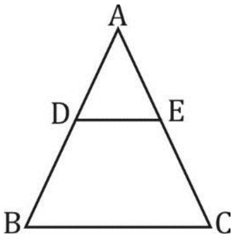
Advance Maths Solutions

S1. Ans.(d)
Sol.



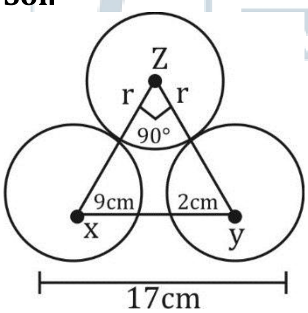
Using property of similar triangles

$$\frac{\text{area } \Delta ADE}{\text{area } \Delta ABC} = \left(\frac{AD}{AB}\right)^2$$

$$\frac{AD}{AB} = \frac{1}{\sqrt{2}}$$

$$\frac{AD}{BD} = \frac{1}{\sqrt{2}-1}$$

S2. Ans.(d)
Sol.



xz = 9 + r
yz = 2 + r
xy = 17 cm
Δxzy is a Right angled triangle
Therefore,
$xz^2 + zy^2 = xy^2$
$(9 + r)^2 + (2 + r)^2 = (17)^2$
$81 + r^2 + 18r + 4 + r^2 + 4r = 289$
$2r^2 + 22r = 204$
$r^2 + 11r - 102 = 0$
$r^2 + 17r - 6r - 102 = 0$
$r(r + 17) - 6(r + 17) = 0$
$r = -17, 6$
$r = 6$

S3. Ans.(a)

Sol. Ratio of number of sides of Polygon = 1 : 2

Let number of sides ⇒ x, 2x

Interior angle ratio = $\frac{2}{3}$

$$\frac{\frac{(n_1 - 2) \times 180}{n_1}}{\frac{(n_2 - 2) \times 180}{n_2}} = \frac{2}{3}$$

$$\frac{\frac{(x - 2) \times 180^\circ}{x}}{\frac{(2x - 2) \times 180^\circ}{2x}} = \frac{2}{3}$$

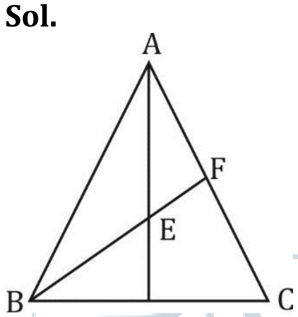
3x – 6 = 2x – 2

x = 4

Sides are → 4, 8

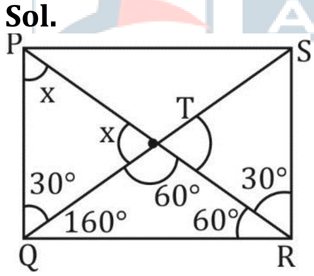
S4. Ans.(b)

Sol.



S5. Ans.(c)

Sol.



In ΔPQT

PQ = QT

∠x + ∠x + 30° = 180°

2x = 150°

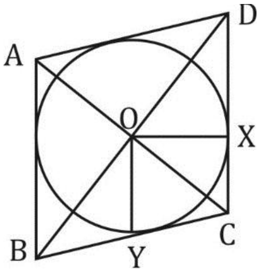
x = 75°

Similarly in ΔRTS

y = 75°

∠PTS = 360 – (75 + 75 + 60) = 150°

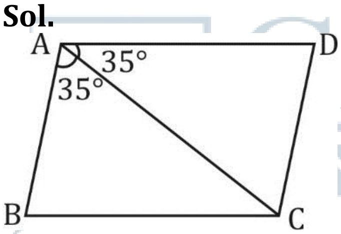
S6. Ans.(b)
Sol.



OX = OY
∠OYC = 90°
∠OXC = 90°
∴ ∠BCD = 90°

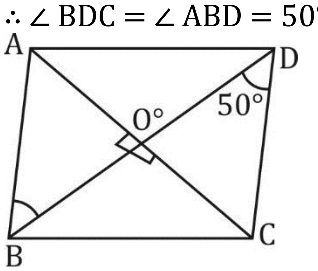
S7. Ans.(b)
Sol.
Side of rhombus = $\frac{1}{2}\sqrt{(d_1)^2 + (d_2)^2}$
= $\frac{1}{2}\sqrt{(18)^2 + (24)^2}$
= $\frac{1}{2}$ × 30 = 15 cm

S8. Ans.(b)
Sol.

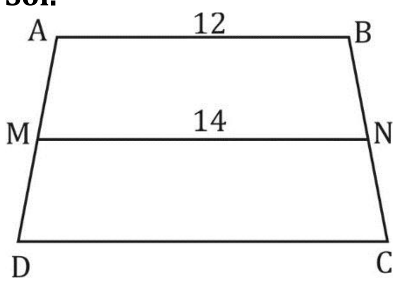


∠ BAD = 35° + 35° = 70°
∵ AD || BC
∴ ∠ BAD + ABC = 180°
70°+∠ ABC = 180°
∴ ∠ ABC = 110°

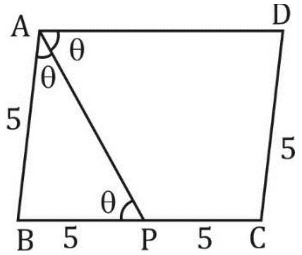
S9. Ans.(a)
Sol.
∵ AD || BC
∴ ∠ BDC = ∠ ABD = 50° [alternate angle]



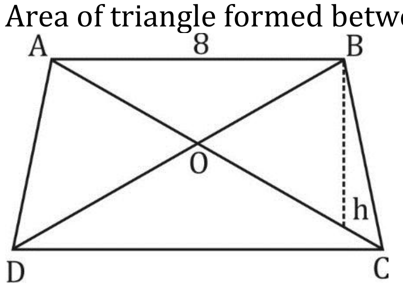
In ΔABO
⇒ ∠OAB+ ∠ABO + ∠AOB = 180°
⇒ ∠DAB + 50° + 90° = 180°
∠ OAB = 40°

S10. Ans.(d)
Sol.


$MN = \frac{AB+CD}{2} \Rightarrow 14 = \frac{12+CD}{2}$
CD = 28 – 12 = 16 cm

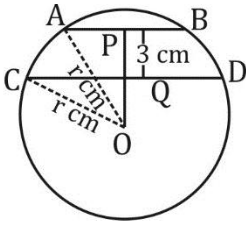
S11. Ans.(a)
Sol.


∵ P is the mid point of BC
∴ $BP = PC = \frac{10}{2} = 5$ cm
Let ∠BAP = ∠DAP = θ
∵ AD || BC
∴ ∠DAP = ∠APB = θ [alternate angle]
∵ AB = BP = PC = CD = 5 cm
∴ CD = 5 cm

S12. Ans.(c)
Sol.
Area of triangle formed between parallel lines are equal


Area(ΔABD) = ar(ΔABC) = 24
∴ $ar(\Delta ABC) = \frac{1}{2} \times 8 \times h = 24$
h = 6 cm

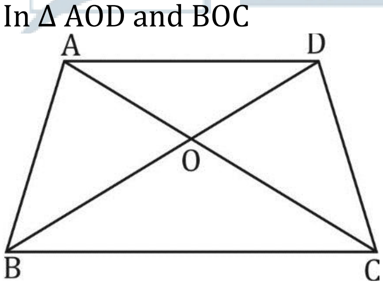
S13. Ans.(a)
Sol.
Let O and r be the center and radius of a circle respectively and AB and CD be its chords.
Let OP ⊥CD



∵ AB ∥ CD and OP ⊥ CD
∴ Points O, Q and P are collinear
Given PQ = 3 cm
Let OQ = r cm
∴ OP = (x+3) cm
From Pythagoras theorem–
In right triangles OPA and OQC
$OA^2 = OP^2 + AP^2$ and $OC^2 = OQ^2 + OQ^2$

$\Rightarrow r^2 = (x+3)^2 + 3^2$ and $r^2 = x^2 + 6^2$
$\left[\because AP = \frac{1}{2} AB = 3cm \text{ and } CQ = \frac{1}{2} CD = 6\ cm\right]$
$\Rightarrow (x+3)^2 + 3^2 = x^2 + 6^2$
$\Rightarrow x^2 + 6x + 18 = x^2 + 36$
$\Rightarrow 6x = 18 \Rightarrow x = 3$ cm
$\Rightarrow r^2 = x^2 + 6x + 18$ ...(i)
Putting the value of x in (i)
$r^2 = (3)^2 + 36 \Rightarrow r^2 = 9 + 36 = 45$
$\Rightarrow r = \sqrt{45} = 6.7$ cm

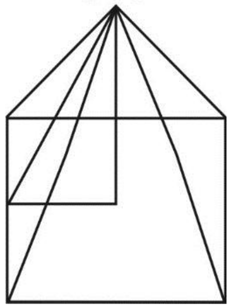
S14. Ans.(d)
Sol.
In Δ AOD and BOC



$\frac{OD}{OB} = \frac{OA}{OC}$
$\frac{x-5}{3x-19} = \frac{3}{x-3}$
$x^2 - 8x + 15 = 9x - 57$
$x^2 - 17x = 72 = 0$
(x–8) (x–9) = 0
X = 8, 9

S15. Ans.(a)
Sol.

x = 3



$l = 4$

Area of slant surface

$= \frac{1}{2} \times$ perimeter of base × slant height

$12 = \frac{1}{2} \times 4a \times 4$

$8a = 12$

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

$\frac{\text{Area of slant surface}}{\text{Are of base}} = \frac{12}{\frac{3}{2}\times\frac{3}{2}} = \frac{48}{9}$

$= \frac{16}{3} = 16 : 3$

S16. Ans.(b)
Sol.

$h = H\left(\frac{cot\theta_1 - cot\theta_2}{cot\theta_1}\right)$

$= \frac{54\left(\sqrt{3}-\frac{1}{\sqrt{3}}\right)}{\sqrt{3}}$

$= 54 \times \left(\frac{3-2}{3}\right) = 36$ m

S17. Ans.(b)
Sol.

Height of the cloud $= \frac{h(cos\theta_1 + cos\theta_2)}{cot\theta - \theta_2}$

$= h\left(\frac{\sqrt{3}+\frac{1}{\sqrt{3}}}{\sqrt{3}-\frac{1}{\sqrt{3}}}\right) = h\left(\frac{\frac{4}{\sqrt{3}}}{\frac{2}{\sqrt{3}}}\right)$

$=2$

S18. Ans.(c)
Sol.

$A+B=90°$, $B = 90° - A$

$Sec^2A + sec^2 (90°-A) - sec^2 A \, sec^2 (900-A)$

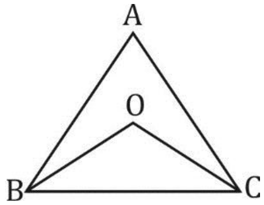
$= sec^2 A + cosec^2 A - sec^2 A.cosec^2 A$

$= \frac{1}{cos^2 A} + \frac{1}{sin^2 A} - \frac{1}{cos^2 A} \times \frac{1}{sin^2 A}$

$= \frac{sin^2 A + cos^2 A - 1}{sin^2 A.cos^2 A}$

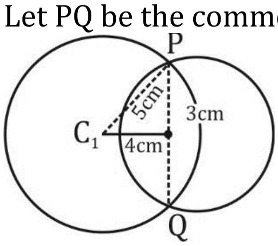
$= \frac{1-1}{sin^2 A.cos^2 A} = 0$

S19. Ans.(a)
Sol.



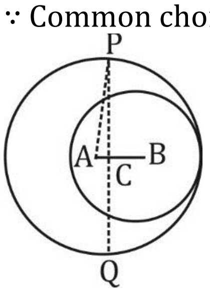
$\angle$ BOC = $90 + \frac{\angle BAC}{2}$
$110–90 = \frac{\angle BAC}{2}$
$\angle BAC = 20 \times 2 = 40°$

S20. Ans.(C)
Sol.
Let PQ be the common chord of two circles whose centers are C_1 and C_2.



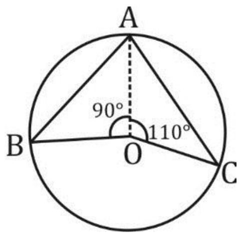
Given–
C_1P = 5 cm, C_2P = 3 cm and C_1C_2 = 4 cm
Clearly, $5^2 = 4^2 + 3^2$
i.e. $C_1P^2 = C_1C^2{}_2 + C_1P^2$
$\Rightarrow \angle C_1C_2P = 90°$
$\Rightarrow$ C_2 is on the common chord PQ and bisects it.
$\because$ $C_1C_2 \perp$ PQ and the line segment joining the two centers bisects this common chord. Therefore, C_2 is the midpoint is chord PQ.
PQ = 2 C_2P = 2 ×3 = 6 cm

S21. Ans.(b)
Sol.
We know when two circles intersect each other internally, the distance between their centers is equal to the difference of their radii.
$\therefore$ AB = 5 – 3 = 2 cm
$\because$ Common chord PQ is the right bisector of AB.



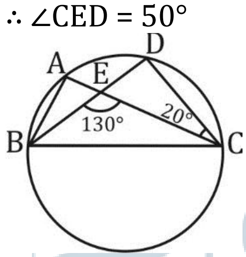
$\therefore$ AC = BC = $2\times\frac{1}{2}$ = 1 cm
In right triangle ACP
$AP^2 = CP^2 + AC^2$
$\Rightarrow 5^2 = CP^2 + (1)^2$
$\Rightarrow CP^2 = 25 - 1 = 24 \Rightarrow CP = \sqrt{24} = 2\sqrt{6}$
$\therefore PQ = 2PC = 2\times2\sqrt{6} = 4\sqrt{6}$cm

S22. Ans.(a)
Sol.



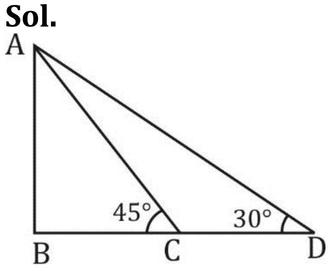
$\angle BOA = 90°$ and $\angle AOC = 110°$
$\therefore \angle BOC = 360° - (\angle BOA + \angle AOC)$
$\Rightarrow \angle BOC = 360° - (90° + 110°) = 160°$
Now, $\angle BAC = \frac{1}{2} \angle BOC$
$\Rightarrow \angle BAC \ \frac{1}{2} \times 160° = 80°$

S23. Ans.(c)
Sol.
Since BED is a straight line and $\angle BEC = 130°$
$\therefore \angle CED = 50°$



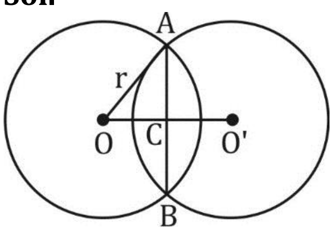
In ΔCDE,
$\angle DCE + \angle CED + \angle CDE = 180°$
$\Rightarrow 20° + 50° + \angle CDE = 180°$
$\Rightarrow \angle CDE = 180° - 70° = 180°$
$\Rightarrow \angle CDBE = 110°$
[$\because$ Angles of the same segment are equal]
$\therefore \angle BAC = \angle BDC = \angle CDB = 110°$

S24. Ans.(c)
Sol.



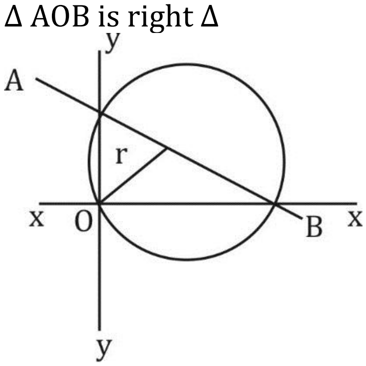
$d = h\,(\cot\theta_1 - \cot\theta_2)$
$60 = h\left(\sqrt{3} - 1\right)$
$h = \frac{60}{\sqrt{3}-1}$
$h = \frac{60\left(\sqrt{3}+1\right)}{\left(\sqrt{3}-1\right)\left(\sqrt{3}+1\right)}$
$= 30\left(\sqrt{3} + 1\right)$ m

S25. Ans.(c)
Sol.
$\frac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}}+\frac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}}=14$
$\frac{\left(x+\sqrt{x^2-1}\right)^2+\left(x-\sqrt{x^2-1}\right)}{x^2-(x^2-1\,)}=14$
$\frac{x^2+x^2-1+2x\sqrt{x^2-1}+x^2+x^2-1-2x\sqrt{x^2-1}}{x^2-x^2+1}=14$
$4x^2-2=14$
$4x^2=16$
$x^2=4$
$x=\pm 2$

S26. Ans.(c)
Sol.


OO' = 12 cm
AB = 16 cm
$OC=\frac{OC\prime}{2}=\frac{12}{2}=6$ cm
$AC=\frac{16}{2}=8$ cm
$r=\sqrt{6^2+8^2}$
$=\sqrt{36+64}=10$ cm

S27. Ans.(b)
Sol.
$(2\cos^2\theta-1)\left(\frac{1+tan\theta}{1-tan\theta}+\frac{1-tan\theta}{1+tan\theta}\right)$
$=(2\cos^2\theta-1)\left\{\left(\frac{(1+tan\theta)^2+(1-tan\theta)^2}{1-\tan^2\theta}\right)\right\}$
$=\cos 2\theta\left(\frac{1+\tan^2\theta+2tan\theta+1+\tan^2\theta-2\tan\theta}{1-\frac{\sin^2\theta}{\cos^2\theta}}\right)$
$=\frac{cos2\theta\times 2(\tan^2\theta+1)}{cos2\theta\times\sec^2\theta}=\frac{2\sec^2\theta}{\sec^2\theta}=2$

S28. Ans.(a)
Sol.
Δ AOB is right Δ


∴ radius of circumcircle $= \frac{Diagonal}{2} = \frac{AB}{2}$

$x = 0, y = 3$ A (0,3)

$y = 0, x = 4$ B (4,0)

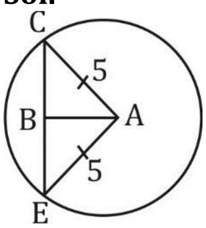
$AB = \sqrt{(0-4)^2 + (3-0)^2}$

$= \sqrt{25} = 5$

Radius $= \frac{5}{2} = 2.5$ unit

S29. Ans.(d)

Sol.



CA = 5cm

$\angle B = 90°$

$BC = 3, AB = 4$

$3^2 + 4^2 = 5^2$

∴ Length of $CE = 2 \times BC$

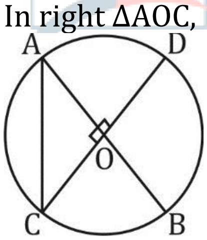
$= 2 \times 3 = 6$ cm

S30. Ans.(d)

Sol.

∵ OA = OC = r

In right ΔAOC,



$AC = \sqrt{OA^2 + OC^2} = \sqrt{r^2 + r^2}$

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