BIHAR BOARD
SUBJECT : MATHEMATICS

SUBJECT CODE – 210 **PAPER CODE – C**
CLASS : X

HINTS & SOLUTIONS

SECTION – A

OBJECTIVE TYPE QUESTIONS

1. First 5 odd numbers are 1, 3, 5, 7, 9

Mean = $\frac{1+3+5+7+9}{5} = \frac{25}{5} = 5$.

2. $x + 2y = 3$ and $5x + ky = 15$

for infinite solution

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

$\frac{1}{5} = \frac{2}{k} = \frac{3}{15}$

so k = 10.

3. $\sqrt{\frac{64}{81}} = \frac{8}{9}$ is not irrational.

4. $x^2 = ax - b$

Zeroes of polynomial are equal but of opposite sign, let zeroes are α and $-\alpha$

so $\alpha + (-\alpha) = -\frac{a}{1}$

$-a = 0 \Rightarrow \quad a = 0$.

5. $\frac{6}{15} = \frac{2}{5} = 0.4$

so $\frac{6}{15}$ is terminating decimal expansion.

6. $x^2 - 9x + a$ product of zeroes = 9

$\frac{a}{1} = 8 \Rightarrow \quad a = 8$.

7. $d_1 = 30$ cm ; $d_2 = 40$ cm

side of rhombus = $\sqrt{\left(\frac{d_1}{2}\right)^2 + \left(\frac{d_2}{2}\right)^2} = \sqrt{(15)^2 + (20)^2} = \sqrt{225+400} = \sqrt{625} = 25$ cm.

8. cosec $(90 - \theta)$ sin $(90 - \theta)$

= secθ . cosθ = 1.

9. $x^2 + 3x + 2$

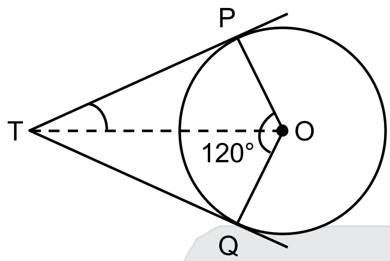
for zeroes : $x^2 + 2x + x + 2 = 0$

$x(x + 2) + 1(x + 2) = 0$

$(x + 1)(x + 2) = 0$

so zeroes are – 1 and – 2.

10.

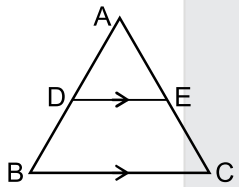


$\therefore \quad \angle POQ = 120°$

$\therefore \quad \angle PTQ = 180° - 120° = 60°.$

and $\angle OTP = \frac{1}{2}\angle PTQ = \frac{60°}{2} = 30°.$

11. In ΔABC,



DE || BC

$\frac{AD}{DB} = \frac{3}{5}$ and AE = 4 .8 cm

by BPT,

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

$\frac{3}{5} = \frac{4.8}{EC} \quad \Rightarrow \quad EC = 8$ cm.

12. On throwing a dice

prime numbers are 2, 3, 5 probability of getting a prime number = $\frac{3}{6} = \frac{1}{2}$.

13. Circumference = 462 cm

$2\pi r = 462$

$r = \frac{462 \times 7}{44} \Rightarrow r = 73.5$ cm.

14. If two linear equations in two variables have infinite solutions, then their graphs will be <u>two coincident lines.</u>

15. $kx^2 + 4x + 1 = 0$ for real and distinct roots

$D > 0$

$b^2 - 4ac > 0$

$16 - 4k > 0$

$k < 4.$

16. $\frac{1+\cot^2 A}{1+\tan^2 A} = \frac{\text{cosec}^2 A}{\sec^2 A} = \frac{\left(\frac{1}{\sin^2 A}\right)}{\left(\frac{1}{\cos^2 A}\right)} = \frac{\cos^2 A}{\sin^2 A} = \cot^2 A.$

17. If a line touches a circle at only one point, then it is known as tangent.

18. Let x = $3.\overline{27}$

$100x = 327.\overline{27}$

99x = 324

$x = \frac{324}{99} = \frac{36}{11}$

So $3.\overline{27}$ is a rational number.

19. $\cos A = \frac{1}{2}$

$1 - 2\cos^2 A = 1 - 2\left(\frac{1}{4}\right) = 1 - \frac{1}{2} = \frac{1}{2}.$

20. If all sides of a parallelogram touch a circle then the parallelogram will be a rhombus.

21. Ratio of side of two similar triangles = 3 : 5. ratio of their areas will be $(3)^2 : (5)^2 = 9 : 25$.

22. Volume of right circular cylinder = $\pi r^2 h$.

23. C.S.A of sphere = 144π cm^2

$4\pi r^2 = 144\pi$

r = 6 cm.

24. Cumulative frequency curve is known as ogive.

25. In ΔABC, $\angle A = 90°$, BC = 13 cm, AB = 12 cm by pythagoras theorem,

$(BC)^2 = (AB)^2 + (AC)^2$

$AC = \sqrt{BC^2 - AB^2} = \sqrt{(13)^2 - (12)^2} = \sqrt{169 - 144} = \sqrt{25} = 5.$

26. $a_6 = 13 \Rightarrow a + 5d = 13$ ....(i)

$a_{12} = 25 \Rightarrow a + 11d = 25$ ....(ii)

Equation (ii) – equation (i)

$\Rightarrow 6d = 12 \Rightarrow d = 2$

then a = 13 – 5(2) = 13 – 10

a = 3 or first term is 3.

27. cosec 45° = $\sqrt{2}$.

28. 15 cot A = 8

$\cot A = \frac{8}{15}$

$\text{cosec } A = \sqrt{1+\cot^2 A} = \sqrt{1+\frac{64}{225}} = \sqrt{\frac{289}{225}} = \frac{17}{15}.$

29. $\cos\theta = \sqrt{1-\sin^2\theta}$

30. $P(x) = x^2 - 2x - 6$

if α, β are the zeroes then $\alpha\beta = \frac{c}{a} = \frac{-6}{1} = -6$.

31. Maximum value of probability of an event is 1.

32. P + 1, 2P + 1, 4P – 1 are in A.P. {a, b, c in A.P. so 2b = a + b}

2(2P + 1) = (P + 1) + (4P – 1)

33. Areas of two circles are in ratio 4 : 1

$\frac{\pi r_1^2}{\pi r_2^2} = \frac{4}{1}$

$\frac{r_1}{r_2} = \frac{2}{1}$ or $r_1 : r_2 = 2 : 1$.

34. Probability of an impossible event is 0.

35. $\frac{\tan 65^\circ}{\cot 25^\circ} = \frac{\tan(90^\circ - 25^\circ)}{\cot 25^\circ} = \frac{\cot\ 25^\circ}{\cot 25^\circ} = 1$.

36. $\tan^2\theta - \sec^2\theta = -1$.

37. $x + 3y - 4 = 0$

$2x - 5y - 1 = 0$

here $\frac{a_1}{a_2} = \frac{1}{2}$; $\frac{b_1}{b_2} = \frac{-3}{5}$ and $\frac{c_1}{c_2} = \frac{4}{1}$.

$\because \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

so unique solution and the pair of linear equation is consistent.

38. Form of even integer is 2m.

39. Volume of cone = 1570 cm^3 and base area = 314 cm^2

$\frac{1}{3}\pi r^2 h = 1570$ and $\pi r^2 = 34$.

$\frac{1}{3} \times 314 \times h = 1570$

$h = \frac{1570 \times 3}{314} = 15$ cm.

40. Distance of P(2, 3) from origin is $\sqrt{(2)^2 + (3)^2} = \sqrt{13}$.

41. P(3, – 4) ; ordinate is – 4.

42. In ΔABC, A(2, 3), B(1, – 3) ; centroid is (3, 0).

$x = \frac{x_1 + x_2 + x_3}{3}$ and $y = \frac{y_1 + y_2 + y_3}{3}$

$3 = \frac{2 + 1 + x_3}{3}$ and $0 = \frac{3 - 3 + y_3}{3}$

$x_3 = 6$ and $y_3 = 0$

So $c(x_3, y_3) = c(6, 0)$.

43. A(– 2, 3) and B(4, 1)

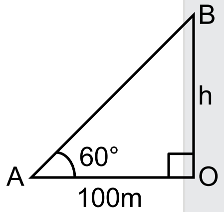
Let mid point of AB is C(x, y)

$x = \frac{-2 + 4}{2} = 1$ and $y = \frac{3 + 1}{2} = 2$

So, C(1, 2).

44. 29 is a prime number.

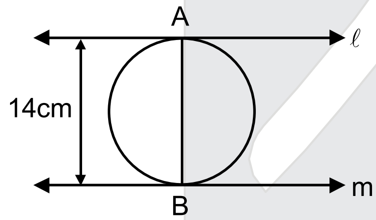
45. Angle of elevation = 60° and in ΔAOB, $\tan 60° = \frac{h}{100}$.



$h = 100\sqrt{3}$ m.

parallelogram AB = 14 cm.

46.



r = 7 cm.

47. Point (4, 3) lies in 1^{st} quadrant.

48. 3, 5, 4, 3, 2, 3, 1, 3

mode = 3.

49. Perimeter of semicircle = 72 cm

$\pi r + 2r = 72$

$r\left(\frac{22}{7} + 2\right) = 72$

$r = \frac{72 \times 7}{36} = 14 \quad \Rightarrow \quad r = 14$ cm.

50. $\cot(90° - \theta) = \tan\theta$.

SECTION – B

NON - OBJECTIVE TYPE QUESTIONS
SHORT ANSWER TYPE QUESTIONS

1. $13 \times 182 = 26 \times x$

$\Rightarrow \quad x = \frac{13 \times 182}{26} = 91.$

2. $3x - 5y = 4 \quad$ ....(i) × 3

$9x - 2y = 7 \quad$ ....(ii)

$\Rightarrow \quad 9x - 15y = 12$

$\quad\quad 9x - 2y = 7$

$\quad - \quad + \quad -$

$-13y = 5$

$y = -\frac{5}{13}$

then,

$9x - 2 \times \left(-\frac{5}{13}\right) = 7$

$9x = 7 + \frac{10}{13}$

$x = \frac{101}{117}.$

3. LHS

$\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A}$

$\Rightarrow \quad \frac{\cos^2 A + (1+\sin A)^2}{(1+\sin A)\ \cos A}$

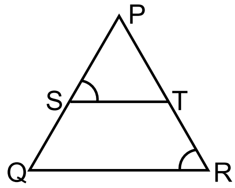
$\Rightarrow \quad \frac{\cos^2 A + \sin^2 A + 2\sin A + 1}{(1+\sin A)\ \cos A}$

$\Rightarrow \quad \frac{2+2\sin A}{(1+\sin A)\ \cos A} = \frac{2(1+\sin A)}{(1+\sin A)\ \cos A}$

$\Rightarrow \quad \frac{2}{\cos A} = 2 \sec A.$

4. $\because \quad \frac{PS}{SQ} = \frac{PT}{TR}$

So by converse of B.P.T



ST || QR

$\therefore \quad \angle PST = \angle PQR \quad$ ....(i) $\quad$ [corresponding angle]

But $\angle PST = \angle PRQ$ ....(ii)

By (i) and (ii)

$\angle PQR = \angle PRQ$

$\therefore$ PR = PQ

$\therefore$ ΔPQR is isosceles Δ.

5. $963 = 657 \times 1 + 306$

$657 = 306 \times 2 + 45$

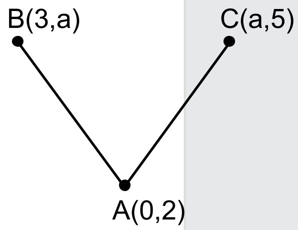
$306 = 45 \times 6 + 36$

$45 = 36 \times 1 + 9$

$36 = 9 \times 4 + 0$

So, HCF = 9.

6. AB = AC



$\Rightarrow$ $\sqrt{(3-0)^2+(a-2)^2} = \sqrt{(a-0)^2+(5-2)^2}$

squaring on both sides

$\Rightarrow$ $(3)^2 + (a-2)^2 = (a)^2 + (3)^2$

$\Rightarrow$ $9 + a^2 + 4 - 4a = a^2 + 9$

$\Rightarrow$ $4 - 4a = 0$

$\Rightarrow$ $a = 1$.

7. $\dfrac{5\cos^2 60 + 4\sec^2 30 - \tan^2 45}{\sin^2 30 + \cos^2 30}$

$\Rightarrow$ $\dfrac{5\left(\frac{1}{2}\right)^2 + 4 \times \left(\frac{2}{\sqrt{3}}\right)^2 - (1)^2}{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}$

$\Rightarrow$ $\dfrac{\frac{5}{4} + \frac{16}{3} - 1}{\frac{1}{4} + \frac{3}{4}} = \dfrac{\frac{67}{12}}{\frac{1}{1}} \Rightarrow \dfrac{67}{12}$.

8. $f(x) = x^2 - 5x + 6$

$= x^2 - 3x - 2x + 6$

$= x(x-3) - 2(x-3)$

$= (x-3)(x-2)$

so zeroes are 3 and 2.

9. Length of wire = circumference of circle.

length of wire = $2\pi r$

$= 2 \times \dfrac{22}{7} \times 42 = 264$ cm.

perimeter of square = length of wire

4 × side = 264

side = $\frac{264}{4}$ = 66 .

10. For unit's digit to be 0. then 4^n should have 2 and 5 as its prime factor, but $4^n = (2^2)^n$ does not contain 5 as one of its factor.

Hence, 4^n cannot end with 0.

11. tan 2A = cot (A – 18)

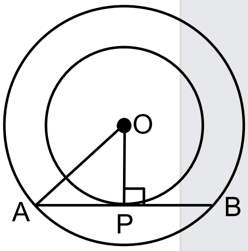
cot (90 – 2A) = cot (A – 18)

∴ 90 – 2A = A – 18

– 3A = – 108

A = 36°.

12. Here OP = 3 cm is radius of smaller circle and OA = 5 cm is radius of larger circle.



AB chord touches the smaller circle. So OP ⊥ AB and bisect the AB.

∴ AP = PB.

Now, $OA^2 = OP^2 + AP^2$

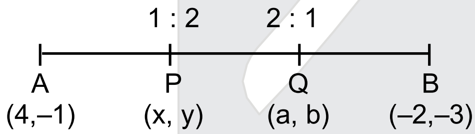
$AP^2 = (5)^2 – (3)^2$

= 25 – 9 = 16.

AP = $\sqrt{16}$ = 4 cm.

So, AB = 2 × 4 = 8 cm.

13.



AB is trisect so AP = PQ = QB.

Now, P divides the segment AB in ratio of $\frac{AP}{PB} = \frac{1}{2}$.

So, coordinates of P(x, y)

$x = \frac{1\times(-2)+2\times 4}{1+2} = \frac{6}{3} = 2.$

$y = \frac{1\times(-3)+2\times(-1)}{1+2} = -\frac{5}{3}.$

Hence, P(x, y) = P $\left(2, -\frac{5}{3}\right)$

Now, Q(a, b) divides the segment AB in ratio of $\frac{AQ}{QB} = \frac{2}{1}$.

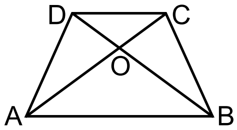
So, coordinates of Q(a, b)

$a = \frac{2\times(-2)+1\times 4}{2+1} = 0$

$$b = \frac{2 \times (-3) + 1 \times (-1)}{2+3} = -\frac{7}{3}.$$

Hence, $Q(a, b) = Q\left(0, -\frac{7}{3}\right)$.

14. ABCD is a trapezium where AB || CD and AC and BD intersect at O.



Now in ΔAOB and ΔCOD

$\angle OAB = \angle OCD$ [A.I.A]

$\angle OBA = \angle ODC$ [A.I.A]

$\therefore$ By AA criterion

$\Delta AOB \sim \Delta COD$

$\therefore$ ratio of area of ΔAOB and ΔCOD

$$\frac{\Delta AOB}{\Delta COD} = \frac{(AB)^2}{(CD)^2}$$, but AB = 2CD

$$\therefore \quad \frac{\Delta AOB}{\Delta COD} = \frac{(2\ \ CD)^2}{(CD)^2} = \frac{4\ \ CD}{CD^2} = \frac{4}{1}$$

15. Let us assume that $3 + 2\sqrt{5}$ is rational number.

Hence, $3 + 2\sqrt{5} = \frac{a}{b}$ where a, b are co-prime and $b \neq 0$.

$$2\sqrt{5} = \frac{a}{b} - 3$$

$$2\sqrt{5} = \frac{a-3b}{b}$$

$$\sqrt{5} = \frac{a-3b}{2b}$$

Now, $\frac{a-3b}{2b}$ is a rational number but $\sqrt{5}$ is an irrational number. Since ration $\neq$ irrational.

$\therefore$ our assumption is incorrect. Hence $3 + 2\sqrt{5}$ is irrational.

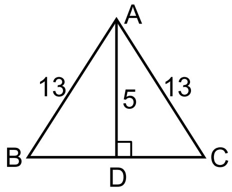
16. $3x^2 - 2\sqrt{6}\,x + 2 = 0$

$\Rightarrow \quad 3x^2 - \sqrt{6}\,x - \sqrt{6}\,x + 2 = 0$

$\Rightarrow \quad \left(\sqrt{3}x - \sqrt{2}\right)\left(\sqrt{3}x - \sqrt{2}\right) = 0$

$\sqrt{3}x - \sqrt{2} = 0$	$\sqrt{3}x - \sqrt{2} = 0$
$x = \frac{\sqrt{2}}{\sqrt{3}}$	$x = \frac{\sqrt{2}}{\sqrt{3}}$

17. ΔABC is an isosceles triangle



where AB = AC = 13 cm and altitude AD = 5 cm.

In isosceles Δ altitudes drawn to the unequal side from opposite vertex bisect the side.

BD = DC.

Now, $(BD)^2 = (AB)^2 - (AD)^2$

$= (13)^2 - (5)^2$

$(BD)^2 = 169 - 25 = 144.$

BD = 12

Hence, side BC = 2 × 12 = 24 cm.

18. Height of cone = 8 : 4 cm = h

base raidus of cone = 2.1 cm = r_2

Now, volume of sphere = volume of cone

$$\frac{4}{3}\pi r_1^3 = \frac{1}{3}\pi r_2^2 h$$

$$\frac{4}{3}\pi r_1^3 = \frac{1}{3}\pi \times (2.1)^2 \times (8.4)$$

$4r_1^3 = 2.1 \times 2.1 \times 8.4$

$$r_1^3 = \frac{2.1 \times 2.1 \times 8.4}{4}$$

$r_1 = \sqrt[3]{2.1 \times 2.1 \times 2.1}$

$r_1 = 2.1$ cm.

19. Dice is thrown once.

$\therefore$ Total events = {1, 2, 3, 4, 5, 6}

Getting an even number.

Favourable event = {2, 4, 6}

Hence probability of even is $P(E) = \frac{3}{6} = \frac{1}{2}$.

20. Condition of collinearty is $x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_2(y_1 - y_2) = 0$

$\Rightarrow$ $x(y - 1) + 0 + 1(0 - y) = 0$

$\Rightarrow$ $xy - x - y = 0$

$\Rightarrow$ $xy = x + y$

dividing by xy, we get

$\Rightarrow \quad \frac{xy}{xy} = \frac{x}{xy} + \frac{y}{xy} \quad \Rightarrow \quad 1 = \frac{1}{y} + \frac{1}{x}$.

21.

x	y or f	fx
2	3	6
4	2	8
6	3	18
10	1	10
$P+5$	2	$2P+10$
	$\Sigma f = 11$	$\Sigma fx = 2P + 52$

mean = $\frac{\Sigma fx}{\Sigma f}$ = $\frac{2P+52}{11}$

$\Rightarrow$ 6 = $\frac{2P+52}{11}$

$\Rightarrow$ 66 = 2P + 52

$\Rightarrow$ 66 – 52 = 2P

$\Rightarrow$ P = $\frac{14}{2}$ = 7.

22. Volume of cuboid = n × volume of spheres

$9 \times 11 \times 12 = n \times \frac{4}{3}\pi(r)^3$

$9 \times 11 \times 12 = n \times \frac{4}{3} \times \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2}$

$11 \times 12 = n \times \frac{11}{7}$

n = 84.

23. A.P. = 3, 10, 17, 24,..............
where a = 3, d = 10 – 3 = 7.
$\therefore$ $a_{13} = a + (13 – 1)\,d = 3 + 12 \times 7 = 87$
Now term which is 84 greater then 13^{th} term is
$a_n = a_{13} + 84 = 87 + 84 = 171$.
a + (n – 1)d = 171.

$\Rightarrow$ 3 + (n – 1)7 = 171

$\Rightarrow$ (n – 1) 7 = 168

$\Rightarrow$ n – 1 = $\frac{168}{7}$ = 24.

$\Rightarrow$ n = 24 + 1 = 25.

So, 25^{th} term is 84 more than 13^{th} term.

24. T(E) = 52 and event of having a club card is F(E) = 13.
Hence, probability of event.

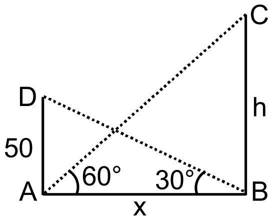
P(E) = $\frac{13}{52}$ = $\frac{1}{4}$.

25.

Variable x	f	fx
2	3	6
4	4	16
3	2	6
4	4	28
8	6	48
	$\Sigma f = 19$	$\Sigma fx = 104$

Hence, mean $(\bar{x})$ = $\frac{\Sigma fx}{\Sigma f}$ = $\frac{104}{19}$ = 5.47.

26. Let the height of mountain is h m and height of tower is 50m. The distance between tower and mountain is x m.



Now, In ΔADB

$\tan 30° = \frac{50}{x}$

$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{50}{x}$

$\Rightarrow \quad x = 50\sqrt{3}$ m and in ΔABC

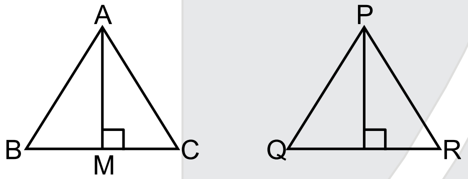
$\tan 60 = \frac{h}{x}$

$\Rightarrow \quad \sqrt{3} = \frac{h}{x50\sqrt{3}}$.

$\Rightarrow \quad h = 50\sqrt{3} \times \sqrt{3} = 150$ m.

Hence, height of mountain is 150 m.

27. Given : two triangles ABC and PQR such that $\Delta ABC \sim \Delta PQR$.



To prove : $\frac{\text{area}(ABC)}{\text{area}(PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{CA}{PR}\right)^2$

Construction : Draw altitudes AM and PN of ΔABC and ΔPQR

Proff : area $(\Delta ABC) = \frac{1}{2} \times BC \times AM$

and area $(\Delta PQR) = \frac{1}{2} \times QR \times PN$

So, $\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta PQR)} = \frac{\frac{1}{2} \times BC \times AM}{\frac{1}{2} \times QR \times PN}$ ....(i)

Now, In ΔABM and ΔPQN

$\angle B = \angle Q$ [$\because \Delta ABC \sim \Delta PQR$]

$\angle M = \angle N$ [90° each]

$\therefore \quad \Delta ABM \sim \Delta PQN$ [AA-criterion]

Therefore $\frac{AM}{PN} = \frac{AB}{PQ}$ ....(ii)

also $\Delta ABC \sim \Delta PQR$

$\therefore \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{Rp}$ ....(iii)

Therefore, $\frac{\text{area}(ABC)}{\text{area}(PQR)} = \frac{BC}{QR} \times \frac{AB}{PQ}$ [by (i) and (ii)]

$$= \frac{AB}{PQ} \times \frac{AB}{PQ} \quad \text{[from (iii)]}$$

$$= \left(\frac{AB}{PQ}\right)^2$$

Now, by equation (iii)

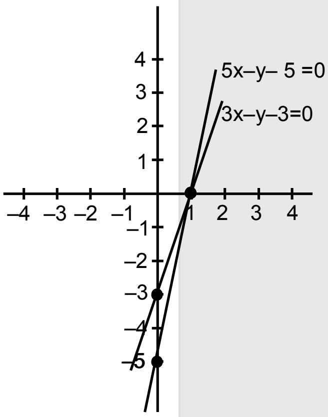
$$\frac{\text{area } (\Delta ABC)}{\text{area}(\Delta PQR)} = \left(\frac{AB}{PQ}\right)^2 = \left(\frac{BC}{QR}\right)^2 = \left(\frac{CA}{RP}\right)^2.$$

28. $5x - y - 5 = 0$ where

x	0	1
y	–5	0

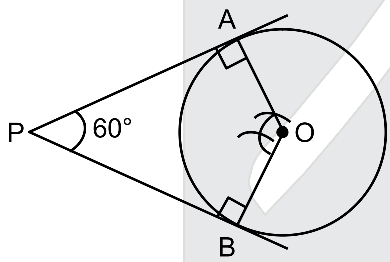
and $3x - y - 3 = 0$ where

x	0	1
y	–3	0



So graphically solution of (x, y) is (1, 0).

29.



30. LHS

$$\frac{\sin\theta}{1-\cos\theta} + \frac{\tan\theta}{1+\cos\theta}$$

$$\Rightarrow \quad \frac{\sin\theta\ (1-\cos\theta)\ +\ \tan\theta(1-\cos\theta)}{(1-\cos\theta)\ (1+\cos\theta)}$$

$$\Rightarrow \quad \frac{\sin\theta + \sin\theta\ \cos\theta\ +\ \tan\theta - \sin\theta}{1-\cos\theta}$$

$$\Rightarrow \quad \frac{\sin\theta\ \cos\theta + \tan\theta}{\sin^2\theta}$$

$$\Rightarrow \quad \frac{\sin\theta\ \cos\theta}{\sin^2\theta} + \frac{\tan\theta}{\sin^2\theta}$$

$\Rightarrow \quad \frac{\cos\theta}{\sin\theta} + \frac{1}{\cos\theta} \cdot \frac{1}{\sin\theta}$

$\Rightarrow \quad \cot\theta + \sec\theta \cdot \text{cosec}\,\theta$ = RHS.

31. Let the fraction is $\frac{x}{y}$

Now, from 1st condition

$\frac{x-1}{y} = \frac{1}{3}$

$\Rightarrow \quad 3x - 3 = y \quad$ ....(i)

and from 2nd condition

$\frac{x}{y+8} = \frac{1}{4} \quad$ ....(ii)

Putting value of y from equation (i)

$\Rightarrow \quad 4x = 3x - 3 + 8$

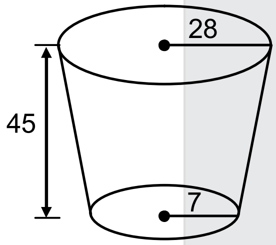
$\Rightarrow \quad x = 5$ and $y = 12$.

$\therefore \quad$ fraction $\frac{x}{y} = \frac{5}{12}$

32. R = 28 cm

r = 7 cm

h = 45 cm



So, volume of glass

$= \frac{1}{3}\pi h\left(R^2 + r^2 Rr\right)$

$= \frac{1}{3} \times \frac{22}{7} \times 45\left[(28)^2 + (7)^2 + 28 \times 7\right]$

$= \frac{22 \times 15}{7}$ [784 + 49 + 196]

$= \frac{22 \times 15}{7} \times 1029$

= 22 × 15 × 147

= 48510 cm^3.

33. Diameter of hemispherical tank = 3 m.

$\therefore \quad$ radius = $\frac{3}{2}$ m

So capacity of tank

$= \frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2}$

$= \frac{99}{14}$ m^3

$\because$ $1m^3 = 1000$ litre.

$\therefore$ capacity = $\frac{99}{14}$ × 1000 litre.

half of tank capacity = $\dfrac{\frac{99}{14} \times 1000}{2} = \frac{99}{14} \times 500$ ltire.

Now,

$\frac{27}{7}$ ltire emptied per second so time taken to emptied the half tank is

$= \dfrac{\frac{99}{14} \times 500}{\frac{25}{7}}$ = 990 seconds.

or $\frac{990}{60}$ min = $\frac{33}{2}$ min.