20 Trigonometry

EXERCISE 20B

For SSC CHSL Exam

1. The value of $\sin 35° \cos 55° + \cos 35° \sin 55°$ is:

SSC CHSL 07/06/2022 (Shift-3)

(a) 0 **(b)** $\frac{3}{4}$

(c) $\frac{1}{2}$ **(d)** 1

2. Select the correct identity from the following options.

SSC CHSL 07/06/2022 (Shift-2)

(a) $1 + \cos^2 A = \sin^2 A$

(b) $1 + \sin^2 A = \cos^2 A$

(c) $1 + \tan^2 A = \sec^2 A$

(d) $1 + \sec^2 A = \tan^2 A$

3. If $\text{cosec}^2\,\theta + \cot^2\,\theta + \frac{5}{3}$, then what is the value of $\cot 2\,\theta$.

SSC CHSL 07/06/2022 (Shift-1)

(a) $\frac{1}{\sqrt{3}}$ **(b)** $-\frac{1}{\sqrt{3}}$

(c) $\frac{2}{\sqrt{3}}$ **(d)** $-\frac{2}{\sqrt{3}}$

4. If $A = 30°$, what is the value of:

$$\frac{[6 \sin A + 9 \text{ cosec } A - \cot^2 A]}{12 \sin A}$$

SSC CHSL 06/06/2022 (Shift-1)

(a) 6 **(b)** –6

(c) 3 **(d)** –3

5. The value of $\sin 18°$ is given as $\frac{\sqrt{5}-1}{4}$. Find the value of $\text{cosec } 18°$.

SSC CHSL 06/06/2022 (Shift-2)

(a) $\frac{\sqrt{5}+1}{4}$ **(b)** $\frac{\sqrt{5}+1}{2}$

(c) $\sqrt{5}-1$ **(d)** $\sqrt{5}+1$

6. If $\tan\theta + \frac{1}{\tan\theta} = 2$, then the value of $\tan^2\theta + \frac{1}{\tan^2\theta}$ is ..... .

SSC CHSL 06/06/2022 (Shift-1)

(a) –4 **(b)** 2

(c) 4 **(d)** 3

7. What is the value of the expression $100 (\sin 15° \cos 15°)$?

SSC CHSL 03/06/2022 (Shift-3)

(a) 50 **(b)** 75

(c) 100 **(d)** 25

8. If $\sec\theta - \text{cosec}\,\theta = 0$ and θ is an acute angle, then what is the value of $\sec^2\theta + \text{cosec}^2\,\theta$?

SSC CHSL 12/08/2021 (Shift-3)

(a) 4 **(b)** 1

(c) 2 **(d)** 0

9. If $\sin\alpha + \text{cosec}\,\alpha = \tan\frac{\pi}{3}$, then the value of $(\sin^3\alpha + \text{cosec}^3\alpha)$ is equal to:

SSC CHSL 11/08/2021 (Shift-3)

(a) 1/2 **(b)** 1

(c) 0 **(d)** 3/2

10. The value of

$$\frac{\cos^2 89° + \cos^2 1°}{\cos 30° \sin 90° - \sin 30° \cos 90°}$$ is

SSC CHSL 11/08/2021 (Shift-3)

(a) $\frac{2}{\sqrt{3}}$ **(b)** $2\sqrt{3}$

(c) $\frac{1}{\sqrt{3}}$ **(d)** $\frac{1}{1-\sqrt{3}}$

11. If $\cot^2\theta + \cot^4\theta = 2$, then the value of $2\sin^4\theta + \sin^2\theta$ is:

SSC CHSL 11/08/2021 (Shift-3)

(a) 3 **(b)** 5

(c) 1 **(d)** 2

12. If $\cot A + \text{cosec}\,A = 2$ and A is an acute angle, then the value of $\frac{9\tan A + 16\,\text{cosec}\,A}{5\sin A + 3\tan A}$ is:

SSC CHSL 11/08/2021 (Shift-2)

(a) 3 **(b)** 6

(c) 4 **(d)** 8

13. Solve for θ : $3\,\text{cosec}\,\theta + 4\sin\theta - 4\sqrt{3} = 0$, where θ is an acute angle.

SSC CHSL 11/08/2021 (Shift-2)

(a) 45° **(b)** 30°
(c) 60° **(d)** 15°

14. The value of $\left[\frac{\sin^2 27° + \sin^2 63°}{\cos^2 24° + \cos^2 66°} - \sin^2 69° - \cos 69° \sin 21°\right]$ is:

SSC CHSL 11/08/2021 (Shift-1)

(a) 3 **(b)** 2
(c) 0 **(d)** 1

15. If $3\sin^2 A + 4\cos^2 A - 3 = 0$, then the value of cot A (where $0 \geq A \leq 90°$) is:

SSC CHSL 11/08/2021 (Shift-1)

(a) ∞ **(b)** 0
(c) 1 **(d)** not defined

16. If $(1 + \cot^2 \theta) + (1 + (\cot^2 \theta)^{-1})$ is equal to k, then $\sqrt{k}$ = ? **SSC CHSL 10/08/2021 (Shift-3)**

(a) $\sin \theta \sec \theta$ **(b)** $\text{cosec}\ \theta \cos \theta$
(c) $\text{cosec}\ \theta \sec \theta$ **(d)** $\sin \theta \cos \theta$

17. The value of $\cot^2 46° - \sec^2 44° + (\sin^2 1° + \sin^2 3° + \sin^2 5° + ... + \sin^2 89°)$

SSC CHSL 10/08/2021 (Shift-3)

(a) 23.5 **(b)** 20.5
(c) 22.5 **(d)** 21.5

18. If $\frac{5\cot \theta + \sqrt{3}\text{cosec}\ \theta}{2\sqrt{3}\text{cosec}\ \theta + 3\cot \theta} = 1, 0 < \theta < 90°$, then the value of $\frac{\frac{7}{2}\cot^2 \theta - \frac{3}{4}\text{cosec}^2 \theta}{4\sin^2 \theta + \frac{3}{2}\tan^2 \theta}$ will be

SSC CHSL 10/08/2021 (Shift-1)

(a) 7 **(b)** 2
(c) 3 **(d)** 5

19. If $\sin^2 x - 3\cos^2 x = 0$, then the value of x ($0° < x < 90°$) is: **SSC CHSL 10/08/2021 (Shift-2)**

(a) 45° **(b)** 30°
(c) 60° **(d)** 15°

20. If $\tan \theta = \frac{4}{3}$, then the value of $\frac{9\sin \theta + 12\cos \theta}{27\cos \theta - 20\sin \theta}$ will be equal to:

SSC CHSL 10/08/2021 (Shift-1)

(a) 72 **(b)** 36
(c) 18 **(d)** 100

21. For $\theta : 0° < \theta < 90°$, $3\sec \theta + 4\cos \theta = 4\sqrt{3}$, find the value of $(1 - \sin \theta + \cos \theta)$

SSC CHSL 10/08/2021 (Shift-1)

(a) $\frac{1+2\sqrt{3}}{2}$ **(b)** $\frac{1+\sqrt{3}}{2}$
(c) $\frac{1-\sqrt{3}}{2}$ **(d)** $\frac{1-2\sqrt{3}}{2}$

SOLUTIONS

1. (d) $\sin 35° \cos 55° + \cos 35° \sin 55°$

$[\because \sin(A + B) = \sin A \cos B + \cos A \sin B]$

$= \sin(35° + 55°)$

$= \sin 90° = 1$

2. (c) $\sec^2 A - \tan^2 A = 1$

$\sec^2 A = 1 + \tan^2 A$

3. (b) $\text{cosec}^2 \theta + \cot^2 \theta = \frac{5}{3}$

$1 + \cot^2 \theta + \cot^2 \theta = \frac{5}{3}$

$[\because \text{cosec}^2 \theta = 1 + \cot^2 \theta]$

$\Rightarrow 2\cot^2 \theta = \frac{5}{3} - 1 = \frac{2}{3}$

$\Rightarrow \cot^2 \theta = \frac{1}{3}$

$\Rightarrow \cot^2 \theta = \cot 60°$

$\Rightarrow \theta = 60°$

then, $\cot 2\theta = \cot 120°$

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

4. (c) Given A = 30°

$= \frac{(6 \sin A + 9\,\text{cosec}\ A - \cot^2 A)}{12 \sin A}$

Put the value A = 30°

$= \frac{6 \times \frac{1}{2} + 9 \times 2 - (\sqrt{3})^2}{12 \times \frac{1}{2}}$

$= \frac{3 + 18 - 3}{6} = \frac{18}{6} = 3$

5. (d) Given: $\sin 18° = \frac{\sqrt{5} - 1}{4}$

then $\text{cosec}\ 18° = \frac{1}{\sin 18°} = \frac{4}{\sqrt{5} - 1} \times \frac{\sqrt{5} + 1}{\sqrt{5} + 1}$

$= \sqrt{5} + 1$

6. (b) Given: $\tan \theta + \frac{1}{\tan \theta} = 2$

Squaring both sides

$$\tan^2\theta + \frac{1}{\tan^2\theta} + 2 = 4$$

$$\tan^2\theta + \frac{1}{\tan^2\theta} = 4 - 2 = 2$$

7. (d) Given: Value of $100(\sin 15^\circ \cos 15^\circ)$

then $\sin(A + B) = \sin A \cos B + \cos A \sin B$

Let $A = 15^\circ$, $B = 15^\circ$ and put the value

$$\sin(15^\circ + 15^\circ) = \sin 15^\circ \cos 15^\circ + \sin 15^\circ \cos 15^\circ$$

$$\frac{1}{2} = 2(\sin 15^\circ \cos 15^\circ)$$

$$\sin 15^\circ \cos 15^\circ = \frac{1}{4}$$

then value of $100 \sin 15^\circ \cos 15^\circ$

$$= 100 \times \frac{1}{4} = 25$$

8. (a) Let $\theta = 45^\circ$

Put the value of $\theta = 45$ in

$$\sec^2\theta + \operatorname{cosec}^2\theta = (\sqrt{2})^2 + (\sqrt{2})^2$$
$$= 2 + 2 = 4$$

9. (c) $\sin\alpha + \operatorname{cosec}\alpha = \tan \pi/3$

$[\because \tan \pi/3 = \tan 60^\circ = \sqrt{3}\,]$

$$\sin\alpha + \operatorname{cosec}\alpha = \sqrt{3}$$

Cubing both sides

$$\sin^3\alpha + \operatorname{cosec}^3\alpha + 3(\sin\alpha \operatorname{cosec}\alpha)(\sin\alpha \operatorname{cosec}\alpha) = 3\sqrt{3}$$

$$\sin^3\alpha + \operatorname{cosec}^3\alpha + 3 \times \sqrt{3} = 3\sqrt{3}$$

$[\because \sin\alpha \cdot \operatorname{cosec}\alpha = 1]$

$$\sin^3\alpha + \operatorname{cosec}^3\alpha = 0$$

10. (a) $$\frac{\cos^2 89^\circ + \cos^2 1^\circ}{\sin 90^\circ \cos 30^\circ - \cos 90^\circ \sin 30^\circ}$$

$$\Rightarrow \quad \frac{\sin^2 1^\circ + \cos^2 1^\circ}{\sin 60^\circ}$$

$[\because \sin(A - B) = \sin A \cos B - \cos A \sin B$ and $\cos(90^\circ - \theta) = \sin\theta]$

$$\frac{1}{\frac{\sqrt{3}}{2}} = \frac{2}{\sqrt{3}}$$

11. (c) Let $\theta = 45^\circ$ and put the value $\theta = 45^\circ$

LHS. $\cot^2 45^\circ + \cot^4 45^\circ$

$$(1)^2 + (1)^4 = 1 + 1 = 2 \text{ RHS}$$

Put the value of $\theta = 45^\circ$

$2 \sin^4\theta + \sin^2\theta$

$$\Rightarrow \quad 2\sin^4 45^\circ + \sin^2 45^\circ$$

$$\Rightarrow \quad 2 \times \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^2$$

$$\Rightarrow \quad 2 \times \frac{1}{4} + \frac{1}{2}$$

$$\Rightarrow \quad \frac{1}{2} + \frac{1}{2} = 1$$

12. (c) Given: $\operatorname{cosec} A + \cot A = 2$

$$\operatorname{cosec} A - \cot A = \frac{1}{\operatorname{cosec} A + \cot A} = \frac{1}{2}$$

$[\because \operatorname{cosec}^2 A - \cot^2 A = (\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A)]$

$$2 \operatorname{cosec} A = 2 + \frac{1}{2} = \frac{5}{2}$$

$$\operatorname{cosec} A = \frac{5}{4}$$

Using triplet, 3, 4, 5

$$\sin A = \frac{4}{5}, \tan A = \frac{4}{3}$$

Put the value

$$\frac{9 \times \frac{4}{3} + 16 \times \frac{5}{4}}{5 \times \frac{4}{5} + 3 \times \frac{4}{3}} = \frac{32}{8} = 4$$

13. (c) Let $\theta = 60^\circ$

Put the value LHS

$3 \operatorname{cosec} 60^\circ + 4 \sin 60^\circ = 4\sqrt{3}$

$$3 \times \frac{2}{\sqrt{3}} + 4 \times \frac{\sqrt{3}}{2}$$

$$\frac{6}{\sqrt{3}} + 2\sqrt{3} = \frac{12}{\sqrt{3}} = \frac{4\sqrt{3} \times \sqrt{3}}{\sqrt{3}} = 4\sqrt{3} = \text{R.H.S.}$$

$\therefore$ Value of θ is 60°.

14. (c) $$\left[\frac{\sin^2 27^\circ + \sin^2 63^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} - \sin^2 69^\circ - \cos 69^\circ \sin 21^\circ\right]$$

$$1 - \sin^2 69^\circ - \cos 69^\circ \cos 69^\circ$$

$[\because \sin(90^\circ - \theta) = \cos\theta, \cos(90^\circ - \theta) = \sin\theta \sin^2\theta + \cos^2\theta = 1]$

$$\cos^2 69^\circ - \cos^2 69 = 0$$

15. (b) Given $3\sin^2 A + 4\cos^2 A - 3 = 0$

$$3\sin^2 A + 3\cos^2 A + \cos^2 A = 3$$

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

$$\Rightarrow \quad 3 + \cos^2 A = 3$$

$$\Rightarrow \quad \cos^2 A = 3 - 3 = 0$$

$\Rightarrow \quad \cos A = 0$

$\Rightarrow \quad A = 90°$

$\Rightarrow \quad \cot A = \cot 90° = 0$

16. (c) $(1 + \cot^2\theta) + (1 + (\cot^2\theta)^{-1}) = k$

$\Rightarrow \quad \operatorname{cosec}^2\theta + \sec^2\theta = k$

$\left[\because \quad 1 + (\cot^2\theta)^{-1} = \dfrac{1}{\cot^2\theta}\right.$

$\left. = 1 + \tan^2\theta + 1 + \tan^2\theta = \sec^2\theta \right]$

$\Rightarrow \quad \dfrac{1}{\sin^2\theta} + \dfrac{1}{\cos^2\theta} = k$

$\dfrac{\cos^2\theta + \sin^2\theta}{\sin^2\theta\cos^2\theta} = k$

$\Rightarrow \quad \dfrac{1}{\sin^2\theta\cos^2\theta} = k$

Squaring root both side

$\Rightarrow \quad \sqrt{k} = \operatorname{cosec}\theta \sec\theta$

17. (d) $\cot^2 46° - \sec^2 44° + (\sin^2 1° + \sin^2 3°$
$+ \sin^2 5° + ... + \sin^2 89°)$

$\cot^2(90° - 44°) - \sec^2 44° + \{\sin^2 1° + \sin^2 3°$
$+ \sin^2 5° + \sin 45° + \sin^2 85°$
$+ \sin 87° + \sin^2 89°\}$

$\tan^2 44° - \sec^2 44° + \sin^2 1° + \sin^2 3° + \sin^2 5°$
$+ ... + \sin^2 45° + ... + \cos^2 5°$
$+ \cos^2 3° + \cos^2 1°.$

$= -1 + 22 + \dfrac{1}{2}$

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

$= 21.5$

18. (d) $\dfrac{5\cot\theta + \sqrt{3}\operatorname{cosec}\theta}{2\sqrt{3}\operatorname{cosec}\theta + 3\cot\theta} = 1$

$\Rightarrow \quad 5\cot\theta + \sqrt{3}\operatorname{cosec}\theta = 2\sqrt{3}\operatorname{cosec}\theta$
$+ 3\cot\theta$

$\Rightarrow \quad 2\cot\theta = \sqrt{3}\operatorname{cosec}\theta$

$\Rightarrow \quad \cos\theta = \dfrac{\sqrt{3}}{2} = \cos$

$\Rightarrow \quad 60°\theta = 60°$

Now, put the value of given expression

$\Rightarrow \quad \dfrac{\frac{7}{2}\cot^2 30° - \frac{3}{4}\operatorname{cosec}^2 30°}{4\sin^2 30° - \frac{3}{2}\tan^2 30°}$

$\Rightarrow \quad \dfrac{\frac{21}{2} - 8}{1 - \frac{1}{2}} = \dfrac{\frac{5}{2}}{\frac{1}{2}} = 5$

19. (c) $\sin^2 x - 3\cos^2 x = 0$

$\Rightarrow \quad \sin^2 x + \cos^2 x - 4\cos^2 x = 0$

$\Rightarrow \quad 1 - 4\cos^2 x = 0$

$\Rightarrow \quad \cos^2 x = \dfrac{1}{4}$

$\Rightarrow \cos x = \dfrac{1}{2} = \cos 60°$

$\therefore \; x = 60°$

20. (a) Trick $\tan\theta = \dfrac{4}{3}$

$\dfrac{\sin\theta}{\cos\theta} = \dfrac{4}{3}$

$\dfrac{9\sin\theta + 12\cos\theta}{27\cos\theta - 20\sin\theta} = \dfrac{9\times4 + 12\times3}{27\times3 - 20\times4}$

$= \dfrac{36 + 36}{81 - 80} = 72$

21. (b) Let $\theta = 30°$

LHS = RHS

LHS. $3\sec 30° + 4\cos 30°$

$\Rightarrow \quad 3\times\dfrac{2}{\sqrt{3}} + 4\times\dfrac{\sqrt{3}}{2} = 2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3}$

LHS = RHS

then, put the value $\theta = 30°$

$1 - \sin 30° + \cos 30°$

$\Rightarrow \quad 1 - \dfrac{1}{2} + \dfrac{\sqrt{3}}{2} = \dfrac{1}{2} + \dfrac{\sqrt{3}}{2} = \dfrac{1+\sqrt{3}}{2}$

EXERCISE 20C

For SSC CGL & CPO Exams

1. If $\operatorname{cosec} A = \sec B$, where A and B are acute angles, then what is the value of $(A + B)$?

SSC CGL 21/04/2022 (Shift-2)

(a) 0° **(b)** 135°

(c) 90° **(d)** 45°

2. If $(2\cos A + 1)(2\cos A - 1) = 0$, $0° < A \le 90°$, then find the value of A.

SSC CGL 21/04/2022 (Shift-1)

(a) 90° **(b)** 45°

(c) 30° **(d)** 60°

3. If A = 30°, what is the value of

$$\frac{8\sin A + 11\,\text{cosec}\, A - \cot^2 A}{10\cos 2A}\ ?$$

SSC CGL 21/04/2022 (Shift-1)

(a) $5\frac{1}{5}$ **(b)** $4\frac{3}{5}$

(c) $4\frac{2}{5}$ **(d)** $3\frac{4}{5}$

4. The value of $\frac{5\cos^2 62° + 5\cos^2 28° - 21}{7\sin^2 35° + 7\sin^2 55° + 1}$ is:

SSC CGL 20/04/2022 (Shift-3)

(a) 2 **(b)** –2

(c) 3 **(d)** –3

5. Simplify the following expression: $\text{cosec}^4 A(1 - \cos^4 A) - 2\cot^2 A - 1$

SSC CGL 20/04/2022 (Shift-1)

(a) $\sin^2 A$ **(b)** $\text{cosec}^2 A$

(c) 1 **(d)** 0

6. If 6 tan A (tan A + 1) = 5 – tan A, Given that $0 < A < \frac{\pi}{2}$. What is the value of (sin A + cos A)?

SSC CGL 20/04/2022 (Shift-1)

(a) $3\sqrt{5}$ **(b)** $\frac{5}{\sqrt{3}}$

(c) $5\sqrt{3}$ **(d)** $\frac{3}{\sqrt{5}}$

7. If $\cot^2 \alpha + \tan^2 \alpha = 2$, $0° \le \alpha \le 90°$, then find the value of α. **SSC CGL 20/04/2022 (Shift-3)**

(a) 0° **(b)** 45°

(c) 60° **(d)** 90°

8. Simplify the following expression:

$$\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} - \sin A$$

SSC CGL 19/04/2022 (Shift-3)

(a) 1 + cos A **(b)** (1 + sin A) cos A

(c) 1 + sin A **(d)** cos A

9. If $\cos 53° = \frac{x}{y}$, then sec 53° + cot 37° is equal to:

SSC CGL 19/04/2022 (Shift-2)

(a) $\frac{x + (\sqrt{y^2 - x^2})}{y}$ **(b)** $\frac{x + (\sqrt{y^2 - x^2})}{x}$

(c) $\frac{y + (\sqrt{y^2 - x^2})}{x}$ **(d)** $\frac{y + (\sqrt{y^2 - x^2})}{y}$

10. If $\cos B = \frac{5}{7}$, what is the value of cosec B + cot B?

Given that $0 < B < \frac{\pi}{2}$

SSC CGL 19/04/2022 (Shift-2)

(a) $\frac{5}{\sqrt{6}}$ **(b)** $\frac{\sqrt{6}}{12}$

(c) $\frac{7}{\sqrt{6}}$ **(d)** $\sqrt{6}$

11. If $3\sin^2\theta + 4\cos\theta - 4 = 0$, $0° < \theta < 90°$, then find the value of $(\text{cosec}^2\theta + \cot^2\theta)$ is:

SSC CGL 19/04/2022 (Shift-1)

(a) $\frac{5}{4}$ **(b)** $\frac{25}{3}$

(c) $\frac{4}{3}$ **(d)** $\frac{17}{9}$

12. If A = 60°, what is the value of

$$\frac{10\sin\frac{A}{2} + 8\cos A}{7\sin\frac{3A}{2} - 12\cos A}\ ?$$

SSC CGL 19/04/2022 (Shift-1)

(a) 10 **(b)** 12

(c) 9 **(d)** 7

13. If $2\sin^2\theta + 3\cos\theta = 3$, $0° < \theta < 90°$, then the value of $(\sec^2\theta + \cot^2\theta)$ is:

SSC CGL 18/04/2022 (Shift-3)

(a) $3\frac{2}{3}$ **(b)** $3\frac{1}{3}$

(c) $4\frac{1}{3}$ **(d)** $4\frac{1}{2}$

14. If A = 10°, what is the value of

$$\frac{12\sin 3A + 5\cos(5A - 5°)}{9\sin\frac{9A}{2} - 4\cos(5A + 10°)}\ ?$$

SSC CGL 18/04/2022 (Shift-3)

(a) $\frac{6\sqrt{2} + 5}{(9 - 2\sqrt{2})}$ **(b)** $\frac{6\sqrt{2} - 5}{(9 - 2\sqrt{2})}$

(c) $\frac{(9 - 2\sqrt{2})}{(9 - 2\sqrt{2})}$ **(d)** $\frac{6\sqrt{2} - 5}{(9 - 2\sqrt{2})}$

15. The value of $2-\sqrt{\frac{\cot\theta+\cos\theta}{\cot\theta-\cos\theta}}$, when $0°<\theta<90°$ is equal to **SSC CGL 18/04/2022 (Shift-2)**

(a) $2+\sec\theta+\tan\theta$ **(b)** $2-\sec\theta+\tan\theta$

(c) $2-\sec\theta-\tan\theta$ **(d)** $2+\sec\theta-\tan\theta$

16. The expression $(\cos^6\theta+\sin^6\theta-1)(\tan^2\theta+\cot^2\theta+2)+1$ is equal to: **SSC CGL 18/04/2022 (Shift-2)**

(a) 1 **(b)** –2

(c) 0 **(d)** –1

17. If $\sec^2\theta+\tan^2\theta=3\frac{1}{2}$, $0°<\theta<90°$, then $(\cos\theta+\sin\theta)$ is equal to: **SSC CGL 18/04/2022 (Shift-1)**

(a) $\frac{1+\sqrt{5}}{3}$ **(b)** $\frac{2+\sqrt{5}}{3}$

(c) $\frac{1+\sqrt{5}}{6}$ **(d)** $\frac{9+2\sqrt{5}}{6}$

18. If $A=60°$, what is the value of:

$$\frac{[8\cos A+7\sec A-\tan^2 A]}{10\sin\frac{A}{2}}?$$

SSC CGL 18/04/2022 (Shift-1)

(a) 5 **(b)** 3

(c) 15 **(d)** 10

19. $(\sec\theta-\tan\theta)^2(1+\sin\theta)^2\div\cos^2\theta=?$ **SSC CGL 13/04/2022 (Shift-3)**

(a) $\cos^2\theta$ **(b)** 1

(c) $\cot^2\theta$ **(d)** –1

20. If $\sin^2\theta-\cos^2\theta-3\sin\theta+2=0$, $0°<\theta<90°$, then what is the value of $1+\sec\theta+\tan\theta$? **SSC CGL 13/04/2022 (Shift-3)**

(a) $-1+\sqrt{3}$ **(b)** $-1-\sqrt{3}$

(c) $1+\sqrt{3}$ **(d)** $1-\sqrt{3}$

SOLUTIONS

1. (c) According to the question,

$$\text{cosec } A = \sec B$$
$$\text{cosec } 45° = \sec 45°$$
$$\sqrt{2} = \sqrt{2}$$

$\therefore$ Value of $(A+B)=45°+45°=90°$

2. (d) $(2\cos A+1)(2\cos A-1)=0$

$\Rightarrow 4\cos^2 A-1=0$

$\Rightarrow \cos A=\frac{1}{2}=\cos 60°$

$\Rightarrow \cos A=60°$

3. (d) $A=30°$ put the value of given expression

$$=\frac{8\times\frac{1}{2}+11\times 2-3}{10\times\frac{1}{2}}$$

$$=\frac{4+22-3}{5}=\frac{19}{5}=3\frac{4}{5}$$

4. (b) $\frac{5\cos^2 62°+5\cos^2 28°-21}{7\sin^2 35°+7\sin^2 55°+1}$

$$\Rightarrow \frac{5[\cos^2 62°+\sin^2 62°]-21}{7[\sin^2 35°+\cos^2 35°]+1}$$

$$\left[\because \begin{array}{l}\sin(90°-\theta)=\cos\theta\\ \cos(90°-\theta)=\sin\theta\end{array}\right]$$

$$\Rightarrow \frac{5-21}{7+1}=\frac{-16}{8}=-2$$

5. (d) $\text{cosec}^4 A(1-\cos^4 A)-2\cot^2 A-1$

Put $A=45°$ (Let)

$$\Rightarrow (\sqrt{2})^4\left[1-\left[\frac{1}{\sqrt{2}}\right]^4\right]-2\times(1)^2-1$$

$$\Rightarrow 4\times\frac{3}{4}-2-1$$

$$\Rightarrow 3-3=0$$

6. (d) $6\tan A(\tan A+1)=5-\tan A$

$\Rightarrow 6\tan^2 A+6\tan A=5-\tan A$

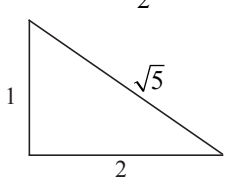
$\Rightarrow 6\tan^2 A+7\tan A-5=0$

$\Rightarrow 6\tan^2 A+10\tan A-3\tan-5=0$

$(3\tan A+5)(2\tan-1)=0$

$\Rightarrow 2\tan A=1$

$$\tan A=\frac{1}{2}$$



$\sin A+\cos A$

$$\Rightarrow \frac{1}{\sqrt{5}}+\frac{2}{\sqrt{5}}=\frac{3}{\sqrt{5}}$$

7. (b) Let $\theta=45°$

$\cot^2\alpha+\tan^2\alpha$

$\Rightarrow \cot^2 45°+\tan^2 45°$

$\Rightarrow \quad (1)^2 + (1)^2 = 1 + 1 = 2$

LHS = RHS

$\therefore$ Value of $\alpha = 45°$

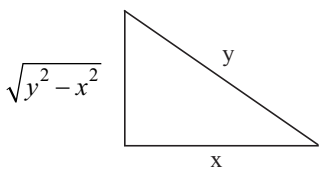
8. (d) $\dfrac{\cos A}{1+\tan A} + \dfrac{\sin A}{1-\cot A} - \sin A$

$\Rightarrow \quad \dfrac{\cos A}{1-\dfrac{\sin A}{\cos A}} + \dfrac{\sin A}{1-\dfrac{\cos A}{\sin A}} - \sin A$

$\Rightarrow \quad \dfrac{\cos^2 A - \sin^2 A}{\cos A - \sin A} - \sin A$

$\Rightarrow \quad \cos A + \sin A - \sin A = \cos A$

9. (c) Given $\cos 53° = \dfrac{x}{y}\sqrt{y^2 - x^2}$



$\Rightarrow \quad \sec 53° + \cot 37°$

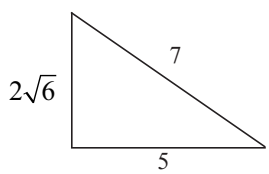
$\Rightarrow \quad \sec 53° + \tan 53°$

$[\because \cot(90° - \theta) = \tan\theta]$

$\Rightarrow \quad \dfrac{y}{x} + \dfrac{\sqrt{y^2 - x^2}}{x}$

$\Rightarrow \quad \dfrac{y + \sqrt{y^2 - x^2}}{x}$

10. (d) $\cos B = \dfrac{5}{7}$



then, cosec B + cot B

$\dfrac{7}{2\sqrt{6}} + \dfrac{5}{2\sqrt{6}} = \dfrac{12}{2\sqrt{6}} = \sqrt{6}$

11. (a) $3\sin^2\theta + 4\cos\theta - 4 = 0$

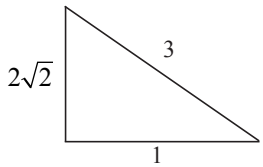
$\Rightarrow \quad 3 - 3\cos^2\theta + 4\cos\theta - 4 = 0$

$\Rightarrow \quad 3\cos^2\theta + 4\cos\theta - 1 = 0$

$\Rightarrow \quad 3\cos^2\theta + 3\cos\theta + \cos\theta - 1 = 0$

$\Rightarrow \quad (\cos\theta - 1)(3\cos\theta - 1) = 0$

so, $\cos\theta = \dfrac{1}{3}$



$\text{cosec}^2\theta + \cot^2\theta = \left(\dfrac{3}{2\sqrt{2}}\right)^2 + \left(\dfrac{1}{2\sqrt{2}}\right)^2$

$= \dfrac{9}{8} + \dfrac{1}{8} = \dfrac{10}{8} = \dfrac{5}{4}$

12. (c) $\dfrac{10\sin\dfrac{60°}{2} + 8\cos 60°}{7\sin\dfrac{3\times 60}{2} - 12\cos 60°}$

$\Rightarrow \quad \dfrac{5+4}{7-6} = 5 + 4 = 9$

13. (c) $2\sin^2\theta + 3\cos\theta - 3 = 0$

$\Rightarrow \quad 2 - 2\cos^2\theta + 3\cos\theta - 3 = 0$

$\Rightarrow \quad 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow \quad 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$(2\cos\theta - 1)(\cos\theta - 1) = 0$

$\therefore \quad \cos\theta = \dfrac{1}{2} = \cos 60°$

$\theta = 60°$

so, $\sec^2 60° + \cot^2 60°$

$\Rightarrow \quad (2)^2 + \left(\dfrac{1}{\sqrt{3}}\right)^2$

$\Rightarrow \quad 4 + \dfrac{1}{3} = 4\dfrac{1}{3}$

14. (a) $\dfrac{12\sin 3\times 10° + 5\cos(5\times 10° - 5°)}{9\sin\dfrac{9\times 10°}{2} - 4\cos(5\times 10° + 10°)}$

$\Rightarrow \quad \dfrac{12\times\dfrac{1}{2} + 5\times\dfrac{1}{\sqrt{2}}}{9\times\dfrac{1}{\sqrt{2}} - 4\times\dfrac{1}{2}}$

$\Rightarrow \quad \dfrac{6 + \dfrac{5}{\sqrt{2}}}{\dfrac{9}{\sqrt{2}} - 2} = \dfrac{6\sqrt{2} + 5}{9 - 2\sqrt{2}}$

15. (c) $2 - \sqrt{\dfrac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$

$\Rightarrow \quad 2 - \sqrt{\dfrac{\cos\theta\left(\dfrac{1+\sin\theta}{\sin\theta}\right)}{\cos\theta\left(\dfrac{1-\sin\theta}{\sin\theta}\right)}}$

$$\Rightarrow \quad 2-\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$$

$$\Rightarrow \quad 2-\sec\theta-\tan\theta$$

16. (b) Let $\theta = 45°$

$(\cos^6 45° + \sin^6 45° - 1)$

$(\tan^2 45° + \cot^2 45° + 2) + 1$

$$\Rightarrow \quad \left(\frac{1}{8}+\frac{1}{8}-1\right)(1+1+2)+1$$

$$\Rightarrow \quad -\frac{3}{4}\times 4+1 \;=\; -3+1=-2$$

17. (b) Given

$$\sec^2\theta+\tan^2\theta=\frac{7}{2} \qquad ...(i)$$

$$\sec^2\theta-\tan^2\theta=1 ...(ii)$$

equation $(i) + (ii)$

$$2\sec^2\theta \;=\; \frac{9}{2}$$

$$\sec\theta \;=\; \frac{3}{2}$$

so, $$\cos\theta \;=\; \frac{2}{3},$$

$$\sin\theta \;=\; \sqrt{1-\left(\frac{2}{3}\right)^2} \;=\; \frac{\sqrt{5}}{3}$$

then, $\cos\theta + \sin\theta = \frac{2}{3}+\frac{\sqrt{5}}{3}=\frac{2+\sqrt{5}}{3}$

18. (a) $A = 60°$, Put the value

$$\frac{8\cos 60° + 7\sec 60° - \tan^2 60°}{10\sin\frac{60°}{2}}$$

$$\Rightarrow \quad \frac{8\times\frac{1}{2}+7\times 2-(\sqrt{3})^2}{10\times\frac{1}{2}}$$

$$\Rightarrow \quad \frac{4+14-3}{5} \;=\; \frac{15}{3}=5$$

19. (b) $(\sec\theta - \tan\theta)^2 (1 + \sin\theta)^2 \div \cos^2\theta$

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

$$\Rightarrow \quad \frac{(1-\sin\theta)^2}{\cos^2\theta}\times\frac{(1+\sin\theta)^2}{\cos^2\theta}$$

$$[\because \quad (a)^2-(b)^2=(a-b)(a+b)]$$

$$\Rightarrow \quad \frac{(1-\sin^2\theta)^2}{\cos^4\theta} \;=\; \frac{\cos^4\theta}{\cos^4\theta}=1$$

20. (c) $\sin^2\theta - \cos^2\theta - 3\sin\theta + 2 = 0$

$$\Rightarrow \quad \sin^2\theta-(1-\sin^2\theta)-3\sin\theta+2=0$$

$$\Rightarrow \quad \sin^2\theta-1+\sin^2\theta-3\sin\theta+2=0$$

$$\Rightarrow \quad 2\sin^2\theta-3\sin\theta+1=0$$

$$\therefore \quad \text{value of } \sin\theta \;=\; \frac{2}{2}=1, \text{ and } \frac{1}{2}$$

$$\theta \;=\; 30°$$

$$=\; 1+\sec 30°+\tan 30°$$

$$\therefore \quad 1+\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}} \;=\; 1+\sqrt{3}$$