Trigonometry Questions for CGL Tier 2, CGL Tier 1 and SSC 10+2 Exams

TRIGONOMETRY QUIZ 9

Direction: Study the following questions carefully and choose the right answer:

1. For any real values of $\sqrt{\frac{\sec\theta - 1}{\sec\theta + 1}}$ = ?

A. cot Θ – cosec Θ

B. sec Θ – tan Θ

C. cosec Θ – cot Θ

D. tan Θ – sec Θ

2. In a ΔABC, ∠B = $\frac{\pi}{3}$, ∠C = $\frac{\pi}{4}$ and D divides BC internally in the ratio 1 : 3 then $\frac{sin\angle BAD}{sin\angle CAD}$ ual to

A. 1/√2

B. 1/√3

C. 1/√6

D. √6

3. If sin 3A = cos (A – 26°), where 3A is an acute angle then the value of A is

A. 29°

B. 26°

C. 23°

D. 28°

4. Value of $\sec^2\theta - \frac{\sin^2\theta - 2\sin^4\theta}{2\cos^4\theta - \cos^2\theta}$ is

A. 1

B. 2

C. – 1

D. 0

5. If x = a (sin Θ + cos Θ), y = b (sin Θ – cos Θ) then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is

A. 0 B. 1

C. 2 D. – 2

6. If sin 5Θ = cos 20° (0° < Θ < 90°) then the value of Θ is

A. 4° B. 22°

C. 10° D. 14°

7. If sec α = $\frac{5}{4}$, then $\frac{tan\ \alpha}{1 + tan2\ \alpha}$ is equal to

A. 9/25 B. 12/25

C. ¾ D. 1/25

8. If tanΘ – cotΘ = 0, and Θ is a positive acute angle, then the value of

tan (Θ + 15°)/tan (Θ – 15°)

A. 1√3 B. √3

C. 3 D. 1/3

9. $\frac{\sin^8 \theta - \cos^8 \theta}{\cos 2\theta}$ $(1 + \cos^2 2\theta)$ **is equal to -**

A. 1 B. – 1/2

C. – 1 D. 2

10. √3 cosec 20° – sec 20° = ?

A. $\frac{\sin 20^\circ}{\sin 40^\circ}$

B. 4

C. 2

D. $\frac{4 \sin 20^\circ}{\sin 40^\circ}$

Correct answers:

1	2	3	4	5	6	7	8	9	10
C	C	A	A	C	D	B	C	B	B

Explanations:

1.

$$\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}=\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}\times\sqrt{\frac{\sec\theta-1}{\sec\theta-1}}$$

[Rationalising the numerator and the denominator]

$$=\sqrt{\frac{(\sec\theta-1)^2}{\sec^2\theta-1}}$$

$$=\sqrt{\frac{(\sec\theta-1)^2}{\tan^2\theta}}$$

$[\therefore \sec^2\theta-1=\tan^2\theta]$

$$=\frac{\sec^2\theta-1}{\tan\theta}$$

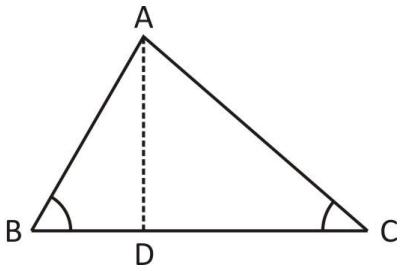
$$=\frac{\sec\theta}{\tan\theta}-\frac{1}{\tan\theta}$$

$$=\frac{\frac{1}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}}=\frac{1}{\tan\theta}$$

$$\left[\because \frac{1}{\sin\theta}=cosec\ \theta \quad and \quad \frac{1}{\tan\theta}=\cot\theta\right]$$

Hence, option C is correct.

2.



$Given\ that \angle B = \frac{\pi}{3} and \angle C = \frac{\pi}{4}$

$and \frac{BD}{CD} = \frac{1}{3}$

$In\ \Delta ABD,$

$$\frac{\text{BD}}{\sin \angle \text{BAD}} = \frac{\text{AD}}{\sin \angle \text{ABD}}$$

$$\Rightarrow \frac{\text{BD}}{\sin \angle \text{BAD}} = \frac{\text{AD}}{\sin \pi/3}$$

$$\Rightarrow \frac{\text{BD}}{\sin \angle \text{BAD}} = \frac{\text{AD}}{\sqrt{3}/2}$$

$$\Rightarrow \sin \angle \text{BAD} = \frac{\sqrt{3}}{2} \times \frac{\text{BD}}{\text{AD}} \quad ...(i)$$

In ΔACD,

$$\frac{\text{CD}}{\sin \angle \text{CAD}} = \frac{\text{AD}}{\sin \angle \text{ACD}}$$

$\Rightarrow \frac{CD}{\sin \angle CAD} = \frac{AD}{\sin \pi/4}$

$\Rightarrow \frac{CD}{\sin \angle CAD} = \frac{AD}{1/\sqrt{2}}$

$\Rightarrow \sin \angle CAD = \frac{1}{\sqrt{2}} \cdot \frac{CD}{AD}$ ...(ii)

Equation (i) ÷ (ii),

$$\frac{\sin \angle BAD}{\sin \angle CAD} = \frac{\frac{\sqrt{3}}{2} \cdot \frac{BD}{AD}}{\frac{1}{\sqrt{2}} \cdot \frac{CD}{AD}}$$

$$= \frac{\sqrt{3}}{\sqrt{2}} \cdot \frac{BD}{CD} = \frac{\sqrt{3}}{\sqrt{2}} \times \frac{1}{3} \quad [\because \frac{BD}{CD} = \frac{1}{3}]$$

$$= \frac{1}{\sqrt{6}}$$

Hence, option C is correct.

3.

sin 3A = cos (A – 26°)

$\Rightarrow$ cos (90° – 3A) = cos (A – 26°)

[$\because$ cos (90° – Θ) = sin Θ]

$\Rightarrow$ 90° – 3A = A – 26°

$\Rightarrow$ 4A = 116°

$\Rightarrow$ A = 29°

Hence, option A is correct.

4.

$$\sec^2\Theta - \frac{\sin^2\Theta - 2\sin^4\Theta}{2\cos^4\Theta - \cos^2\Theta}$$

$$= \sec^2\Theta - \frac{\sin^2\Theta\,(1 - 2\sin^2\Theta)}{\cos^2\Theta\,(2\cos^2\Theta - 1)}$$

$$= \sec^2\Theta - \frac{\sin^2\Theta\cos 2\Theta}{\cos^2\Theta\cos 2\Theta}$$

[$\because \cos 2\Theta = 1 - 2\sin^2\Theta = 2\cos^2\Theta - 1$]

$$= \sec^2\Theta - \frac{\sin^2\Theta}{\cos^2\Theta}$$

$$= \sec^2\Theta - \tan^2\Theta$$

$$[\because \frac{\sin\Theta}{\cos\Theta} = \tan\Theta]$$

= 1

[$\because \sec^2\Theta - \tan^2\Theta = 1$]

Hence, option A is correct.

5.

Given that $x = a(\sin\Theta + \cos\Theta)$ and $y = b(\sin\Theta - \cos\Theta)$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2}$$

$= \frac{a^2 (\sin \Theta + \cos \Theta)^2}{a^2} + \frac{b^2 (\sin \Theta - \cos \Theta)^2}{b^2}$

$= (\sin \Theta + \cos \Theta)^2 + (\sin \Theta - \cos \Theta)^2$

$= \sin^2 \Theta + \cos^2 \Theta + 2 \sin \Theta \cos \Theta + \sin^2 \Theta + \cos^2 \Theta - 2 \sin \Theta \cos \Theta$

$= 2(\sin^2 \Theta + \cos^2 \Theta)$

$= 2 \times 1$

[$\because \sin^2 \Theta + \cos^2 \Theta = 1$]

$= 2$

Hence, option C is correct.

6.

$\sin 5\Theta = \cos 20°$

$\Rightarrow \sin 5\Theta = \sin (90° - 20°)$

[$\because \sin (90° - \Theta) = \cos \Theta$]

$\Rightarrow \sin 5\Theta = \sin 70°$

$\Rightarrow 5\Theta = 70°$

$\Rightarrow \Theta = 14°$

Hence, option D is correct.

7.

$\sec \alpha = \frac{5}{4}$

$\therefore \tan\alpha = \sqrt{\sec^2\alpha - 1}$

$= \sqrt{\frac{25}{16} - 1} = \sqrt{\frac{25-16}{16}} = \sqrt{\frac{9}{16}} = \frac{3}{4}$

Now, $\frac{\tan\alpha}{1+\tan^2\alpha} = \frac{3/4}{1+3/4^2} = \frac{3/4}{1+9/16}$

$= \frac{3/4}{25/16} = \frac{12}{25}$

Hence, option B is correct.

8.

$\tan\Theta - \cot\Theta = 0$

Therefore, $\tan\Theta = \cot\Theta$

We know that the value of $\tan\Theta$ and $\cot\Theta$ is equal for Θ to be equal to 45°.

Clearly, the given expression will become like:

$\frac{\tan 60°}{\tan 30°} = \frac{3}{1/3} = \frac{3}{1} \times \frac{3}{1} = 3$

Hence, option C is correct.

9.

$\frac{\sin^8\Theta - \cos^8\Theta}{\cos 2\Theta\,(1+\cos^2 2\Theta)}$

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

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

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

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

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

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

Hence, option B is correct.

10.

$\sqrt{3}$ cosec 20° – sec 20° =?

$$\frac{\sqrt{3}}{\sin 20°} - \frac{1}{\cos 20°}$$

$$= \frac{\sqrt{3}\cos 20° - \sin 20°}{\sin 20° . \cos 20°}$$

$$= \frac{2(\frac{\sqrt{3}}{2}\cos 20° - \frac{1}{2}\sin 20°)}{\sin 20°.\cos 20°}$$

$$= \frac{2(\sin 60° . \cos 20° - \cos 60°. \sin 20°)}{\sin 20°. \cos 20°}$$

$$= \underline{2(\sin (60° - 20°)}$$

$\sin 20°. \cos 20°$

$$= \frac{2 \times 2 \sin 40°}{2 \sin 20°. \cos 20°}$$

$$= \frac{4 \sin 40°}{\sin 40} = 4 \qquad [2 \sin\Theta.\cos\Theta = \sin 2\Theta]$$

Hence, option B is correct.