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

TRIGONOMETRY QUIZ 3

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

(1). If Θ is an acute angle and $\tan^2\Theta + \frac{1}{\tan^2\Theta} = 2$, then the value of Θ is:

A. 60° B. 15°

C. 45° D. 30°

(2). If α + β = 90°, then the value of $(1 - \sin^2\alpha)(1 - \cos^2\alpha) \times (1 + \cot^2\beta)(1 + \tan^2\beta)$ is

A. 1 B. –1

C. 0 D. 2

(3). If α and β are complementary angles, then what is cosα cosecβ – cosα sinβ equal to?

A. sec β B. cos α

C. sin α D. – tan β

(4). The value of cos 25° – sin 25° is

A. positive but less than 1 B. positive but greater than 1

C. negative D. 0

(5). If sin (A + B) = 1, where 0 < B < 45°, then what is cos (A – B) equal to?

A. sin 2B B. sin B

C. cos 2B D. cos B

(6). **If α and β are complementary angles, then what is**

$$\sqrt{\text{cosec}\alpha.\text{cosec}\beta}\left(\frac{\sin\alpha}{\sin\beta}+\frac{\cos\alpha}{\cos\beta}\right)^{-\frac{1}{2}}$$ **equal to?**

A. 2 B. 3

C. 1 D. 0

(7). **What is the value of** $\frac{\sin\Theta}{1+\cos\Theta}+\frac{1+\cos\Theta}{\sin\Theta}$ **?**

A. sec Θ B. 2cosec Θ

C. 2 sin Θ D. cos Θ

(8). **What is sin 25° sin 35° sec 65° sec 55° equal to?**

A. −1 B. 0

C. $\frac{1}{2}$ D. 1

(9). **If sec Θ =** $\frac{13}{5}$**, then what is the value of** $\frac{2\sin\Theta - 3\cos\Theta}{4\sin\Theta - 9\cos\Theta}$**?**

A. 1 B. 2

C. 3 D.4

(10). **If sin Θ =** $\frac{x^2 - y^2}{x^2 + y^2}$ **then which one of the following is correct?**

A. cos Θ = $\frac{2xy}{x^2 - y^2}$ B. cos Θ = $\frac{2xy}{x^2 + y^2}$

C. cos Θ = $\frac{x - y}{x^2 + y^2}$ D. cos Θ = $\frac{xy(x - y)}{x^2 + y^2}$

Correct Answers:

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

Explanations:

1.

$$\tan^2\theta + \frac{1}{\tan^2\theta} = 2$$

$\tan^4\theta + 1 = 2\tan^2\theta$

$\tan^4\theta + 1 - 2\tan^2\theta = 0$

$(\tan^2\theta)^2 + (1)^2 - 2(\tan^2\theta)(1) = 0$

$[\therefore a^2 + b^2 - 2ab = (a + b)^2]$

$(\tan^2\theta - 1)^2 = 0 \Rightarrow \tan^2\theta = 1$

$\tan\theta = 1 = 1 \Rightarrow \tan\theta = \tan 45° \Rightarrow \therefore \theta = 45°$.

Hence, option C is correct.

2.

As per the question, $\alpha + \beta = 90°$, $\therefore \alpha = 90° - \beta$.

$(1 - \sin^2\alpha)(1 - \cos^2\alpha) \times (1 + \cot^2\beta)(1 + \tan^2\beta)$

$[\because 1 + \tan^2\beta = \sec^2\beta$ **and** $1 + \cot^2\beta = \text{coesce}^2\beta]$

$\Rightarrow (1 - \cos^2\beta)(1 - \sin^2\beta) \times \text{cosec}^2\beta \times \sec^2\beta$

$[\because \sin^2\alpha = \sin^2(90 - \beta) = \cos^2\beta$ **and** $\cos^2\alpha = \cos^2(90 - \beta) = \sin^2\beta]$

$\therefore \sin^2\beta \, . \, \cos^2\beta \times \frac{1}{\cos^2\beta} \times \frac{1}{\sin^2\beta} = 1$

$[\because (1 - \cos^2\beta) = \sin^2\beta$ **and** $(1 - \sin^2\beta) = \cos^2\beta]$

Hence, option A is correct.

3.

α & β complementary angle.

α = 90 – β & β = 90 – α

cosα.cosecβ – cosα.sinβ

$= \sqrt{\cos\alpha.\operatorname{cosec}(90-\alpha) - \cos\alpha.\sin(90-\alpha)}$

[∵ cosec(90 – α) = secα and sin(90 – α) = cosα]

$= \sqrt{\cos\alpha.\sec\alpha - \cos\alpha.\cos\alpha}$

[∵ cosα.secα = $\frac{\cos\alpha \times 1}{\cos\alpha}$= 1 – cos2α

= $\sqrt{\sin^2\alpha}$ = sinα.

Hence, option C is correct.

4.

Since, value of cos Θ decreases, from 0° to 90° and at 45° it is equal to the value of sin Θ.

Similarly, value of sin Θ increases from 0° to 90° and at 45° it is equal to the value of cos Θ.

For 0° < Θ < 45°, cos Θ > sin Θ

So, value of cos 25° – sin 25° is always positive but less than 1.

Hence, option A is correct.

5.

∵ sin (A + B) = 1

⇒ A + B = $\sin^{-1}$ 1 ⇒ (A + B) = 90° ⇒ B = 90° – A ⇒ A = 90° – B

Now, cos (A – B) = cos A cos B + sin A + sin B

= cos (90 – B) cos B + sin (90 – B) sin B

= sin B cos B + cos B sin B

= 2 sin B cos B = sin 2B.

Hence, option A is correct.

6.

α and β are complementary angles so β = (90° – α)

Let f (x) = $\sqrt{\text{cosec}\alpha.\text{cosec}\beta}\ \left(\frac{\sin\alpha}{\sin\beta}+\frac{\cos\alpha}{\cos\beta}\right)^{-\frac{1}{2}}$ sec (90° – α) ×

$$= \sqrt{\text{cosec}\alpha.\text{cosec}(90° - \alpha)} \times \left(\frac{\sin\alpha}{\sin(90° - \alpha)} + \frac{\cos\alpha}{\cos(90° - \alpha)}\right)^{-\frac{1}{2}}$$

$$= (\text{cosec}\alpha.\sec\alpha)^{\frac{1}{2}}\left(\frac{\sin\alpha}{\cos\alpha}+\frac{\cos\alpha}{\sin\alpha}\right)^{-\frac{1}{2}}$$

$$= (\text{cosec}\alpha.\sec\alpha)^{\frac{1}{2}}\left(\frac{\sin\alpha+\cos\alpha}{\cos\alpha\ \sin\alpha}\right)^{-\frac{1}{2}}$$

$$= (\text{cosec}\alpha.\sec\alpha)^{\frac{1}{2}}\left(\frac{1}{\cos\alpha\ \sin\alpha}\right)^{-\frac{1}{2}}$$

$$= (\text{cosec}\alpha.\sec\alpha)^{\frac{1}{2}}(\text{cosec}\alpha.\sec\alpha)^{\frac{1}{2}}s$$

= (cosec α.sec α)^{0} = 1.

Hence, option C is correct.

7.

$$\text{Let f(x)} = \frac{\sin\Theta}{1 + \cos\Theta} + \frac{1 + \cos\Theta}{\sin\Theta}$$

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

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

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

$$[\therefore \sin^2\theta + \cos^2\theta = 1]$$

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

$$= \frac{2}{\sin\theta} = 2\text{cosec}\theta$$

Hence, option B is correct.

8.

sin25° sin35° sec65° sec 55°

$$= \sin 25°.\sin 35°.\frac{1}{\cos 65}°.\frac{1}{\cos 55}°$$

$$[\therefore \cos(90 - \theta) = \sin\theta\,]$$

$$= 1$$

9.

$$\text{Given}, \sec\theta = \frac{13}{5}$$

$$\text{We know that}, 1 + \tan^2\theta = \sec^2\theta$$

$$\tan^2\theta = \left(\frac{13}{5}\right)^2 - 1$$

$$\tan^2\theta = \sqrt{\frac{169}{25} - 1} = \sqrt{\frac{144}{25}} = \frac{12}{5}$$

$$\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta} = \frac{2 \times \frac{\sin\theta}{\cos\theta} - 3}{4 \times \frac{\sin\theta}{\cos\theta} - 9}$$

[∴ Dividing by cosθ numerator & denominator]

$$= \frac{2 \times \frac{12}{5} - 3}{4 \times \frac{12}{5} - 9}$$

$$\left[\therefore \frac{\sin\theta}{\cos\theta} = \tan\theta = \frac{12}{5} \right]$$

$$= \frac{24 - 15}{48 - 45} = \frac{9}{3} = 3.$$

Hence, option C is correct.

10.

$$\sin\theta = \frac{x^2 - y^2}{x^2 + y^2}$$

We know that,

$$\cos^2\theta = 1 - \sin^2\theta$$

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

$$= \frac{(x^2 + y^2)^2 - (x^2 - y^2)^2}{(x^2 + y^2)^2}$$

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

$$= \cos^2 \theta = \frac{4x^2y^2}{(x^2 + y^2)} = \left(\frac{2xy}{x^2 + y^2}\right)^2$$

$$= \cos\theta = \frac{2xy}{x^2 + y^2}$$

Hence, option B is correct.


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