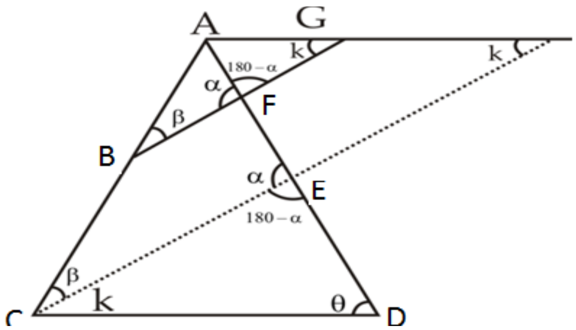
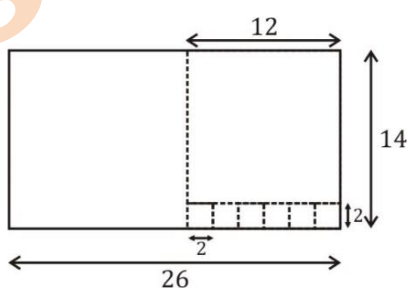
Quant Quiz SSC CGL [Advance level] Mega quiz (Solution)

S1. Ans.(d)
Sol.



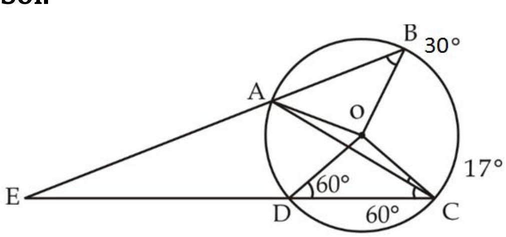
In ΔAGF and ΔDCE
$\angle AGF = \angle ECD$
Clearly, $\angle FAG = \angle EDC$
$\angle AFG = \angle CED$
$\Delta AFG \sim \Delta DEC$
$\therefore \frac{AG}{CD} = \frac{FG}{EC} = \frac{2}{7}$

S2. Ans.(c)
Sol.



8 squares can be cut from the given rectangular section.

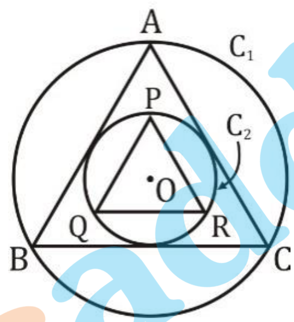
S3. Ans.(b)
Sol.



$\angle OAB = 30°$
$\angle AOB = 120°$
$\angle ODE = 120°$
$\angle AOC = 180° - 34 = 146°$
$\therefore \angle AOD = 146 – 60 = 86$
Now $\angle EAO = 180° - 30° = 150°$
So, $\angle AED = 360 – 150° – 86° – 120° = 4°$

S4. Ans.(c)
Sol. $\sqrt{2+\sqrt{2(1+\cos 4\theta)}} = \sqrt{2+\sqrt{2+2(\cos^2 2\theta - \sin^2 2\theta)}} = \sqrt{2 \pm 2\cos 2\theta}$
$= \sqrt{2-2\cos 2\theta}\left(\because \frac{\pi}{2} < \theta < \frac{3\pi}{4}\right)$
$= 2\sin\theta$

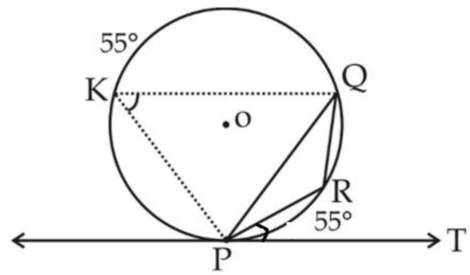
S5. Ans.(b)
Sol.



Since C_1 and C_2 are circumcircle and incircle of ΔABC
$\therefore \boxed{\frac{\text{Radius of } C_1}{\text{Radius of } C_2} = \frac{2}{1}}$
Now,
$\Delta ABC \approx \Delta PQR$ (equilateral Δles)
$\therefore$ ratio of sides = ratio of circumradius
C_2 is also the circumcircle of ΔPQR
$\therefore \frac{\text{Sides of PQR}}{\text{sides of ABC}} = \frac{1}{2}$
$\Rightarrow \frac{\text{area of } \Delta PQR}{\text{Area of } \Delta ABC} = \frac{1}{4}$

S6. Ans.(d)
Sol. If the sheet can overlap 2 cm extra from both ends then
Total length required = 132 + 2 = 134 cm
Given
$\Rightarrow 2\pi r$
$= 2 \times \frac{22}{7} \times 21$
$= 132$ cm
Wastage = $(150 – 134) \times 120 = 1920\ cm^2$

S7. Ans.(a)
Sol.



Clearly $\angle PKQ = 55°$ (interior opposite angle)
$\therefore \angle PRQ = 180 - 55 = 125°$

S8. Ans.(b)
Sol. $X^7 + 64x^2 + 2$
$= (x^3)^2 x + 64x^2 + 2$
(ATQ, $x^3 = 8-4x$)
$\therefore (8-4x)^2\, x + 64x^2 + 2$
$= (64+16x^2-64x)\, x + 64x^2 + 2$
$= 64x + 16x^3 - 64x^2 + 64x^2 + 2$
$= 64x + 16x^3 + 2$
$= 64x + 16(8-4x) + 2$
$= 64x + 128 - 64x + 2 = 130$

S9. Ans.(b)
Sol. $4n\,\alpha = \pi \Rightarrow 2n\alpha = \pi/2$
Now,
$\cot\alpha.\,\text{Cot}\,(2n-1)\alpha = \cot\alpha.\cot\left(\frac{\pi}{2} - \alpha\right) = \cot\alpha\,.\tan\alpha = 1$
Similarly,
$\cot 2\alpha.\cot(2n-2)\,\alpha = 1$
$\cot 3\alpha.\,\cot(2n-3)\,\alpha = 1$
$\cot\alpha.\,\cot 2\alpha.\,\cot 3\alpha$ ………. $\text{Cot}\,(2n-1)\,\alpha$
$= [\cot\alpha.\,\cot(2n-1)\,\alpha]\,[\cot 2\alpha.\,\cot(2n-2)\,\alpha]$ ………..$[\cot(n-1)\,\alpha.\,\cot(\cot(n+1)\,\alpha]$
$= 1.1$…….$1 = 1$

S10. Ans.(a)
Sol. Put $A = B = C = 60°$
Equation satisfied

S11. Ans.(d)
Sol. We know that,
$\sin^2 P + \sin^2 Q + \sin^2 R = 2 + 2\cos P\cos Q\cos R$
$\Rightarrow 2 = 2 + 2\cos P.\,\cos Q.\,\cos R$
$\Rightarrow \cos P.\,\cos Q.\,\cos R = 0$
$\therefore$either P, Q or R $= \pi/2$

S12. Ans.(a)

Sol. (i) let $x + 1 = 0$

Then, $(x = -1)$

$\Rightarrow 1 + 3 + 1 = 5 \neq 0$

(ii) let $x^2 - 3x + 1 = 1$

$\Rightarrow x(x - 3) = 0$

$\Rightarrow x = 0, x = 3$

(iii) $x^2 - 3x + 1 = -1$ (When $x + 1$ is even)

$\Rightarrow x^2 - 3x + 2 = 0$

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

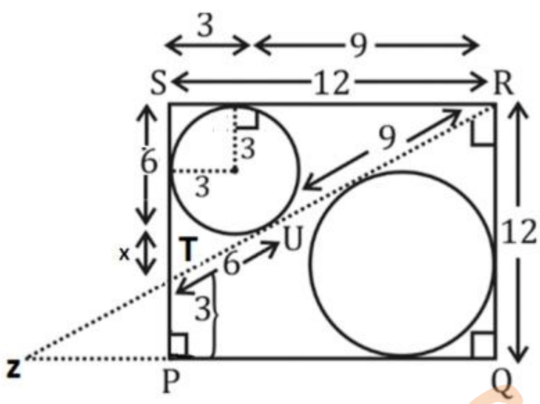
$X = 1, 2$

$\therefore x = 1$ only (since, When $x + 1$ is even)

So, $-1 + 0 + 3 + 1 = 3$

S13. Ans.(b)

Sol.



In right angle Δ TRS,

$RT = \sqrt{144 + (6 + x)^2}$

Inradius of Δ TRS, $r = \frac{(a+b-c)}{2}$

$= \frac{a+b-c}{2} = \frac{12+6+x-\sqrt{144+(6+x)^2}}{2}$

$\Rightarrow 6 = 18 + x - \sqrt{180 + x^2 + 12x}$

$\Rightarrow (12 + x)^2 = 180 + x^2 + 12x$

$\Rightarrow 144 + x^2 + 24x = 180 + x^2 + 12x$

$\Rightarrow 36 = 12x$

$\Rightarrow x = 3$

Δ TZP ~ Δ RZQ

$\Rightarrow \frac{3}{12} = \frac{ZP}{ZP+12}$

$\Rightarrow 3ZP = 12$

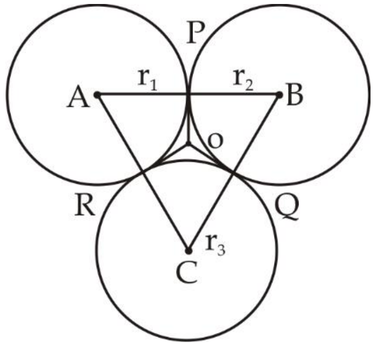
$\Rightarrow ZP = 4$

Inradius of Δ RZQ, $R = \frac{16+12-20}{2} = \frac{8}{2} = 4$

$\therefore$ Diameter = 8 cm

S14. Ans.(a)

Sol. Let centers of three circles be A, B, C & they meet at P, Q, R& point of intersection of common tangents be O & radius be r_1, r_2& r_3.



Now, $AB = r_1 + r_2$

$BC = r_2 + r_3$, $CA = r_1 + r_3$

Clearly O is the in-centre of triangle ABC & OP = OQ = OR = 4

So, $r = \frac{\Delta}{s} = 4$

$\& \ S = \frac{r_1 + r_2 + r_2 + r_3 + r_3 + r_1}{2}$

$= r_1 + r_2 + r_3$

&

$\Delta = \sqrt{(r_1 + r_2 + r_3)(r_1)(r_2)(r_3)}$

$\therefore 16 = \frac{(r_1 + r_2 + r_3)(r_1 r_2 r_3)}{(r_1 + r_2 + r_3)^2}$

$\Rightarrow \frac{16}{1} = \frac{r_1 r_2 r_3}{r_1 + r_2 + r_3}$

S15. Ans.(a)

Sol. $\because r_a > r_b > r_c$

$\Rightarrow \frac{\Delta}{s-a} > \frac{\Delta}{s-b} > \frac{\Delta}{s-c}$

$\Rightarrow s - a < s - b < s - c$

$\Rightarrow \ -a < -b < -c$

$\Rightarrow a > b > c$

S16. Ans.(c)

Sol. $3^{530} - 3^{529} = x$

$x = 3^{529}(3 - 1)$

$x = 3^{529}.2$

S17. Ans.(b)

Sol.

Let $2^x = A \ \& \ 2^y = B$

$A - B = 1$

$A^2 - B^2 = \frac{5}{3}$

$\Rightarrow A + B = \frac{5}{3}$

$\therefore 2A = \frac{8}{3} \Rightarrow A = \frac{4}{3} \& B = \frac{1}{3}$

$2^x = \frac{4}{3} \& 2^y = \frac{1}{3}$

$\Rightarrow \frac{2^x}{2^y} = 4 \Rightarrow 2^{x-y} = 2^2$

or, $x - y = 2$

S18. Ans.(b)

Sol.

$\sqrt{(3000)^2 + 2^2 + 2.2.3000}$

$= \sqrt{(3000 + 2)^2} = 3002$

S19. Ans.(b)

Sol.

$4^a + 4^b + 4^c = (2^a)^2 + (2^b)^2 + (2^c)^2$

$= (2^a + 2^b + 2^c)^2 - 2(2^a.2^b + 2^b.2^c + 2^c.2^a)$

$= \left(\frac{19}{2}\right)^2 - 2(2^{a+b} + 2^{b+c} + 2^{c+a})$

$= \frac{361}{4} - 2(2^{2-c} + 2^{2-a} + 2^{2-b})$

$= \frac{361}{4} - 2\ (2^2.(2^{-c} + 2^{-a} + 2^{-b}))$

$= \frac{361}{4} - 8\left(\frac{25}{8}\right)$

$= \frac{361}{4} - \frac{100}{4} = \frac{261}{4}$

S20. Ans.(d)

Sol.

Area of trapezium $= \frac{1}{2} \times$ (sum of ∥ sides) $\times$ height

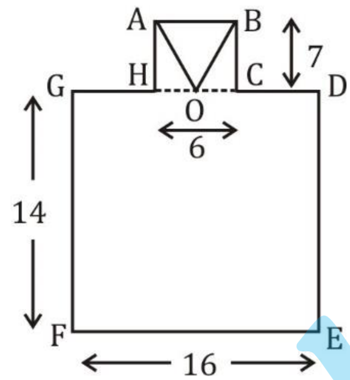
$= \frac{1}{2} \times 50 \times 21$

$= 525\ cm^2$

Vol. of Prism $= 525 \times 80\ cm^3 = 42000\ cm^3$

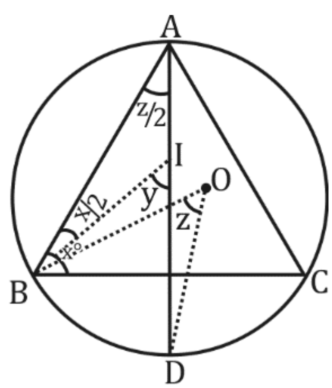
Vol. of frustum $= \frac{1}{3}\pi(r_1^2 + r_2^2 + r_1 r_2) \times h$
$= \frac{1}{3} \times \frac{22}{7}(400 + 25 + 100) \times 21$
$= 11550 \text{ cm}^3$
Vol. of jar = vol. of prism + vol. of frustum
$= 42000 + 11550$
$= 53550 \text{ cm}^3$

S21. Ans.(d)
Sol.



Vol. of cork $= \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{6}{2} \times \frac{6}{2} \times 7 \times \pi$
$= 21\pi$
Vol. of cylinder ABHC $= \pi r^2 h$
$= \pi \times 7 \times 9$
$= 63\pi$
Vol. of cylinder GDEF $= \pi r^2 h$
$= \pi \times 8 \times 8 \times 14$
$= 896\pi$
Total vol. of syrup $= 896\pi + 63\pi - 21\pi$
$= 938 \times \frac{22}{7}$
$= 2948 \text{ cm}^3$

S22. Ans.(b)
Sol.



$\angle ABC = x°$, $\angle BID = y°$, $\angle BOD = z°$
$\therefore$ I is the incentre → IB will be the angle bisector.
$\angle ABI = \frac{1}{2}\angle ABC = \frac{x°}{2}$
$\because$ O is circum-center of Δ ABC
$\angle BAD = \frac{1}{2}\angle BOD = \frac{z°}{2}$
Now, in Δ ABI,
$y° = \frac{x°}{2} + \frac{z°}{2}$ (exterior angle)
$\Rightarrow \frac{x°+z°}{2y} = 1$

S23. Ans.(d)
Sol. Given equation
$x^2 + x + 1 = 0$
$\alpha + \beta = -1$ and $\alpha\beta = 1 \Rightarrow \beta = \frac{1}{\alpha}$
$\therefore \alpha + \frac{1}{\alpha} = -1$
$\Rightarrow \alpha^3 + \frac{1}{\alpha^3} = (-1)^3 - 3(-1) = -1 + 3 = 2$
$\Rightarrow \alpha^3 + \frac{1}{\alpha^3} = 2$
$\Rightarrow \alpha^3 + \beta^3 = 2$
→ The equation can be written as
$X^2 -$ (sum of roots) x + product of roots = 0
$\Rightarrow x^2 - (2)x + 1 = 0$
$\Rightarrow x^2 - 2x + 1 = 0$

S24. Ans.(d)
Sol. $b = 2, c = \sqrt{3}, \angle A = 30°$
$a = \sqrt{b^2 + c^2 - 2bc\cos A}$
$a = \sqrt{4 + 3 - 2.2.\sqrt{3}.\frac{\sqrt{3}}{2}}$
$= 1$
$\therefore S = \frac{a+b+c}{2} = \frac{3+\sqrt{3}}{2}$
& $\Delta = \frac{1}{2}bc\sin A$
$= \frac{1}{2} \times 2 \times \sqrt{3} \times \frac{1}{2}$
$= \frac{\sqrt{3}}{2}$
$\Rightarrow r = \frac{\Delta}{S} = \frac{\sqrt{3}}{3+\sqrt{3}}$
$= \frac{1}{\sqrt{3}+1}$
$= \frac{\sqrt{3}-1}{2}$

S25. Ans.(b)

Sol. $\sin^2\theta = \sin\phi\cos\phi$

or $1 - \cos 2\theta = \sin 2\phi$

or $\cos 2\theta = 1 - \sin 2\phi = 1 + \cos\left(\frac{\pi}{2} + 2\phi\right)$

or $\cos 2\theta = 2\cos^2\left(\frac{\pi}{4} + \phi\right)$