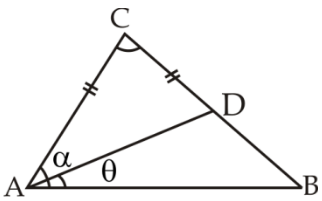
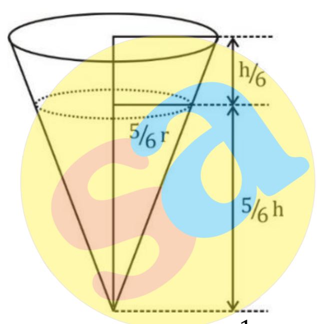
Quant Mega quiz for SSC CGL (Advance level)
Solutions

S1. Ans.(a)
Sol.



Let ∠BAC = α ∠BAD = θ
AC = DC ⇒∠ACD = 180 – 2(α – θ)
∴∠ABC = 180 – (α + 180° - 2(α- θ))
= α - 2θ
But,
∠CAB - ∠ABC = 30°
α- α + 2θ= 30°
⇒ θ= 15° = ∠BAD

S2. Ans.(b)
Sol.



Vol. of the cone = $\frac{1}{3}\pi r^2 h$
Vol. of the kerosene measured by the shopkeeper
$= \frac{1}{3}\pi\left(\frac{5}{6}r\right)^2 \times \frac{5}{6}h$
$= \frac{1}{3}\pi r^2 h\left(\frac{125}{216}\right)$
Assuming total vol. be 216 cubic unit then vol. measured is 125 cubic units
% profit made by shopkeeper
$= \frac{216 - 125}{125}$
$= \frac{91}{125}$
= 72.8% ≈ 73%

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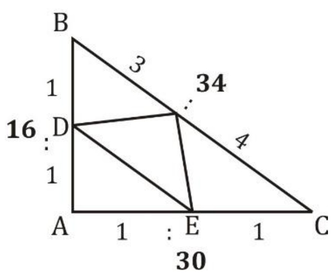
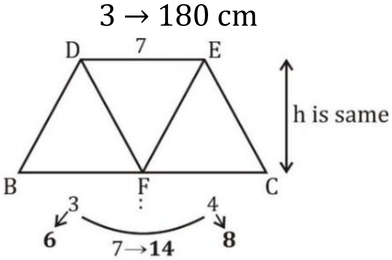
S3. Ans.(a)
Sol.
Let r_a, r_b & r_c be radii of circles with centers at A, B & C respectively.
therefore, $BC = r_b + r_c = 9$
$AY = r_a = 5 + r_c$
& $AX = r_a = 6 + r_b$
$\therefore 9 = r_a - 5 + r_a - 6$
$\Rightarrow 2r_a = 20$
$\Rightarrow AX = r_a = 10$

S4. Ans.(b)
Sol. $x = -y/2 = -z/2 = k$
$\Rightarrow xy + yz + zx = -2k^2 + 4k^2 - 2k^2 = 0$

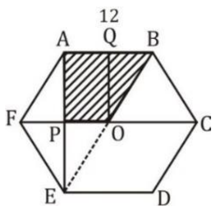
S5. Ans.(b)
Sol.


$\Delta ADE \approx \Delta ABC$
(because D & E are mid points dividing AB and AC in equal ratio and ∠A is common)
$\therefore \frac{DE}{BC} = \frac{1}{2}$
Since BC is further divided in the ratio 3 : 4.
So $\frac{DE}{BC} = \frac{7}{14}$ ... (i)
Now,
$\frac{AD}{AB} = \frac{1}{2} \Rightarrow \frac{\text{area } \Delta ADE}{\text{area of } \Delta ABC} = \frac{1}{4}$ ....(2)
$\Rightarrow$ the difference of 3 units in the 2nd ratio for area represents area of trapezium DECB.
$4 \rightarrow \frac{1}{2} \times 16 \times 30 = 240 \text{ cm}^2$
$3 \rightarrow 180$ cm


∴ area DBF : DEF : FCE
6 : 7 : 8
$180 \leftarrow 21$
$60 \text{ cm}^2 \leftarrow 7$

S6. Ans.(b)

Sol.



In ΔAFP,

$\sin 60° = \frac{AP}{AF}$

$\frac{\sqrt{3}}{2} = \frac{AP}{12}$

$AP = 6\sqrt{3}$

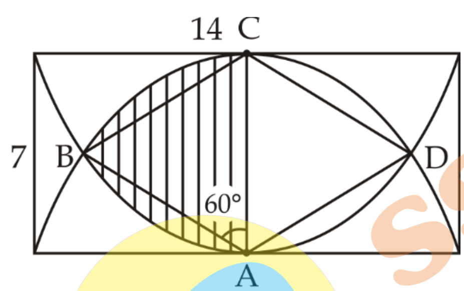
Area of APOB = Area of APOQ + Area of OQB

$= 6\sqrt{3} \times 6 + \frac{1}{2} 6\sqrt{3} \times 6$

$= 54\sqrt{3}$

S7. Ans.(a)

Sol.



Clearly, AB = AC = BC = CD = DA = 7 cm

$\therefore$ ΔABC & ΔADC are equilateral Δ's

So, area of ABC

$= \frac{\sqrt{3}}{4} . 49$

Now area of sector ABC ,

$= \frac{\pi \times 49}{6} = \frac{49\pi}{6}$

Such overlapping sectors are formed & this overlap has two equilateral Δ

$\therefore$ Area of shaded resign

$= 4 \times \frac{49\pi}{6} - 4 \times \frac{\sqrt{3}}{4} \times 49 + 2 \times \frac{\sqrt{3}}{4} \times 49$

$= 49\left(\frac{2\pi}{3} - \frac{\sqrt{3}}{2}\right)$

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S8. Ans.(b)

Sol.

$$\sqrt{\frac{1+\frac{b}{a}}{1-\frac{b}{a}}}+\sqrt{\frac{1-\frac{b}{a}}{1+\frac{b}{a}}}=\sqrt{\frac{1+\tan x}{1-\tan x}}+\sqrt{\frac{1-\tan x}{1+\tan x}}$$

$$=\frac{2}{\sqrt{1-\tan^2 x}}=\frac{2\sqrt{\cos^2 x}}{\sqrt{\cos^2 x-\sin^2 x}}$$

$$=\frac{2\cos x}{\sqrt{\cos 2x}}$$

S9. Ans.(d)

Squaring & adding both equation.

$9 + 16 + 24\{\sin(P + Q)\} = 37$

$\sin(P + Q) = 1/2$

$\Rightarrow \sin\{180 - R\} = 1/2$

$\Rightarrow \sin R = ½ \quad \Rightarrow R = \pi/6$

S10. Ans.(b)

Sol.

$$\frac{\cos A}{\cos B}=m \Rightarrow \frac{\cos A+\cos B}{\cos A-\cos B}=\frac{m+1}{m-1}$$

$$\Rightarrow \frac{2\cos\frac{A+B}{2}\cos\frac{A-B}{2}}{2\sin\frac{A+B}{2}\sin\frac{B-A}{2}}=\frac{m+1}{m-1}$$

$$\Rightarrow \cot\frac{A+B}{2}=\frac{m+1}{m-1}.\tan\left(\frac{B-A}{2}\right)$$

S11. Ans.(a)

Sol. Let $\theta = 12$

We know that

$\sin\theta \sin(60+\theta)\sin(60-\theta)=\frac{1}{4}\sin 3\theta$

$\Rightarrow \sin 12°.\sin 72°.\sin 48° = \frac{1}{4}\sin 36°$

So,

$$\frac{1}{\sin 72}\times\frac{1}{4}\sin 36°.\sin 54°=\frac{\sin 36°.\sin 54°}{8\sin 36°.\cos 36°}=\frac{\cos 36°}{8\cos 36°}=\frac{1}{8}$$

S12. Ans.(b)

Sol. $2^{\frac{1}{2}}\times 2^{\frac{2}{4}}\times 2^{\frac{3}{8}}\times 2^{\frac{4}{16}}\times \dots\dots$

$= 2^{\frac{1}{2}+\frac{2}{4}+\frac{3}{8}+\frac{4}{16}+\frac{5}{32}+\dots..}=2^x$

$\Rightarrow x=\frac{1}{2}+\frac{2}{4}+\frac{3}{8}+\frac{4}{16}$ ....(i)

$\Rightarrow \frac{x}{2}=\frac{1}{4}+\frac{2}{8}+\frac{3}{16}+\frac{4}{32}$ .....(ii)

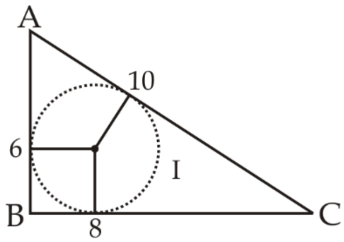
(i) – (ii)

$\frac{x}{2}=\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\cdots$

$\frac{x}{2}=\frac{1/2}{1-1/2}=1 \quad \Rightarrow \quad x = 2$

$\therefore 2^x = 2^2 = 4$

S13. Ans.(b)
Sol.



Clearly ΔABC is a right $\angle$'d Δ
Where I is the incentre of Δ
Clearly, in radius $= \frac{a+b-c}{2} = \frac{14-10}{2} = 2$
But for IA. Let A(0, 6), C(8, 0) & B(0, 0)
$\therefore$coordinates of I will be (2, 2)
$\therefore AI = \sqrt{(2-0)^2 + (2-6)^2}$
$= \sqrt{4+16} = \sqrt{20}$

S14. Ans.(a)
Sol.
$\Delta CED \sim \Delta CFB$
$\angle CED = \angle CFB = 30°$
Now,
$\frac{BC}{BF} = \frac{1}{\sqrt{3}} \Rightarrow BC = \frac{10}{\sqrt{3}}$

S15. Ans.(c)
Sol.
As,
Area ABD $= \frac{1}{2}$ ar ABC
$\Rightarrow \frac{1}{2} y \times x = \frac{1}{2} \times \frac{1}{2} \times (z+y) \times x$
$\Rightarrow y = \frac{z+y}{2} \Rightarrow z = y$
Now, AD $= \sqrt{x^2 + y^2}$
& $w^2 = x^2 + (y+z)^2$
$w^2 = x^2 + 4y^2$
$\Rightarrow x^2 = w^2 - 4y^2$
$\therefore AD = \sqrt{w^2 - 3y^2}$

S16. Ans.(a)
Sol.
$2^x = 3^y = 12^z = k$
$\Rightarrow 2 = k^{\frac{1}{x}}, \quad 3 = k^{\frac{1}{y}}, \quad 12 = k^{\frac{1}{z}} \quad \& \quad 12$
$= 2^2 \times 3$
$\therefore k^{\frac{1}{z}} = k^{\frac{2}{x}+\frac{1}{y}}$
$\frac{1}{z} = \frac{2}{x} + \frac{1}{y} \Rightarrow \frac{x+2y}{xy} = \frac{1}{z}$
or $\frac{z(x+2y)}{xy} = 1$

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S17. Ans.(d)

Sol.

$ab = a^b \Rightarrow b = a^{b-1}$

$\& \frac{a}{b} = a^{3b} \Rightarrow b = a^{1-3b}$

$\therefore b - 1 = 1 - 3b \Rightarrow b = \frac{1}{2} \quad \Rightarrow \quad a = 4$

so, $\left(\frac{1}{2}\right)^{-4} = 16$

S18. Ans.(b)

Sol.

Let $2018^x = a$

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

Required value $x = \sqrt{\frac{2018^{6x}-2018^{-6x}}{2018^x-2018^{-x}}} = \left[\frac{(a^6-\frac{1}{a^6})}{(a-\frac{1}{a})}\right]^{\frac{1}{2}}$

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

ATQ,

$\therefore a - \frac{1}{a} = \sqrt{5} \quad a^3 - \frac{1}{a^3} = 8\sqrt{5} \quad a^3 + \frac{1}{a^3} = 18$

By putting value

$x = \left[\frac{8\sqrt{5}\times18}{\sqrt{5}}\right]^{\frac{1}{2}} = 12$

S19. Ans.(d)

Sol.

$p = q^r, q = r^p$

$r = p^q$

$p = q^r \Rightarrow p = (r^p)^r$

$\Rightarrow p = r^{pr}$

$\Rightarrow \ p = (p^q)^{pr} = p^{qpr}$

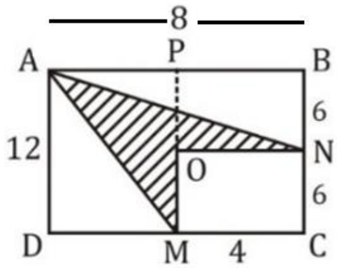
$\Rightarrow pqr = 1$

$\therefore p = q = r = 1$

$\therefore 1$

S20. Ans.(c)

Sol.



a. Area of ΔADM

$= \frac{1}{2} \times 12 \times 4 = 24$

b. Area of $\Delta ABN = \frac{1}{2} \times 8 \times 6 = 24$

c. Area of rectangle NCMO $= 24$

Area of shaded region = Area of rectangle – a – b – c

ABCD – a – b – c

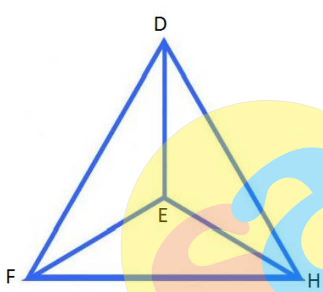
$= 12 \times 8 - 24 - 24 - 24$

$= 96 - 72$

$= 24$ sq. unit

S21. Ans.(a)

Sol.



$DH = FH = DF = 16\sqrt{2}$

$\Delta DFH = \frac{\sqrt{3}}{4} \times \left(16\sqrt{2}\right)^2$

$= \frac{\sqrt{3}}{4} \times 16\sqrt{2} \times 16\sqrt{2}$

$= 64 \times 2\sqrt{3} = 128\sqrt{3}$

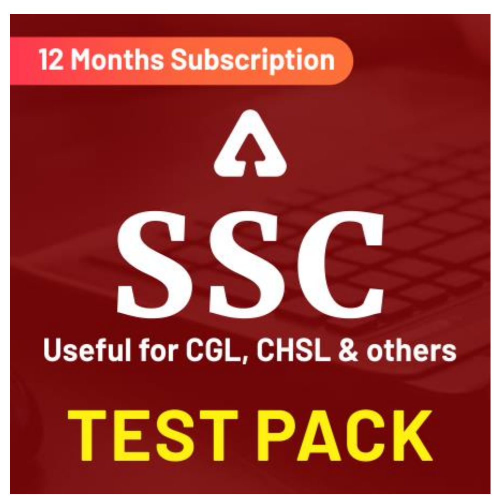
Area of $\Delta DEF = \Delta DEH = \Delta EFH$

$= \frac{1}{2} \times 16 \times 16$

$= 128$

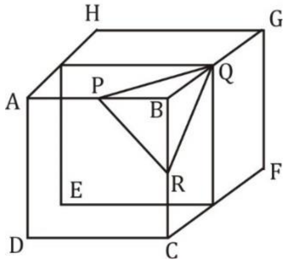
Total surface area of pyramid $= 128\,(3 + \sqrt{3})$

$= 128$



S22. Ans.(b)

Sol.



Length of sides PQ = QR = RP = $5\sqrt{2}$ cm

Area of $\Delta PQR = \frac{\sqrt{3}}{4} \times \left(5\sqrt{2}\right)^2$

$= \frac{\sqrt{3}}{4} \times 50$

$= \frac{25\sqrt{3}}{2}$

S23. Ans.(d)

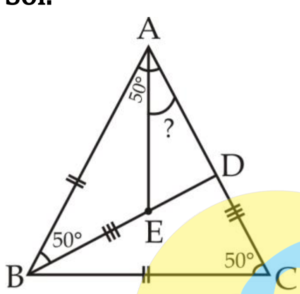
Sol.

$(2^5)^{1111} = (32)^{1111}, (3^3)^{1111} = (27)^{1111}, (6^2)^{1111} = (36)^{1111}$, clearly

$27 < 32 < 36$

S24. Ans.(b)

Sol.



$\angle ABC = 180° - 100° = 80°$

Now,

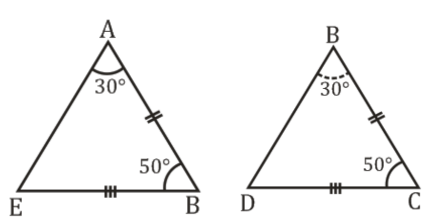
$\because AD = BD$

$\therefore \angle BAD = \angle DBA = 50°$

$\& \angle ABC = 80°$

$\Rightarrow \angle DBC = 30°$

Now, $\Delta AEB \sim \Delta BDC$ ($\because BE = CD \& \angle BCD = \angle ABE$)



$\Rightarrow EAB = \angle DBC = 30°$

$\therefore \angle EAD = 50° - 30° = 20°$

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S25. Ans.(a)

Sol. $a \cos 2\theta + b \sin 2\theta = c$

$a(\cos^2\theta - \sin^2\theta) + 2b \sin\theta \cos\theta = c$

$a(1 - \tan^2\theta) + 2b \tan\theta = c \sec^2\theta$

$\tan^2\theta\,(c + a) - 2b \tan\theta + (c - a) = 0$

roots of equation are $\tan\alpha$ & $\tan\beta$

$\therefore \tan\alpha + \tan\beta = \frac{2b}{c+a}$ & $\tan\alpha \tan\beta = \frac{c-a}{c+a}$