SSC CGL Tier-II QUQNT: Memory Based (Solutions)

S1. Ans.(b)
Sol. $\cos(x-y) = -1$
$\cos(x-y) = \cos 180°$
So, $x - y = 180°$
$\cos x + \cos y = 2.\cos\left(\frac{x+y}{2}\right).\cos\left(\frac{x-y}{2}\right)$
$= 2\cos\frac{(x+y)}{2}.\cos 90°$
$= 0$

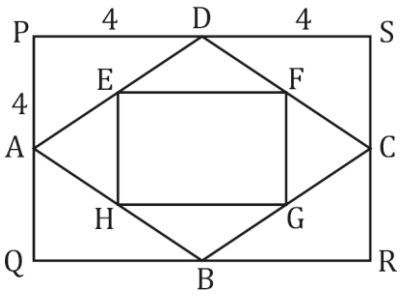
S2. Ans.(c)
Sol. $\cos A = 1 - \cos^2 A$.
$\cos A = \sin^2 A$
$\cos^2 A = \sin^4 A$.
$1 - \sin^2 A = \sin^4 A$
$\sin^4 A + \sin^2 A = 1$
$(\sin^4 A + \sin^2 A)^3 = 1^3$
$\sin^{12} A + \sin^6 A + 3\sin^{10} A + 3\sin^8 A = 1$
$a = 1$
$b = 3$
$d = 1$
$c = 3$
$\Rightarrow \frac{b+c}{a+d} = \frac{3+3}{1+1} = 3$

S3. Ans.(d)
Sol. $(3x+y)^3 = 27x^3 + 27x^2y + 9xy^2 + y^3$
A.T.Q.
$(3x+y)^3 - 9x^2y + 3xy^2$
$= (3x+y)^3 - 3xy(3x-y)$
$= (3\times 4 - 5)^3 - 3(4)(-5)(3\times 4 + 5)$
$= 343 + 1020 = 1363$

S4. Ans.(b)
Sol. $x + \frac{1}{4x} = 2$
$\left(2x + \frac{1}{2x}\right)^3 = (4)^3$
$8x^3 + \frac{1}{8x^3} = 52$
Multiply both side by 4
$32x^3 + \frac{1}{2x^3} = 208$
Adding 3 both side.
$32x^3 + \frac{1}{2x^3} + 3 = 208 + 3 = 211.$

S5. Ans.(d)

Sol.



In ΔAPD

PA = PD

$AD^2 = PA^2 + PD^2$

$AD^2 = 16 + 16$

$AD = \sqrt{32}$

$= 4\sqrt{2}$

We can write the infinite series of area of squares.

$8^2 + \left(4\sqrt{2}\right)^2 + (4)^2 + \left(2\sqrt{2}\right)^2 - - - \infty$

$64 + 32 + 16 + 8 - - - - \infty$

Above series in G.P

a = 64

$r = \frac{1}{2}$

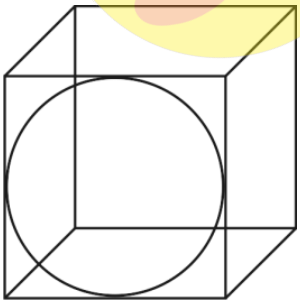
$\text{Sum} = \frac{a}{1-r}$

$\frac{64}{1-\frac{1}{2}}$

$64 \times 2 = 128 cm^2$

S6. Ans.(d)

Sol.



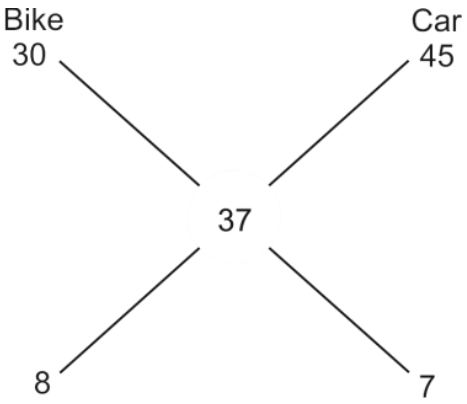
$\text{Distance of travel} = \frac{\text{Diagonal of cube} - \text{diameters of sphere}}{2}$

diagonal of cube = $\sqrt{3}a$

$\text{Distance} = \frac{\sqrt{3} \times 6 - 6}{2} = \frac{6(\sqrt{3}-1)}{2} = 3(\sqrt{3} - 1)$

S7. Ans.(b)

Sol. Using allegation



15 units → 259 km

1 unit → $\frac{259}{15}$

8 unit → $\frac{259}{15} \times 8$ km

Distance on bike = $138\frac{2}{15}$ km

S8. Ans.(c)

Sol. Sum of observations = 15x

New sum = 15x – 15 × 99

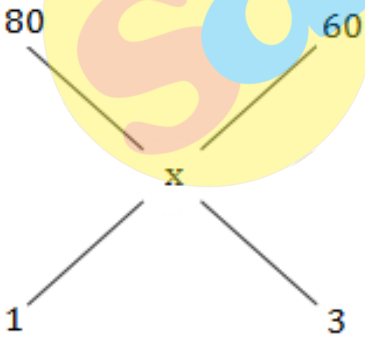
Or 15(x – 99)

New average = $\frac{15(X-99)}{15}$

= X – 99

S9. Ans.(b)

Sol.



$\frac{80-x}{x-60} = \frac{3}{1}$

⇒ 80 – x = 3x – 180

⇒ 4x = 260

⇒ x = 65

% milk in mixture = 65%

S10. Ans.(b)

Sol. SI in 4 yrs = 18240 – 12000 = 6240

SI in 1 year $= \frac{6240}{4} = 1560$

Rate $= \frac{1560}{12000} \times 100\% = 13\%$

New rate = 13 ×1.5 = 19.5

SI $= \frac{12000 \times 5 \times 19.5}{100}$

SI = 11700

Amount in 5 yrs = 12000 + 11700 = 23700

S11. Ans.(b)

Sol. CP of 156 bottles $= 21.7 \times \frac{600}{775}$

CP of 1 bottle $= \frac{21.7}{156} \times \frac{600}{775}$

SP of 1 bottle for 15.55% profit

$= \frac{21.7}{156} \times \frac{600}{775} \times \frac{2311}{2000}$

So, bottle sold for 16.80

$= \frac{156 \times 775 \times 2000}{21.7 \times 600 \times 2311} \times 16.80 = 135$

S12. Ans.(d)

Sol. $x + \frac{1}{x} = P$

Squaring both side:-

$\left(x + \frac{1}{x}\right)^2 = P^2$

$x^2 + \frac{1}{x^2} + 2 = P^2$

$x^2 + \frac{1}{x^2} = P^2 - 2$

Cubing both sides

$\left(x^2 + \frac{1}{x^2}\right)^3 = (P^2 - 2)^3$

or, $x^6 + \frac{1}{x^6} + 3(P^2 - 2) = P^6 - 8 - 6P^4 + 12P^2$

or, $x^6 + \frac{1}{x^6} = P^6 - 6P^4 + 9P^2 - 2$

S13. Ans.(d)

Sol. Let the no. of boys = 4x and

Girls = x

No. of Boys who hold scholarship $= \frac{75}{100} \times 4x = 3x$

and no. of Girls who hold scholarship $= \frac{70 \times x}{100} = \frac{7x}{10}$

Number of students who do not hold scholarship

$= 5x - \left(3x + \frac{7x}{10}\right) = 2x - \frac{7x}{10} = \frac{13x}{10}$

The required percentage $= \frac{\frac{13x}{10}}{5x} \times 100 = 26\%$

S14. Ans.(c)

Sol. C's 1 day's work $= \frac{1}{4} - \left(\frac{1}{8} + \frac{1}{12}\right) = \frac{1}{4} - \left(\frac{3+2}{24}\right) = \frac{1}{24}$

$A : B : C = \frac{1}{8} : \frac{1}{12} : \frac{1}{24} = 3 : 2 : 1$

C's share $= \frac{1}{6} \times 4500 = 750$

S15. Ans.(a)

Sol. Ratio of investment of P, Q & R–

$= 5x \times 12 : 6x \times 12 : 6x \times 6$

$= 5 : 6 : 3$

Total profit = 98000 = 20% of total investment

So, R's share $= \frac{3}{14} \times 98{,}000 = 21{,}000$

S16. Ans.(d)

Sol. C.I. $\rightarrow 100 \xrightarrow{30\%} 130 \xrightarrow{30\%} 169$

C.I. $\rightarrow 69\%$

S.I. $\rightarrow 36 \times 2 = 72\%$

Percentage difference = 72% – 69% = 3%

Difference between S.I. and C.I.

$= 2200 \times \frac{3}{100} =$ Rs. 66

S17. Ans.(d)

Sol. Let the capacity of the tank be 600 lit (LCM of 40, 60, 100)

Efficiency of A = 15 lit/min.

Efficiency of B = 10 lit/min.

Efficiency of C = 6 lit/min.

For the first 10 minutes, work done = 15 × 10 = 150 lit

For next 5 minutes, work done = 125 lit.

Remaining work = 600 – (150 + 125) = 325 lit

Required time $= \frac{325}{(15+10+6)} = \mathbf{10\frac{15}{31}}$ min.

S18. Ans.(c)

Sol. Let the cost price and selling price be Rs x and Rs y respectively.

ATQ

$$\frac{1}{2} \times \frac{y-x}{x} \times 100 = \frac{0.6y - x}{x} \times 100$$

$$x = 0.2\,y$$

Required profit $\% = \frac{1.2y - 0.2y}{0.2y} \times 100 = 500\%$

S19. Ans.(a)
Sol.

$$\frac{352}{11x}+\frac{112}{7x}=24$$

Speed of boat & stream are 18 km/hr and 4 km/hr
Distance travelled in D.S = 5 × 22
=110 km
Distance travelled in U.S = 2 × 14
=28 km
Req. value = $\frac{110-28}{28}\times 100$
$=292\frac{6}{7}\%$

S20. Ans.(b)
Sol.
To be divisible by 72, no. should be divisible by both 8 and 9.
So,

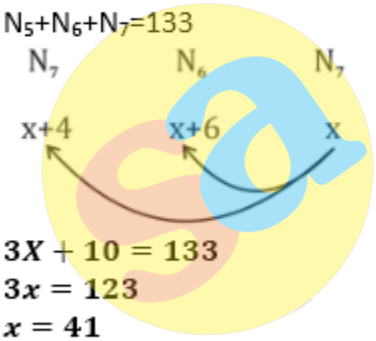
$$\frac{78y}{8}\rightarrow y=4$$

And

$$\frac{9+8+5+x+3+6+7+8+4}{9}\rightarrow x=4$$

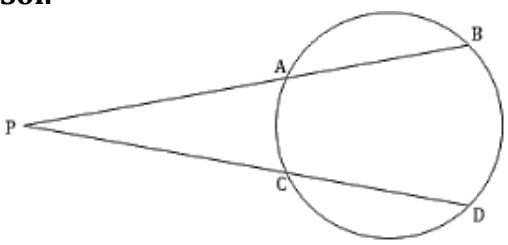
Required value $\rightarrow 16-12=4$.

S21. Ans.(d)
Sol.
$N_1 + N_2 + ... N_{12} = 12 \times 46 = 552$
$N_1 + N_2 + N_3 + N_4 = 4\times44 =172$
$N_8+N_9....N_{12}=5\times49.4=247$
$N_5+N_6+N_7=133$



$3X+10=133$
$3x=123$
$x=41$
Required average $=\frac{41+45}{2}=\frac{86}{2}=43$

S22. Ans.(b)
Sol.



PA x PB = PC x PD

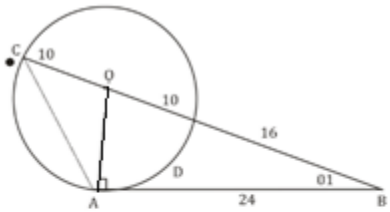
10 x 22 = 11 x PD

PD = 20cm

CD = 9 cm

S23. Ans.(a)

Sol.



$\text{Tan}\ \theta = \frac{10}{24}$

$\text{Sin}\theta = \frac{10}{26}$

Area of $\Delta ABC = \frac{1}{2} AB \times BC \sin\theta$

$= \frac{1}{2} \times 24 \times 36 \times \frac{10}{26}$

$= 166.15\ \text{cm}^2$

S24. Ans.(c)

Sol.

∵ (||gm ABCD) & (||gm ABMN) are on the same base & between the same parallels.

∴ar(||gm ABCD) = ar(||gm ABMN)

∴ar(||gm ABCD) = 80 sq. unit

Again, Δ APN & ||gm (ABMN) are on the same base & between the same parallels.

$\therefore ar(\Delta APN) = \frac{1}{2} ar(||gm\ ABMN)$

$= \frac{1}{2} \times 80\ sq.unit$

$= 40\ sq\ unit.$

S25. Ans.(b)

Sol.

Suppose (–4, 6) divides AB in the ratio of K : 1

$\frac{A(-6,10)}{K} = \frac{B(-4,6)}{1} = \frac{B(3,-8)}{1}$

By section formula

$-4 = \frac{K \times 3 + 1 \times -6}{K+1}$

$-4K - 4 = 3K - 6$

$-7K = -2$

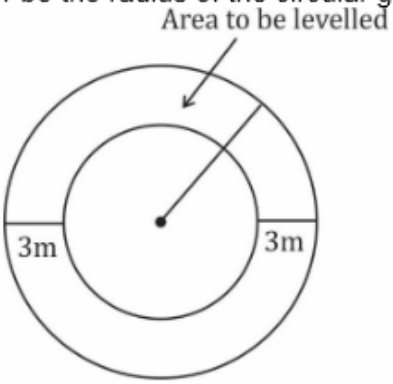
$K = \frac{2}{7}$

∴ Required ratio = 2 : 7

S26. Ans.(d)

Sol.

Let r be the radius of the circular ground.



$\therefore 2\pi r = 88 \Rightarrow r = 14$

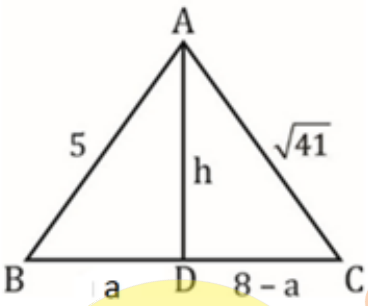
∴ Area of the ground to be levelled

$= \pi \times 14^2 - \pi \times 11^2 = 196\pi - 121\pi = 75\pi$

Cost of leveling = $75 \times \frac{22}{7} \times 7 = Rs.\,1650$.

S27. Ans.(b)

Sol.



AS BC=8

LET BD=a then CD=8-a

$(5)^2 - a^2 = (\sqrt{41})^2 - (8-a)^2$

$25 - a^2 = 41 - 64 - a^2 + 16a$

a = 3

So, h = 4 cm

$A = \frac{1}{2} \times 4 \times 3 = 6cm$

[Hitting method → ABD is right angle triangle Hypotenuse = 5 so, either base (BD) and perpendicular (Ad) is 3 & 4. Because of Triplets (3, 4, 5). In any case area = ½ × 4 × 3 = 6]

S28. Ans.(a)

Sol. Centroid of ΔABC coincide with the centroid of triangle formed by mid-points of AB, BC and CA.

∴ Required coordinates

$\equiv \left(\frac{4+3+2}{3}, \frac{2+3+2}{3}\right) \equiv (3, 7/3)$

S29. Ans.(c)
Sol.

$$27x^3 + \frac{3}{x} = 9x \quad \text{....(i)}$$

$$\left[9x^2 + \frac{1}{x^2} = 3\right] \times 3x$$

$$\left[9x^2 + \frac{1}{x^2} = 3\right] \times \frac{1}{x}$$

$$9x + \frac{1}{x^3} = \frac{3}{x} \quad \text{...(ii)}$$

Adding (i) and (ii)

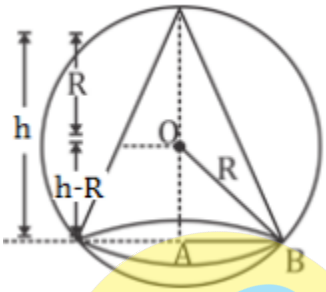
$$27x^3 + \frac{3}{x} + 9x + \frac{1}{x^3} = 9x + \frac{3}{x}$$

$$27x^3 + \frac{1}{x^3} = 0$$

S30. Ans.(c)
Sol.

$$\frac{1}{2}(9 + 4 + 25) = 19$$

S31. Ans.(b)
Sol.



Let r be radius of cone and h be height of cone

$$R^2 = (h - R)^2 + r^2$$

$$R^2 = h^2 + R^2 - 2hR + r^2$$

$$r^2 = 2hR - h^2$$

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

$$V = \frac{1}{3}\pi[2h^2R - h^3]$$

$$\frac{dv}{dh} = \frac{\pi}{3}[4hR - 3h^2] = 0$$

$4hR = 3h^2$

$$h = \frac{4R}{3}$$

$$r^2 = 2\left(\frac{4R}{3}\right)R - \frac{(4R)^2}{(3)^2}$$

$$r^2 = \frac{8R^2}{3} - \frac{16R^2}{9}$$

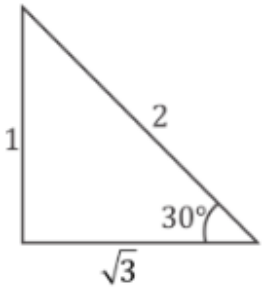
$$r^2 = \frac{8R^2}{9}$$

Volume of cone $= \frac{1}{3}\pi\frac{8R^2}{9}\frac{4R}{3}$

$$= \frac{32\pi R^3}{81}$$

S32. Ans.(b)

Sol.



2 — 420

1 — 210

S33. Ans.(d)

Sol. ATQ,

Let a = 4.63 – 3.17

b = 3.17 – 2.25

c = 2.25 – 4.63

Here, a + b + c = 0

$\therefore a^3 + b^3 + c^3 = 3abc$

$\Rightarrow \frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = 3$

= 3

S34. Ans.(d)

Sol.

Total students who do not have Royal elite pass from Q = $6000 \times \frac{15}{100} - 500 = 400$

Total students who do not have Royal elite pass from T = $6000 \times \frac{20}{100} - 360 = 840$

Total students who do not have Royal elite pass from R = $6000 \times \frac{28}{100} - 440 = 800$

Required percentage = $\frac{(400+840)-800}{800} \times 100 = 55\%$

S35. Ans.(b)

Sol.

Let total girls who do not have Royal elite pass from S be 3a

So, total boys who do not have Royal elite pass from S will be 5a

Total boys who do not have Royal elite pass from S = $\left(6000 \times \frac{25}{100} - 700\right) \times \frac{5a}{8a} = 500$

Total students who do not have Royal elite pass P & R

$= \left(6000 \times \frac{12}{100} - 440\right) + \left(6000 \times \frac{28}{100} - 880\right)$

= 280 + 800 = 1080

Required ratio $= \frac{500}{1080} = 25 : 54$

S36. Ans.(a)
Sol.
Total students who do not have Royal elite pass from Q & R
$= \left(6000 \times \frac{15}{100} - 500\right) + \left(6000 \times \frac{28}{100} - 880\right)$
= 400 + 800 = 1200
Total students = 1200 + 360 = 1560
Required central angle = $\frac{1560}{6000} \times 360° = 93.6°$

S37. Ans.(d)
Sol.
Total girls who play 'Pubg' from R = $6000 \times \frac{28}{100} \times \frac{325}{7} \times \frac{1}{100} = 780$
Total girls who have Royal elite pass from R = $780 \times \frac{7}{13} = 420$
Total boys who do not have Royal elite pass from R = $(6000 \times \frac{28}{100} - 780) - (880 - 420) = 440$

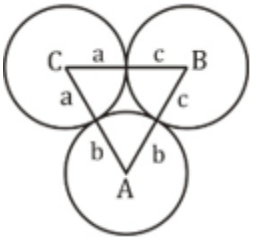
S38. Ans.(c)
Sol.
Total students who have Royal elite pass from 'U' = $\left(6000 \times \frac{12}{100} - 440\right) \times \frac{120}{100} = 336$
Total students who do not have Royal elite pass from 'U' = $336 \times \frac{4}{3} = 448$
Total students who do not have Royal elite pass from R = $(6000 \times \frac{28}{100} - 880) = 800$
Required percentage = $\frac{800-448}{800} \times 100$
$= \frac{352}{800} \times 100 = 44\%$

S39. Ans.(c)
Sol.
$1 - \cos^2\theta + 3\cos\theta - 2 = 0$
$-1 + \cos^2\theta - 3\cos\theta + 2 = 0$
$\cos^2\theta - 3\cos\theta + 1 = 0$
$\cos\theta = \frac{3 \pm \sqrt{9-4}}{2}$
$\cos\theta = \frac{3 \pm \sqrt{5}}{2}; \sec\theta = \frac{3 \mp \sqrt{5}}{2}$
$\cos^3\theta + \sec^3\theta + 3(\cos\theta + \sec\theta) - \cos\theta - \sec\theta$
$= (cos\theta + sec\theta)^3 - (cos\theta + sec\theta)$
(added above → $\cos\theta + \sec\theta = 3$)
$\Rightarrow 3^3 - 3 = 24$

S40. Ans.(b)
Sol.
TSA = 340 sq cm
Base area = 100 sq cm
Total lateral surface area = 240 sq cm
No of sides = x
$x \times 30 = 240$ sq cm
$x = 8$

S41. Ans.(d)

Sol.



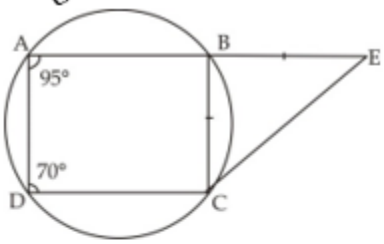
Semi perimeter of ABC = a + b + c

Required area = $\sqrt{(a+b+c)abc}$ (by hero's formula)

S42. Ans.(a)

Sol.

ATQ,



→ In circle quadrilateral, sum of opposite angles is 180°

∴ ∠BCD = 180° - ∠BAD = 180° - 95° = 85°

And,

∠ABC = 180° - ∠ADC = 180° - 70° = 110°

Now,

∠EBC = 180° - ∠ABC = 180° - 110° = 70°

Now,

∵BE = BC

$\therefore \angle BCE = \angle BEC = \frac{180° - 70°}{2} = 55°$

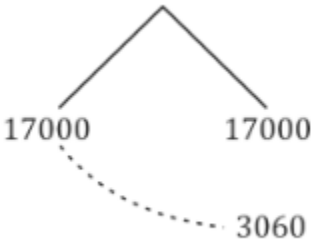
∴ ∠DCE = ∠BCE + ∠BCD

= 55° + 85° = 140°

S43. Ans.(b)

Sol.

Simple interest for one year $= \frac{51000}{3} = 17000$



$R\% = \frac{3060}{17000} \times 100 = 18\%$

S44. Ans.(a)

Sol. ∵ AD || BC

$\therefore \angle A + \angle B = 180°$

$\Rightarrow \angle AOB = 180° - \frac{1}{2}(\angle A + \angle B)$

$= 180° - \frac{1}{2} \times 180° = 90°$

S45. Ans.(c)

Sol. In Δ BAP and Δ BCR

$\frac{BC}{AB} = \frac{CR}{PA} = \frac{y}{x} \ldots . (i)$

In Δ ARC and Δ AQB

$\frac{AC}{AB} = \frac{CR}{QB} = \frac{y}{z} \ldots . \ldots (ii)$

Adding equation (i) and (ii)

$\frac{BC}{AB} + \frac{AC}{AB} = \frac{y}{x} + \frac{y}{z}$

$\frac{AC+BC}{AB} = \frac{yz+xy}{xz} [\therefore AC + BC = AB]$

$xz = yz + xy$

S46. Ans.(b)

Sol. Let number of boys = x

$\text{No. of girls} = \frac{120}{100}x$

ATQ,

$x + \frac{120}{100}x = 66$

$x = 30$

No. of girls = 66 – 30 = 36

So, New ratio = 30 : (36 + 4) = 30 : 40

= 3 : 4

S47. Ans.(b)

Sol. $\sin\theta = \frac{3}{4}$

From this we can conclude that

$= \sqrt{\frac{\text{cosec}^2\theta - \cot^2\theta}{\sec^2\theta - 1}} = \sqrt{\frac{\frac{1}{\sin^2\theta} - \frac{\cos^2\theta}{\sin^2\theta}}{\frac{1}{\cos^2\theta} - 1}} = \sqrt{\frac{\cos^2\theta}{\sin^2\theta}}$

$= \sqrt{\frac{1-\sin^2\theta}{\sin^2\theta}} = \frac{\sqrt{1-\frac{9}{16}}}{\left(\frac{3}{4}\right)} = \frac{\sqrt{7}}{4} \times \frac{4}{3} = \frac{\sqrt{7}}{3}$

S48. Ans.(c)

Sol. Area of square $(a)^2 = 196$

$\therefore a = \sqrt{196} = 14$ cm

Radius of a circle = 14 × 2 = 28 cm

$\therefore$ Circumference $= \frac{22}{7} \times 2 \times 28 = 176$ cm

Now according to the question b = 176 cm

Also, 2(l + b) = 712

2(l + 176) = 712

l + 176 = 356

$\therefore$ l = 356 - 176

$\therefore$ l = 180 cm^2

S49. Ans.(a)

Sol. $\frac{1}{12}$ hectare $= \frac{1}{12} \times 10000\ m^2$

$= \frac{2500}{3} m^2$

$\therefore 3x \times 4x = \frac{2500}{3}$

$\Rightarrow x^2 = \frac{2500}{3 \times 3 \times 4} \Rightarrow x = \frac{50}{6}$

$\Rightarrow$ Width $= 3x = \left(3 \times \frac{50}{6}\right) = 25$ m

S50. Ans.(b)

Sol. $(1 + \tan\theta + \sec\theta)(1 + \cot\theta - \text{cosec}\,\theta)$

$\Rightarrow \left(1 + \frac{\sin\theta}{\cos\theta} + \frac{1}{\cos\theta}\right)\left(1 + \frac{\cos\theta}{\sin\theta} - \frac{1}{\sin\theta}\right)$

$\Rightarrow \left(\frac{\cos\theta + \sin\theta + 1}{\cos\theta}\right)\left(\frac{\sin\theta + \cos\theta - 1}{\sin\theta}\right)$

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