TRIGONOMETRY

SHEET 05

Questions Based on Basic Trigonometric Identities

* $1 + \tan^2\theta = \sec^2\theta$

* $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

1. The numerical value of

$$\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta \text{ is :}$$

SSC CGL 13 June 2019 (Evening)

(a) 5 (b) 2

(c) 3 (d) 4

$5\cos^2\theta + \frac{2}{\operatorname{cosec}^2\theta} + 3\sin^2\theta$

$= \underline{5\cos^2\theta} + \underline{2\sin^2\theta + 3\sin^2\theta}$

$= 5[\cos^2\theta + \sin^2\theta]$

$= 5 \times 1 = 5$

2. The numerical value of

$$\left(\frac{1}{1+\cot^2\theta}+\frac{3}{1+\tan^2\theta}+2\sin^2\theta\right)$$ **is :**

(a) 2 **(b) 5**

(c) 6 **(d) 3**

$\sin^2\theta + 3\cos^2\theta + 2\sin^2\theta$

$\left(\frac{1}{c}+\frac{s}{c}\right)\left(\frac{1}{c}-\frac{s}{c}\right)$

$= \frac{(1+s)}{c}\cdot\frac{(1-s)}{c} = \frac{1^2-s^2}{c^2}$

$= \frac{c^2}{c^2} = 1$

3. The numerical value of

$$\left(\frac{1}{\cos\theta}+\frac{1}{\cot\theta}\right)\left(\frac{1}{\cos\theta}-\frac{1}{\cot\theta}\right)$$ **is :**

(a) 0 **(b) – 1**

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

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

$\frac{S}{(1+C)} + \frac{S}{(1-C)}$

$= \frac{S-SC+S+SC}{1-C^2}$

$= \frac{2S}{S^2} = \frac{2}{\sin A} = 2\,\mathrm{cosec}A$

4. The value of $\frac{\sin A}{1+\cos A} + \frac{\sin A}{1-\cos A}$ is $(0° < A < 90°)$:

(a) 2 cosecA (b) 2 secA

(c) 2 sinA (d) 2 cosA

5. **The numerical value of**

$$1+\frac{1}{\cot^2 63^\circ}-\sec^2 27^\circ+\frac{1}{\sin^2 63^\circ}-\operatorname{cosec}^2 27^\circ$$

is :

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

(c) – 1 **(d) 0**

$$1+\frac{1}{\tan^2 27^\circ}-\sec^2 27^\circ+\frac{1}{\cos^2 27^\circ}-\operatorname{cosec}^2 27^\circ$$

$$=\frac{1+\cot^2 27^\circ}{\operatorname{cosec}^2 27^\circ}-\sec^2 27^\circ+\sec^2 27^\circ-\operatorname{cosec}^2 27^\circ$$

$$=0$$

$$\frac{\sec^2 81^\circ}{1+\cot^2 81^\circ}$$

$$= \frac{\operatorname{cosec}^2 9^\circ}{1+\tan^2 9^\circ}$$

$$= \frac{\operatorname{cosec}^2 9^\circ}{\sec^2 9^\circ} = \frac{\cos^2 9}{\sin^2 9^\circ}$$

$$= \cot^2 9 = \frac{q^2}{p^2}$$

6. If $\tan 9^\circ = \frac{p}{q}$, then the value of $\frac{\sec^2 81^\circ}{1+\cot^2 81^\circ}$ is :

(a) $\frac{p}{q}$

(b) 1

(c) $\frac{p^2}{q^2}$

(d) $\frac{q^2}{p^2}$

$\theta = 0^\circ$ or 90°

7. $\sin^6\theta + \cos^6\theta + 3\sin^2\theta \cos^2\theta = ?$

If $\theta = 0^\circ$

$0 + 1 + 0$

(a) 0

(b) $-\frac{1}{2}$

(c) 1

(d) $\frac{1}{3}$

$$\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta \cdot \cos^2\theta$$

$$\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta \cdot \cos^2\theta$$

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

7. $\sin^6\theta + \cos^6\theta + 3\sin^2\theta \cos^2\theta = ?$

$1 - 3\sin^2\theta\cos^2\theta + 3\sin^2\theta\cos^2\theta$

(a) 0

(b) $-\frac{1}{2}$

(c) 1

(d) $\frac{1}{3}$

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

$\tan^2\theta = \sec^2\theta - 1$

8. What is the value of

$$\frac{1}{\sin^4(90^\circ-\theta)} + \frac{1}{[\cos^2(90^\circ-\theta)-1]} = ?$$

(a) $\tan^2\theta \sec^2\theta$ **(b)** $\sec^4\theta$

(c) $\tan^4\theta$ **(d)** $\tan^2\theta \sin^2\theta$

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

$$= \sec^4\theta - \sec^2\theta = \sec^2\theta(\sec^2\theta - 1) = \sec^2\theta \cdot \tan^2\theta$$

$$\frac{1+2\tan^2 x - 2\sec x \cdot \tan x}{\sec x - \tan x}$$

$$= \frac{\sec^2 x + \tan^2 x - 2\sec x + \tan x}{\sec x - \tan x}$$

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

$$= \sec x - \tan x$$

9. What is the value of

$$\frac{1+2\cot^2(90^\circ - x) - 2\operatorname{cosec}(90^\circ - x)\cot(90^\circ - x)}{\operatorname{cosec}(90^\circ - x) - \cot(90^\circ - x)} ?$$

(a) $\cos x + \sin x$

(b) $\sin x - \cos x$

(c) $\sec x + \tan x$

(d) $\sec x - \tan x$

$$\sec^2\theta + \operatorname{cosec}^2\theta = \frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta}$$

$$= \frac{\sin^2\theta + \cos^2\theta}{\sin^2\theta \cdot \cos^2\theta}$$

$$= \frac{1}{\sin^2\theta \cdot \cos^2\theta}$$

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

$$\frac{\sec^2\theta+\operatorname{cosec}^2\theta}{\sec\theta\cdot\operatorname{cosec}\theta}$$

$$= \frac{\sec^2\theta\times\operatorname{cosec}^2\theta}{\sec\theta\times\operatorname{cosec}\theta}$$

10. $\dfrac{2+\tan^2\theta+\cot^2\theta}{\sec\theta\operatorname{cosec}\theta}$ **is equal to :**

SSC CGL 4 June 2019 (Morning)

(a) $\cot\theta$ **(b)** $\cos\theta.\sin\theta$

(c) $\sec\theta.\ \operatorname{cosec}\theta$ **(d)** $\tan\theta$

$(1+\tan^2\theta)+\left[1+\frac{1}{\tan^2\theta}\right]=K$

11. If $(1 + \tan^2\theta) + [1 + (\tan^2\theta)^{-1}] = k$, then $\sqrt{k}$ = ?

SSC CGL 6 June 2019 (Evening)

(a) $\sec\theta.\operatorname{cosec}\theta$ (b) $\cos\theta.\operatorname{cosec}\theta$

(c) $\sin\theta.\cos\theta$ (d) $\sec\theta.\sin\theta$

$\Rightarrow \sec^2\theta+[1+\cot^2\theta]=K$

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

$\Rightarrow \sqrt{\sec^2\theta\times\operatorname{cosec}^2\theta}=\sqrt{K}$

$\Rightarrow \sec\theta\times\operatorname{cosec}\theta=\sqrt{K}$

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

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

$$\frac{(\sec\theta+\tan\theta)(1-\sin\theta)}{(\operatorname{cosec}\theta+\cot\theta)(\operatorname{cosec}\theta-\cot\theta)}$$

12. $\dfrac{(\sec\theta + \tan\theta)(1 - \sin\theta)}{\operatorname{cosec}\theta(1 + \cos\theta)(\operatorname{cosec}\theta - \cot\theta)}$ **is equal to :**

SSC CHSL 2 July 2019 (Morning)

(a) $\sin\theta$ (b) $\sec\theta$

(c) $\cos\theta$ (d) $\operatorname{cosec}\theta$

$$= \frac{(\sec\theta+\tan\theta)(1-\sin\theta)}{\operatorname{cosec}^2\theta-\cot^2\theta}\times\frac{\sec\theta}{\sec\theta}$$

$$= \frac{(\sec\theta+\tan\theta)(\sec\theta-\tan\theta)}{\sec\theta}$$

$$= \frac{1}{\sec\theta} = \cos\theta$$

$1+\tan^2\theta=\sec^2\theta \Rightarrow \sec^2\theta-\tan^2\theta=1$

$1+\cot^2\theta=\operatorname{cosec}^2\theta \Rightarrow \operatorname{cosec}^2\theta-\cot^2\theta=1$

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

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

$$= \frac{\frac{-\cos^2\theta}{\sin\theta} \times \left(\frac{-\sin^2\theta}{\cos\theta}\right)}{\sin^2\theta \cdot \frac{\sin^2\theta}{\cos^2\theta}}$$

$$= \frac{C \times S \times C^2}{1 \times S^2 \times S^2} = \frac{C^3}{S^3} = r^3 \Rightarrow \frac{C}{S} = r$$

13. If $\frac{(\sin\theta - \operatorname{cosec}\theta)(\cos\theta - \sec\theta)}{\tan^2\theta - \sin^2\theta} = r^3$, then r = ?

SSC CHSL 3 July 2019 (Morning)

(a) $\sin\theta . \cos\theta$

(b) $\tan\theta$

(c) $\cot\theta$

(d) $\operatorname{cosec}\theta . \sec\theta$

$$\frac{\left(s-\frac{1}{s}\right)\left(c-\frac{1}{c}\right)}{s^2\left[\frac{1}{c^2}-1\right]}$$

$$= \frac{\frac{-c^2}{s}\times\frac{(-s^2)}{c}}{\frac{s^2\times s^2}{c^2}} = \frac{c^3}{s^3} = r^3$$

$$\Rightarrow \frac{c}{s} = r$$

13. If $\frac{(\sin\theta - \operatorname{cosec}\theta)(\cos\theta - \sec\theta)}{\tan^2\theta - \sin^2\theta} = r^3$, then r = ?

SSC CHSL 3 July 2019 (Morning)

(a) $\sin\theta.\cos\theta$

(b) $\tan\theta$

(c) $\cot\theta$ ✓

(d) $\operatorname{cosec}\theta.\sec\theta$

$$\left(\frac{\tan\theta - \sec\theta + \sec^2\theta - \tan^2\theta}{\tan\theta + \sec\theta - 1}\right)\sec\theta$$

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

$\Rightarrow (\sec\theta - \tan\theta)\sec\theta = \frac{1}{k}$

$\Rightarrow \frac{\sec\theta}{\sec\theta + \tan\theta} = \frac{1}{k}$

$\Rightarrow \frac{\sec\theta + \tan\theta}{\sec\theta} = k$

$\Rightarrow 1 + \sin\theta = k$

14. If $\left(\frac{\tan\theta - \sec\theta + 1}{\tan\theta + \sec\theta - 1}\right)\sec\theta = \frac{1}{k}$, then k = ?

SSC CGL 7 June 2019 (Afternoon)

(a) $1 + \sin\theta$ (b) $1 - \cos\theta$

(c) $1 + \cos\theta$ (d) $1 - \sin\theta$

$\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

$\Rightarrow (\sec\theta - \tan\theta) = \frac{1}{(\sec\theta + \tan\theta)}$

$\theta = 135^\circ$

$$\sin 135^\circ = \sin(90+45^\circ) = \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\cos 135^\circ = \cos(90+45^\circ) = -\sin 45^\circ = -\frac{1}{\sqrt{2}}$$

$$\tan 135^\circ = \frac{\sin 135^\circ}{\cos 135^\circ} = \frac{\frac{1}{\sqrt{2}}}{-\frac{1}{\sqrt{2}}} = -1$$

$\theta = 135^\circ$

$\frac{-1}{1-(-1)} + \frac{-1}{1-(-1)} = 1+k$

15. If $\frac{\tan\theta}{1-\cot\theta} + \frac{\cot\theta}{1-\tan\theta} = 1 + k$, then k = ?

SSC CGL 7 June 2019 (Evening)

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

$\Rightarrow -1 \; -1 = k$

$\Rightarrow k = -2$

(a) $\cot\theta + \sec\theta$ ($-1 \; -\sqrt{2}$)

(b) $\tan\theta.\operatorname{cosec}\theta = -\sqrt{2}$ ($-1 \; \sqrt{2}$)

(c) $\tan\theta + \sec\theta$ ($-1 \; -\sqrt{2}$)

(d) $\operatorname{cosec}\theta.\sec\theta$ $(\sqrt{2})(-\sqrt{2}) = -2$

$$\frac{(1-\operatorname{cosec}\theta - 1 - \operatorname{cosec}\theta)\cos\theta = 2}{(1-\operatorname{cosec}^2\theta)}$$

16. If $\left(\frac{1}{1+\operatorname{cosec}\theta} - \frac{1}{1-\operatorname{cosec}\theta}\right)\cos\theta = 2$, $0° < \theta < 90°$, then the value of $\sin^2\theta + \cot^2\theta + \sec^2\theta$ is :

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$$\Rightarrow \frac{-2\operatorname{cosec}\theta \cdot \cos\theta}{-\cot^2\theta} = 2$$

$$\Rightarrow \frac{\cos\theta \cdot \sin^2\theta}{\sin\theta \cdot \cos^2\theta} = 1$$

$\tan\theta = 1$ $\theta = 45°$

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

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

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

$$\sqrt{\frac{1-\sin x}{1+\sin x}} = \sqrt{\frac{1-\sin x}{1+\sin x} \times \frac{(1-\sin x)}{(1-\sin x)}}$$

$$= \sqrt{\frac{(1-\sin x)^2}{(1-\sin^2 x)}} = \frac{1-\sin x}{\cos x} = \sec x - \tan x$$

* $\sqrt{\frac{1-\sin x}{1+\sin x}} = \sec x - \tan x$

* $\sqrt{\frac{1+\sin x}{1-\sin x}} = \sec x + \tan x$

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17. It is given that $\sqrt{\frac{1-\sin x}{1+\sin x}} = a - \tan x$, then a is equal to :

SSC CHSL 10 July 2019 (Evening)

(a) $\cos x$ (b) $\sin x$

(c) $\operatorname{cosec} x$ (d) $\sec x$

$\sec x - \tan x = a - \tan x$

$$= \frac{1+\cos^2\theta+2\cos\theta+\sin^2\theta}{\frac{\cos^2\theta}{\sin^2\theta}\cdot\sin^2\theta}$$

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

$$= 2\sec\theta[\sec\theta+1]$$

18. $\dfrac{(1+\cos\theta)^2+\sin^2\theta}{(\operatorname{cosec}^2\theta-1)\ \sin^2\theta} = ?$

SSC CGL Tier-II (11 September 2019)

(a) $\cos\theta(1+\sin\theta)$

(b) $2\cos\theta(1+\sec\theta)$

(c) $\sec\theta(1+\sin\theta)$

(d) $2\sec\theta(1+\sec\theta)$

$$\left(\frac{1-\frac{s}{c}}{1-\frac{c}{s}}\right)^2 + 1$$

$$= \left(\frac{\frac{c-s}{c}}{\frac{s-c}{s}}\right)^2 + 1$$

$$= \left(\frac{(c-s)\times s}{(s-c)\times c}\right)^2 + 1$$

$$= -1$$

$$\frac{s^2}{c^2} + 1 = \sec^2\theta$$

19. $\left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2 + 1 = ?$

SSC CGL Tier-II (11 September 2019)

(a) $\text{cosec}^2\theta$ **(b)** $\sec^2\theta$

(c) $\sin^2\theta$ **(d)** $\cos^2\theta$

$= \sqrt{\frac{\frac{c}{s} + c}{\frac{c}{s} - c}}$

$= \sqrt{\frac{c\left(\frac{1}{s}+1\right)}{c\left(\frac{1}{s}-1\right)}} = \sqrt{\frac{\frac{1+s}{s}}{\frac{1-s}{s}}}$

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

20. $\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$ **is equal to :**

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

(c) $1 - \sec\theta.\tan\theta$ **(d)** $\sec\theta - \tan\theta$

$$\left(\frac{\sin^2A+(1-\cos A)^2}{\sin A(1-\cos A)}\right)\div\left(\frac{\cot^2A+1+\operatorname{cosec}A}{1+\operatorname{cosec}A}\right)$$

$$=\left(\frac{\sin^2A+1+\cos^2A-2\cos A}{\sin A(1-\cos A)}\right)\times\left(\frac{1+\operatorname{cosec}A}{\operatorname{cosec}^2A+\operatorname{cosec}A}\right)$$

$$=\frac{2(1-\cos A)}{\sin A(1-\cos A)}\times\frac{(1+\operatorname{cosec}A)}{\operatorname{cosec}A(\operatorname{cosec}A+1)}$$

$$=2$$

21. **The value of**

$$\left(\frac{\sin A}{1-\cos A}+\frac{1-\cos A}{\sin A}\right)\div\left(\frac{\cot^2A}{1+\operatorname{cosec}A}+1\right)$$ **is :**

SSC CGL Tier-II (12 September 2019)

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

(c) 1 (d) 2

$$\frac{s(1-s)(s+c)\left(\frac{1+s}{c}\right)}{s\left(1+\frac{s}{c}\right)+c\left(1+\frac{c}{s}\right)}$$

$$= \frac{s \times c^2 \times (s+c)}{s\left(\frac{(1+s)}{c}\right)+c\left(\frac{s+c}{s}\right)}$$

$$= \frac{sc(s+c)}{(s+c)\left[\frac{s}{c}+\frac{c}{s}\right]} = \frac{sc}{\frac{s^2+c^2}{sc}}$$

$$= \frac{s^2c^2}{1}$$

22. The value of

$$\frac{\sin\varphi(1-\sin\varphi)(\sin\varphi+\cos\varphi)(\sec\varphi+\tan\varphi)}{\sin\varphi(1+\tan\varphi)+\cos\varphi(1+\cot\varphi)}$$ **is :**

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(a) $2\cos\varphi$ **(b)** $\operatorname{cosec}\varphi.\sec\varphi$

(c) $2\sin\varphi$ **(d)** $\sin^2\varphi.\cos^2\varphi$

$\left(\frac{1}{C}-\frac{S}{C}\right)^2 (1+S)^2 \times \frac{1}{S^2}$

$= \frac{(1-S)^2}{C^2} \times \frac{(1+S)^2}{S^2}$

$= \frac{[(1-S)(1+S)]^2}{C^2 S^2}$

$= \frac{(C^2)^2}{C^2 S^2} = \frac{C^2 \times C^2}{C^2 S^2} = \cot^2\theta$

23. $(\sec\varphi - \tan\varphi)^2(1 + \sin\varphi)^2 \div \sin^2\varphi = ?$

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(a) $\cos\varphi$ **(b)** $\cot^2\varphi$

(c) $\sec\varphi$ **(d)** $\cos^2\varphi$

24. **The value of $(1 + \cot\theta - \text{cosec}\theta)(1 + \cos\theta + \sin\theta)\sec\theta$ = ?**

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(a) -2 **(b)** 2

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

Note:-

$(1+\cot\theta-\text{cosec}\theta)(1+\tan\theta+\sec\theta)=2$

24. The value of $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \cos\theta + \sin\theta)\sec\theta$ = ?

SSC CGL Tier-II (13 September 2019)

(a) -2 (b) 2

(c) $\sec\theta.\operatorname{cosec}\theta$ (d) $\sin\theta.\cos\theta$

$(1+\cot\theta-\operatorname{cosec}\theta)\ (1+\cos\theta+\sin\theta)\sec\theta$

$= (1+\cot\theta-\operatorname{cosec}\theta)\ (\sec\theta+1+\tan\theta)$

$= \sec\theta+1+\tan\theta+\operatorname{cosec}\theta+\cot\theta+1-\operatorname{cosec}\theta\sec\theta-\operatorname{cosec}\theta-\sec\theta$

$= 2+\tan\theta+\cot\theta-\operatorname{cosec}\theta\sec\theta$

$\theta = 45^\circ$

$= 2+1+1-2 = 2$

(a) $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$

(b) $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} = \sec\theta + \tan\theta$

(c) $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \operatorname{cosec}\theta - \cot\theta$

(d) $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

$$\sqrt{\frac{1-\cos\theta}{1+\cos\theta} \times \frac{(1-\cos\theta)}{(1-\cos\theta)}}$$

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

$$= \operatorname{cosec}\theta - \cot\theta$$

$$\sqrt{\frac{\frac{1-c}{s}}{\frac{1+c}{s}}} \times \frac{(1+c)}{s}$$

$$= \sqrt{\frac{(1-c)}{(1+c)} \times \frac{(1-c)}{(1-c)}} \times \frac{(1+c)}{s}$$

$$= \frac{(1-c)}{s} \times \frac{(1+c)}{s}$$

$$= \frac{1-c^2}{s^2} = \frac{s^2}{s^2} = 1$$

25. **The value of** $\sqrt{\frac{\text{cosec}\varphi - \cot\varphi}{\text{cosec}\varphi + \cot\varphi}} \div \frac{\sin\varphi}{1+\cos\varphi}$ **is equal to :**

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(a) $\text{cosec}\varphi$ **(b)** $\frac{1}{2}$

(c) $\sec\varphi$ **(d)** 1

$$\sqrt{\frac{\frac{1-c}{s}}{\frac{1+c}{s}}} \times \frac{(1+c)}{s}$$

$$= (\operatorname{cosec}\theta - \cot\theta)(\operatorname{cosec}\theta + \cot\theta)$$

$$= (\operatorname{cosec}^2\theta - \cot^2\theta) = 1$$

25. **The value of** $\sqrt{\dfrac{\operatorname{cosec}\varphi - \cot\varphi}{\operatorname{cosec}\varphi + \cot\varphi}} \div \dfrac{\sin\varphi}{1+\cos\varphi}$ **is equal to :**

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(a) $\operatorname{cosec}\varphi$ **(b)** $\dfrac{1}{2}$

(c) $\sec\varphi$ **(d)** 1

$$\frac{\left(\frac{\sqrt{3}}{2}-\frac{1}{2}\right)\cdot\left(1+\sqrt{3}+\frac{1}{\sqrt{3}}\right)}{1+\frac{\sqrt{3}}{2}\cdot\frac{1}{2}}$$

26. **Find the value** * correction

$$\frac{(\sin\theta - \cos\theta)\ \ (1 + \tan\theta + \cot\theta)}{1 + \sin\theta\cos\theta} = ?$$

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(a) $\sec\theta - \operatorname{cosec}\theta$ **(b)** $\operatorname{cosec}\theta - \sec\theta$

(c) $\sin\theta + \cos\theta$ **(d)** $\tan\theta + \cot\theta$

$$\Rightarrow \frac{\left(\frac{\sqrt{3}-1}{2}\right)\left(\frac{4+\sqrt{3}}{\sqrt{3}}\right)}{\frac{4+\sqrt{3}}{4}_{2}}$$

$$\Rightarrow \frac{2(\sqrt{3}-1)}{\sqrt{3}} = \frac{2\sqrt{3}-2}{\sqrt{3}}$$

(a) $2-\frac{2}{\sqrt{3}} = \frac{2\sqrt{3}-2}{\sqrt{3}}$

$\theta = 45^\circ$

$$\left(\frac{\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{2}}-1}{1}\right) \times \frac{1 \times 1}{(\sqrt{2}-1)}$$

$$= \frac{(\sqrt{2}-1)}{1} \times \frac{1}{(\sqrt{2}-1)}$$

27. Find the value of

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

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(a) 0 (b) -1

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

$\theta = 45^\circ$

28. The value of $\dfrac{1 - 2\sin^2\theta\cos^2\theta}{\sin^4\theta + \cos^4\theta} - 1$ is :

SSC CGL 7 March 2020 (Morning)

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

(a) $-2\sin^2\theta.\cos^2\theta$ (b) -1

$\frac{1}{\sqrt{2}}\times\frac{1}{\sqrt{2}}$

(c) 0 (d) 1

$$= \frac{1-2\times\frac{1}{2}\times\frac{1}{2}}{\frac{1}{4}+\frac{1}{4}} - 1 = \frac{1}{\frac{1}{2}} - 1 = 0$$

$\theta = 45^\circ$

29. The value of (cosecA + cotA+1)(cosecA–cotA + 1) – 2cosecA is

SSC CGL 9 March 2020 (Afternoon)

(a) 4cosecA $4\sqrt{2}$ **(b) 2** ✓

(c) 2cosecA $2\sqrt{2}$ **(d) 0**

$= (\sqrt{2}+2)(\sqrt{2}-1+1) - 2\sqrt{2}$

$= (2+\sqrt{2})\sqrt{2} - 2\sqrt{2}$

$= 2\sqrt{2} + 2 - 2\sqrt{2}$

$= 2$

30. If $117\cos^2A + 129\sin^2A = 120$ and $170\cos^2B + 158\sin^2B = 161$, then the value of $\text{cosec}^2A.\sec^2B$ is :

SSC CHSL 13/10/2020 (Morning)

(a) 1 (b) 9

(c) 4 (d) 16

$158(\cos^2B+\sin^2B)+12\cos^2B=161$

$\Rightarrow 4\cancel{12}\cos^2B=\cancel{3}$

$\Rightarrow \cos^2B=\frac{1}{4} \Rightarrow \cos B=\frac{1}{2}$

$B=60^\circ$

4x4

$117(\cos^2A+\sin^2A)+12\sin^2A=120$

$\Rightarrow 4\cancel{12}\sin^2A=\cancel{3}$

$\Rightarrow \sin^2A=\frac{1}{4}$

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

$A=30^\circ$

$\tan^4 x - \tan^2 x = 1$

$\Rightarrow \tan^4 x = \sec^2 x$

$\Rightarrow \frac{\sin^4 x}{\cos^2 x \cos^4 x} = \frac{1}{\cos^2 x}$

$\frac{\sin^4 x}{\cos^2 x} = 1$

$\Rightarrow \sin^4 x = \cos^2 x$

(31) If $\tan^4 x - \tan^2 x = 1$

Then $\sin^4 x + \sin^2 x = ?$

$\cos^2 x + \sin^2 x$

(a) $\frac{3}{4}$

(b) $\frac{1}{2}$

(c) 1

(d) $\frac{3}{2}$

32. The value of $\sin^4\theta + \cos^4\theta + 2\sin^2\theta\cos^2\theta$ is

SSC CHSL 19/10/2020 (Evening)

(a) 1
(b) 2
(c) 4
(d) 0

$\sin^4\theta+\cos^4\theta = 1-2\sin^2\theta\cos^2\theta$

$\sin^6\theta+\cos^6\theta = 1-3\sin^2\theta\cos^2\theta$

$\theta = 0^\circ$

32. **The value of $\sin^4\theta + \cos^4\theta + 2\sin^2\theta\cos^2\theta$ is**

SSC CHSL 19/10/2020 (Evening)

(a) 1 (b) 2

(c) 4 (d) 0

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

$= 1$

33. $\cos A(\sec A - \cos A)(\cot A + \tan A) = ?$

SSC CGL 2019, Tier-II (15/10/2020)

(a) secA (b) cotA

(c) sinA (d) tanA ✓

$c\left(\frac{1}{c} - c\right)\left(\frac{c}{s} + \frac{s}{c}\right)$

$(1 - c^2)\frac{(c^2 + s^2)}{sc}$

$= \frac{s^2 \times 1}{sc}$

$= \tan A$

34. $\left(\frac{1}{\cos\theta} - \frac{1}{\sin\theta}\right) + \frac{1}{\operatorname{cosec}\theta - \cot\theta} - \frac{1}{\sec\theta + \tan\theta} = ?$

SSC CGL 2019, Tier-II (15/10/2020)

(a) $\sec\theta.\operatorname{cosec}\theta$ (b) $\sin\theta.\tan\theta$

(c) $\operatorname{cosec}\theta.\cot\theta$ (d) $\sin\theta.\cos\theta$

$\sec\theta - \operatorname{cosec}\theta + \operatorname{cosec}\theta + \cot\theta - \sec\theta + \tan\theta$

$= \tan\theta + \cot\theta$

$= \frac{S}{C} + \frac{C}{S} = \frac{S^2+C^2}{SC} = \frac{1}{SC} = \operatorname{cosec}\theta\sec\theta$

$\theta = 45^\circ$

$$\frac{(2 \times 4) \div \left(\frac{1}{2} - 1\right)}{4 \times 4}$$

$$= \frac{8 \div \left(-\frac{1}{2}\right)}{16}$$

$$= \frac{8 \times (-2)}{16} = -1$$

35. The value of

$$\frac{\sec^2\theta(2 + \tan^2\theta + \cot^2\theta) \div (\sin^2\theta - \tan^2\theta)}{(\text{cosec}^2\theta + \sec^2\theta)(1 + \cot^2\theta)^2}$$ **is**

SSC CGL 2019, Tier-II (15/10/2020)

(a) –1 **(b) 1**

(c) – 2 **(d) 2**

36. The value of $\dfrac{\cos^6\theta + \sin^6\theta + 3\sin^2\theta\cos^2\theta}{\operatorname{cosec}\theta\sec\theta(\sin\theta + \cos\theta - 1)(\sin\theta + \cos\theta + 1)}$ is

SSC CGL 2019, Tier-II (15/10/2020)

(a) 1 (b) 2

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

$$\frac{1}{\operatorname{cosec}\theta\sec\theta(\sin\theta+\cos\theta-1)(\sin\theta+\cos\theta+1)}$$

$$= \frac{1}{2\left(\frac{1}{\sqrt2}+\frac{1}{\sqrt2}-1\right)\left(\frac{1}{\sqrt2}+\frac{1}{\sqrt2}+1\right)}$$

$$= \frac{1}{2(\sqrt2-1)(\sqrt2+1)}$$

$$= \frac{1}{2\times 1}$$

$$\frac{1}{\sqrt2}+\frac{1}{\sqrt2} = \frac{2}{\sqrt2}\sqrt2$$

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

$\theta = 45^\circ$

$= \left(\frac{\sqrt{2}-1}{1}\right)\times\left(\sqrt{2}+1\right)$

$= 2-1 = 1$

37. **The value of** $\frac{\sin\theta+\cos\theta-1}{\sin\theta-\cos\theta+1}\times\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$

SSC CGL 2019, Tier-II (16/10/2020)

(a) 1 **(b) – 1**

(c) – 2 **(d) 2**

38. If $0° < \theta < 90°$, $3b\,\text{cosec}\theta = a\,\sec\theta$ and $3a\,\sec\theta - b\,\text{cosec}\theta = 8$, then the value of $9b^2 + a^2$ is :

SSC CHSL 19/10/2020 (Afternoon)

(a) 6 (b) 8

(c) 9 (d) 7

$3b\,\text{cosec}\theta = a\,\sec\theta$ — (i)

$3a\,\sec\theta - b\,\text{cosec}\theta = 8$ — (ii)

$\Rightarrow 3 \times 3b\,\text{cosec}\theta - b\,\text{cosec}\theta = 8$

$\Rightarrow 8b\,\text{cosec}\theta = 8$

$\Rightarrow b = \frac{1}{\text{cosec}\theta} = \sin\theta$

$\Rightarrow 3 = a\sec\theta$

$\Rightarrow 3 = \frac{a}{\cos\theta} \Rightarrow a = 3\cos\theta$

$9\sin^2\theta + 9\cos^2\theta$

$= 9$

$x\sin^3\theta + y\cos^3\theta = \sin\theta\cdot\cos\theta$

39. **If $x\sin^3\theta + y\cos^3\theta = \sin\theta.\cos\theta$ and $x\sin\theta = y\cos\theta$ then the value of $x^2 + y^2$ is :**

SSC CHSL 20/10/2020 (Morning)

(a) 0 **(b) 4**

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

$\Rightarrow x\times\frac{1}{2\sqrt{2}} + x\times\frac{1}{2\sqrt{2}} = \frac{1}{2}$

$\Rightarrow \frac{2x}{2\sqrt{2}} = \frac{1}{2\sqrt{2}}$

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

$x\sin\theta = y\cos\theta$

$\theta = 45^\circ$

$x = y$

$2x^2 = 2\times\frac{1}{2} = 1$

40. If $4 - 2\sin^2\theta - 5\cos\theta = 0$, $0° < \theta < 90°$, then the value of $\sin\theta + \tan\theta$ is :

SSC CGL 4 June 2019 (Morning)

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

(c) $3\sqrt{2}$ (d) $2\sqrt{3}$

$4 - 2(1-\cos^2\theta) - 5\cos\theta = 0$

$\Rightarrow 4 - 2 + 2\cos^2\theta - 5\cos\theta = 0$

$\Rightarrow 2x^2 - 5x + 2 = 0$ (let $\cos\theta = x$)

$\Rightarrow 2x^2 - 4x - x + 2 = 0$

$\Rightarrow 2x(x-2) - 1(x-2) = 0$

$\Rightarrow (x-2)(2x-1) = 0$

$x = 2$ or $x = \frac{1}{2}$

$\cos\theta = 2$ or $\cos\theta = \frac{1}{2}$

$\cos\theta = 2$ ✗

$\theta = 60°$

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

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

SSC CGL 7 June 2019 (Afternoon)

(a) $\frac{8\sqrt{3}}{3}$ (b) $\frac{4\sqrt{3}}{4}$

(c) $2\sqrt{3}$ (d) $4\sqrt{3}$

$\cos^2\theta - 3\cos\theta + 2 = 1 - \cos^2\theta$

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

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

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

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

$\Rightarrow \cos\theta = 1$ or $\cos\theta = \frac{1}{2}$

$\cos\theta = 1$ ✗ $\theta = 0°$

$\cos\theta = \frac{1}{2}$ ✓ $\theta = 60°$

$\frac{2 \times 2}{\sqrt{3}/1} + \frac{4}{\sqrt{3}/1} = \frac{8}{\sqrt{3}/1} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$

$4(2\sin^2\theta+7\cos^2\theta)=13$

$\Rightarrow 4(2\sin^2\theta+2\cos^2\theta+5\cos^2\theta)=13$

$\Rightarrow 4(2+5\cos^2\theta)=13$

$\Rightarrow 8+20\cos^2\theta=13$

$\Rightarrow 4\cos^2\theta=5$

$\Rightarrow \cos^2\theta=\frac{1}{4}$

$\cos\theta=\frac{1}{2}$

$\theta=60^\circ$

42. **For θ being an acute angle, $4(2\sin^2\theta + 7\cos^2\theta) = 13$. What is the value of θ?**

SSC CHSL 10 July 2019 (Morning)

(a) 60° **(b) 45°**

(c) 30° **(d) 0°**

$s^2-3s+2=c^2$

$\Rightarrow s^2-3s+2=1-s^2$

$\Rightarrow 2s^2-3s+1=0$

$\Rightarrow 2s^2-2s-s+1=0$

$\Rightarrow 2s(s-1)-1(s-1)=0$

$\Rightarrow (s-1)(2s-1)=0$

$\Rightarrow$ $s=1$ or $s=\frac{1}{2}$

$s=1$ → $\varphi=90^\circ$ ✗

$s=\frac{1}{2}$ → $\varphi=30^\circ$ ✓

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

$=\frac{3}{2}+\frac{2\sqrt{3}}{3}=\frac{9+4\sqrt{3}}{6}$

43. If $\frac{\sin^2\varphi-3\sin\varphi+2}{\cos^2\varphi}=1$, where $0^\circ<\varphi<90^\circ$, then the value of $(\cos2\varphi+\sin3\varphi+\operatorname{cosec}2\varphi)$ is

SSC CGL Tier-II (12 September, 2019)

(a) $\frac{2+\sqrt{3}}{3}$

(b) $\frac{3+\sqrt{3}}{6}$

(c) $\frac{9+4\sqrt{3}}{6}$ ✓

(d) $\frac{3+2\sqrt{3}}{3}$

44. H.W

If $2\cos^2\theta - 3\sin\theta = 3$, $0° < \theta < 90°$, then What is the value of $\sin^2 2\theta + \cos^2\theta + \tan^2 2\theta + \text{cosec}^2 2\theta$ is :

SSC CGL Tier-II (13 September, 2019)

(a) $\frac{35}{12}$

(b) $\frac{29}{3}$

(c) $\frac{35}{6}$

(d) $\frac{29}{6}$