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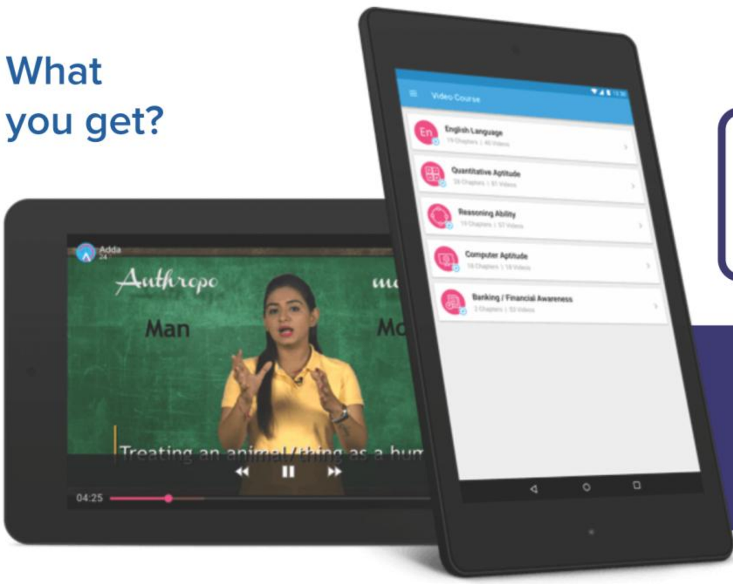

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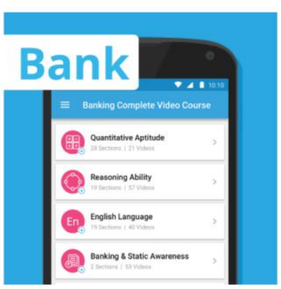

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S1. Ans.(d)

Sol. Given, $x + \frac{1}{x} = 5$

$$\Rightarrow \frac{3x}{2x^2 + 2 - 5x} = \frac{3x}{x\left[\left(2x + \frac{2}{x}\right) - 5\right]}$$

$$\Rightarrow \frac{3}{2\left(x + \frac{1}{x}\right) - 5} = \frac{3}{10 - 5} = \frac{3}{5}$$

S2. Ans.(c)

Sol. $\left(a + \frac{1}{a}\right)^2 = 3$

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

$$a^3 + \frac{1}{a^3} = 3\sqrt{3} - 3\sqrt{3}$$

$$a^3 + \frac{1}{a^3} = 0$$

$$\therefore a^3 + \frac{1}{a^3} + 3\sqrt{3} = 0 + 3\sqrt{3} = 3\sqrt{3}$$

S3. Ans.(a)

Sol. $a^3 + b^3 + c^3 - 3abc$

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

$$= \frac{1}{2}(a + b + c)[(a - b)^2 + (b - c)^2 + (c - a)^2]$$

$$= \frac{1}{2}(258 + 260 + 262)[(-2)^2 + (-2)^2 + 4^2]$$

$$= \frac{1}{2} \times 780 \times 24 = 9360$$

S4. Ans.(b)

Sol. Given, $pq + qr + rp = 0$

$$\Rightarrow -qr = pq + rp$$

$$\therefore \frac{p^2}{p^2 - qr} + \frac{q^2}{q^2 - rp} + \frac{r^2}{r^2 - pq}$$

$$= \frac{p^2}{p^2 + rp + pq} + \frac{q^2}{q^2 + pq + qr} + \frac{r^2}{r^2 + qr + rp}$$

$$= \frac{p}{p + q + r} + \frac{q}{p + q + r} + \frac{r}{p + q + r}$$

$$= \frac{p + q + r}{p + q + r} = 1$$

S5. Ans.(c)
Sol. Given,
$u^3 + (-2v)^3 + (-3w)^3 = 3 \times (-2)(-3)uvw$
$\therefore u + (-2v) + (-3w) = 0$
$u - 2v - 3w = 0$
$u - 2v = 3w$

S6. Ans.(c)
Sol. $x^2 + y^2 + z^2 = 2x - 2y - 2z - 3$
$x^2 + y^2 + z^2 - 2x + 2y + 2z + 1 + 1 + 1 = 0$
$(x^2 - 2x + 1) + (y^2 + 2y + 1) + (z^2 + 2z + 1) = 0$
$(x - 1)^2 + (y + 1)^2 + (z + 1)^2 = 0$
$\therefore x = 1, y = -1$ and $z = -1$
$5(1) - 4(-1) + 2(-1)$
$5 + 4 - 2, 9 - 2 = 7$

S7. Ans.(b)
Sol. $x + 3 + \sqrt{8}$ and
$\frac{1}{x} = \frac{1}{3 + \sqrt{8}} \times \frac{3 - \sqrt{8}}{3 - \sqrt{8}}$
$= \frac{3-\sqrt{8}}{9-8} = 3 - \sqrt{8}$
$x + \frac{1}{x} = 3 + \sqrt{8} + 3 - \sqrt{8}$
$x + \frac{1}{x} = 6$
$x^2 + \frac{1}{x^2} = 6^2 - 2 = 36 - 2 = 34$

S8. Ans.(b)
Sol. $x^4 - 17x^3 + 17x^2 - 17x + 17$
$= 16x^3 - 16x^3 - x^3 + 16x^2 + x^2 - 16x - x + 17$
$= 16x^3 - 16x^3 - 16x^2 + 16x^2 + 16x - 16x - 16 + 17$
$= 17 - 16 = 1$

S9. Ans.(c)
Sol. $\left(\frac{y-z-x}{2}\right)^3 + \left(\frac{z-x-y}{2}\right)^3 + \left(\frac{x-y-z}{2}\right)^3$
$\left(\frac{y - (z + x)}{2}\right)^3 + \left(\frac{z - (x + y}{2}\right)^3 + \left(\frac{x - (y + z)}{2}\right)^3$

$$\left(\frac{y-(-y)}{2}\right)^3+\left(\frac{z-(-z)}{2}\right)^3+\left(\frac{x-(-x)}{2}\right)^3$$
$$=\left(\frac{2y}{2}\right)^3+\left(\frac{2z}{2}\right)^3+\left(\frac{2x}{2}\right)^3$$
$$=y^3+z^3+x^3$$
(If $a+b+c=0$ then $a^3+b^3+c^3=3abc$)
$x^3+y^3+z^3=3xyz$

S10. Ans.(a)
Sol. $pqr=1$
$\therefore r=p^{-1}q^{-1}$ and $r^{-1}=pq$
Eliminating r from given expression,
$$=\frac{1}{1+p+q^{-1}}+\frac{1}{1+q+r^{-1}}+\frac{1}{1+r+p^{-1}}$$
$$=\frac{q}{q+pq+1}+\frac{1}{1+q+pq}+\frac{1}{1+p^{-1}q^{-1}+p^{-1}}$$
$$=\frac{q}{1+q+pq}+\frac{1}{1+q+pq}+\frac{pq}{1+q+pq}$$
$$=\frac{1+q+pq}{1+q+pq}=1$$

S11. Ans.(a)
Sol. $(r\cos\theta-\sqrt{3})^2+(r\sin\theta-1)^2=0$
$\Rightarrow r\cos\theta-\sqrt{3}=0$ and $r\sin\theta-1=0$
$\Rightarrow r\cos\theta=\sqrt{3}$ and $r\sin\theta=1$
$\therefore r^2\cos^2\theta+r^2\sin^2\theta=3+1$
$\Rightarrow r^2(\sin^2\theta+\cos^2\theta)=4$
$\Rightarrow r^2=4\Rightarrow r=2$, -2
$\therefore \tan\theta=\frac{r\sin\theta}{r\cos\theta}=\frac{1}{\sqrt{3}}$
And $r\cos\theta=\sqrt{3}\Rightarrow\cos\theta=\frac{\sqrt{3}}{r}$
$\Rightarrow \sec\theta=\frac{r}{\sqrt{3}}$
$\therefore \frac{r\tan\theta+\sec\theta}{r\sec\theta+\tan\theta}=\frac{\frac{r}{\sqrt{3}}+\frac{r}{\sqrt{3}}}{\frac{r^2}{\sqrt{3}}+\frac{1}{\sqrt{3}}}$
$=\frac{r\left(\frac{2}{\sqrt{3}}\right)}{\frac{r^2+1}{\sqrt{3}}}$ taking positive value of r
$$=\frac{2r}{r^2+1}=\frac{2\times2}{4+1}=\frac{4}{5}$$

S12. Ans.(c)

Sol. x = a (sin θ + cosθ) and y = b (sinθ − cosθ)

$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$ and $\frac{y}{b} = \sin\theta - \cos\theta$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} = (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$

$= \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta + \sin^2\theta + \cos^2\theta - 2\sin\theta.\cos\theta$

$= 2(\sin^2\theta + \cos^2\theta) = 2$

S13. Ans.(a)

Sol. $\sin 21° = \frac{x}{y}$

$\text{Cos } 21° = \sqrt{1 - \sin^2 21°}$

$= \sqrt{1 - \frac{x^2}{y^2}} = \frac{\sqrt{y^2-x^2}}{y}$

$\therefore \sec 21° = \frac{y}{\sqrt{y^2-x^2}}$

$\therefore \sec 21° - \sin 69°$

= sec 21° – sin (90° – 21°)

= sec 21° – cos 21°

$= \frac{y}{\sqrt{y^2-x^2}} - \frac{\sqrt{y^2-x^2}}{y}$

$= \frac{y^2-(y^2-x^2)}{y\sqrt{y^2-x^2}} = \frac{x^2}{y\sqrt{y^2-x^2}}$

S14. Ans.(b)

Sol. a cos θ + b sin θ = p

a sin θ − b cos θ = q

On squaring and adding,

$a^2\cos^2\theta + b^2\sin^2\theta + 2ab$

$\sin\theta.\cos\theta + a^2\sin^2\theta + b^2$

$\cos^2\theta - 2ab\sin\theta.\cos\theta$

$= p^2 + q^2$

$\Rightarrow a^2\cos^2\theta + a^2\sin^2\theta + b^2$

$\sin^2\theta + b^2\cos^2\theta = p^2 + q^2$

$\Rightarrow a^2(\cos^2\theta + \sin^2\theta) + b^2(\sin^2\theta + \cos^2\theta) = p^2 + q^2$

$\Rightarrow a^2 + b^2 = P^2 + q^2$

S15. Ans.(a)

Sol.

$\frac{5}{\sec^2\theta} + \frac{2}{1 + \cot^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + \frac{2}{\text{cosec}^2\theta} + 3\sin^2\theta$

$= 5\cos^2\theta + 2\sin^2\theta + 3\sin^2\theta$

$= 5\ (\cos^2\theta + \sin^2\theta) = 5$

S16. Ans.(c)

Sol. x = a secα. cosβ

$\Rightarrow \frac{x}{\alpha} = \sec\alpha.\cos\beta$

Similarly.

$\frac{y}{b} = \sec\alpha.\sin\beta, \frac{z}{c} = \tan\alpha$

$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$

$= \sec^2\alpha.\cos^2\beta + \sec^2\alpha.\sin^2\beta - \tan^2\alpha$

$= \sec^2\alpha(\cos^2\beta + \sin^2\beta) - \tan^2\alpha$

$= \sec^2\alpha - \tan^2\alpha = 1$

S17. Ans.(d)

Sol. $\tan^2\theta = 1 - e^2$

$\therefore \sec\theta + \tan^3\theta.\operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta.\tan\theta.\operatorname{cosec}\theta$

$= \sec\theta + \tan^2\theta.\frac{\sin\theta}{\cos\theta}.\frac{1}{\sin\theta}$

$= \sec\theta.(1 + \tan^2\theta)$

$= (1 + \tan^2\theta)^{\frac{1}{2}}.(1 + \tan^2\theta)$

$= (1 + \tan^2\theta)^{\frac{3}{2}} = (1 + 1 - e^2)^{\frac{3}{2}} = (2 - e^2)^{\frac{3}{2}}$

S18. Ans.(b)

Sol. $\sqrt{5} + \sqrt{8} = \frac{3}{\sqrt{8}-\sqrt{5}}$

$\sqrt{7} + \sqrt{6} = \frac{1}{\sqrt{7} - \sqrt{6}}$

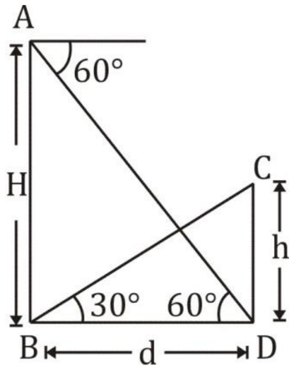
$\sqrt{3} + \sqrt{10} = \frac{7}{\sqrt{10} - \sqrt{3}}$

$\sqrt{2} + \sqrt{11} = \frac{9}{\sqrt{11} - \sqrt{2}}$

$\therefore \sqrt{7} + \sqrt{6}$ is the smallest number.

S19. Ans.(a)

Sol. Given: Angle subtended by the pole at the foot of tower = 30°; Height of tower = H; Distance between tower and pole = d and angle of depression at the foot of the pole. = 60°.



We know that in ΔCBD, $\tan 30° = \frac{h}{d}$ …(i)

Similarly, in ΔABD, $\tan 60° = \frac{H}{d}$ …(ii)

Dividing equation (i) by (ii), we get

$\frac{\tan 30°}{\tan 60°} = \frac{h}{H}$ or $\frac{\frac{1}{\sqrt{3}}}{\sqrt{3}} = \frac{h}{H}$

or $\frac{1}{3} = \frac{h}{H}$ or $h = \frac{H}{3}$

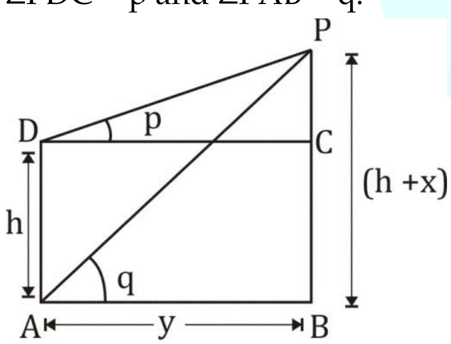
S20. Ans.(c)

Sol. Given: Height of building = h and angles of elevation = p and q.

Let BP be the hill, AD be the building, PC = x and AB = y.

Therefore height of hill (BP) = (h + x)

∠PDC = p and ∠PAB = q.



We know that in ΔPAB,

$\tan q = \frac{h+x}{y}$ …(i)

Similarly, in ΔPDC,

$\tan p = \frac{x}{y}$ or $y = x \cot p$

Substituting this value of y in equation (i), we get

$\tan q = \frac{h+x}{x \cot p}$ or $x \cot p = (h + x) \cot q$ or $x \cot p = h\cot q + x \cot q$

or $x (\cot p - \cot q) = h \cot q$ or $x = \frac{h \cot q}{\cot p - \cot q}$

Therefore height of hill $(h + x) = h + \frac{h \cot q}{\cot p - \cot q}$

$= \frac{h \cot p - h \cot q + h \cot q}{\cot p - \cot q} = \frac{h \cot p}{\cot p - \cot q}.$

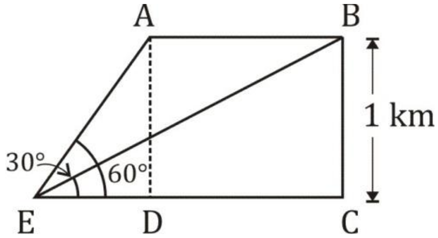
S21. Ans.(d)

Sol. Given: Height of aeroplane from the ground AD = 1 km; Initial angle of elevation = 60° and angle of elevation after 10 second = 30°.

Let A be the initial position of the aeroplane and E be the position of observer.

And B be the position of the aeroplane after 10 sec.

Therefore ∠AED = 60°, ∠BEC = 30° and AB = CD.



We know that in ΔAED, $\frac{AD}{DE} = \tan 60° = \sqrt{3}$

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

Similarly, in ΔBEC, $\frac{BC}{DE + CD} = \tan 30°$

or $\frac{1}{DE + CD} = \frac{1}{\sqrt{3}}$ or $DE + CD = \sqrt{3}$

or $CD = \sqrt{3} - DE = \sqrt{3} - \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}.$

Therefore speed of the aeroplane per hour $= \frac{\text{Distance AB}}{\text{Time taken to travel}} = \frac{\frac{2}{\sqrt{3}}}{\frac{10}{60 \times 60}}$

$= \frac{2}{\sqrt{3}} \times \frac{60 \times 60}{10} = 240\sqrt{3}$ km/h.

S22. Ans.(b)

Sol.

Length of median of triangle$= \frac{\sqrt{3}}{2} \times 8 = 4\sqrt{3}$

radius of the in circle $= \frac{1}{3} \times 4\sqrt{3}$cm $= \frac{4}{\sqrt{3}}$ cm

∴ Area of the in circle $= \pi \left(\frac{4}{\sqrt{3}}\right)^2$ cm² $= \frac{16}{3} \pi$ cm²

radius of circumcircle

$= \frac{2}{3} \times 4\sqrt{3} = \frac{8}{\sqrt{3}}$ cm

∴ Area of the circum- circle $= \pi \times \left(\frac{8}{\sqrt{3}}\right)^2 = \frac{64}{3} \pi$ cm²

$\therefore$ Area of the required region $= \left(\frac{64}{3}\pi - \frac{16}{3}\pi\right)$ cm^2 $= \frac{48\pi}{3} = 16\pi$ cm^2

$= \frac{16 \times 22}{7} = \frac{352}{7} = 50\frac{2}{7}$cm^2

S23. Ans.(b)
Sol. Circumference of circle= 2π r = 2π × 3 =6 π cm
Area of circle $= \pi r^2 = \pi \times 3 \times 3 = 9\pi$ cm^2
Required ratio= 6 π: 9 π= 2:3

S24. Ans.(d)
Sol. Let the length of the rectangle be x units and breadth be y units.
$\therefore$ Perimeter of rectangle $= 2(x + y)$cm
According to the question,

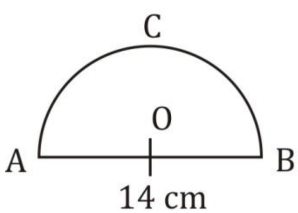
$$\frac{x}{2x + 2y} = \frac{5}{16}$$

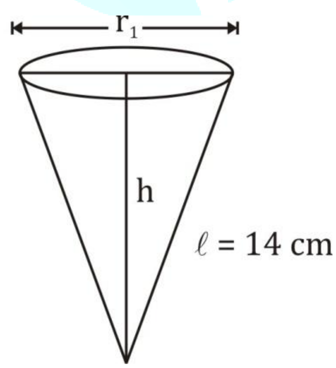
$$\Rightarrow \frac{x}{x + y} = \frac{5}{8}$$

$$\Rightarrow \frac{x + y}{x} = \frac{8}{5} \Rightarrow \frac{x}{x} + \frac{y}{x} = \frac{8}{5} \Rightarrow \frac{y}{x} = \frac{8}{5} - 1$$

$$\Rightarrow \frac{y}{x} = \frac{3}{5} \Rightarrow x : y = 5 : 3$$

S25. Ans.(b)
Sol.





Length of semicircular sheet (ACB) = πr

$= \frac{22}{7} \times 14 = 44$ cm

Slant height of cone = ℓ =14 cm

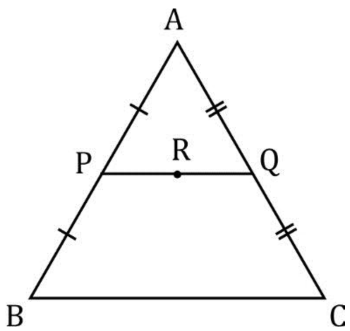
Circumference of the base of the cone $= 2\pi r_1 = \frac{44}{7} r_1$

$$\Rightarrow 44 = \frac{44}{7} r_1 \Rightarrow r_1 = 7 \text{ cm}$$

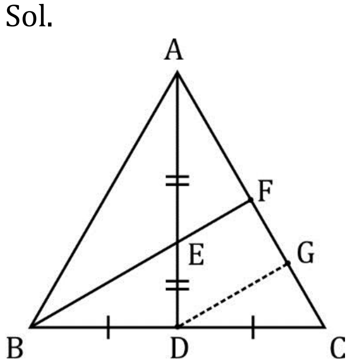
$$\therefore\ h = \sqrt{\ell^2 - r_1^2} = \sqrt{14^2 - 7^2}$$

$= 7\sqrt{3}$ cm
$= 7 \times 1.732 = 12$ cm

S26. Ans.(a)
Sol. Volume of bucket $= \frac{1}{3}\pi h(r_1^2 + r_2^2 + r_2 r_2)$
$= \frac{1}{3} \times \frac{22}{7} \times 45(28^2 + 7^2 + 28 \times 7)$
$= \frac{1}{3} \times \frac{22}{7} \times 45(784 + 49 + 196)$
$= \frac{1}{3} \times \frac{22}{7} \times 45 \times 1029 = 48510 \text{ cm}^3$

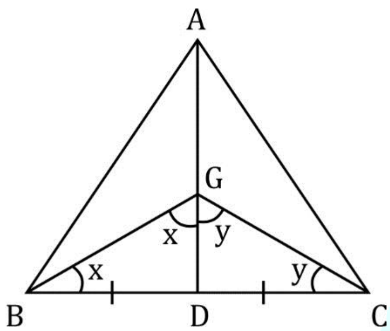
S27. Ans.(d)
Sol.


$\Delta APQ \sim \Delta ABC$
$\therefore \frac{AP}{PB} = \frac{PQ}{BC}$
$\frac{1}{2} = \frac{PQ}{BC}$
BC = 2PQ
BC = 2 (PR + RQ)
BC = 2 × 6
BC = 12 cm

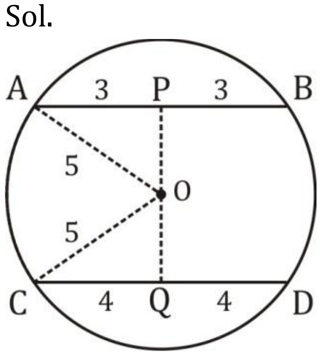
S28. Ans.(b)
Sol.


D is mid point of BC and E is mid point of AD.
Draw a line parallel to BF from D to G. G is a point on AC.

∵ DG ∥ BF
∴ ΔDGC ~ ΔBFC
⇒ CD : DB = CG : GF
⇒ CG = GF
Now ΔAEF ~ ΔADG
⇒ AE : ED = AF : FG
⇒ AF = FG
∴ $\frac{AF}{FC} = \frac{AF}{(FG+CG)} = \frac{AF}{2AF}$
AF : FC = 1 : 2

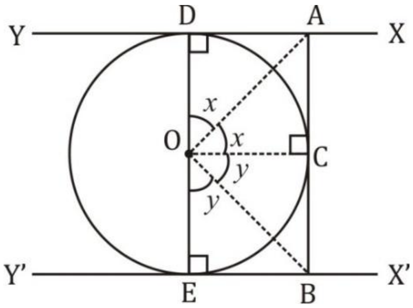
S29. Ans.(d)
Sol.


AG = BC
∴ GD = BD = DC
Let ∠BGD = x
∴ ∠GBD = x
∠BDG + ∠CDG = 180°
$180 - 2x + 180 - 2y = 180°$
⇒ x + y = 90°

S30. Ans.(a)
Sol.


$OP = \sqrt{5^2 - 3^2}$
OP = 4
$OQ = \sqrt{5^2 - 4^2}$

OQ = 3
PQ = 7 cm

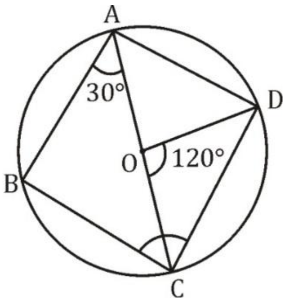
S31. Ans.(b)
Sol.


∠ADO = ∠ACD = 90°
OD = OC (radius of circle)
AO is common in both triangle ΔADO and ΔACO
∴ ΔADO ≅ ΔACO
∴ ∠AOD = ∠AOC = x (say)
In same way we can say,
∠BOC = ∠ BOE = y (say)
And, OD ⊥ XY
OE ⊥ X'Y'
∵ XY ∥ X'Y'
∴ ∠DOE = 180° = (2x + 2y) ⇒ (x + y) = 10°
∠AOB = (x + y) = 90°

S32. Ans.(d)
Sol. Sides of the trapezium = 2x and 3x cm
$\therefore \frac{1}{2}(2x + 3x) \times 12 = 480$
$\Rightarrow 5x = \frac{480}{6} = 80$
$\Rightarrow x = \frac{80}{5} = 16$
Longer side = 16 × 3 = 48 cm

S33. Ans.(b)

Sol.



$\angle COD = 120°$

$\angle BAC = 30°$

$\angle CAD = \frac{1}{2} \times 120° = 60°$

(angle made on other part of circle is half of angle made at centre by same are)

$\therefore \angle BAD = 90°$

$\therefore \angle BCD = 180° - 90° = 90°$ (cyclic quadrilateral)

S34. Ans.(d)

Sol.

$\frac{360°}{n-1} - \frac{360}{n+2} = 6$

$\Rightarrow 60\left(\frac{1}{n-1} - \frac{1}{n+2}\right) = 1$

$\Rightarrow 60(2+1) = (n-1)(n+2) = n^2 + n - 2$

$\Rightarrow n^2 + n - 182 = 0 \Rightarrow (n+14)(n-13) = 0$

$\Rightarrow n = -14$ or $n = 13$

S35. Ans.(b)

Sol. Each interior angle of a regular polygon$= 180 \times \frac{3}{5} = 108°$

$\therefore$ Each exterior angle = 180° – 108° = 72

So, number of sides = $\frac{360}{72} = 5$

S36. Ans.(d)

Sol. We have $\sqrt{3x} + 3y = 6$

Or $3y = -\sqrt{3}x + 6$

Or, $y = -\frac{1}{\sqrt{3}}x + 2$

Comparing the above equation with y = mx + c

We get $m = -\frac{1}{\sqrt{3}}$ and c = 2

Hence slope is $\left(-\frac{1}{\sqrt{3}}\right)$ and intercept on the y-axis is 2.

S37. Ans.(c)
Sol. We have $m = \frac{5}{4}$ and $(x_1, y_1) = (2, -3)$
∴ The equation of the line as point slope form is
$y - y_1 = m(x - x_1)$
Or $y - (-3) = \frac{5}{4}(x - 2)$
Or $y + 3 = \frac{5}{4}(x - 2)$
Or $5x - 4y = 22$

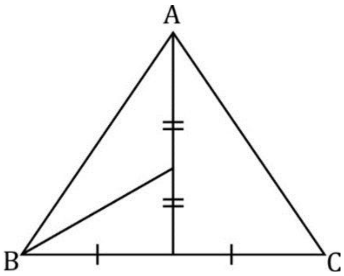
S38. Ans.(b)
Sol. $(a - b)^2 = a^2 - 2ab + b^2$
$x^4 - 2x^2 + K = (x^2)^2 - 2 \times x^2 \times 1 + K$
$K = (1)^2 = 1$

S39. Ans.(c)
Sol. Given, $x = 6$
$= \frac{4 \times 6}{3} + 2P = 12$
$\Rightarrow 8 + 2P = 12$
$2P = 4$
$P = 2$

S40. Ans.(c)
Sol. $\frac{\cos\alpha}{\cos\beta} = a$
$\Rightarrow \frac{\cos^2\alpha}{\cos^2\beta} = a^2$
$\Rightarrow \frac{1-\sin^2\alpha}{1-\sin^2\beta} = a^2$
$\Rightarrow 1 - \sin^2\alpha = a^2(1 - \sin^2\beta)$
$\Rightarrow 1 - b^2\sin^2\beta = a^2 - a^2\sin^2\beta$
$\Rightarrow 1 - a^2 = b^2\sin^2\beta - a^2\sin^2\beta$
$\Rightarrow 1 - a^2 = (b^2 - a^2)\sin^2\beta$
$\Rightarrow \sin^2\beta = \frac{1 - a^2}{b^2 - a^2} = \frac{a^2 - 1}{a^2 - b^2}$

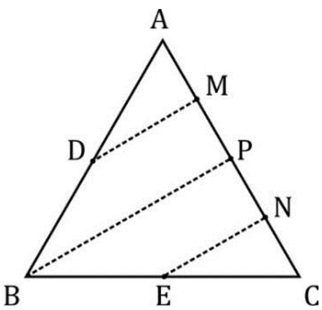
S41. Ans.(c)
Sol. $x = a(\sin\theta + \cos\theta)$ and $y = b(\sin\theta - \cos\theta)$
$\Rightarrow \frac{x}{a} = \sin\theta + \cos\theta$ and $\frac{y}{b} = \sin\theta - \cos\theta$
$\therefore \frac{x^2}{a^2} + \frac{y^2}{b^2} = (\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$
$= \sin^2\theta + \cos^2\theta + 2\sin\theta.\cos\theta + \sin^2\theta + \cos^2\theta - 2\sin\theta.\cos\theta$
$= 2(\sin^2\theta + \cos^2\theta) = 2$

S42. Ans.(c)
Sol.



As we know that median divide area is two equal parts :
Area of ΔBDE = 20 cm^2
∴ area of ΔADB = 40 cm^2
∴ area of ΔABC = 80 cm^2

S43. Ans.(b)
Sol.



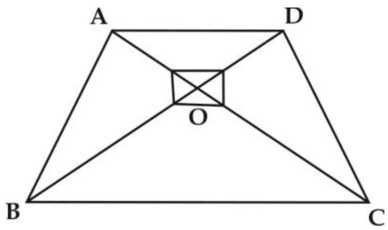
D is mid point of AB and M is mid point of AP
∴ DM ∥ BP
Hence DM = $\frac{1}{2}$BP
E is mid point of BC and N is mid point of PC
∴ EN ∥ BP
∴ EN = $\frac{1}{2}$BP
DM : EN = 1 : 1

S44. Ans.(d)
Sol. CD = radius = OC = OD
$\angle$COD = 60°
$\angle$CAD = $\frac{1}{2}\angle$COD
$\frac{1}{2} \times 60° = 30°$ ....(i)
Now$\angle$ ADB = 90°
[Angle of semicircle]
$\Rightarrow \angle ADP = 180° - 90° = 90°$
Now in ΔADP,
$\angle P = 180° - (\angle PAD + \angle ADP)$

$180° - (30° + 90°) = 60°$

S45. Ans.(b)

Sol.



$OB^2 + OC^2 = BC^2$

$OC^2 + OD^2 = CD^2$

$OD^2 + OA^2 = AD^2$

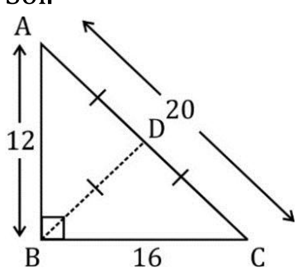
$OA^2 + OB^2 = AB^2$

$\therefore 2\,(OB^2 + OA^2 + OD^2 + OC^2) = AB^2 + BC^2 + CD^2 + DA^2$

$\Rightarrow AB^2 + CD^2 = BC^2 + DA^2$

S46. Ans.(c)

Sol.



Sides are of a right angle triangle

Orthocentre will be point 'B'

And circumcentre will be mid point of AC which is D

BD = AD = CD (circumradius)

$\therefore$ BD = 10 cm

S47. Ans.(c)

Sol.

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

$$a = \frac{x + 2 + x - 2\sqrt{x^2 - 4}}{4} = \frac{x + \sqrt{x^2 - 4}}{2}$$

$$a^2 = \frac{x^2 + x^2 - 4 + 2x\sqrt{x^2 - 4}}{4} = \frac{x^2 + x\sqrt{x^2 - 4} - 2}{2}$$

$$ax = \frac{x^2 + x\sqrt{x^2 - 4}}{2}$$

$$a^2 - ax = \frac{x^2 + x\sqrt{x^2-4} - 2}{2} - \frac{x^2 + x\sqrt{x^2-4}}{2}$$

$$a^2 - ax = -1$$

S48. Ans.(b)

Sol.

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

$$8xy(x^2+y^2) = 8\left(\frac{1}{2+\sqrt{3}}\right)\left(\frac{1}{2-\sqrt{3}}\right)\left(4+3-4\sqrt{3}+4+3+4\sqrt{3}\right)$$

$$= 8(14) = 112$$

S49. Ans.(a)

Sol.

$$\cos(40° - \theta) - \sin(50° + \theta) + \frac{\cos^2 40° + \cos^2 50°}{\sin^2 40° + \sin^2 50°}$$

$$\sin[90° - (40° - \theta)] - \sin(50° + \theta) + \frac{\cos^2 40° + \cos^2(90° - 40°)}{\sin^2 40° + \sin^2(90° - 40°)}$$

$$\sin(50° + \theta) - \sin(50° + \theta) + \frac{\cos^2 40° + \sin^2 40°}{\sin^2 40° + \cos^2 40°}$$

$$0 + \frac{1}{1} = 1$$

S50. Ans.(b)

Sol.

cot 12° cot 38° cot 52° cot 60° cot 78°

(cot 12° cot 78°)(cot 38° cot 52°) (cot 60°)

[cot 12° cot (90° – 12°)] [cot 38° cot (90° – 38°)] cot 60°

(cot 12° tan 12°) (cot 38° tan 38°) cot 60°

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