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

S1. Ans.(b)

Sol.

$AO = h\cot 30° = h\sqrt{3}$

$BO = h \;\&\; CO = \frac{h}{\sqrt{3}}$

$\therefore \frac{AB}{BC} = \frac{AO-BO}{BO-CO} = \frac{h\sqrt{3}-h}{h-\frac{h}{\sqrt{3}}} = \sqrt{3}$

S2. Ans.(a)

Sol.

$$\frac{xyz}{[(x+y+z)-z]\{(x+y+z)-x\}\{(x+y+z)-y\}}$$
$$= \frac{xyz}{(0-z)(0-y)(0-x)} = -1$$

S3. Ans.(c)

Sol.

$\sin\theta_1 = 0.894$

$\tan\theta_2 = 1.5$

$\cos\theta_3 = 0.6$

$\sec\theta_4 = 1.6$

Correct order is $= 3 - 1 - 2 - 4.$

S4. Ans.(a)

Sol.

Max. value of $\sin\theta = 1$

So, $\sin^3\theta + 2\sin^2\theta + 3\sin\theta$

$= 1 + 2 + 3 = 6$

At $\theta = 0°, \sin\theta = 0$

So, statement (a) is correct.

S5. Ans.(d)

Sol.

$(\cos^2 x)^3 + (\sin^2 x)^3 + 3\sin^2 x.\cos^2 x(\sin^2 x + \cos^2 x)$

$= (\cos^2 x + \sin^2 x)^3 = 1$

S6. Ans.(a)

Sol.

$a\sec\theta + b\tan\theta = 1$.....(i)

$a^2\sec^2\theta - b^2.\tan^2\theta = 5$ .....(ii)

From (i) & (ii)

$a\sec\theta - b\tan\theta = 5$ .....(iii)

from eqn. (i) & (iii)

$a\sec\theta = 3$ .....(iv)

$b\tan\theta = -2$ .....(v)

from eqn. (iv)

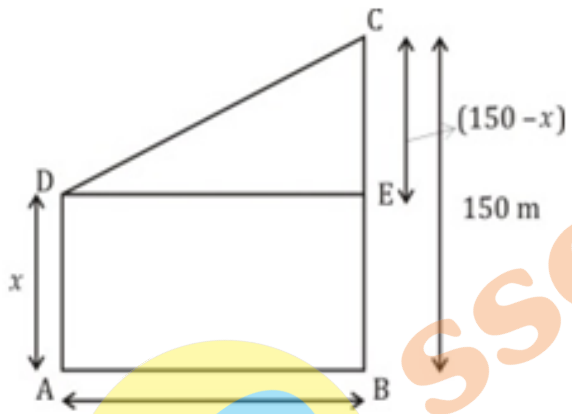
$a^2\sec^2\theta = 9$

$a^2(1+\tan^2\theta) = 9$

$a^2b^2 + 4a^2 = 9b^2$

S7. Ans.(a)

Sol.



Δ CDE,

$\tan 30° = \frac{(150-x)}{60}$

$x = 116\text{m}$ (approx).

S8. Ans.(c)

Sol.

$4\sin^2\theta = 3$

$\sin\theta = \frac{\sqrt{3}}{2}$

$\theta = 60°$

$= \cot^2\theta + \tan^2\theta$

$= \cot°60° + \tan^2 60°$

$= \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\sqrt{3}\right)^2 = \frac{1}{3} + 3 = \frac{10}{3}$

S9. Ans.(c)

Sol.

$$\frac{cos\theta}{1+sin\theta}+\frac{cos\theta}{1-sin\theta}=4$$

$$cos\theta\left(\frac{1-sin\theta+1+sin\theta}{1-sin^2\theta}\right)=4$$

$$cos\theta\times\frac{2}{cos^2\theta}=4$$

$$\cos\theta=\frac{1}{2},\theta=60°$$

S10. Ans.(d)

Sol.

$$\frac{1}{sin\theta+cosec\theta}=\frac{1}{2}$$

$$\frac{1}{sin\theta+\frac{1}{sin\theta}}=\frac{1}{2}\Rightarrow sin\theta+\frac{1}{sin\theta}=2$$

$\text{Sin}\theta + \text{cosec}\theta = 2$

Here, $\sin\theta = 1, \text{cosec}\theta = 1$

$\text{Sin}^{100}\theta + \text{cosec}^{100}\theta = 1$

$= 1 + 1 = 2$

S11. Ans.(c)

Sol.

$$=\frac{\frac{1}{\cos\theta}}{\frac{(\sin^2\theta+\cos^2\theta)}{\text{Sin}\theta\cos\theta}}$$

$= \sin\theta$

S12. Ans.(b)

Sol.

$$2\sin\left(\frac{8\theta+6\theta}{2}\right)\cos\left(\frac{8\theta-6\theta}{2}\right)$$

$$= 2\sin7\theta\cos\theta$$

S13. Ans.(b)

Sol.

Let $\theta = 30°$

$$\frac{\sqrt{3}}{1-\frac{1}{\sqrt{3}}} + \frac{\frac{1}{\sqrt{3}}}{1-\sqrt{3}}$$

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

$$= \frac{3\sqrt{3}-1}{3-\sqrt{3}}$$

$$= \frac{(3\sqrt{3}-1)\times(3+\sqrt{3})}{6}$$

$$= \frac{9\sqrt{3}-3+9-\sqrt{3}}{6}$$

$$= \frac{8\sqrt{3}+6}{6} = \frac{4\sqrt{3}+3}{3}$$

$$= \frac{4}{\sqrt{3}} + 1$$

So, (ii) option

$$= \frac{4}{\sqrt{3}} + 1$$

S14. Ans.(c)

Sol.

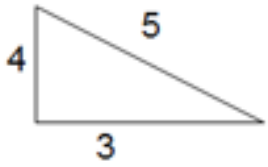
$$\frac{\cot A}{\cot A + \tan A}$$

$$\frac{\cos A/\sin A}{\frac{1}{\cos A \sin A}} = \cos^2 A$$

S15. Ans.(c)

Sol.

$$\sin x = \frac{4}{5}$$



So,

$$\left(\frac{\frac{4}{3}-\frac{3}{4}}{\frac{3}{3}-\frac{4}{3}}\right)\left(\frac{\left(\frac{3}{5}\right)^4-\left(\frac{4}{5}\right)^4}{2\times\left(\frac{3}{5}\right)^2-1}\right)$$

$$= 7/4$$

S16. Ans.(c)

Sol.

$$\frac{tan^2 25}{cosec^2 65} + \frac{cot^2 25}{sec^2 65} + 2\tan 20°.\tan 45°.\text{Tan}70°$$
$$= \frac{tan^2 25}{sec^2 25} + \frac{cot^2 25}{cosec^2 25} + 2\tan(90° - 70°).1.tan70°$$
$$= \frac{sec^2 25° - 1}{sec^2 25°} + \frac{cosec^2 25 - 1}{cosec^2 25} + \frac{2\times 1}{tan70} \times tan70°$$
$$= 1 - \frac{1}{sec^2 25} + 1 - \frac{1}{cosec^2 25} + 2$$
$$= 2 - (sin^2 25 + cos^2 25) + 2$$
$$= 2 - 1 + 2 = 3$$

S17. Ans.(d)

Sol.

$\text{Cosec}\theta + \text{cosec}^2\theta = 1$
$\text{Cosec}\theta = 1 - \text{cosec}^2\theta$
$\text{Cosec}\theta = -\cot^2\theta$
$\cot^2\theta = -\text{cosec}\theta$ ..(i)
$(\cot^{12}\theta - 3\cot^{10}\theta + 3\cot^8\theta - \cot^6\theta)$
$= (\cot^4\theta - \cot^2\theta)^3$
$= ((\text{cosec}\theta)^2 - \cot^2\theta)$ (from eq (i))
$= (\text{cosec}^2\theta - \cot^2\theta)^3 = 1^3 = 1$

S18. Ans.(d)

Sol.

$a \text{ Sin } \theta + b \text{ Cos } \theta = m$ ...(i)
Let $a \cos\theta - b \sin\theta = 6x$ ...(ii)
Squaring and adding (i) and (ii)
$a^2 \text{Sin}^2\theta + b^2 \text{Cos}^2\theta + 2ab \text{Sin}\theta \text{Cos}\theta + a^2\text{Cos}^2\theta + b^2\text{Sin}^2\theta - 2ab \text{Sin}\theta \text{Cos}\theta = m^2 + 36x^2$
$a^2(\text{Sin}^2\theta + \text{Cos}^2\theta) + b^2(\text{Cos}^2\theta + \text{Sin}^2\theta) = m^2 + 36x^2$
$a^2 + b^2 = m^2 + 36x^2$
$36x^2 = a^2 + b^2 - m^2$
$x = \pm\frac{1}{6}\sqrt{a^2 + b^2 - m^2}$

S19. Ans.(d)

Sol.

$$m^2 - 1 = \frac{\sin^2\alpha - \sin^2\beta}{\sin^2\beta}$$

$$n^2 - 1 = \frac{\tan^2\alpha - \tan^2\beta}{\tan^2\beta}$$

$$= \left[\frac{\sin^2\alpha\cos^2\beta - \sin^2\beta\cos^2\alpha}{\cos^2\alpha\cos^2\beta} \times \frac{\cos^2\beta}{\sin^2\beta}\right]$$

$$\frac{\sin^2\alpha(1-\sin^2\beta) - \sin^2\beta(1-\sin^2\alpha)}{\sin^2\beta\cos^2\alpha}$$

$$= \frac{\sin^2\alpha - \sin^2\beta}{\sin^2\beta\cos^2\alpha}$$

$$\therefore \left[\frac{m^2-1}{n^2-1}\right]^{1/2} = \left[\frac{\sin^2\alpha - \sin^2\beta}{\sin^2\beta} \times \frac{\cos^2\alpha\sin^2\beta}{\sin^2\alpha - \sin^2\beta}\right]^{1/2} = \cos\alpha$$

S20. Ans.(a)

Sol.

$$\tan^2 A = \sec^2 A - 1 = \left(a + \frac{1}{4a}\right)^2 - 1$$

$$= \left(a - \frac{1}{4a}\right)^2$$

$$\Rightarrow \tan A = \pm\left(a - \frac{1}{4a}\right)$$

$$\therefore \sec A + \tan A = a + \frac{1}{4a} + a - \frac{1}{4a}$$

$$\text{Or, } a + \frac{1}{4a} - a + \frac{1}{4a} = 2a \text{ or } \frac{1}{2a}$$

S21. Ans.(d)

Sol.

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

$$= 2\,\text{cosec}\,A$$

S22. Ans.(c)

Sol.

Given

$$\frac{1-\cos\theta}{1+\cos\theta} = \frac{A^2}{B^2}$$

$$\Rightarrow \frac{(1-\cos\theta)^2}{1-\cos^2\theta} = \frac{A^2}{B^2} \Rightarrow \frac{(1-\cos\theta)^2}{\sin^2\theta} = \frac{A^2}{B^2}$$

$$\Rightarrow \frac{1-\cos\theta}{\sin\theta} = \frac{A}{B} \Rightarrow \text{cosec}\theta - \cot\theta = \frac{A}{B}$$

$$\text{cosec}\,\theta = \frac{1}{2}\frac{A^2+B^2}{AB}$$

S23. Ans.(a)

Sol.

ATQ,

$$\frac{(\sin\theta+\cos\theta)(1-\sin\theta)\frac{(1+\sin\theta)}{\cos\theta}\sec\theta}{\left[\sin\frac{(\sin\theta+\cos\theta)}{\cos\theta}+\cos\theta\frac{(\sin\theta+\cos\theta)}{\sin\theta}\right]\sin\theta\cos\theta}$$

$$\Rightarrow \frac{\frac{1-\sin^2\theta}{\cos^2\theta}}{\left[\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}\right]\sin\theta\cos\theta} \Rightarrow 1$$

S24. Ans.(b)

Sol.

Given $\Rightarrow$

$$\frac{(\sec\theta-\tan\theta)^2(\sin\theta+1)^2}{\cos^2\theta}$$

$$\Rightarrow \left(\frac{1-\sin\theta}{\cos\theta}\right)^2\frac{(\sin\theta+1)^2}{\cos^2\theta} \Rightarrow \frac{(1-\sin^2\theta)^2}{\cos^4\theta} = 1$$

S25. Ans.(a)

Sol.

$3\tan^2\theta = 4\sin^2\theta$

$\cos^2\theta = \frac{3}{4} \quad \theta = 30°$

$$\text{Required} = \left(\frac{1}{\sqrt{3}}\right)^4 + \left(\frac{2}{\sqrt{3}}\right)^2 + (\sqrt{3})^2$$

$$\Rightarrow \frac{1}{9} + \frac{4}{3} + 3 \Rightarrow \frac{1+12+27}{9} = \frac{40}{9}$$