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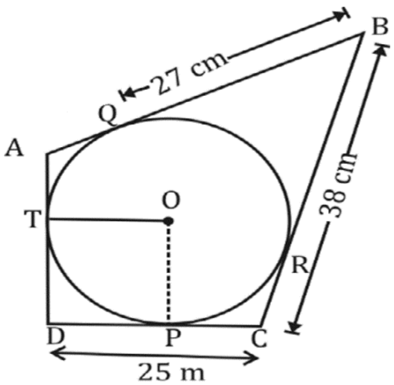
Quant Mega Quiz SSC CGL (Advanced Level) 05.01.2020 Solution

S1. Ans. (b)
Sol.
Given BC = 38 cm
QB = 27 cm
DC = 25 cm AD ⊥ DC

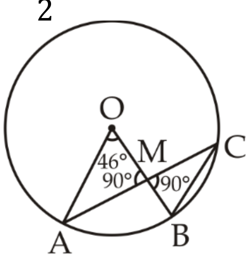


We know that tangents are always equal, when they drawn to the circle from a point outside the circle.
∴ BQ = BR = 27 cm
RC = BC – BR = 38 – 27 = 11 cm
RC = PC =11 cm
DC = 25cm
DP = DC – PC = 25 – 11 = 14cm
DP = OT = OP
∴ Radius of the circle = 14 cm

S2. Ans.(c)
Sol.
Since, angle subtend on the circumference is half of the angle subtend on centre.

$\therefore \angle ACB = \frac{1}{2}\angle AOB$

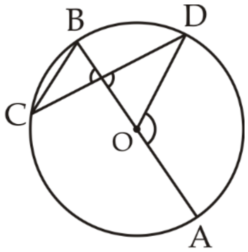
$= \frac{1}{2} \times 46° = 23°$



∠C + ∠B + ∠M = 180°
⇒ 23° + ∠B + 90° = 180°
∴∠B = 67°

S3. Ans.(d)

Sol.∠BOD = 180° - 106° = 74°



Since, ∠BOD is an angle made by arc BD on centre.

Here, ∠BCD is an angle made by arc BD on circumference.

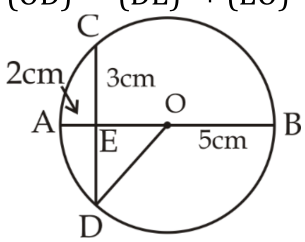
$\therefore BCD = \frac{1}{2} \times \angle BOD$

$= \frac{1}{2} \times 74° = 37°$

S4. Ans.(b)

Sol. In ΔOED,

$(OD)^2 = (DE)^2 + (EO)^2$



⇒ $(5)^2 = (DE)^2 + (3)^2$

⇒ $(DE)^2 = 25 – 9 = 16$

∴ DE = 4 cm

S5. Ans.(d)

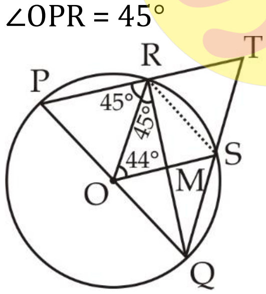
Sol. ∠PRQ = 90° (angle in a semicircle is 90°)

Since, OR is bisector of ∠PRQ,

∴∠PRO = ∠ORQ = 45°

Also, OP = OR

∠OPR = 45°



In ΔORS,

$OR = OS \Rightarrow \angle ORS = \angle OSR = \frac{180° - 44°}{2} = 68°$

∠MRS = 68° - 45° = 23°

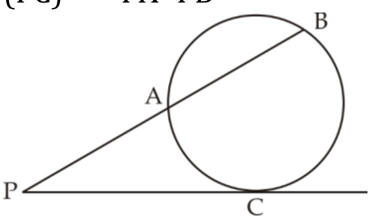
⇒∠PRS = 90° + 23° = 113°

By properties of cyclic quadrilateral,

∠PRS + ∠PQS = 180°

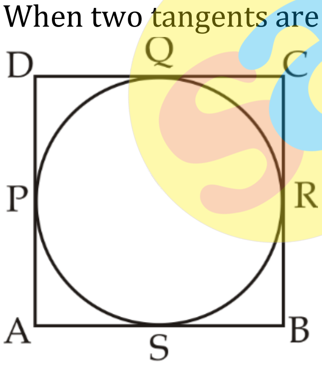
⇒∠PQS = 180° - 113° = 67°
In ΔPTQ,
∠QPT + ∠PQT + ∠ PTQ = 180°
∠PTQ = 180° - 45° - 67° = 68°
Alternatively,
In ΔORQ,
OR = OQ
∠OQR = 45°
Also, $\angle RQS = \frac{1}{2}\angle ROS = 22°$
∴ ∠PQS = 45° + 22° = 67°
In ΔPTQ,
∠QPT + ∠PQT + ∠ PTQ = 180°
∠PTQ = 180° - 45° - 67° = 68°

S6. Ans.(a)
Sol.
If a secant to a circle intersect circle at points A and B PC is a tangent to circle, then
$(PC)^2 = PA \times PB$



Which is equivalent to area of rectangle with PA and PB as sides is equal to the area of square with PC as side.

S7. Ans.(c)
Sol.
When two tangents are drawn from an external point to a circle, the length of the tangents is equal.



AS = AP ...(i)
BS = BR ...(ii)
CQ = CR ...(iii)
DP = DQ ...(iv)
Adding (i), (ii), (iii) and (iv) we get.
AS + BS + CQ + DQ = AP +BR + DP + CR
= AB + CD = AD + BC
∴ Option **(c)** is correct

S8. Ans.(b)

Sol. Given, $x = \sqrt{5} + \frac{1}{\sqrt{5}} = \frac{6}{\sqrt{5}}$

ATQ,

$$\left(x - \frac{\sqrt{160}}{\sqrt{32}}\right)\left(x - \frac{1}{x - \frac{2\sqrt{5}}{5}}\right)$$

$= \left(\frac{6}{\sqrt{5}} - \frac{\sqrt{160}}{\sqrt{32}}\right)\left(x - \frac{1}{\frac{6}{\sqrt{5}} - \frac{2\sqrt{5}}{5}}\right)$

$= \left(\frac{6\sqrt{32} - \sqrt{160} \times \sqrt{5}}{\sqrt{32} \times \sqrt{5}}\right) \times \left(x - \frac{1}{4/\sqrt{5}}\right)$

$= \left(\frac{6\sqrt{32} - 5\sqrt{32}}{\sqrt{5} \times \sqrt{32}}\right) \times \left(\frac{6}{\sqrt{5}} - \frac{\sqrt{5}}{4}\right)$

$= \frac{\sqrt{32}}{\sqrt{5} \times \sqrt{32}} \times \frac{(24-5)}{4 \times \sqrt{5}} = \frac{19}{20}$

S9. Ans.(c)

Sol. ATQ,

$a^2 + b^2 + c^2 = 25$

And, $x^2 + y^2 + z^2 = 36$

Let, $b^2 + c^2 = 0$ and $y^2 + z^2 = 0$

$\therefore$ a = 5 and x = 6

Now,

ax + by + cz = 30

$\Rightarrow 5 \times 6 + 0 + 0 = 30$

$\Rightarrow 30 = 30$ (satisfy)

Now,

$$\frac{a + b + c}{x + y + z} = \frac{5 + 0 + 0}{6 + 0 + 0} = \frac{5}{6}$$

S10. Ans.(b)

Sol. For $a + b + c = \frac{9}{2}$

$2a + b = \frac{9}{2}$ ...(i)

$a^2 b = 2$ ..(ii)

$a = c = 2$ & $b = \frac{1}{2}$ (by hit and trial)

As these values satisfy the equation (i) & (ii)

Now $\frac{1}{a^2} + \frac{2}{b^2} + \frac{1}{c^2} + \frac{2}{bc} + \frac{2}{ab}$

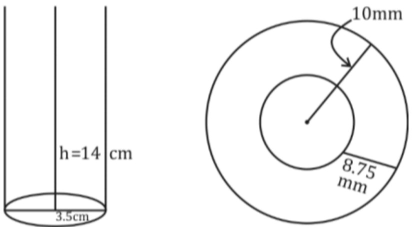
$$= \frac{1}{a^2} + \frac{1}{b^2} + \frac{2}{ab} + \frac{1}{b^2} + \frac{1}{c^2} + \frac{2}{bc}$$

$$= \left(\frac{1}{a} + \frac{1}{b}\right)^2 + \left(\frac{1}{b} + \frac{1}{c}\right)^2$$

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

$$= 2 \times \left(\frac{5}{2}\right)^2 = \frac{25}{2}$$

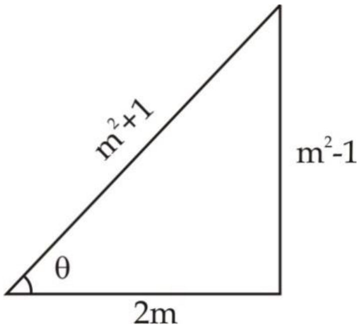
S11. Ans.(d);
Sol.



→ Volume of steel cylinder = $\pi r^2 h$
$= \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 14$
→ Radius of ball = 1cm
→ Thickness of ball
= 8.75mm = 0.875cm
→ Internal radius of ball
= 1–0.875 = 0.125
→ Volume of ball
$= \frac{4}{3}\pi(r_0^3 - r_1^3)$
$= \frac{4}{3} \times \pi \times \{1^3 - (0.125)^3\}$
⇒ Total number of balls
$= \frac{\pi \times 3.5 \times 3.5 \times 14}{\frac{4}{3} \times \pi \times .99804} = 129$ (approx)

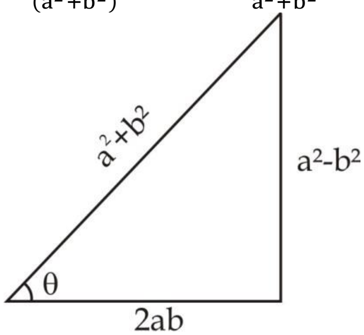
S12. Ans.(d);
Sol. We know
If $N = x^a \times y^b \times z^c$
↓ Where x, y & z are prime numbers
∴ No. of Factors = (a+1) × (b +1) × (c+1)
Given,
$= 5^{11} + 5^{12} + 5^{13} + 5^{14}$
$= 5^{11}(1 + 5 + 5^2 + 5^3)$
$= 5^{11}\ (1 + 5 + 25 + 125)$
$= 5^{11} \times 156$
$= 5^{11} \times 2^2 \times 3 \times 13$
∴ No. of factors = (11+1) × (2+1) × (1+1) × (1+1)
= 12 × 3 × 2 × 2= 144

S13. Ans.(b)
Sol. ATQ,
$\sec\theta + \tan\theta = m$ ...(i)
then, $\sec\theta - \tan\theta = \frac{1}{m}$ ...(ii)
(Because, $\sec^2\theta - \tan^2\theta = 1$)
⇒ Now,
From eqn (i) – eqn(ii)
$2\tan\theta = m - \frac{1}{m}$
$\Rightarrow \tan\theta = \frac{m^2 - 1}{2m}$



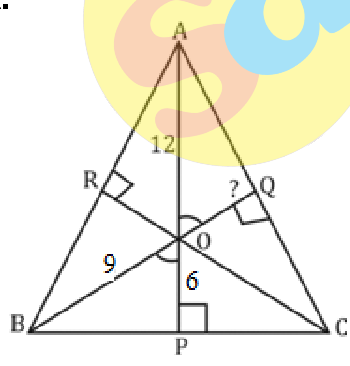
$\therefore \cos\theta = \dfrac{2m}{m^2 + 1}$

S14. Ans.(b)
Sol. ATQ.
$(a^2 - b^2)\sin\theta + 2ab\cos\theta = a^2 + b^2$
→ Divide by $a^2 + b^2$
$\Rightarrow \frac{(a^2-b^2)}{(a^2+b^2)} \times \sin\theta + \frac{2ab}{a^2+b^2} \times \cos\theta = 1$



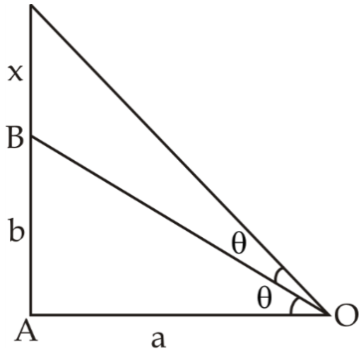
$\therefore \sin\theta = \frac{a^2-b^2}{a^2+b^2}$ ... (i)
And, $\cos\theta = \frac{2ab}{a^2+b^2}$ ... (ii)
$\therefore \cot\theta = \dfrac{\cos\theta}{\sin\theta} = \dfrac{2ab}{a^2 - b^2}$

S15. Ans.(c);
Sol.



Since O is the intersection point of all the altitudes → O is the orthocentre
$\Delta AOQ \sim \Delta BOP$
$\Rightarrow \frac{AO}{BO} = \frac{OQ}{OP}$
$\Rightarrow AO \times OP = BO \times OQ$
$\Rightarrow 12 \times 6 = 9 \times OQ$
$\Rightarrow OQ = \frac{12 \times 6}{9} = 8cm$

S16. Ans.(b)
Sol.



$\tan\theta = \frac{b}{a}$

$\tan 2\theta = \frac{b+x}{a}$

$\frac{2\tan\theta}{1-\tan^2\theta} = \frac{b+x}{a}$

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

$\frac{2b \,.\, a^2}{a^2-b^2} = b+x$

$b\left[\frac{2a^2-a^2+b^2}{a^2-b^2}\right] = x$

$b\left[\frac{b^2+a^2}{a^2-b^2}\right] = x$

S17. Ans.(a)
Sol. Required area = Area of larger semicircle + 2 (area of smaller semicircle)

$\text{Area} = \frac{1}{2} \times \pi \times (7)^2 + 2\left[\frac{1}{2} \times \pi \times \left(\frac{7}{2}\right)^2\right]$

$= 115.5 \text{ cm}^2$

S18. Ans.(b)
Sol. There are 12 equilateral triangle each of side 'a'

$= 12 \times \frac{\sqrt{3}}{4}(a)^2 = 3\sqrt{3}a^2$

S19. Ans.(c)
Sol. $x\frac{3}{4} - \frac{3}{2} \times 2.\frac{1}{3} + \frac{4}{5} \times \frac{1}{2} \times 3 = 0$

$\frac{3x}{4} - 1 + \frac{6}{5} = 0$

$\frac{3x}{4} = 1 - \frac{6}{5}$

$\frac{3x}{4} = -\frac{1}{5}$

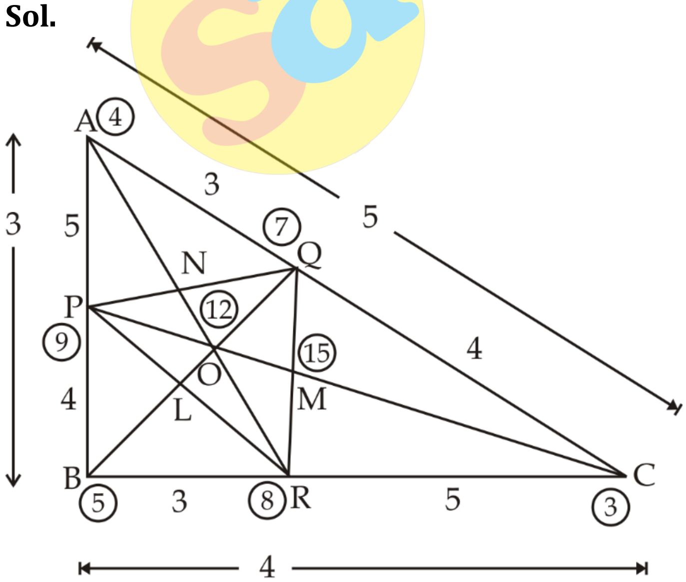
$x = -\frac{4}{15}$

S20. Ans.(c)
Sol.
In case of a $\sin^2\theta$ + $b\cos^2\theta$ minimum value of the expression will be
'a' if a < b
'b' if b < a
Hence, minimum value of the given expression = 2

S21. Ans.(b)
Sol.
$L \Rightarrow 2x - y = 0$
For (0, 1) L' = -1
L' < 0
For $\left(\frac{4}{5}, \frac{3}{5}\right)$
$L'' = \frac{8}{5} - \frac{3}{5} = 1$
L" > 0
Hence both points lie on opposite side of the line.

S22. Ans.(c)
Sol.
Let the line divides the line in ratio k : 1
Then the co-ordinates of the point of division are $= \left(\frac{3k-4}{k+1}, \frac{7k+5}{k+1}\right)$
But it lies on y-axis then
$$\frac{3k-4}{k+1} = 0$$
$$k = \frac{4}{3}$$
Required ratio is 4: 3

S23. Ans**(b)**
Sol.



Total area of ABC $= \frac{1}{2} \times 3 \times 4 = 6$ sq. units

Using weight balance method for the given problem,
For Area of ΔAPC⇒

$\boxed{9} \rightarrow 6$

$\boxed{5} \rightarrow \frac{6}{9} \times 5 = \frac{10}{3} sq.units$

For area of ΔPQC ⇒

$\boxed{7} \rightarrow \frac{10}{3}$

$\boxed{4} \rightarrow \frac{10\times4}{21} = \frac{40}{21}$ sq. units

Fore area of ΔPQO ⇒

$\boxed{1} \rightarrow \frac{10\times4}{21\times4} = \frac{10}{21}$ sq/units

From Δ OQC,
Area of Δ

$\boxed{3} \rightarrow \frac{10 \times 3}{21} = \frac{10}{7}$

$\boxed{3} \Rightarrow \boxed{5} \rightarrow \frac{10}{7}$

$\boxed{1} \rightarrow \frac{10}{35}$

Total area of Δ PQM $= \frac{10}{21} + \frac{10}{35}$

$= \frac{50 + 30}{105}$

$= \frac{80}{105}$ units

$\boxed{8} \rightarrow \frac{80}{105}$

$\boxed{15} \rightarrow \frac{80 \times 15}{105} \Rightarrow \frac{150}{105} = \frac{30}{21} = \frac{10}{7}$

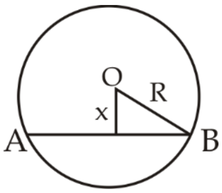
S24. Ans.(b)
Sol.
Let the area of farm be x^2 this year and y^2 last year
$x^2 - y^2 = 279$
$(x - y)(x + y) = 279$
$(x - y)(x + y) = 9 \times 31$

Case I	**Case II**
$(x - y) = 9$	$x - y = 3$
$x + y = 31$	$x + y = 93$
$2x = 40$	$2x = 96$
$x = 20$	$x = 48$
$y = 11$	$y = 45$

$Y^2 < 279$
Hence y=11 can't be possible.
Hence production for this year = 2304

S25. Ans.(a)

Sol.



Area of old sphere = $4\pi R^2$

Extra area added by the cut = $0.3 \times 4\,\pi R^2$

But this B double of the area of now plane created by the cut.

Hence area of the single plain = $.15 \times 4\pi R^2$

$= 0.6\pi R^2$

$\pi R'^2 = 0.6\pi R^2$

$R'^2 = \frac{3}{5} R^2$

$$R' = \sqrt{\frac{3}{5}}R$$

$$x = \sqrt{R^2 - \frac{3}{5}R^2}$$

$$x = \sqrt{\frac{2}{5}}\,R$$