Quantitative Aptitude Sunday Mega Quiz for SSC CGL – (Solutions)

S1. Ans.(d)
Sol.

Given,
ab +bc +ac = abc ...(i)
Now,

$$\frac{a+b}{ab(c-1)}+\frac{b+c}{bc(a-1)}+\frac{c+a}{ca(b-1)}$$

$$=\frac{a+b}{bc+ac}+\frac{b+c}{ab+ac}+\frac{c+a}{ab+bc}$$

$$=\frac{a+b}{c(a+b)}+\frac{b+c}{a(b+c)}+\frac{c+a}{b(a+c)}=\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=\frac{bc+ab+ac}{abc}$$

$$=\frac{abc}{abc}=1$$

S2. Ans.(b)
Sol.
Given,
$x + y + z = 14$
Squaring both sides, we get
$x^2+y^2+z^2+2(xy+yz+zx)=196$
$\Rightarrow 28+2(xy+yz+zx)=196$
$\Rightarrow 2(r+r^2+r^3)=168$
$\Rightarrow r+r^2+r^3=84$
$\Rightarrow r+r^2+r^3=4+16+64$
$\Rightarrow r=4$
$\therefore xy = 4$ and $xz = 16$
$\Rightarrow \frac{xz}{xy}=\frac{z}{y}=\frac{16}{4}=4$

S3. Ans.(a)
Sol.

$$x=\sqrt{\frac{\sqrt{10}+1}{\sqrt{10}-1}}=\sqrt{\frac{\sqrt{10}+1}{\sqrt{10}-1}\times\frac{\sqrt{10}+1}{\sqrt{10}+1}}=\frac{\sqrt{10}+1}{3}$$

$=3x=\sqrt{10}+1 \Rightarrow 3x-1=\sqrt{10}$
Squaring both sides, we get
$9x^2 + 1 - 6x = 10$
$9x^2 - 6x = 9$
$9x^2 - 6x - 6 = 3$

S4. Ans.(b)
Sol.
ATQ,
$(x + y)^2 - z^2 = 8$
$(x + y + z)(x + y - z) = 8$ ...(i)
$\Rightarrow (y + z)^2 - x^2 = 16$
$(x + y + z)(y + z - x) = 16$ ...(ii)
$(z - x)^2 - y^2 = 42$
$(x + y + z)(z + x - y) = 42$ ..(iii)
adding all three equations, we get
$(x + y + z)(x + y - z + y + z - x + z + x - y) = 64$
$\Rightarrow (x + y + z)^2 = (8)^2 \Rightarrow x + y + z = \pm 8$

S5. Ans.(b)
Sol.

$$x + \sqrt{x^2 + \sqrt{x^4 + \sqrt{x^8 + \sqrt{x^{16} + \cdots}}}}$$

$$= x + \sqrt{x^2 + \sqrt{x^4 + \sqrt{x^8 + x^8\sqrt{1 + \cdots}}}}$$

$$= x + \sqrt{x^2 + \sqrt{x^4 + \sqrt{x^8(1 + \sqrt{+ \cdots}}}}$$

$$= x + \sqrt{x^2 + \sqrt{x^4 + x^4\sqrt{1 + \sqrt{1}}}}$$

$$= x + \sqrt{x^2 + \sqrt{x^4(1 + \sqrt{1 + \cdots})}}$$

$$= x + \sqrt{x^2 + x^2\sqrt{1 + \sqrt{1 + \cdots}}}$$

$$= x + x\sqrt{1 + \sqrt{1 + \sqrt{1 + \cdots}}}$$

$$= x(1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \cdots}}})$$

Now

Let $1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \cdots}}}} = y$ (let)

$\therefore 1 + \sqrt{y} = y \Rightarrow \sqrt{y} = y - 1$
Squaring both sides
$y = y^2 + 1 - 2y$
$\Rightarrow y^2 - 3y + 1 = 0$
Then, $y = \frac{3 \pm \sqrt{9-4}}{2} = \frac{3 \pm \sqrt{5}}{2}$
$\because 1 + \sqrt{1 + \sqrt{1 + \cdots}}$ will be positive and equal to $\frac{3+\sqrt{5}}{2}$
$\therefore x\left(1 + \sqrt{1 + \sqrt{1 + \cdots}}\right) = x\left(\frac{3+\sqrt{5}}{2}\right)$

S6. Ans.(b)

Sol.

$$\frac{x^2-yz}{x^2+yz}+1+\frac{y^2-xz}{y^2+xz}+1+\frac{z^2-xy}{z^2+xy}+1=4$$

$$2\left(\frac{x^2}{x^2+yz}+\frac{y^2}{y^2+xz}+\frac{z^2}{z^2+xy}\right)=4$$

$$\Rightarrow \frac{x^2}{x^2+yz}+\frac{y^2}{y^2+zx}+\frac{z^2}{z^2+xy}=2$$

S7. Ans.(b)

Sol.

$(x+y+z)^2 = x^2+y^2+z^2+2(xy+yz+zx)$............(1)

$x^3+y^3+z^3-3xyz = (x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

$13-6 = 1\,(x^2+y^2+z^2-xy-yz-zx)$

$x^2+y^2+z^2 = 7+xy+yz+zx$......(2)

Now, from eq^n(1) and (2)

$1 = 7+3(xy+yz+zx)$

$\Rightarrow xy+yz+zx = -2$

S8. Ans.(d)

Sol.

Put x = -1 then,

$(-1)^3 + a(-1)^2 - b(-1) - 6 = 0$

a + b – 7 = 0 ...(i)

put x = 2 then,

$(2)^3 + a(2)^2 - b(2) - 6 = 0$

4a – 2b + 2 = 0 ...(ii)

By solving equation (i) and (ii)

a = 2, b = 5

S9. Ans.(a)

Sol.

$x^4+y^4 = (x^2+y^2)^2 - 2x^2y^2$

$= (x^2+y^2)^2 - \left(\sqrt{2}xy\right)^2$

$= \left(x^2+y^2-\sqrt{2}xy\right)\left(x^2+y^2+\sqrt{2}xy\right)$

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

$= x^2+y^2+\sqrt{2}xy$

= p + q

S10. Ans.(c)

Sol.

$(x + y)^2 - z^2 = 23$

$\Rightarrow (x + y + z)(x + y - z) = 23$ ...(i)

$(y + z)^2 - x^2 = 14$

$\Rightarrow (y + z + x)(y + z - x) = 14$ ...(ii)

$(z + x)^2 - y^2 = 12$

$(y + x + z)(z + x - y) = 12$ ..(iii)

Add all three equation

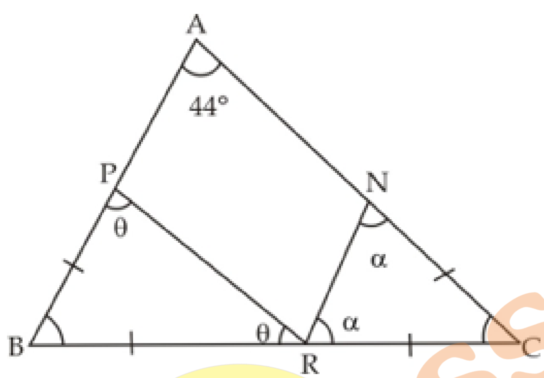
$(x + y + z)[(x + y - z + y + z - x + z + x - y)] = 49$

$(x + y + z)(x + y + z) = 49$

$x + y + z = \pm 7$

S11. Ans.(c)

Sol.



$\because BP = BR$

$\Rightarrow \angle BPR = \angle BRP = \theta$

$\because CN = CR$

$\Rightarrow \angle CRN = \angle CNR = \alpha$

$\therefore \angle PBR = 180 - 2\theta$

$\& \angle NCR = 180 - 2\alpha$

Now, in ΔABC

$\angle BAC + \angle ABC + \angle ACB = 180°$

$\Rightarrow 44° + (180 - 2\theta) + (180 - 2\alpha) = 180°$

$\Rightarrow 2(\theta + \alpha) = 44° + 180°$

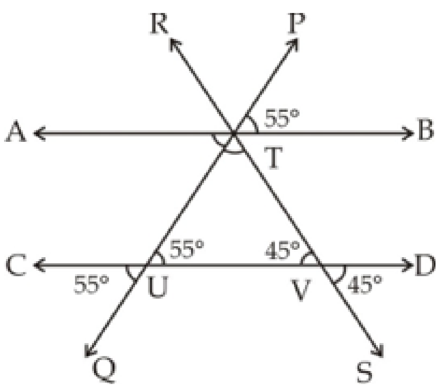
$\Rightarrow \theta + \alpha = 112°$

$\therefore \angle PRN = 180° - (\theta + \alpha)$

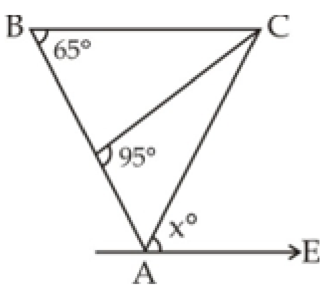
$= 180 - 112$

$\angle PRN = 68°$

S12. Ans.(d)
Sol. ATQ
∠A : ∠B : ∠C = 3 : 2 : 1
∴ ∠A = 3x, ∠B = 2x, ∠C = x
In ΔABC
⇒ ∠A + ∠B + ∠C = 180°
⇒ 3x + 2x + x = 180°
⇒ x = 30°
∴ ∠C = 30°
∠ECD = 180 - ∠C - ∠ACE
= 180° - 30° - 90°
= 60°

S13. Ans.(b)
Sol.


∠PTB = ∠TUV = 55° (Corresponding angles)
∠PTB = ∠UTA = 55° (Vertically opposite angle)
∠CUQ = ∠UTA = 55° (corresponding angles)
∠DVS = ∠UVT = 45° (Vertically opposite angles)
⇒ In ΔUTV,
∠T = 180° - (55° + 45°)
∠T = 80° = ∠PTR (vertically opposite angles)
∴ ∠CUQ + ∠RTP = 55° + 80°
= 135°

S14. Ans.(d)
Sol.


$\because$ BC = AC

$\angle CBA = \angle CAB = 65°$

And, ATQ,

BC || AE

$\angle CBA + \angle EAB = 180°$

$\Rightarrow \angle EAB = 180° - 65° = 115°$

Now,

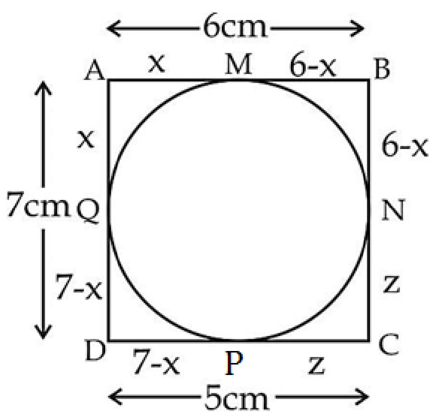
$\angle EAB = \angle EAC + \angle CAB$

$\Rightarrow 115° = x + 65°$

$x = 50°$

S15. Ans.(a)

Sol.



Tangents drawn to circle from same external point are equal

$\Rightarrow AM = AQ = x$

$\therefore MB = BN = 6 - x$

And,

$QD = DP = 7 - x$

$\Rightarrow$ Let $NC = PC = Z$

$\Rightarrow$ consider side DC

$7 - x + z = 5$

$\Rightarrow -x + z = -2$ ...(i)

And,

$BC = 6 - x + z$

$= 6 - 2$ [from eq^n (i)]

BC = 4 cm

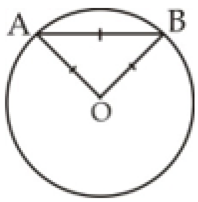
$\Rightarrow$ Alternate

AB + CD = BC + AD

$\Rightarrow 6 + 5 = BC + 7$

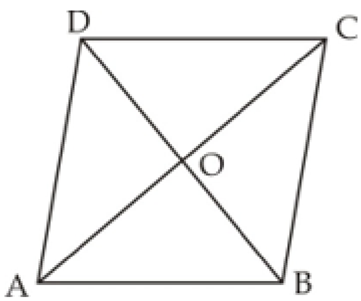
$\Rightarrow$ BC = 4 cm

S16. Ans.(b)
Sol.



→ Let AB is the chord and 'o' is the centre of a circle
→ ATQ,
OA = OB = AB
∴ All sides are equal then Δ is equilateral Δ
∴ Angle subtended by the chord is 60°

S17. Ans.(c)
Sol.



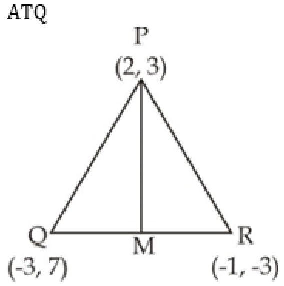
Let,
BD = 6 m and AC = 8 m
∴ BO = 3 m and AO = 4 m
Let AB = 5 m (given)
∴ ∠AOB = 90°
⇒ ∠BOC = ∠COD = ∠DOA = 90°
∴ ABCD is a rhombus
And,
Area of rhombus ABCD = $\frac{AC \times BD}{2} = \frac{6 \times 8}{2}$
= 24 m^2

S18. Ans.(b)
Sol.
∠PEF = ∠PGH = 80°
(Corresponding angles)
∴ ∠QGH = 180° - ∠PGH = 100°
Now, ∠QHD = 120°
And ∠GHQ = 180° - 120°= 60°
∴ In ΔQGH
∠QGH + ∠GHQ + ∠GQH = 180°
⇒ 100° + 60° + x = 180°
⇒ x = 20°

S19. Ans.(c)

Sol.

ATQ



PM → median (given)

Clearly M is midpoint of QR we know

∴ coordinates of M are

$= \left(\frac{-3-1}{2}, \frac{7-3}{2}\right)$

i.e., M (–2, 2)

∴ Required equation of line joining

P(2, 3) and M(-2, 2)

$\Rightarrow (y - 3) = \frac{2-3}{-2-2}(x-2)$

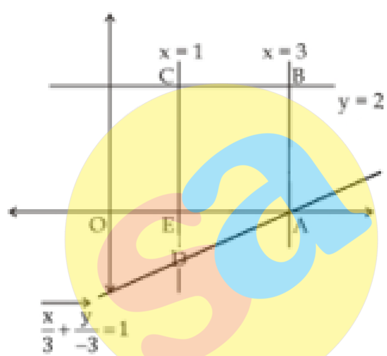
$\Rightarrow (y-3) = \frac{1}{4}(x-2)$

$\Rightarrow (4y-12) = x-2$

$\Rightarrow x - 4y + 10 = 0$

S20. Ans.(a)

Sol.



Point D ⇒ intersection of x = 1

And,

$\frac{x}{3} + \frac{y}{(-3)} = 1$

∴ Point D will be (1, -2)

⇒ ABCD is a trapezium

AB = 2

CD = CE + ED = 2 + 2 = 4

BC = 2

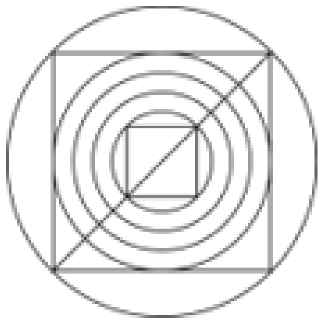
⇒ Area of trapezium ABCD

$= \frac{1}{2} \times BC \times (AB + CD)$

$= \frac{1}{2} \times 2 \times (2+4) = 6$ sq. units

S21. Ans.(d)

Sol.



$\Rightarrow$ Diagonal of innermost square

$= \sqrt{50} \times \sqrt{2} = 10$ cm

$\Rightarrow$ Diagonal of outermost square

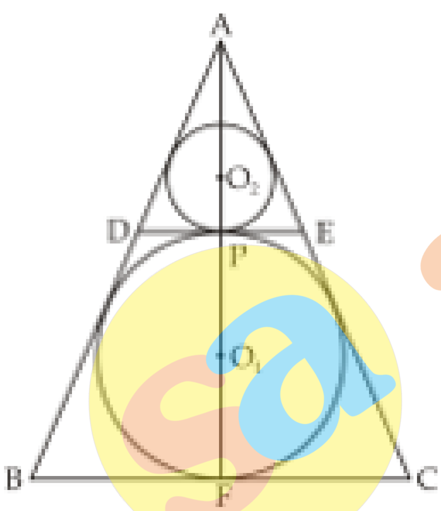
= 10+ 2.75× 8 = 32 cm

$\therefore$ Side of outermost square

$= \frac{32}{\sqrt{2}} = 16\sqrt{2}$ cm

S22. Ans.(c)

Sol.



ABC is an equilateral triangle

$AF = \frac{\sqrt{3}a}{2} = \frac{\sqrt{3}}{2} \times 54 = 27\sqrt{3}$

In radius $(R_1) = \frac{a}{2\sqrt{3}} = \frac{54}{2\sqrt{3}} = 9\sqrt{3}$

$\therefore$ AP =AF – $2R_1$

$= 27\sqrt{3} - 9\sqrt{3} \times 2 = 9\sqrt{3}$

Now, ΔADE is also an equilateral triangle

$AP = \frac{\sqrt{3}}{2} DE = 9\sqrt{3}$

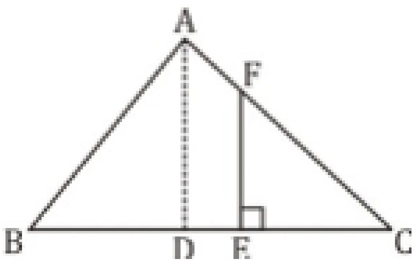
$\Rightarrow$ DE = 18 cm

$\therefore$ In radius of ΔADE

$= \frac{DE}{2\sqrt{3}} = \frac{18}{2\sqrt{3}} = 3\sqrt{3}$ cm

S23. Ans.(c);

Sol.



Draw $AD \perp BC$.

$S = \frac{13+14+15}{2} = 21$

Area $\Delta ABC = \sqrt{S(S-a)(S-b)(S-c)}$

$= \sqrt{21 \times (21-13) \times (21-14) \times (21-15)}$

= 84 sq. units

Also,

Ar $\Delta ABC = \frac{1}{2} \times AD \times BC$

$\Rightarrow \frac{1}{2} \times 14 \times AD = 84$

$\Rightarrow$ AD= 12 units

$\therefore AD = 12,\ BD = 5,\ DC = 9$

& clearly $\Delta FEC \sim \Delta ADC$

$\Rightarrow \frac{FE}{EC} = \frac{AD}{DC} = \frac{4}{3}$

$\Rightarrow EC = \frac{3FE}{4}$

Now, Area of $\Delta ABC = \frac{1}{2} \times 14 \times 12 = 84$

$\Rightarrow$ Ar $\Delta FEC = \frac{84}{2} = 42 = \frac{1}{2} \times FE \times EC$

$\Rightarrow 42 \times 2 = FE \times \frac{3}{4} \times FE$

$\Rightarrow FE = 4\sqrt{7}$

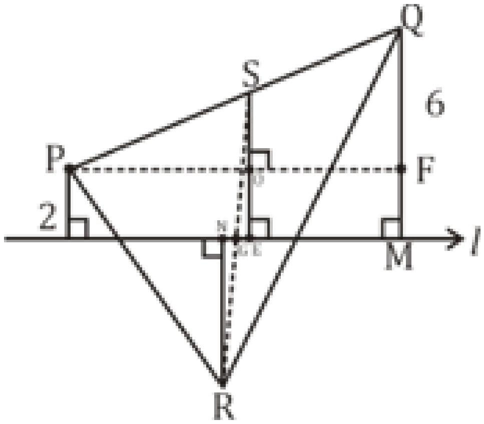
S24. Ans.(b);

Sol. If the length of medians form triplets then we can directly use the formula below to find out the area

Area $= \frac{2}{3} m_1 m_2 = \frac{2}{3} \times 9 \times 12 = 72\ cm^2$

S25. Ans.(a)

Sol.



Join R to PQ at S, S being midpoint of PQ & intersecting line 'ℓ 'at G (being centroid)

Construct SE ⊥ to ℓ . Also construct PF || ℓ intersecting SE at O.

Clearly, SE = SO+ 2 & QM = QF +2 ⇒ QF = 4

Now, $\Delta POS \sim \Delta PFQ \Rightarrow \frac{SO}{QF} = \frac{PS}{PQ} \Rightarrow SO = 2 \Rightarrow SE = 4$

∵ G is centroid of ΔPQR & $\angle SEN = \angle RNE = 90°$

∴ SEG ~ RNG

$\Rightarrow \frac{SG}{GR} = \frac{SE}{NR} = \frac{1}{2}$(∵ G is centroid) $\Rightarrow RN = 2 \times 4 = 8$