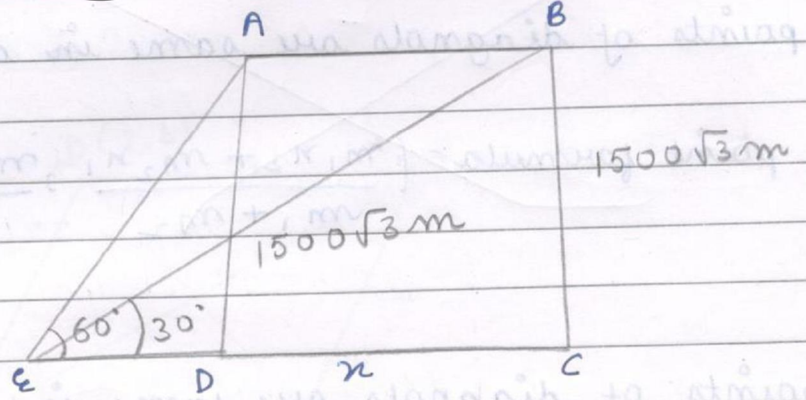
10.5

$\frac{22}{7} \times 10.5 = 33m$

$t = \frac{d}{s}$

$t = \frac{330}{5} = \boxed{66s}$ Ans

38.



(i) decreases

(ii) In $\triangle$ ~~BCE~~ ADE,

$$\tan 60^\circ = \frac{1500\sqrt{3}}{ED}$$

$$\sqrt{3} = \frac{1500\sqrt{3}}{ED}$$

$$ED = 1500\,m$$

In $\triangle$ BCE,

$$\tan 30^\circ = \frac{1500\sqrt{3}}{1500+x}$$

$$\frac{1}{\sqrt{3}} = \frac{1500\sqrt{3}}{1500+x}$$

$$4500 = 1500 + x$$

$$3000 = x$$

$$S = \frac{d}{t}$$

$$S = \frac{3000}{15} = \boxed{200\,m/s}$$

(iii) 3000 m (solved above)

OR

(iii) EB = ? In $\triangle$ EBC,

$$\sin 30^\circ = \frac{1500\sqrt{3}}{EB}$$

$$\frac{1}{2} = \frac{1500\sqrt{3}}{EB} = \boxed{3000\sqrt{3}\,m}$$ Ans

SOLUTIONS FOR UTS-16

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UTS-16

CBSE Sample Papers (Umang Test Series)

By O.P. GUPTA,
SACHIN PANDEY,
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Section - A

1. (d) 435
2. (a) 0
3. (d) $\sin 80°$
4. (b) $\sqrt{2}$
5. (a) 3 : 4
6. (b) 2
7. (b) 25
8. (d) $\sqrt{7} + 2$
9. (b) $3 - \sqrt{5}$
10. (c) 0.5
11. (c) AB + CD = AD + BC
12. (d) 6.7 cm
13. (d) $x^2 + 2x - 6$
14. (c) 1980 m
15. (d) 401.5 m
16. (a) 121 cm
17. (d) 0
18. (d) none of these
19. (a) Both are true, correct explanation
20. (d) A false, R true

vishal institute 1

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Section - B

21. $2x + 3y = 2xy \Big] \times 2$

$4x + 3y = 3xy$

$4x + 6y = 4xy$

$(-)4x + 3y = 3xy$

$- \quad - \quad -$

$3\cancel{y} = x\cancel{y}$

$\boxed{x=3}$

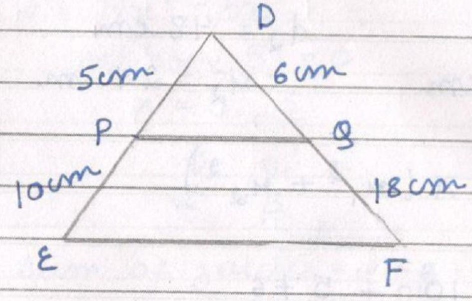
$4(3) + 6y = 4(3)y$

$12 + 6y = 12y$

$12y = 6y$

$\boxed{2 = y}$ Ans

22.



$PE = DE - DP = 10cm$

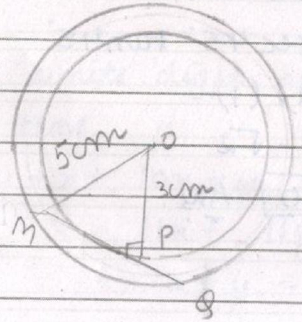
$\frac{DP}{PE} = \frac{5}{10} = \frac{1}{2}$

$\frac{DQ}{QF} = \frac{6}{18} = \frac{1}{3}$

as $\frac{DP}{PE} \neq \frac{DQ}{QF}$

$\therefore PQ \nparallel EF.$

23.



$PM = ?$

In $\triangle OMP$

$\angle OPM = 90°$

($r \perp$ tangent at point of contact)

$25 = OP^2 + PM^2$

$16 = PM^2$

$4cm = PM$

$MQ = 2 \times 4 = \boxed{8\ cm}$ Ans

[$\perp$ on chord from centre bisects the chord]

24. $d_1 = 20cm$ $\quad$ $d_2 = 48 cm$

$r_1 = 10cm$ $\quad$ $r_2 = 24 cm$

$\pi R^2 = \pi(r_1^2 + r_2^2)$

$R^2 = 100 + 576$

$R^2 = 676$

$R = 26cm$

$D = 26 \times 2 = \boxed{52 cm}$ Ans

OR area of sector $= \frac{\theta}{360} \pi R^2$

$\frac{\theta}{\cancel{360}_{10}} \cancel{\pi} \cancel{36} \times 36 = \cancel{\pi} 54$

$36 \times \theta = 540$

$\theta = 15°$

length of arc $= \frac{\theta}{360} \times 2\pi r$

$\frac{15}{\cancel{360}_{10}} \times 2\pi \cancel{36}$

$\boxed{3\pi cm}$ Ans

25. $(1 - \cos\theta)(1 + \cos\theta) \operatorname{cosec}^2\theta$

$(1 - \cos^2\theta) \operatorname{cosec}^2\theta$

$\sin^2\theta \; \frac{1}{\sin^2\theta}$

$= \boxed{1}$ Ans

OR $A = 45°$ $\quad$ $\sec A - \operatorname{cosec} A \tan A$

$\sec 45° - \operatorname{cosec} 45° \tan 45°$

$\sqrt{2} - (\sqrt{2})(1)$

$\sqrt{2} - \sqrt{2}$

$= \boxed{0}$ Ans

vishal institute 5

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Section - C

26. Sanju → 40 minutes
suman → 32 minutes

$40 = 2^3 \times 5$

$32 = 2^5$

$LCM = 2^5 \times 5$

160 minutes

∴ they will meet again after 160 minutes.

rounds by sanju $= \frac{160}{40} = 4$ rounds

" suman $= \frac{160}{32} = 5$ rounds Ans

27. $4x^2 - 5x$

$x(4x - 5) = 0$

$x = 0, \frac{5}{4}$

$\downarrow \quad \downarrow$

$\alpha \quad \beta$

Sum of zeroes $= \alpha + \beta = 0 + \frac{5}{4} = \frac{5}{4}$

product " $= \alpha\beta = (0)(\frac{5}{4}) = 0$

$-\frac{b}{a} = \frac{5}{4}$; $\frac{c}{a} = 0$

$\therefore \alpha + \beta = -\frac{b}{a}$, $\alpha\beta = \frac{c}{a}$

Hence, verified Ans

28. Let the units digit be x
" tens " y

ATQ
$10y + x + 10x + y = 88$

$11x + 11y = 88$

$x + y = 8$ - (1)

Case 1:

$x - y = 2$ - (2)

$+ \; x + y = 8$

$2x = 10$

$x = 5$

$y = 3$

No. = $\boxed{35}$

Case 2:

$x + y = 8$

$+ \; -x + y = 2$ - (2)

$2y = 10$

$y = 5$

$x = 3$

No. $\boxed{53}$

Ans - ∴ the no. is either 35 or 53.

OR

Let the certain amount of money be ₹x
& other be ₹y

ATQ $\frac{12x}{100} + \frac{10}{100}y = 130$

$12x + 10y = 13000$

$6x + 5y - 6500 = 0$ — (1)

$\frac{10x}{100} + \frac{12}{100}y = 134$

$10x + 12y = 13400$

$5x + 6y - 6700 = 0$ — (2)

Mutiplying (1) by 5 & (2) by 6

$30x + 25y - 32500 = 0$

$(-)30x + 36y - 40200 = 0$

$\quad - \quad - \quad +$

$-11y + 7700 = 0$

$-11y = -7700$

$\boxed{y = 700}$; $\boxed{x = 500}$ Ans

29. T.P ⇒ $\sin^6\alpha + \cos^6\alpha + 3\sin^2\alpha\cos^2\alpha = 1$

$(\sin^2\alpha + \cos^2\alpha)^3 = 1^3$
$= 1$

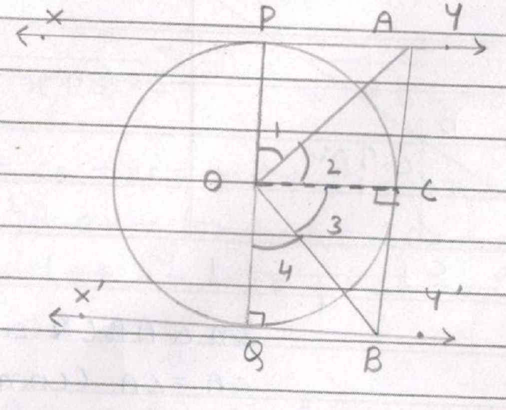
$\sin^6\alpha + \cos^6\alpha + 3\sin^2\alpha\cos^2\alpha(1) = 1$

$\sin^6\alpha + \cos^6\alpha + 3\sin^2\alpha\cos^2\alpha = 1$

using identity, $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$

Hence, proved Ans

30.



Given : $XY \parallel X'Y'$

T.P : $\angle AOB = 90°$

const. : Join OC

Proof : In $\triangle COB$ & $\triangle QOB$

$OC = OQ$ (radii)

$OB = OB$ (common)

$BC = BQ$ (tangents from same ext. pt)

$\therefore \triangle COB \cong \triangle QOB$ (SSS)

$\therefore \angle 3 = \angle 4$ (cpct)

$\parallel$ly $\angle 1 = \angle 2$

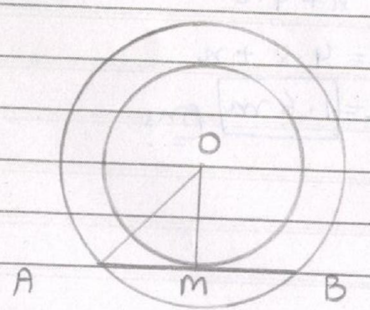
Now, $\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180°$ (angles on a straight line)

$2(\angle 3 + \angle 4) = 180°$

$\angle 3 + \angle 4 = 90°$ i.e $\angle AOB = 90°$

Hence, proved Ans

OR.



Given :- $C(O, r)$

T.P :- $AM = BM$

Proof :- $OM \perp AB$

(r $\perp$ tangent at pt. of contact)

$\therefore AM = BM$

($\perp$ on chord from centre bisects the chord)

Hence, proved

31. $P(E) = \dfrac{\text{No. of fav. outcomes}}{\text{" possible "}}$

(i) $P(\text{divisible by } 2) = \dfrac{50}{100} = \dfrac{1}{2}$

(ii) $P(\text{divisible by } 5) = \dfrac{20}{100} = \dfrac{1}{5}$

(iii) $P(\text{divisible by } 2 \,\&\, 5) = \dfrac{10}{100} = \dfrac{1}{10}$

Section - D

32. (i) $\Delta ABC \sim \Delta RQP$ (SSS)

given that $\dfrac{AB}{RQ} = \dfrac{BC}{QP} = \dfrac{AC}{RP} = \dfrac{1}{2}$

In ΔABC,

$60^\circ + 80^\circ + \angle C = 180^\circ$ [ASP of a Δ]

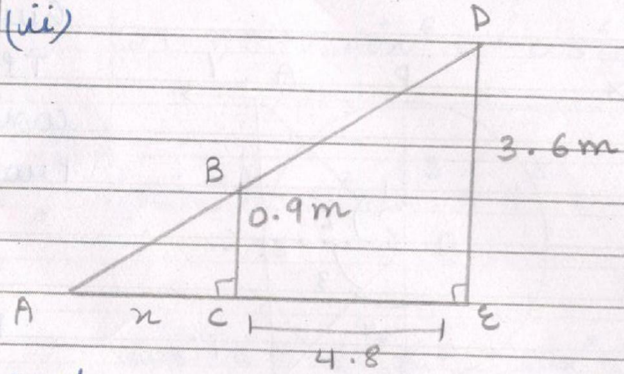
$140^\circ + \angle C = 180^\circ$

$\angle C = 40^\circ$

$\angle C = \angle P$ [corres. $\angle$s of $\sim\Delta$s]

$\boxed{\angle P = 40^\circ}$ Ans

(ii)



$s = \dfrac{d}{t}$

$1.2 = \dfrac{d}{4}$

$4.8\,m = CE =$ distance

In ΔABC & ΔADE

$\angle A = \angle A$ (common)

$\angle C = \angle E$ (each 90°)

$\Delta ABC \sim \Delta ADE$ (AA)

$\cancel{\dfrac{BC}{AD}}$ $\dfrac{BC}{DE} = \dfrac{AE}{AE}$ (corres. parts of $\sim\Delta$s)

$\dfrac{9}{36} = \dfrac{x}{x+4.8}$

$4x = 4.8 + x$

$x = \boxed{1.6\,m}$ Ans

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33. $\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$; $S = 0$ $P = -\frac{1}{2}(a^2+b^2)$

$\frac{x+b+x+a}{(x+a)(x+b)} = \frac{1}{c}$; $\frac{2x+a+b}{x^2+ax+bx+ab} = \frac{1}{c}$

$2cx + ca + bc = x^2 + ax + bx + ab$

$0 = x^2 + ax + bx + ab - 2cx - ca - bc$

$x^2 + (a+b-2c)x + (ab - ca - bc) = 0$

$S = 0$ $\quad -\frac{b}{a} = 0$

$b = 0$ $\quad P = \frac{c}{a}$

$a + b - 2c = 0$

$a + b = 2c$

$c = \frac{a+b}{2}$

$\frac{ab - ac - bc}{1}$

$ab - (a+b)c$

$ab - (a+b)\frac{(a+b)}{2}$

$\frac{2ab - (a^2+b^2+2ab)}{2}$

$\frac{\cancel{2ab} - a^2 - b^2 - \cancel{2ab}}{2}$

$-\frac{1}{2}(a^2+b^2)$

Hence, proved

Ans

OR $px^2 + 5x + r = 0$

put $x = 2$

$p(2)^2 + 5(2) + r = 0$

$4p + 10 + r = 10$

$r = -4p - 10$ — (1)

put $x = \frac{1}{2}$

$p\left(\frac{1}{2}\right)^2 + 5\left(\frac{1}{2}\right) + r = 0$

$\frac{1}{4}p + \frac{5}{2} + r = 0$

$\frac{1}{4}p + \frac{5}{2} + (-4p - 10) = 0$

$\frac{1}{4}p + \frac{5}{2} - 4p - 10 = 0$

$\frac{p + 10 - 16p - 40}{4} = 0$

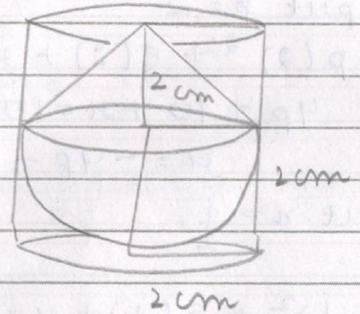
$-15p = 30$ $\quad \boxed{p = -2}$

$r = -4(-2) - 10 = 8 - 10$

$\boxed{r = -2}$ Ans

A

34. volume of toy = volume of cone + vol. of hemisphere



$\frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$

$\frac{1}{3}\pi r^2 [h + 2r]$

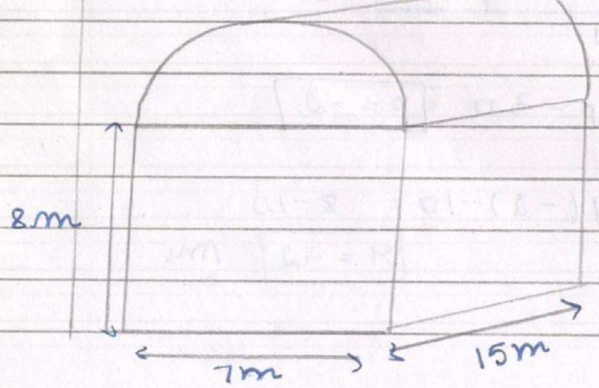
$\frac{1}{3} \times \frac{22}{7} \times 2 \times 2 \, [2 + 4]$

$\frac{1}{\cancel{3}} \times \frac{22}{7} \times 2 \times 2 \times \cancel{6}\,2 = \boxed{25.1 \text{ cm}^3}$

volume of cylinder $= \pi r^2 h = \frac{314}{100} \times 4 \times 2 \times 2 = 50.24 \text{ cm}^3$

difference of volumes $= 50.24 - 25.1 = \boxed{25.1 \text{ cm}^3 \text{ Ans}}$

OR



(I) volume of air = volume of cuboid + $\frac{1}{2}$ vol. of cylinder

$(7)(15)(8) + \frac{1}{2}\left[\frac{\overset{11}{\cancel{22}}}{\cancel{7}} \times \frac{\cancel{7}}{2} \times \frac{7}{\cancel{2}} \times 15\right]$

$840 + \frac{1}{2}\left[\frac{1155}{2}\right]$

$840 + \frac{1155}{4} = 840 + 288.7 = \boxed{1128.75 \text{ m}^3}$

(II) volume by machinery $= 300 m^3$

volume by 1 worker $= 0.08 m^3$

" 20 " $= 0.08 \times 20 = 1.6 m^3$

volume of air = volume of shed − (volume of machinery + volume of 20 workers)

$1128.7 - (300 + 1.6)$

$1128.7 - 301.6$

$= \boxed{827.1 m^3}$ Ans

35.

Marks	cf
~~90-100~~	50
0-10	47
10-20	47
20-30	39
30-40	32
40-50	28
50-60	23
60-70	18
70-80	
80-90	
90-100	

35.

	cf	f_i	x_i	$f_i x_i$
0-10	50	3	5	15
10-20	47	0	15	0
20-30	47	8	25	~~170~~ 200
30-40	39	7	35	245
40-50	32	4	45	180
50-60	28	5	55	275
60-70	23	5	65	325
70-80	18	6	75	450
80-90	12	5	85	425
90-100	7	7	95	~~685~~ 665
		50		2780

$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i}$

$= \frac{2780}{50}$

$\boxed{55.6}$

Section - E

36. (i) Batsman (3, 0) extra cover (-7, -5)

distance formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$\sqrt{(-7-3)^2 + (-5-0)^2} = \sqrt{(-10)^2 + (-5)^2} = \sqrt{100+25} = \sqrt{125} = 5\sqrt{5}$ units

(ii) third man (-5, 10) deep fine leg (5, 11)

$\sqrt{(5+5)^2 + (11-10)^2}$

$\sqrt{10^2 + 1} = \sqrt{101}$ units

(iii) Mid on (3, -8) wicket keeper (0, b)

$\sqrt{117} = \sqrt{(0-3)^2 + (b+8)^2}$

$\sqrt{117} = \sqrt{9 + b^2 + 8\cancel{6}4 + 16b}$

$\sqrt{117} = \sqrt{9 + b^2 + 64 + 16b}$

$117 = 9 + b^2 + 64 + 16b$

$117 = b^2 + 16b + 73$

$0 = b^2 + 16b + 73 - 117$

$b^2 + 16b - \overset{4}{\cancel{3}}4$

$D = b^2 - 4ac$

$D = 80$

$\sqrt{D} = 4\sqrt{5}$

$\alpha, \beta = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-16 \pm 4\sqrt{5}}{2}$ units

Ans

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(iii) OR. C(−6, −1) B(0, −2), M(4, −3)

for the points to be collinear, area of $\triangle$ must be 0 units

$x_1 = -6$ $y_1 = -1$
$x_2 = 0$ $y_2 = -2$
$x_3 = 4$ $y_3 = -3$

A of $\triangle = \frac{1}{2}\left[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)\right]$

$\frac{1}{2}\left[(-6)(1) + 0(-2) + (4)(1)\right]$

$\frac{1}{2}[-6 + 0 + 4] = \frac{1}{2}[-2] = -1 = 1$ units

$\therefore$ they do not lie on a straight line. Ans

37.(i) $a_4 = 1800$
$a_8 = 2600$

$a_1 + 3d = 1800$
(−) $a_1 + 7d = 2600$
 − − −

$+4d = +800$
$d = 200$

$a + 3(200) = 1800$
$a + 600 = 1800$
$\boxed{a = 1200}$

(ii) $a_{12} = ?$
$a_1 + 11d$
$1200 + 11(200)$
$1200 + 2200$
$\boxed{3400}$ Ans

(iii) $S_{10} = ?$

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

$5[\cancel{20} + 9(200)]$ (1200)

$5[2400 + 1800]$

$5[4200] = \boxed{21000}$ Ans

OR $S_n = 31200$

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

$31200 = \frac{n}{2}[2400 + (n-1)(200)]$

$62400 = n[2400 + 200n - 200]$

$62400 = 2400n + 200n^2 - 200n$

$62400 = 200n^2 + 2200n$

$0 = 200n^2 + 2200n - 62400$

$0 = 200(n^2 + 11n - 312)$

$0 = n^2 + 11n - 312$

$n^2 + 24n - 13n - 312$

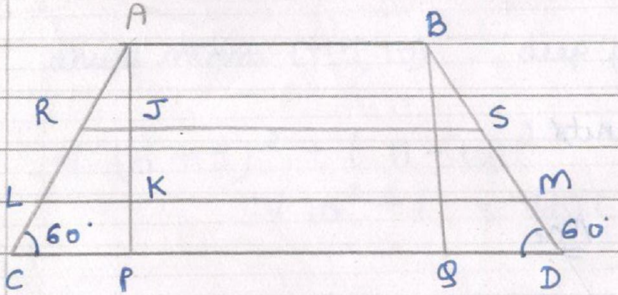
$n(n+24) - 13(n+24)$

$13, -\underbrace{24}$

rejected

Ans - $\boxed{\text{13 years}}$

38.



(i) In ΔAPC, $\sin 60° = \frac{1.8}{AC}$

$\frac{\sqrt{3}}{2} = \frac{18}{10AC}$

$5\sqrt{3}AC = 18$

2.07 (approx.) m

(ii) $AR = ?$

In ΔACP,

$\tan 60° = \frac{AP}{PC}$

$\sqrt{3} = \frac{1.8}{PC}$

$PC = 1.04$

Now, in ΔARJ & ΔACP,

$\angle A = \angle A$ (common)

$\angle J = \angle P$ (each 90°)

$\Delta ARJ \sim \Delta ACP$ (AA)

$\frac{AR}{2.07} = \frac{0.6}{1.8}$ (corres sides of ~ Δs)

$3AR = 2.07$

$AR = \boxed{0.69\ m}$ Ans

(iii) In ΔALK,

$\tan 60° = \frac{1.2}{KL}$

$\sqrt{3} = \frac{1.2}{KL}$

$KL = \frac{1.2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{1.2 \times 1.73}{3}$

$\frac{2.076}{3} = 0.692$

$LM = (0.692 \times 2) + 0.5$

$1.384 + 0.5$

$\boxed{1.884\ m}$

OR

In ΔARJ,

$\tan 60° = \frac{0.6}{RJ}$

$\sqrt{3} = \frac{0.6}{RJ}$ $\quad RJ = \frac{0.6}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$\frac{0.6\sqrt{3}}{3}$

$= 0.2 \times 1.73$

0.346

$RS = (2 \times 0.346) + 0.5$

$\boxed{1.192\ m}$ Ans

SOLUTIONS FOR UTS-17

CBSE SAMPLE PAPERS

(Umang Test Series)

<u>**A TEAM EFFORT FROM**</u>

O.P. GUPTA

SACHIN PANDEY

VISHAL MINOCHA

Section A

Ans 01. (a) 24 and 24

Ans 02. (b) 33

Ans 03. (b) $K(x^2+2x-15)$

Ans 04. (d) K = no value

Ans 05. (d) 1

Ans 06. (d) RHS

Ans 07. (a) 4/3

Ans 08. (b) −1

Ans 09. (b) 3 Units

Ans 10. (b) 8 units

Ans 11. (a) 462 sq. cm

Ans 12. (a) real and unequal

Ans 13. (b) 13 cm

Ans 14. (c) 3 median − 2 mean

Ans 15. (b) 4 units

Ans 16. (b) 60°

Ans 17. (a) $\frac{3}{8}$

Ans 18. (a) terminate after 3 decimal places.

Ans 19. (b) Both A and R are true and R is not the Correct explanation of A.

Ans 20. (b) Both A and R are true and R is not the Correct Explanation of A.

25

Section B

Ans 21. let $\frac{2x}{3} + \frac{3y}{2} = 5 \rightarrow (1)$

$$\Rightarrow \frac{2x \times 2 + 3y \times 3}{6} = 5$$

$$\Rightarrow \frac{4x + 9y}{6} = 5$$

$$\Rightarrow 4x + 9y = 30 \longrightarrow (1)$$

also, $\frac{3x}{2} + \frac{2y}{3} = \frac{35}{6} \longrightarrow (2)$

$$\Rightarrow \frac{3x \times 3 + 2y \times 2}{6} = \frac{35}{6}$$

$$\Rightarrow \frac{9x + 4y}{6} = \frac{35}{6}$$

$$\Rightarrow 9x + 4y = \frac{35}{\cancel{6}} \times \cancel{6}$$

$$\Rightarrow 9x + 4y = 35 \longrightarrow (2)$$

multiply eq (1) by 4 and eq (2) by 9 we get,

$$\Rightarrow (4x + 9y = 30) \times 4 \quad , (9x + 4y = 35) \times 9$$

$$\Rightarrow 16x + 36y = 120 \; (3) \quad , \quad 81x + 36y = 315 \; (4)$$

On subtracting eq (3) from (4) we get,

$$\begin{array}{r} 81x + 36y = 315 \\ (-) \; 16x \underset{(-)}{+} 36y \underset{(-)}{=} 120 \\ \hline 65x + 0y = 195 \end{array}$$

$$65x = 195$$

$$x = \frac{195}{65} = 3 \rightarrow \boxed{x = 3}$$

using $x=3$ in eq(1)

$\Rightarrow \quad 4(3)+9y=30$

$\Rightarrow \quad 12+9y=30$

$\Rightarrow \quad 9y=30-12$

$\Rightarrow \quad 9y=18$

$\Rightarrow \quad y=\frac{18}{9}=2$

$\Rightarrow \quad \boxed{y=2}$

<u>Ans</u>: $x=3, y=2$

<u>Ans 22.</u> In ΔPOQ, $DE \parallel OQ$

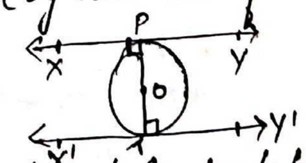
Hence, $\frac{PE}{EQ}=\frac{PD}{DO}$ (By BPT) $\rightarrow (1)$

Now, In ΔPOR, $\frac{PD}{DO}=\frac{PF}{FR}$ (by BPT) $\rightarrow (2)$

On comparing eq (1) and (2)

we get, $\frac{PE}{EQ}=\frac{PF}{FR}$

$\rightarrow$ This implies that, $EF \parallel QR$. (by converse of BPT)



<u>Ans 23.</u> To prove :- $XY \parallel X'Y'$

Proof - we know that

$\angle OPX = 90° \rightarrow (1)$ (angle at contact point is 90°)

and $\angle OTY' = 90° \rightarrow (2)$ (" " " " ")

from eq (1) and (2)

$\because \angle OPX = \angle OTY'$ (alternate angles)

$\therefore XY \parallel X'Y'$ (alternate angles are equal)

$\hookrightarrow$ Hence proved.

Ans 24. Angle made by minute hand in 1 minute = 6°

Angle made by minute hand in 25 minute $= 25 \times 6^\circ$

$= 150^\circ$

Area swept $= \dfrac{\theta}{360^\circ} \pi r^2$

$= \dfrac{\cancel{150}^{5}}{\cancel{360}_{\cancel{18}\,3}} \times \dfrac{\cancel{22}^{11}}{\cancel{7}} \times \cancel{14}^{2} \times 14 = \dfrac{770}{3}$ sq. cm.

OR

24. Let radius of smaller circle be r

A/q

$\pi (r+3)^2 = 154$

$\dfrac{22}{7}(r+3)^2 = 154$

$(r+3)^2 = \dfrac{\cancel{154}^{7} \times 7}{\cancel{22}} \Rightarrow r+3 = 7$

$r = 4 \quad R = 4+3 = 7$

Now Area of shaded part

$\pi (R^2 - r^2) = \pi (R+r)(R-r)$

$= \dfrac{22}{7}(7+4)(7-4) = \dfrac{22 \times 11 \times 3}{7} = \dfrac{726}{7}$ cm^2

Ans. 25. $3 \sin^2\alpha + 7 \cos^2\alpha = 4$

$3 \sin^2\alpha + 7(1 - \sin^2\alpha) = 4$

$3 \sin^2\alpha + 7 - 7\sin^2\alpha = 4 \Rightarrow \tan\alpha = \tan 60^\circ = \sqrt{3}$

$+4 \sin^2\alpha = +3$

$\sin^2\alpha = 3/4$

$\sin\alpha = \dfrac{\sqrt{3}}{2} \Rightarrow \alpha = 60^\circ$

OR

$x = a\sin\alpha \quad y = a\cos\alpha$

$x^2 + y^2 = a^2\sin^2\alpha + a^2\cos^2\alpha$

$= a^2(\sin^2\alpha + \cos^2\alpha) = a^2 \times 1 = a^2$

(8)

Section C

Ans 26. Let $\sqrt{2}$ is rational

$\Rightarrow \sqrt{2} = p/q$ (p & q are co-prime & $q \neq 0$)

Squaring both side.

$2 = \frac{p^2}{q^2} \Rightarrow 2q^2 = p^2$ — ①

$\Rightarrow$ 2 divides p^2

$\Rightarrow$ 2 divides p

Let $p = 2r$

Keeping this in ①

$2q^2 = (2r)^2$

$\Rightarrow 2q^2 = 4r^2 \Rightarrow 2r^2 = q^2$

$\Rightarrow$ 2 divides q^2

$\Rightarrow$ 2 divides q

It means p & q has common factor 2 which is against our assomption. that p & q are co-prime.

Hence $\sqrt{2}$ is irrational.

Ans 27. $\alpha + \beta = -b/a = -\frac{(-5)}{3} = 5/3 \quad \alpha\beta = \frac{c}{a} = \frac{2}{3}$

Now

$\alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta = \left(\frac{5}{3}\right)^2 - 2 \times \frac{2}{3} = \frac{25}{9} - \frac{4}{3}$

$= \frac{13}{9}$

Ans. 28. Let digit at unit place be x & the digit at ten's place be y.

Number $= 10y + x$

I case

$x + y = 9$ — ①

II case

$10x + y = 10y + x + 9$

$9x - 9y = 9$

$x - y = 1$ — ②

Adding ① & ②

$2x = 10 \quad y = 4$

$x = 5$

Number $= 10 \times 4 + 5 = 45$

(a) 5

OR

Let the cost of 1 bag = ₹x

& the cost of 1 pen = ₹ y

A/q I case

$$3x + 4y = 257 \quad (1)$$
$$4x + 3y = 324 \quad (2)$$

Adding (1) & (2)

$$7x + 7y = 581$$
$$\Rightarrow x + y = 83 \quad - (3)$$

subtracting (1) from (2)

$$x - y = 67 \quad - (4)$$

Adding (3) & (4)

$$2x = 150 \qquad y = ₹\, 8$$
$$x = ₹\, 75$$

Now cost of 1 bag and 10 pens

$$75 \times 1 + 8 \times 10 = 75 + 80 = ₹\,155$$

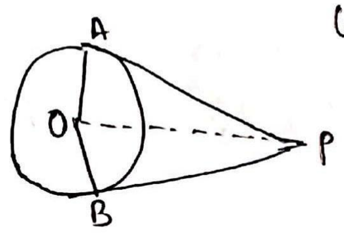
Ans- 29. L.H.S $\sqrt{\dfrac{1-\sin\theta}{1+\sin\theta} \times \dfrac{1-\sin\theta}{1-\sin\theta}} = \sqrt{\dfrac{(1-\sin\theta)^2}{1-\sin^2\theta}}$

$$= \sqrt{\frac{(1-\sin\theta)^2}{\cos^2\theta}} = \frac{1-\sin\theta}{\cos\theta} = \frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}$$

$$= \sec\theta - \tan\theta$$

LHS = RHS.

Ans. 30.



Given: PA & PB are tangent from same external point

To Prove: $PA = PB$

Const. Join OA OB & OP

Proof: $OA \perp AP$ (radius is $\perp^r$ to the point of contact)

$OB \perp BP$

In rt $\triangle OAP$ & $\triangle OBP$

$OA = OB$ (radius)

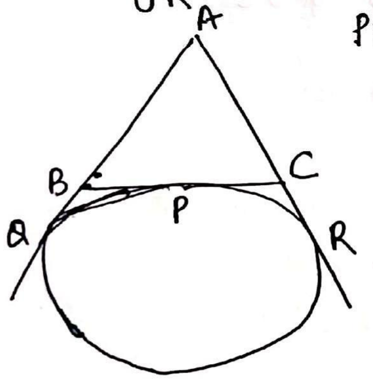
$OP = OP$ (common)

$\angle OAP = \angle OBP = 90^\circ$

$\triangle OAP \cong \triangle OBP$ (RHS)

$\Rightarrow AP = PB$ (CPCT)

OR



Proof:- $AQ = AR$
$BQ = BP$
$CP = CR$
} length of tangent from external point

Perimeter of $\triangle ABC = AB + BC + CA$

$= AB + (BP + CP) + CA$

$= AB + BQ + CR + CA$

$= AQ + AR$

$= AQ + AQ = 2AQ$

$AQ = \frac{1}{2}$ (Perimeter of $\triangle ABC$)

Ans. 31. Total no. of cases $= 6 \times 6 = 36$.

(i) Sum of numbers obtained $= 6$

favourable cases: (1,5) (5,1) (2,4) (4,2) (3,3)

$P(E) = \frac{\text{No. of fav. cases}}{\text{Total no. cases.}}$ | P(sum of no. obtained 6) $= \frac{5}{36}$

(ii) fav. cases obtained more than 6

(1,6) (6,1) (2,5) (2,6) (5,2) (6,2) (3,4) (4,3) (3,5) (5,3)
(3,6) (6,3) (4,4) (4,5) (4,6) (6,4) (5,5) (5,6) (6,5) (6,6)
(5,4)

No. of cases = 21

P (sum. of no. more than 6) = $\frac{\cancel{21}}{\cancel{36}}$ $\frac{7}{12}$

(iii) cases for sum less than 6

(1,1) (1,2) (1,3) (1,4) (2,1) (3,1) (4,1)
(2,2) (2,3) (3,2)

No. of cases = 10

P (sum obtained less than 6) = $\frac{\cancel{10}}{\cancel{36}}$ = 5/18

Section D.

32. Refer to Page 11 (Umang Test Series) Q.33

In the given fig

$\frac{AD}{DB} = \frac{AE}{EC}$ (BPT)

$\frac{1.5}{3} = \frac{1}{EC}$ ⇒ EC = 2 cm.

33. Let $\frac{x-2}{x+2} = t$

$t^2 + 6 = 5t$

$t^2 - 5t + 6 = 0$

$t^2 - 3t - 2t + 6 = 0$

$t(t-3) - 2(t-3) = 0$

$(t-3)(t-2) = 0$

$t = 3 \quad t = 2$

Now

$\frac{x-2}{x+2} = 3$

$x - 2 = 3x + 6$

$-2x = 8$

$x = -4$

Also

$\frac{x-2}{x+2} = 2$

$x - 2 = 2x + 4$

$-x = 6$

$x = -6$

OR

Ans 33 Let larger pipe take x hour to fill the pool then smaller pipe will take $(x+10)$ hrs

Now A/q to case

$$\frac{4}{x} + \frac{9}{x+10} = \frac{1}{2}$$

$$\frac{4x+40+9x}{x(x+10)} = \frac{1}{2} \Rightarrow 26x + 80 = x^2+10x$$

$$\Rightarrow x^2-16x-80 = 0$$

$$x^2-20x+4x-80 = 0$$

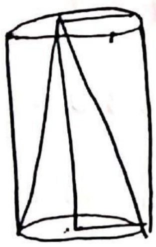
$$x(x-20)+4(x-20) = 0$$

$$(x-20)(x+4) = 0$$

$$x = 20 \quad x \neq -4$$

larger pipe takes 20 hour & smaller pipe takes 30 hours.

Ans 34



diameter $= 1.4$ cm $\quad h = 2.4$ cm

radius $= \frac{1.4}{2} = 0.7$ cm $= \frac{7}{10}$

Slant height $(l) = \sqrt{r^2+h^2}$

$$= \sqrt{(0.7)^2+(2.4)^2} = \sqrt{6.25}$$

$$= 2.5 \text{ cm}$$

T.S.A of remaining solid

= CSA of cyl. part + CSA of conical part + Area of cyl. base.

$$= 2\pi rh + \pi rl + \pi r^2$$

$$= \pi r(2h+l+r) = \frac{22}{7} \times \frac{7}{10} \{2 \times 2.4 + 2.5 + 0.7)$$

$$= 17.60 \text{ cm}^2$$

Now volume of the remaining solid

= Volume of cylinder − volume of cone

$= \pi r^2 h - \frac{1}{3}\pi r^2 h$

$= \pi r^2 h \{1 - \frac{1}{3}) = \frac{2}{3}\pi r^2 h$

$= \frac{2}{\cancel{3}} \times \frac{22}{\cancel{7}} \times \frac{\cancel{7}^{1}}{10} \times \frac{7}{10} \times \frac{\cancel{24}^{8}}{10} = 2.464\ cm^3$

OR

$r + h = 37\ m$

TSA of cylinder = 1628 sq. m

$2\pi r(r+h) = 1628\ m^2$

$2\pi r \times 37 = 1628\ m^2$

$r = \frac{1628 \times 7}{2 \times 22 \times 37} = 7\ m \quad h = 30\ m$

Area of base $= \pi r^2 = \frac{22}{\cancel{7}} \times \cancel{7} \times 7 = 154\ m^2$

volume $= \pi r^2 h = \frac{22}{\cancel{7}} \times \cancel{7} \times 7 \times 30 = 4620\ m^3$

Ans. 35. First converting into continuous interval

C.I	F	C.F
-0.5-9.5	5	5
9.5-19.5	7	12
19.5-29.5	20	32
29.5-39.5	15	47
39.5-49.5	10	57
49.5-59.5	5	62

$N = \Sigma f_i = 62$

$N/2 = \frac{62}{2} = 31$

Median class 19.5−29.5

Median $= l + \left\{\frac{N/2 - cf}{f}\right\} \times h$

$= 19.5 + \left(\frac{31 - 12}{20}\right) \times 10$

$= 19.5 + \frac{19}{2\cancel{0}} \times 1\cancel{0}$

$= 19.5 + 9.5 = 29$

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(12)

Case study I

(i) Taking C as origin, the co-ordinates of P are (-12,-2)

(ii) Taking D as origin, the co-ordinates of Q are (-13,2)

(iii) P(4,6) R(6,5) Q(3,2)

$D = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$PQ = \sqrt{(4-6)^2+(6-5)^2} = \sqrt{5}$ units

$RQ = \sqrt{(6-3)^2+(5-2)^2} = \sqrt{18}$ units

$QP = \sqrt{(3-4)^2+(2-6)^2} = \sqrt{17}$ units

$PQ \neq RQ \neq QP$

Hence ΔPQR is scalene.

Ans 37. Here AP will be 20, 19, 18 ......

$a = 20 \quad d = -1$

$S_n = 200$

$\frac{n}{2}[2a+(n-1)d] = 200$

$\frac{n}{2}[2\times 20+(n-1)-1] = 200$

$\frac{n}{2}[40-n+1] = 200$

$\Rightarrow n^2 - 41n + 400 = 0$

$n^2 - 16n - 25n + 400 = 0$

$n(n-16) - 25(n-16) = 0$

$n = 16 \quad n = 25$

$a_{25} = a + 24d = 20 + 24 \times -1$

$= 20 - 24 = -4$ (Not possible)

$n = 16$

(i) No. of rows 16

Middle rows 8^{th} & 9^{th}

$a_8 = a + 7d = 20 + 7(-1) = 13$

$a_9 = a + 8d = 20 + 8(-1) = 12$

(ii) last row has

$a_{16} = a + 15d = 20 + 15(-1) = 20 - 15 = 5$

Now logs can be put

$4 + 3 + 2 + 1 = 10$ logs.

(iii) Row logs can be put into 16 rows.

OR.

Top row has 5 logs.

38. (i) In rt ACB

$\frac{AC}{AB} = \sin 60^\circ$

$\frac{30}{AB} = \frac{\sqrt{3}}{2} \Rightarrow AB = \frac{60}{\sqrt{3}} = 20\sqrt{3}$ m

(ii) In rt ACD

$\frac{AC}{CD} = \tan 45^\circ$

$\frac{30}{CD} = 1 \Rightarrow CD = 30$ m

(iii) In rt ACE

$\frac{AC}{CE} = \tan 30^\circ$

$\frac{30}{CE} = \frac{1}{\sqrt{3}} \Rightarrow CE = 30\sqrt{3}$ m

$DE = CE - CD = 30\sqrt{3} - 30$

$= 30(\sqrt{3} - 1)$ m

OR

$BD = BC + CD$

$= (10\sqrt{3} + 30)$ m.

$\frac{AC}{BC} = \tan 60^\circ$

$\frac{30}{BC} = \sqrt{3} \Rightarrow BC = \frac{30}{\sqrt{3}} = 10\sqrt{3}$ m

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Uts

Section A

1. (b)
2. (c)
3. (b)
4. (a)
5. (c)
6. (b)
7. (c)
8. (c)
9. (d)
10. (b)
11. (b)
12. (c)
13. (c)
14. (d)
15. (c)
16. (c)
17. (d)
18. (c)
19. (d)
20. (b)

Section B

21. $2x - 5y = 7$

$4x + ky = 21$

For no solution,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

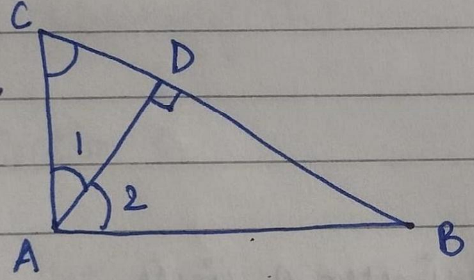
I $\quad \frac{a_1}{a_2} = \frac{b_1}{b_2}$

$$\frac{2}{4} = \frac{-5}{k}$$

$$2k = -20$$

$$\underline{k = -10}$$

22.



$\angle 1 + \angle C = 90^\circ$

$\angle 1 + \angle 2 = 90^\circ$

$\therefore \cancel{\angle 1} + \angle C = \cancel{\angle 1} + \angle 2$

$\angle C = \angle 2$

In $\triangle CDA$ and $\triangle ADB$,

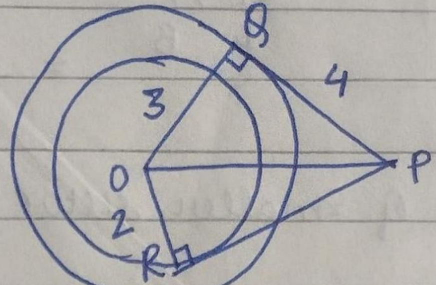
$\angle D = \angle D$ (90°)

$\angle A = \angle A$ (common)

$\therefore \triangle CDA \sim \triangle ADB$ (by AA)

$\rightarrow \underline{\triangle DBA \sim \triangle DCA}$

23.



$\angle OQP = 90^\circ$ (radius $\perp$ tangent)

$\angle ORP = 90^\circ$ (radius $\perp$ tangent)

$\therefore$ In $\triangle OQP$, $OQ^2 + QP^2 = OP^2$

$3^2 + 4^2 = OP^2$

$9 + 16 = OP^2$

$25 = OP^2$

$OP = 5$ cm

In $\triangle ORP$, $OR^2 + PR^2 = OP^2$

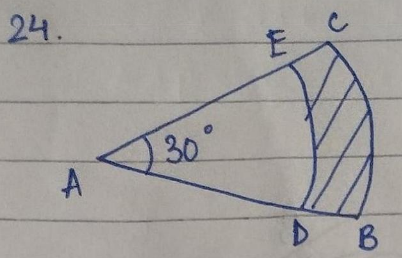
$2^2 + PR^2 = 5^2$

$4 + PR^2 = 25$

$PR^2 = 21$

$PR = \underline{\sqrt{21}\text{ cm}}$

24.



Area of bigger sector $= \frac{\theta}{360} \times \pi r^2$

$= \frac{30}{360} \times \frac{22}{7} \times 14 \times 14$

$= \frac{11 \times 14}{3} = \frac{154}{3}$ cm^3

Area of smaller sector $= \frac{\theta}{360} \times \pi r^2$

$= \frac{30}{360} \times \frac{22}{7} \times 10.5 \times 10.5 = \frac{11 \times 21}{8} = \frac{231}{8}$

Area of shaded region = Area of bigger sector − area of small sec

$= \frac{154}{3} - \frac{231}{8} = \frac{1232 - 693}{24} = \frac{539}{24}$ cm^3

OR. Area of circle = 616 cm^2

$\pi R^2 = 616$

$R^2 = \frac{616 \times 7}{22} = 28 \times 7$

$R = \sqrt{28 \times 7} = 14$

Length of an arc of each part = $\frac{\text{perimeter of circle}}{8}$

$\frac{2\pi R}{8} = \frac{2 \times 22 \times 14}{7 \times 8} = 11$ m

Perimeter of each sector = 2R + length of an arc

$= 28 + 11 = \underline{39 \text{ m}}$

25. $3\sin^2\theta + 7\cos^2\theta = 4$

$3\sin^2\theta + 3\cos^2\theta + 4\cos^2\theta = 4$

$3(1) + 4\cos^2\theta = 4$

$4\cos^2\theta = 1$

$\cos^2\theta = \frac{1}{4}$

$\cos\theta = \frac{1}{2}$

$\cos\theta = \cos 60°$

$\theta = 60°$

$\tan\theta = ?$

$\underline{\tan 60° = \sqrt{3}}$

$\therefore \tan\theta = \sqrt{3}$

25. OR $\sin(A+B) = \sin A \cos B + \cos A \sin B$

Let $A = 45^\circ$, $B = 30^\circ$

$\sin(45+30) = \sin 75^\circ$

$\sin 45^\circ + \cos 30^\circ + \cos 45^\circ \sin 30^\circ$

$$\frac{1}{\sqrt{2}} \times \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{2}$$

$$\frac{\sqrt{3}}{2\sqrt{2}} + \frac{1}{2\sqrt{2}} = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

$$\frac{\sqrt{3}+1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{6}+\sqrt{2}}{4}$$

Section C

26. Let $5+2\sqrt{3}$ be a rational number. $5+2\sqrt{3} = \frac{p}{q}$

Where ★ q & p are int. ★ p & q are coprime ★ $q \neq 0$

$$5+2\sqrt{3} = \frac{p}{q}$$

$$2\sqrt{3} = \frac{p}{q} - 5$$

$$\sqrt{3} = \frac{p}{2q} - 5$$

LHS ≠ RHS

∴ Our assumption is wrong

We have a contradiction

Hence, $5+2\sqrt{3}$ is not rational.

⇒ $5+2\sqrt{3}$ is irrational.

27. $3x^2 + 2x + k$

$\alpha + \beta = \frac{-b}{a} = \frac{-(-2)}{3} = \frac{2}{3}$

$\alpha\beta = \frac{c}{a} = \frac{k}{3}$

$\alpha^2 + \beta^2 = 6$

$(\alpha+\beta)^2 - 2\alpha\beta = 6$

$\left(\frac{2}{3}\right)^2 - 2\left(\frac{k}{3}\right) = 6$

$\frac{4}{9} - \frac{2k}{3} = 6$

$\frac{4 - 6k}{9} = 6$

$4 - 6k = 54$

$-6k = 50$

$k = -\frac{50}{6}$

$k = -\frac{25}{3}$

28. Let units digit be x

Let tens digit be y

$\therefore$ Number $= 10y + x$

Given, $10y + x + 10x + y = 110$

$11x + 11y = 110$

$x + y = 10 \quad -(1)$

$x - y = 6 \quad -(2)$

$x + y = 10$

$x - y = 6$

$2x = 16$

$x = 8$

Putting value of x in (1)

$x + y = 10$

$8 + y = 10$

$y = 2$

No $= 10x + y = 10(8) + 2$

$= 80 + 2 = 82$

Rev. no $= 10y + x$

$= 10(2) + 8 = 20 + 8 = 28$

$\therefore$ Nos = 82, 28

28. OR Let numerator be x
Let denominator by y
Then fraction will be $\frac{x}{y}$

I $\frac{(x+2)}{y} = \frac{1}{2}$

$2x+4 = y$
$2x - y = -4$ — (i)

II $\frac{x}{(y-1)} = \frac{1}{3}$

$3x = y-1$
$3x - y = -1$ — (ii)

$2x - y = -4$
$3x - y = -1$
$- \quad + \quad +$

$-x = -3$
$x = 3$

$2x - y = -4$
$2(3) - y = -4$
$6 - y = -4$
$-y = -10$
$y = 10$

fraction $= \frac{x}{y} = \frac{3}{10}$

29. $\tan^2\theta - \sin^2\theta = \tan^2\theta \cdot \sin^2\theta$

LHS: $\tan^2\theta - \sin^2\theta$

$= \frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta$

$= \frac{\sin^2\theta(1-\cos^2\theta)}{\cos^2\theta}$

$= \sin^2\theta \times \frac{\sin^2\theta}{\cos^2\theta}$

$= \sin^2\theta \times \tan^2\theta$

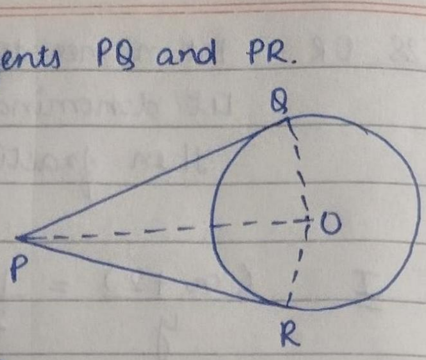
$=$ RHS

Hence, Proved.

30. Given: Circle with centre O. Tangents PQ and PR.

To prove: $PQ = PR$

Const: Join OQ, OR, PO



Proof: In ΔPOR and ΔPOQ

$PO = PO$ (common)

$OQ = OR$ (radii)

$\angle ORP = \angle OQP = 90^\circ$ (radius $\perp$ tangent)

$\Delta POR \cong \Delta POQ$ (by RHS)

$\therefore PR = PQ$ (cpct)

OR. Given: Circle with centre O.

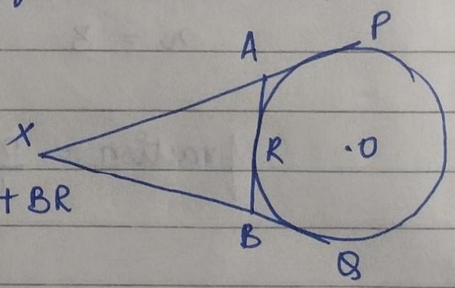
To prove: $XA + AR = XB + BR$

Proof: $XP = XQ$ (tangents from ext. pt are eq.)

$AP = AR$, $BQ = BR$

$XP = XA + AP$ —(1)

$XQ = XB + BQ$ —(2)



$\Rightarrow XP = XA + AR$, $XQ = XB + BR$

$\therefore XA + AR = XB + BR$

31. P(same numbers) = (1,1) (2,2) (3,3) (4,4) (5,5) (6,6)

No. of favourable outcomes = 6, Total = 36

(i) P(same nos.) $= \dfrac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}} = \dfrac{6}{36} = \dfrac{1}{6}$

(ii) P(product 12) = (2,6) (3,4) (4,3) (6,2)

No. of favourable outcomes = 4

P(product as 12) $= \dfrac{\text{No. of favourable outcomes}}{\text{Total no. of outcomes}} = \dfrac{4}{36} = \dfrac{1}{9}$

(iii) P(diff. as 1) = (1,2) (2,1) (3,4) (4,3) (4,5) (5,4) (3,2) (2,3) (5,6) (6,5)

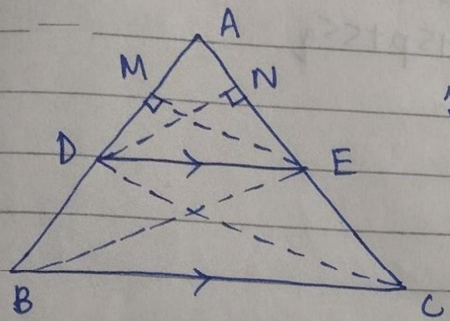
No. of favourable outcomes = 10

P(diff. as 1) $= \dfrac{10}{36} = \dfrac{5}{18}$

Section D

32. Basic Proportionality Theorem (BPT)

STATEMENT: If a line is drawn parallel to one side of a triangle then it divides the other two sides in the same ratio.



Given: $\triangle ABC$, $DE \parallel BC$

To prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Const: $EM \perp AD$, $DN \perp AE$

Join B to E, C to D

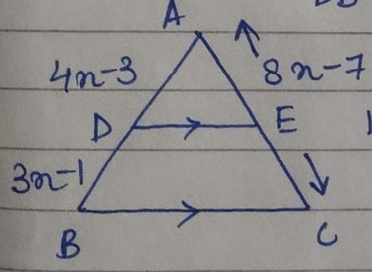
Proof: $\frac{ar(\triangle ADE)}{ar(BDE\triangle)} = \frac{\cancel{\frac{1}{2}} \times AD \times \cancel{EM}}{\cancel{\frac{1}{2}} \times BD \times \cancel{EM}} = \frac{AD}{BD}$ — (1)

$\frac{ar(\triangle ADE)}{ar(\triangle CDE)} = \frac{\cancel{\frac{1}{2}} \times AE \times \cancel{DN}}{\cancel{\frac{1}{2}} \times CE \times \cancel{DN}} = \frac{AE}{CE}$ — (2)

$ar(\triangle BDE) = ar(\triangle CDE)$ [$\angle$s on same parallels] — (3)

$\therefore$ From (1), (2), and (3)

$\frac{AD}{DB} = \frac{AE}{EC}$



$EC = AC - AE$

$= 13x - 10 - (8x - 7)$

$= 13x - 10 - 8x + 7 = 5x - 3$

$\frac{4x-3}{3x-1} = \frac{8x-7}{5x-3}$ $\left[\frac{AD}{DB} = \frac{AE}{EC}\right]$

$(4x-3)(5x-3) = (3x-1)(8x-7)$

$20x - 12x - 15x + 9 = 24x - 21x - 8x + 7$

$-7x + 9 = -5x + 7$

$-2x = -2$

$\underline{x = 1}$

33. $x^2 - 2(a^2+b^2)x + (a^2-b^2)^2 = 0$

$x^2 - 2(a^2+b^2)x + [(a+b)(a-b)]^2 = 0$

$x^2 - 2a^2 - 2b^2 x + (a+b)^2 (a-b)^2 = 0$

$x^2 - (a+b)^2 x - (a-b)^2 x + (a+b)^2 (a-b)^2 = 0$

$x[x-(a+b)^2] - [a-b]^2 [x + (a+b)^2] = 0$

$[x-(a+b)^2][x-(a-b)^2] = 0$

$\Rightarrow \quad x = (a+b)^2$ or $x = (a-b)^2$

OR. Let Rohan's present age be x years

His mother's age $= (x+26)$ yrs

Rohan's age after 3 years $= (x+3)$ yrs

Mother's age after 3 years $= (x+26+3) = (x+29)$ yrs

Product of ages 3 yrs later $= (x+3)(x+29) = 360$

$\Rightarrow x^2 + 29x + 3x + 87 = 360$

$\Rightarrow x^2 + 32x - 273 = 0$

$x^2 + 39x - 7x - 273 = 0$

$x(x+39) - 7(x+39) = 0$

$(x+39)(x-7)$

$x = -39$ (rejected) $\quad x = 7$

$\therefore$ Rohan's age $= x = 7$ years

His mother's age $= x + 26 = 7 + 26 = 33$ years

Q 34 OR

$V = 41\frac{19}{21}\ cm^3$

$Vol\ cyl + V_{hemi} = \frac{880}{21}$

$\pi r^2 r + \frac{2}{3}\pi r^3 = \frac{880}{21}$

$\frac{22}{7} \times r^3 \left(1 + \frac{2}{3}\right) = \frac{880}{21}$

$\frac{22}{7} \times r^3 \times \frac{5}{3} = \frac{880}{21}$

$r^3 = \frac{880}{22 \times 5}$

$r^3 = 8$

$r = 2$

$h = 2r = 4\ m$ (ht. of the building)

(34)

Outer CSA − Inner CSA = 44

$2\pi Rh - 2\pi rh = 44$

$2 \times \frac{22}{7} \times 14 (R - r) = 44$

$R - r = \frac{44 \times \cancel{7}}{2 \times 22 \times \cancel{14}_{2}}$

$R - r = \frac{1}{2}$ — (i)

Outer V − inner V = 99

$\pi R^2 h - \pi r^2 h = 99$

$\frac{22}{\cancel{7}} \overset{2}{\cancel{14}} (R^2 - r^2) = 99$

$(R + r)(R - r) = \frac{\overset{9}{\cancel{99}}}{\underset{4}{\cancel{44}}}$

$(R + r)\left(\frac{1}{\cancel{2}}\right) = \frac{9}{\cancel{4}_{2}}$

$R + r = \frac{9}{2}$ — (ii)

$R - \cancel{r} = 0.5$

$R + \cancel{r} = 4.5$

$2R = 5$

$R = \frac{5}{2} = 2.5\ cm$

$r = 4.5 - 2.5 = 2\ cm$

35.

Class (CI)	freq	x_i	$f_i x_i$
0-10	5	5	25
10-20	7	15	105
20-30	13	25	325
30-40	4	35	140
40-50	p	45	45p
50-60	q	55	55q
	50		595 + 45p + 55q

$595 + 45p + 55q = f_i x_i$

$$29 + p + q = 50$$
$$p + q = 21$$
$$q = 21 - p$$

$$\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

$$32.8 = \frac{595 + 45p + 55q}{50} = \frac{\cancel{5}(119 + 9p + 11q)}{\cancel{50}\,10}$$

$$328 = 119 + 9p + 11q$$
$$209 = 9p + 11(21 - p)$$
$$209 = 9p + 231 - 11p$$
$$209 - 231 = 9p - 11p$$
$$-22 = -2p$$
$$11 = p$$
$$q = 21 - 11 = 10$$

$\underline{p = 11,\ q = 10}$

Section E

36. $L(6,-6)$ $M(3,-7)$ $N(3,3)$

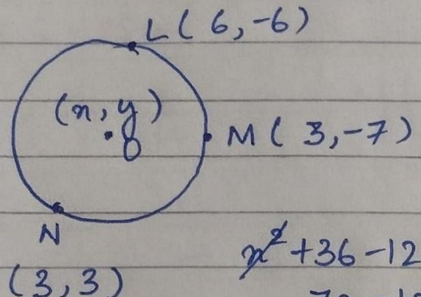
(i) $LM = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(3-6)^2+(-7+6)^2}$

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

$= \sqrt{9+1} = \sqrt{10}$ units

(iii)



$OL = OM$

$OL^2 = OM^2$

$(x-6)^2+(y+6)^2 = (x-3)^2+(y+7)^2$

$\cancel{x^2}+36-12x+\cancel{y^2}+36+12y = \cancel{x^2}+9-6x+\cancel{y^2}+49+14y$

$72-12x+12y = 58-6x+14y$

$14-6x-2y = 0$

$-3x-y = -7 \Rightarrow 3x+y = 7$

$OM^2 = ON^2$

$\cancel{(x-3)^2}+(y+7)^2 = \cancel{(x-3)^2}+(y-3)^2$

$\cancel{y^2}+49+14y = \cancel{y^2}+9-6y$

$20y = -40$

$y = -2$

$3x+y = 7$

$3x-2 = 7$

$3x = 9$

$x = 3$

$\therefore$ Coordinates of the centre $= (x,y) = (3,-2)$

(ii) $ON = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

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

$= \sqrt{25} = 5$ units (radius of circle)

(iii) OR $\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$ centroid of ΔLMN

$= \left(\frac{6+3+3}{3}, \frac{-6-7+3}{3}\right) = \left(\frac{12}{3}, \frac{-10}{3}\right) = \left(4, \frac{-10}{3}\right)$

37. $1, 2, 3 \ldots\ldots x-1, x, x+1 \ldots 49$

(iii) $S_{x-1} = S_{49} - S_x$

$S_{x-1} + S_x = S_{49}$

$$\frac{(x-1)(\cancel{x-1}+\cancel{1})}{2} + \frac{x(x+1)}{2} = \frac{49 \times 50}{2}$$

$$\frac{x^2 - \cancel{x} + x^2 + \cancel{x}}{2} = \frac{49 \times 50}{2}$$

$$\frac{\cancel{2}x^2}{\cancel{2}} = 49 \times 25$$

$$x^2 = 49 \times 25$$

$$x = \sqrt{49 \times 25}$$

$$x = 7 \times 5 = \underline{35}$$

(i) Sum of all house no. preceding $x = S_{34}$

$S_{34} = \frac{34 \times 35}{2} = 595$ (S_n of n natural no's $= \frac{n(n+1)}{2}$)

(ii) Total no of houses $= 49$

middle most house $= \frac{n+1}{2} = \frac{49+1}{2} = 25$

(iii) $x = 35$

OR AP of multiples of $2 = 2, 4, 6, 8 \ldots 48$, $n = \frac{48}{2} = 24$

AP of multiples of $3 = 3, 6, 9, 12 \ldots 48$, $n = \frac{48}{3} = 16$

$S_{24} = \frac{24}{2}(2+48) = 12(50) = 600$

$S_{16} = \frac{16}{2}(3+48) = 8(51) = 408$

$S_8 = \frac{8}{2}(6+48) = 4(54) = 216$

{ AP of multiples of $6 = 6, 12 \ldots 48$ }

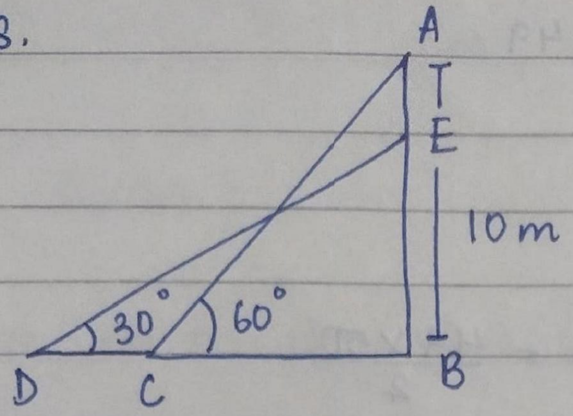
$S = S_{24} + S_{16} = S_8$ { because 6 is a common multiple of 2 and 3 }

$S = 600 + 408 - 216$

$= 1008 - 216 = 792$

$\therefore$ Sum of house numbers which are a multiple of 2 or 3 is 792.

38.



AB is wall = 10 m

(i) In Δ ABC, $\sin 60° = \frac{AB}{AC}$

$$\frac{\sqrt{3}}{2} = \frac{10}{AC}$$

$$\sqrt{3} AC = 20$$

$$AC = \frac{20}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{20\sqrt{3}}{3} = \frac{20 \times 1.73}{3} = 11.5 m$$

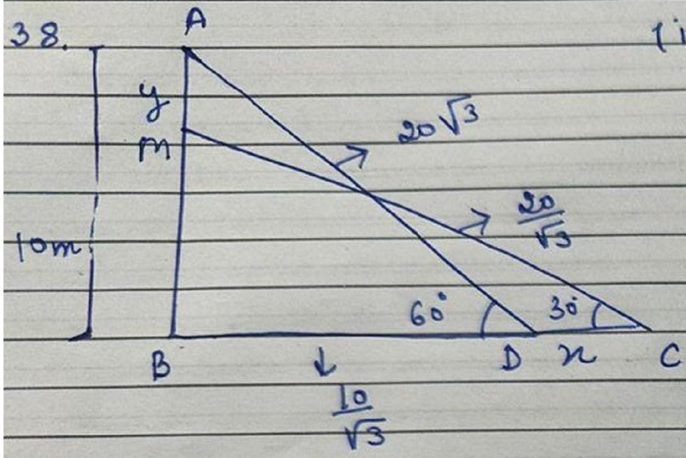
(ii) In Δ ABC, $\tan 60° = \frac{AB}{BC}$

$$\sqrt{3} = \frac{10}{BC}$$

$$\sqrt{3} \; BC = 10$$

$$BC = \frac{10\sqrt{3}}{3} = 5.7 m$$

38.



(iii) $AB = 10m$

In $\triangle ABD$,

$$\tan 60 = \frac{10}{BD}$$

$$\sqrt{3} = \frac{10}{BD}$$

$$BD = \frac{10}{\sqrt{3}}$$

In $\triangle ABD$,

$$\sin 60^\circ = \frac{AB}{AD}$$

$$\frac{\sqrt{3}}{2} = \frac{10}{AD}$$

$$AD = \frac{20}{\sqrt{3}}$$

Now, In $\triangle$ MBC

$$\cos 30^\circ = \frac{\frac{10}{\sqrt{3}} + \frac{x}{1}}{\frac{20}{\sqrt{3}}}$$

$$\frac{\sqrt{3}}{2} = \frac{\frac{10+\sqrt{3}x}{\cancel{\sqrt{3}}}}{\frac{20}{\cancel{\sqrt{3}}}}$$

$$\frac{\sqrt{3}}{2} = \frac{10+\sqrt{3}x}{\cancel{20}10}$$

$$10\sqrt{3} = 10 + \sqrt{3}x$$

$$\frac{10(\sqrt{3}-1)}{\sqrt{3}} = x$$

$$\boxed{x = 4.3 m}$$ Ans.

OR. (iii) In ΔCBM,

$$\sin 30 = \frac{BM}{CM}$$

$$\frac{1}{2} = \frac{BM}{\frac{1}{\frac{20}{\sqrt{3}}}}$$

$$\frac{1}{2} = \frac{\sqrt{3}\,BM}{\cancel{20}\ 10}$$

$$10 = \sqrt{3}\,BM$$

$$\frac{10}{\sqrt{3}} = BM$$

$$AB = AM + BM$$

$$10 = y + \frac{10}{\sqrt{3}}$$

$$10 - \frac{10}{\sqrt{3}} = y$$

$$\frac{10\sqrt{3} - 10}{\sqrt{3}} = y$$

$$\frac{10(\sqrt{3}-1)}{\sqrt{3}} = y$$

$$\boxed{y = 4.3\,m}$$ Ans

SOLUTIONS FOR UTS-19

CBSE SAMPLE PAPERS

(Umang Test Series)

<u>A TEAM EFFORT FROM</u>

O.P. GUPTA

SACHIN PANDEY

VISHAL MINOCHA

Section-A

Ans 1 -

3	255
5	85
17	17
	1

3 is a factor of 255.

5	255
51	51
	1

5 is a factor of 255.

17	255
5	15
3	3
	1

17 is a factor of 255.

Hence, 25 is not a factor of 255.

Ans ⇒ (b). 25

Ans 2 -

$$\text{class mark} = \frac{\text{upper limit} + \text{lower limit}}{2}$$

$$= \frac{19.5 + 29.5}{2} = \frac{49}{2} = 24.5$$

Ans ⇒ (c). 24.5

Ans 3 -

Let the radius of bigger circle (R) be 4cm and the radius of smaller circle (r) be 2cm.

Area = Area of bigger circle − Area of smaller circle

$= \pi R^2 - \pi r^2$

$= \pi [R^2 - r^2]$

$= \pi [(4)^2 - (2)^2]$

$= \pi [16 - 4]$

$= \pi [12]$

$= 12\pi$ sq. cm

Ans ⇒ a). 12π sq. cm

Ans4 - Mean = $\frac{\text{Sum of observation}}{\text{Total no. of observation}}$

$\Rightarrow \frac{3+5+5+7+7+7+9+9+9+9}{10}$

$\Rightarrow \frac{70}{10} = 7$

Number of favourable cases of 7 = 3

P(No. of favourable cases of 7) = $\frac{\text{No. of outcomes}}{\text{Total no. of outcomes}}$

$\Rightarrow \frac{3}{10} = 0.3$

Ans ⇒ b). 0.3

Ans 5 - $4x^2-1$

Zeroes of $4x^2-1$

$\Rightarrow 4x^2-1=0$

$\Rightarrow 4x^2=1$

$\Rightarrow x^2 = \frac{1}{4}$

$\Rightarrow x = \pm\sqrt{\frac{1}{4}}$

$\Rightarrow x = \pm\frac{1}{2}$

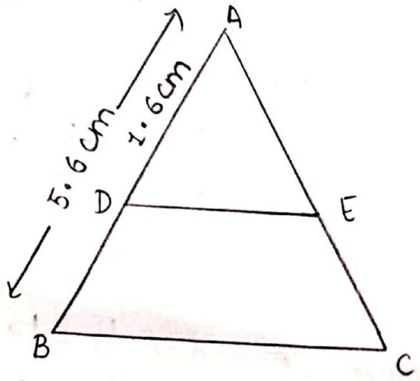
Zeroes are $\frac{1}{2}$ and $-\frac{1}{2}$

Ans ⇒ b). $\frac{1}{2}, -\frac{1}{2}$

Ans6 - Given : DE ∥ BC

AB = 5.6cm

AD = 1.6cm



$\frac{AD}{DB} = \frac{AE}{EC}$

AB − AD = DB

5.6 − 1.6 = DB

4.0 = DB

DB = 4cm

$\frac{AD}{DB} = \frac{AE}{EC}$

$\Rightarrow \frac{1.6}{4.0} = \frac{AE}{EC}$

$\Rightarrow \frac{2}{5} = \frac{AE}{EC}$

$\Rightarrow AE : EC = 2 : 5$

Ans $\Rightarrow$ d). 2 : 5

Ans 7 - Given : central angle = $90°$
radius = 7cm

Perimeter of sector = $2r + \frac{2\pi r \theta}{360}$

$= 2 \times 7 + \frac{2 \times \frac{22}{7} \times 7 \times 90}{360}$

$= 14 + 11 = 25$

Ans $\Rightarrow$ b). 25cm

Ans 8 - $2x + 3y = 6 \rightarrow$ Equation of pair of dependent linear equations.
Second equation will be $\Rightarrow 4x + 6y = 12$
$\Rightarrow 2x + 3y = 6$

Ans $\Rightarrow$ c). $4x + 6y = 12$

Ans 9 - a). tangent

Ans 10 - $\cos 9\theta = \frac{1}{\sqrt{2}}$

$\cos 9\theta = \cos 45°$

$9\theta = 45°$

$\theta = \frac{45}{9}$

$\theta = 5°$

To find : $\tan 6\theta = \tan 6 \times 5°$

$= \tan 30°$

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

Ans $\Rightarrow$ b). $\frac{1}{\sqrt{3}}$

Ans 11- $\sqrt{25} \times \sqrt{4} = \sqrt{100} = 10$

Ans ⇒ b). $\sqrt{25}, \sqrt{4}$

Ans 12- Given: PA & PB (tangents to the circle)

$\angle OAB = 25°$

To find: $\angle APB$

Proof: PA = PB (given)

$\angle 2 = \angle 3$ (Isoceles property)

$\angle 2 + \angle 4 = 90°$

(Radis is perpendicular to point of contact)

$\angle 1 + \angle 2 + \angle 3 = 180°$ (angle sum property)

$\angle 1 + \angle 2 + \angle 2 = 180°$

$\angle 1 + 2\angle 2 = 180°$

$\angle 1 + \angle 2\,(90 - \angle 4) = 180°$

$\angle 1 + 180° - 2\angle 4 = 180°$

$\angle 1 - 2\angle 4 = 180° - 180°$

$\angle 1 = 2\angle 4$

$\angle APB = 2\angle OAB)$

$\angle APB = 50°$

Ans ⇒ b). 50°

Ans 13-

$$\frac{1 + \tan^2\beta}{1 + \cot^2\beta} = \frac{1 + \frac{\sin^2\beta}{\cos^2\beta}}{1 + \frac{\cos^2\beta}{\sin^2\beta}} = \frac{\frac{\cos^2\beta + \sin^2\beta}{\cos^2\beta}}{\frac{\sin^2\beta + \cos^2\beta}{\sin^2\beta}}$$

$$= \frac{\frac{1}{\cos^2\beta}}{\frac{1}{\sin^2\beta}} = \frac{\sin^2\beta}{\cos^2\beta} = \tan^2\beta$$

Ans ⇒ a). $\tan^2\beta$

Ans 14 - Perimeter of one triangle be $(P_1) = 25\text{cm}$

Perimeter of other triangle be $(P_2) = 15\text{cm}$

Ratio of perimeter of similar triangle is equal to corresponding sides of triangle.

$$\frac{P_1}{P_2} = \frac{a_1}{a_2} \Rightarrow \frac{25}{15} = \frac{a_1}{a_2}$$

$$\frac{a_1}{a_2} = \frac{25}{15}$$

$$\Rightarrow \frac{9}{a_2} = \frac{5}{3}$$

$$\Rightarrow 27 = 5a_2$$

$$\Rightarrow a_2 = 5.4 \text{ cm}$$

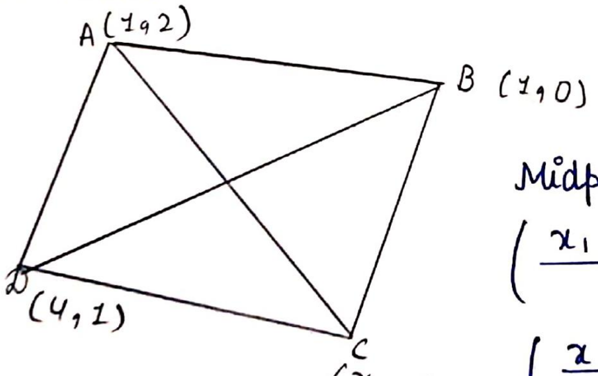
Ans $\Rightarrow$ b). 5.4cm

Ans 15 - $\frac{21}{2^4 . 5^7} = \frac{21}{1250000} = 0.0000168$

Ans $\Rightarrow$ c). 0.0000168

Ans 16 - c). Cubic

Ans 17 -



Let c coordinates be (x, y).

Midpoint of AC = Midpoint of BD

$$\left(\frac{x_1 + x_2}{2}\right) = \left(\frac{y_1 + y_2}{2}\right)$$

$$\left(\frac{x+1}{2}, \frac{y+2}{2}\right) = \left(\frac{4+1}{2}, \frac{1+0}{2}\right)$$

$$\left(\frac{x+1}{2}, \frac{y+2}{2} = \frac{5}{2}, \frac{1}{2}\right)$$

Now,

$$\frac{x+1}{\cancel{2}} = \frac{5}{\cancel{2}}$$

$$x = 5 - 1$$

$$x = 4$$

Scanned by CamScanner

$$\frac{y+2}{\cancel{x}} = \frac{1}{\cancel{x}}$$

$y = 1-2$

$y = -1$

Ans 18- $\sec\theta - \tan\theta = k$ (given)

To find : $\sec\theta + \tan\theta$

$\sec\theta - \tan\theta = k$

we know, $\sec^2\theta - \tan^2\theta = 1$

$(\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$k(\sec\theta + \tan\theta) = 1$

$$\sec\theta + \tan\theta = \frac{1}{k}$$

Ans ⇒ c). $\frac{1}{k}$

ct

Ans 19- Ans ⇒ c). A is true but R is false.

Ans 20- Ans ⇒ a). Both A and R is true and R is the correct explaination of A.

Section-B

Ans 21- $21x + 47y = 110$ — ①

$47x + 21y = 162$ — ②

Adding eq ① + ②

$68x + 68y = 272$

$x + y = 4$ — ③

Substracting eq ① + ②

$26x - 26y = 52$

$x - y = 2$ — ④

By elimination method eq ③ + ④

$2x = 6$

$x = 3$

putting $x = 3$ in eq ③

$x + y = 4$

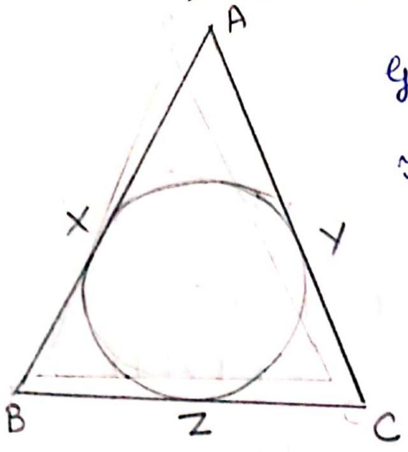
$3 + y = 4$

$y = 4-3$

$y = 1$

Hence, the value of x and y is 3 and 1.

Ans 22-



Given: ABC is an isosceles triangle

$AB = AC$

To prove: BC is bisected at a point of contact

Proof:

$AX = AY$
$BX = BZ$
$CY = CZ$

[tangent from same external points are equal.]

It is given ABC is an isosceles triangle,

$\Rightarrow AB - AX = AC - AY$

$\Rightarrow BX = CY$

$\Rightarrow BZ = CZ$

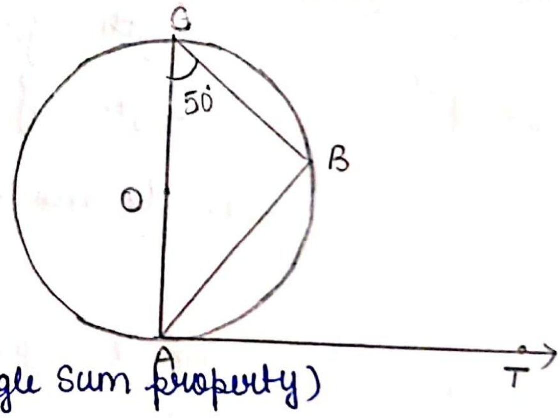
Therefore, $BZ = CZ$. Hence, BC is bisected at point of contact.

Ans 23-

Given: $\angle ACB = 50^\circ$

AOC = diameter of circle

To prove: $\angle BAT$



Proof: $\angle CBA = 90^\circ$

(Angle of semi-circle is right angle).

$\angle CAB + \angle CBA + \angle ACB = 180^\circ$ (Angle Sum property)

$\angle CAB + 90^\circ + 50^\circ = 180^\circ$

$\angle CAB + 140^\circ = 180^\circ$

$\angle CAB = 40^\circ$

$OA \perp OT$ [Radius is perpendicular to tangent at point of contact]

So, $\angle CAB + \angle BAT = 90^\circ$

$40^\circ + \angle BAT = 90^\circ$

$\angle BAT = 50^\circ$

Therefore, $\angle BAT = 50^\circ$.

Ans24. (II Part) 'Or'

Radius of semi-circle = 7cm

circumference of semi-circle = $\pi r + 2r$

$= \frac{22}{7} \times 7 + 2(7)$

$= 22 + 14$

$= 36cm$

Hence, the perimeter of semicircle is 36cm.

Ans-24 (I part)

length of minute hand(R) = 14cm

length of hour hand(r) = 7cm.

Angle made by minute hand in 90 minutes.

$= 90 \times 6^\circ = 540^\circ$

Angle made by hour hand in 90 minutes

$= \frac{3}{\cancel{2}} \times \overset{15}{\cancel{30}}^\circ = 45^\circ$

Distance travelled by minute hand

$= \frac{\theta}{360^\circ} 2\pi R = \frac{54\cancel{0}}{36\cancel{0}} \times 2 \times \frac{22}{\cancel{7}} \times \overset{2}{\cancel{14}} = 132cm$

Distance travelled by hour hand

$= \frac{\theta}{360^\circ} 2\pi r = \frac{45^\circ}{360^\circ} \times 2 \times \frac{22}{\cancel{7}} \times \cancel{7} = 5.5cm$

total distance $= 132 + 5.5 = 137.5cm$.

Ans. 25 (I) $\sin X = \frac{199}{201}$

$$\Rightarrow (\tan^2 X + \cot^2 X) - (\sec^2 X + \operatorname{cosec}^2 X)$$

$$\Rightarrow \left(\frac{\sin^2 X}{\cos^2 X} + \frac{\cos^2 X}{\sin^2 X}\right) - \left(\frac{1}{\cos^2 X} + \frac{1}{\sin^2 X}\right)$$

$$\Rightarrow \left(\frac{\sin^4 X + \cos^4 X}{\sin^2 X \cos^2 X}\right) - \left(\frac{\sin^2 X + \cos^2 X}{\sin^2 X \cos^2 X}\right)$$

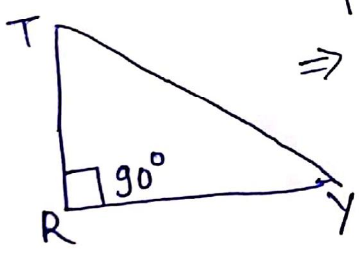
$$= \left(\frac{(\sin^2 X + \cos^2 X)^2 - 2\sin^2 X \cos^2 X}{\sin^2 X \cos^2 X}\right) - \left(\frac{1}{\sin^2 X \cos^2 X}\right)$$

$$= \frac{1 - 2\sin^2 X \cos^2 X}{\sin^2 X \cos^2 X} - \frac{1}{\sin^2 X \cos^2 X}$$

$$= \frac{\cancel{1} - 2\sin^2 X \cos^2 X - \cancel{1}}{\sin^2 X \cos^2 X} = \frac{-2\,\cancel{\sin^2 X \cos^2 X}}{\cancel{\sin^2 X \cos^2 X}}$$

$$= -2$$

OR II



$TR = RY$

$\Rightarrow \angle T = 45^\circ \quad \angle Y = 45^\circ$

$\angle R = 90^\circ$

Now $\cos T + \cos R + \cos Y$

$\cos 45^\circ + \cos 90^\circ + \cos 45^\circ$

$\frac{1}{\sqrt{2}} + 0 + \frac{1}{\sqrt{2}}$

$= \frac{2}{\sqrt{2}} = \sqrt{2}$

Section - C

Ans 26 - Let $\sqrt{3}$ is irrational.

$\sqrt{3} = \frac{a}{b}$ (where a and b are co-prime & $b \neq 0$)

squaring both sides,

$(\sqrt{3})^2 = \left(\frac{a}{b}\right)^2$

$3 = \frac{a^2}{b^2}$

$3b^2 = a^2$

$\therefore$ 3 divides a^2

$\therefore$ 3 divides a

$3b^2 = (3\lambda)^2$ (where λ is some integer)

$3b^2 = 9\lambda^2$

$b^2 = 3\lambda^2$

$\Rightarrow$ 3 divides b^2

$\therefore$ 3 divides b

It means a & b has 3 as a common factor which is against our assumption that a & b are co-prime

hence $\sqrt{3}$ is irrational.

Let $\sqrt{3} - 5 = \frac{a}{b}$ (where a and b are co-prime & $b \neq 0$)

$\sqrt{3} = \frac{a}{b} + 5$

$\sqrt{3} = \frac{a+5b}{b}$

Hence, $\frac{a+5b}{b}$ is rational but $\sqrt{3}$ is irrational which means our assumption is wrong.

Ans27- $4x^2 - 7x + 3$ $(a = 4,\ b = -7,\ c = 3)$

$\Rightarrow 4x^2 - 4x - 3x + 3$

$\Rightarrow 4x(x-1) - 3(x-1)$

$\Rightarrow (4x-3)(x-1)$

$x = \frac{3}{4}$, $x = 1$

Verifying relationship

Sum of zeroes $= \frac{-b}{a}$

$\alpha + \beta = \frac{-b}{a}$

$\frac{3}{4} + 1 = \frac{-(-7)}{4}$

$\frac{3+4}{4} = \frac{7}{4}$

$\frac{7}{4} = \frac{7}{4}$

Product of zeroes $= \frac{c}{a}$

$\alpha\beta = \frac{c}{a}$

$\frac{3}{4} \times 1 = \frac{3}{4}$

$\frac{3}{4} = \frac{3}{4}$

Hence Verified

Ans 28- For infinite solution,

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$2x - 3y = 7$

$(a+b)x - (a+b-3)y = 4a+b$

$$\frac{2}{a+b} = \frac{-3}{-(a+b-3)} = \frac{-7}{-(4a+b)}$$

$$\frac{2}{a+b} = \frac{3}{(a+b-3)} = \frac{7}{(4a+b)}$$

Now,

$$\frac{2}{a+b} = \frac{3}{(a+b-3)}$$

$2a + 2b - 6 = 3a + 3b$

$\Rightarrow -a - b = 6$

$\Rightarrow a + b = -6$ — (1)

$$\frac{2}{a+b} = \frac{7}{4a+b}$$

$\Rightarrow 8a + 2b = 7a + 7b$

$\Rightarrow a - 5b = 0$ — (2)

By elimination method, both the equation

$b = -1$

putting $b = -1$ in eq (1)

$a + b = -6$

$a - 1 = -6$

$a = -5$

Hence, the value of a and b is -5 & -1.

'Or'

Let the numerator be x

Let the denominator be y.

A/q I^st condition

$$\Rightarrow \frac{x-2}{y} = \frac{1}{3}$$

$\Rightarrow 3x - 6 = y$

$\Rightarrow 3x - y = 6$ — (1)

A/q II^nd condition

$$\frac{x}{y-1} = \frac{1}{2}$$

$$2x = y - 1$$

$$2x - y = -1 \quad \text{— (2)}$$

By elimination method,
we get, $x = 7$

putting $x = 7$ in eq (1)

$$3x - y = 6$$
$$3(7) - y = 6$$
$$21 - y = 6$$
$$-y = 6 - 21$$
$$-y = -15$$
$$y = 15$$

Therefore, fraction is $\frac{7}{15}$.

Ans 29 -

$$\frac{\cos A}{1-\sin A} + \frac{\sin A}{1-\cos A} + 1 = \frac{\sin A \cos A}{(1-\sin A)(1-\cos A)}$$

$$LHS = \frac{\cos A}{1-\sin A} + \frac{\sin A}{1-\cos A} + 1$$

$$\Rightarrow \frac{\cos A(1-\cos A) + \sin A(1-\sin A) + (1-\sin A)(1-\cos A)}{(1-\sin A)(1-\cos A)}$$

$$\Rightarrow \frac{\cos A - \cos^2 A + \sin A - \sin^2 A + 1 - \cos A - \sin A + \sin A \cos A}{(1-\sin A)(1-\cos A)}$$

$$\Rightarrow \frac{-(\cos^2 A + \sin^2 A) + 1 + \sin A \cos A}{(1-\sin A)(1-\cos A)}$$

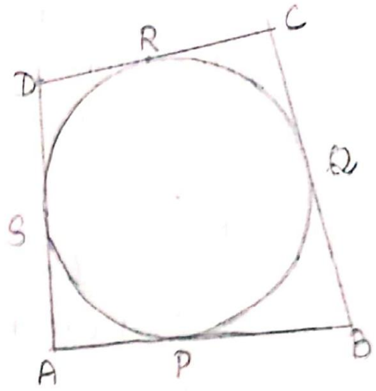
$$\Rightarrow \frac{-(1) + 1 + \sin A \cos A}{(1-\sin A)(1-\cos A)} = \frac{-1 + 1 + \sin A \cos A}{(1-\sin A)(1-\cos A)}$$

$$\Rightarrow \frac{\sin A \cos A}{(1-\sin A)(1-\cos A)}$$

LHS = RHS

Hence Proved

Ans 30 - Given: ABCD is a quadrilateral



To prove: $AB + CD = BC + AD$

Proof:

$AP = AS$
$BP = BQ$
$CR = CQ$
$DR = DS$

[tangent from same external point are equal]

Adding,

$$AP + BP + CR + DR = AS + DS + BQ + CQ$$
$$AB + CD = AD + BC$$

Hence, Proved.

Ans 31 - i. Total number of red coloured card = 26

Total number of card = 52

$$P(\text{red colored}) = \frac{\text{No. of outcomes}}{\text{Total no. of outcomes}} = \frac{26}{52} = \frac{1}{2}$$

ii. Total number of jack card = 4

Total number of card = 52

$$P(\text{jack}) = \frac{\text{No. of outcomes}}{\text{Total no. of outcomes}} = \frac{4}{52} = \frac{1}{13}$$

iii. Total number of red or jack card = 28

Total number of card = 52

$$P(\text{red or jack}) = \frac{\text{No. of outcomes}}{\text{Total no. of outcomes}} = \frac{28}{52} = \frac{7}{13}$$

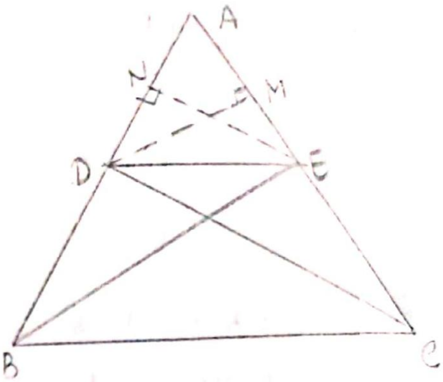
Section-D

Ans 32-

Given: ΔABC, $DE \parallel BC$

To prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Draw $DM \perp AC$ and $EN \perp AB$.



Proof:

$$\frac{\text{area}(\Delta ADE)}{\text{area}(\Delta DBE)} = \frac{1/2 \times AD \times EN}{1/2 \times DB \times EN} = \frac{AD}{DB} \quad \text{--- (1)}$$

$$\frac{\text{area}(\Delta AED)}{\text{area}(\Delta ECD)} = \frac{1/2 \times AE \times DM}{1/2 \times EC \times DM} = \frac{AE}{EC} \quad \text{--- (2)}$$

$\text{area}(\Delta DBE) = \text{area}(\Delta ECD)$ [triangles are lying in the same base and same parallel line].

$$\frac{\text{area}(\Delta ADE)}{\text{area}(\Delta DBE)} = \frac{\text{area}(\Delta AED)}{\text{area}(\Delta ECD)}$$

From eq (1) + (2)

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Hence Proved

$DE \parallel BC$

$\Rightarrow \Delta ADE \sim \Delta ABC$

$\frac{AD}{DB} = \frac{3}{4}$ (given)

Adding 1 both sides

$\frac{AD}{DB} = \frac{3}{4} \Rightarrow \frac{DB}{AD} = \frac{4}{3}$

$\frac{DB}{AD} + 1 = \frac{4}{3} + 1$

$\frac{DB + AD}{AD} = \frac{7}{3}$

$\frac{AB}{AD} = 7/3 \Rightarrow \frac{AD}{AB} = \frac{3}{7}$

Now

$\frac{AD}{AB} = \frac{DE}{BC} \Rightarrow \frac{DE}{BC} = \frac{3}{7}$

Ans 33 - Let the speed of second train be x km/hr.

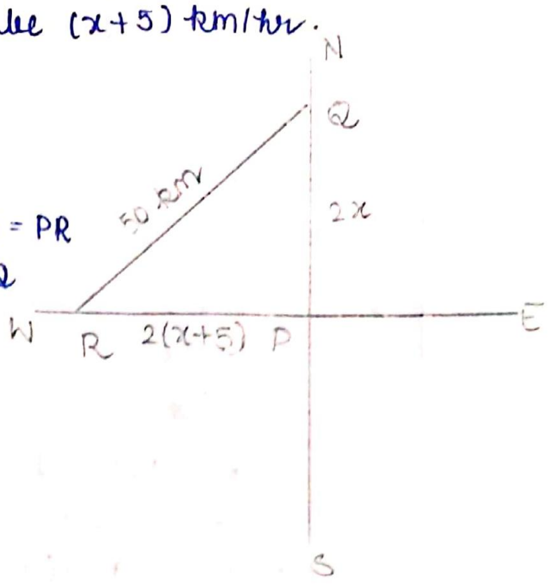
Let the speed of first train will be $(x+5)$ km/hr.

Let point P be origin

Speed × Time = Distance

Distance of first train $= 2(x+5) = PR$

Distance of second train $= 2x = PQ$



In ΔQRP

$$H^2 = P^2 + B^2$$
$$QR^2 = QP^2 + PR^2$$
$$(50)^2 = (2x)^2 + (2x+10)^2$$
$$2500 = 4x^2 + 4x^2 + 100 + 4x$$

Dividing equation be 4.

$$x^2 + x^2 + 25 + 10x = 625$$
$$2x^2 + 10x - 600 = 0$$
$$x^2 + 5x - 300 = 0$$
$$x^2 + 20x - 15x - 300 = 0$$
$$x(x+20) - 15(x+20) = 0$$
$$(x-15)(x+20) = 0$$
$$x = 15, \quad x \neq -20$$

Hence, the actual speed of second train = 15 km/hr.

and the speed of first train $= (x+5)$ km/hr
$= (15+5)$ km/hr
$= 20$ km/hr.

'Or'

Let the time taken by the faster pipe to fill the cistern be x min.

Let the time taken by the slower pipe be $(x+3)$ minutes.

The portion of cistern filled by the pipe in 1 minute is $\frac{1}{x}$.

The portion of cistern filled by the faster pipe in $\frac{40}{13}$ minutes is $\frac{40}{13x}$.

The portion of cistern filled by the slower pipe in $\frac{40}{13}$ minutes is $\frac{40}{13(x+3)}$

As the cistern is filled fully in $\frac{40}{13}$ minutes.

then,

$$\Rightarrow \frac{40}{13x} + \frac{40}{13(x+3)} = 1$$

$$\Rightarrow \frac{1}{x} + \frac{1}{x+3} = \frac{13}{40}$$

$$\Rightarrow \frac{x+3+x}{x^2+3x} = \frac{13}{40}$$

$$\Rightarrow \frac{2x+3}{x^2+3x} = \frac{13}{40}$$

$$\Rightarrow 40(2x+3) = 13(x^2+3x)$$

$$\Rightarrow 13x^2 - 41x - 120 = 0$$

$$\Rightarrow 13x^2 - 65x + 24x - 120 = 0$$

$$\Rightarrow 13x(x-5) + 24(x-5) = 0$$

$$(13x+24)(x-5) = 0$$

$$x = -\frac{24}{13}, \quad x = 5$$

$\therefore$ x can not be a negative

Therefore, the faster pipe will fill the cistern in 5 minutes and the slower pipe will fill the cistern in 8 minutes.

Ans 34- Diameter of sphere (d) = 12 cm

Radius of sphere (r) = 6 cm

Water level in the vessel rises by $3\frac{5}{9}$ hours = $\frac{32}{9}$ hours

Volume of sphere = volume of water rise in cylindrical vessel

$$\frac{4}{3}\pi \times (r)^3 = \pi r^2 h$$

$$\frac{4}{3} \times \pi \times (6)^3 = \pi \times r^2 \times \frac{32}{9}$$

$$288 = \frac{32r^2}{9}$$

$$2592 = 32r^2$$

$$\frac{2592}{32} = r^2$$

$$r^2 = 81$$

$$r = 9$$

Hence, the diameter of the cylindrical vessel = 18 cm

'Or'

Ans ⇒ Diameter (d) of the graphite cylinder = 1mm = $\frac{1}{10}$ cm

Radius (r) of cylinder = $\frac{1}{20}$ cm

Length of the graphite cylinder = 10cm

Volume of the graphite cylinder = $\pi r^2 h$

$= \left(\frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 10\right) cm^3$

Weight of graphite = volume x specific gravity

$= \left(\frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 10 \times 2.1\right)$ gm

$= 0.165$ gm

Diameter of pencil = 7mm = $\frac{7}{10}$ cm

Radius (R) of pencil = $\frac{7}{20}$ cm

length of pencil = 10cm

Volume of pencil = $\left(\frac{22}{7} \times \frac{7}{20} \times \frac{7}{20} \times 10\right) cm^3$

Volume of wood = $\left(\frac{22}{7} \times \frac{7}{10} \times \frac{7}{10} \times 10 - \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 10\right) cm^3$

Volume of wood = $\frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times 10 (7 \times 7 - 1) cm^3$

$= \left(\frac{11}{7} \times \frac{1}{20} \times 48\right) cm^3$

Weight of wood = $\left(\frac{11}{7} \times \frac{1}{20} \times 48 \times 0.7\right)$ gm

$= 2.64$ gm

Total weight = $(2.64 + 0.165)$ gm = 2.805 gm

Ans 35.

C.I	f_i	x_i	f_ix_i
10 - 30	90	20	1800
30 - 50	f_1	40	$40f_1$
50 - 70	30	60	1800
70 - 90	f_2	80	$80f_2$
90 - 110	40	100	4000

Total frequency = 200

$f_1 + f_2 = 40$ — ①

Mean = 50

$$\text{Mean} = \frac{\Sigma f_ix_i}{\Sigma f_i}$$

$$50 = \frac{7600 + 40f_1 + 80f_2}{200}$$

$\Rightarrow 40f_1 + 80f_2 = 2400$

$\Rightarrow f_1 + 2f_2 = 60$ — ②

By elimination method,

$f_2 = 20$

putting $f_2 = 20$ in eq ①

$f_1 + f_2 = 40$

$f_1 + 20 = 40$

$f_1 = 20$

Therefore, the value of f_1 and f_2 is 20 & 20

Section- E

Ans 36- i). AP ⇒ 4, 8, 12 - - - - - 27

$a = 4 \quad d = 4$

Middlemost flag is 14^{th} flag

For placing fourteenth flag and return her inital position = 26 + 26 = 52 m

(iii). Here $S_{13} = \frac{13}{2}[2\times4 + (13-1)4]$

$= \frac{13}{2}(8+48) = \frac{13}{2}\times 56 = 364$

Distance travelled to fix 13 flag to the left of A = 364 m

Similarly distance travelled to fix remaining 13 to right of A = 364 m

Total distance = 364+364 = 728 m.

OR

Total steps she needed to cover 728 m will be $728 \times 3 = 2184$ steps

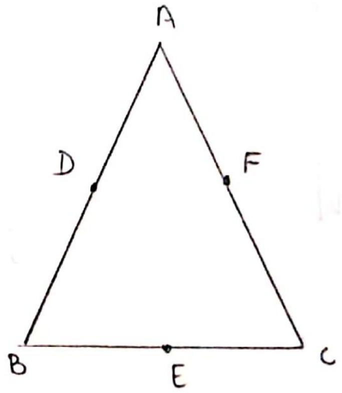
(ii) She completed the task in 6 minutes

Total distance travelled = 728 m

$T = \frac{D}{S} \Rightarrow S = \frac{D}{T} = \frac{728}{6} = 2.02$ m/s

Her speed will be 2.02 m/s

Ans 37- Coordinates :



A(3, 2) B(5, 6) C(8, 1)

$D \Rightarrow \left[\frac{3+5}{2}, \frac{2+6}{2}\right]$

$\Rightarrow \left(\frac{8}{2}, \frac{8}{2}\right) = (4, 4)$

$F \Rightarrow \left[\frac{3+8}{2}, \frac{2+1}{2}\right]$

$\Rightarrow \left(\frac{11}{2}, \frac{3}{2}\right)$

$E \Rightarrow \left[\frac{5+8}{2}, \frac{6+1}{2}\right]$

$\Rightarrow \left(\frac{13}{2}, \frac{7}{2}\right)$

i). $AD = \sqrt{(x_2 + x_1)^2 + (y_2 + y_1)^2}$

$= \sqrt{(4-3)^2 + (4-2)^2}$

$= \sqrt{1 + 4} = \sqrt{5}$

ii). $EF = \sqrt{\left(\frac{13}{2} - \frac{11}{2}\right)^2 + \left(\frac{7}{2} - \frac{3}{2}\right)^2}$

$= \sqrt{\left(\frac{2}{2}\right)^2 + \left(\frac{4}{2}\right)^2}$

$= \sqrt{(1)^2 + (2)^2} = \sqrt{1+4}$

$= \sqrt{5}$

iii) $D = (4, 4)$

$E = \left(\frac{13}{2}, \frac{7}{2}\right)$

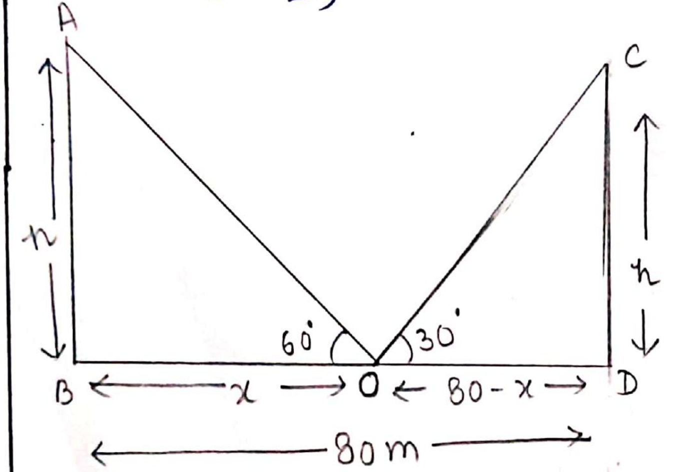
$F = \left(\frac{11}{2}, \frac{3}{2}\right)$

OR Points of Intersection of AE, BF & CD, will be centroid of $\triangle ABC$

$= \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right) = \left(\frac{3+5+8}{3}, \frac{2+6+1}{3}\right)$

$= \left(\frac{16}{3}, 3\right)$

Ans 38-



i). AB is closer. Because angle of elevation is high

ii). In $\triangle ABO$

$\frac{AB}{BO} = \tan 60°$

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

$h = \sqrt{3}x$

In $\triangle CDO$

$\frac{CD}{DO} = \tan 30°$

$\frac{h}{80-x} = \frac{1}{\sqrt{3}}$

Scanned by CamScanner

$$\sqrt{3}(x\sqrt{3}) = 80 - x$$
$$3x = 80 - x$$
$$4x = 80$$
$$x = 20$$

$BO = 20m$
$DO = 80 - 20$
$= 60\ m$

iii). Height of pole ⇒ $\tan 60^\circ = \dfrac{AB}{BO}$

$$\sqrt{3} = \frac{h}{x}$$
$$x\sqrt{3} = h$$
$$h = 20\sqrt{3}\ m$$

'OR'

Height of pole $= 20\sqrt{3}$ m
Distance of point $= 20$ m

$$\text{Ratio} = \frac{20\sqrt{3}}{20} = \frac{\sqrt{3}}{1} = \sqrt{3} : 1$$