

TRIGONOMETRY (SHEET-04)

त्रिकोणमिति

UPDATED

CLASS ROOM SHEET

FOR ALL EXAMS

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 Rankers Gurukul

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TRIGONOMETRY / त्रिकोणमिति

(CLASSROOM SHEET-04)

Multiple and Sub-multiple Trigonometric function of 2A

2A के गुणक तथा उपगुणक त्रिकोणमितीय फलन

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

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

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

$$= 1 - 2 \sin^2 A = \frac{1 - \tan^2 A}{1 + \tan^2 A}$$

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

$$= 1 - 2 \sin^2 \frac{A}{2} = \frac{1 - \tan^2 \frac{A}{2}}{1 + \tan^2 \frac{A}{2}}$$

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

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

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

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

$$\cot 2A = \frac{\cot^2 A - 1}{2 \cot A}$$

Trigonometric function of 3A

3A के त्रिकोणमितीय फलन

$$\sin 3A = 3 \sin A - 4 \sin^3 A$$

$$\cos 3A = 4 \cos^3 A - 3 \cos A$$

$$\tan 3A = \left(\frac{3 \tan A - \tan^3 A}{1 - 3 \tan^2 A} \right)$$

$$\cot 3A = \left(\frac{\cot^3 A - 3 \cot A}{3 \cot^2 A - 1} \right)$$

1. If $2(\cos^2 \theta - \sin^2 \theta) = 1$ (θ is a positive acute angle), then $\cot \theta$ is equal to :

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

2. The 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

3. Simplify the following expression

$$\frac{\sin \theta - 2 \sin^3 \theta}{2 \cos^3 \theta - \cos \theta}$$

SSC CGL 21/07/2023 (Shift-03)

- (a) $\tan \theta$ (b) $\sin \theta$
(c) $\sec \theta$ (d) $\cos \theta$

4. Evaluate the following:

$$\sqrt{2 + \sqrt{2 + \sqrt{2 + \cos 8\theta}}}$$

SSC CGL 27/07/2023 (Shift-3)

- (a) $2 \cos \theta$ (b) $2 \cos 2\theta$
(c) $\sin 2\theta$ (d) $\cos 2\theta$

5. $\frac{2 \tan A}{1 + \tan^2 A} = ?$

SSC CGL 20/07/2023 (Shift-02)

- (a) $\cos 2A$ (b) $\sin A$
(c) $\cos A$ (d) $\sin 2A$

6. The value of $\frac{\sin 4\theta}{(1 - \cos 4\theta)}$ is:

SSC CHSL 01/06/2022 (Shift- 03)

- (a) $\cot \theta$ (b) $\cot 2\theta$
(c) $\tan \theta$ (d) $\tan 2\theta$

7. What is the value of $\cos^2 15^\circ$?

SSC CGL 06/12/2022 (Shift- 04)

- (a) $(2 + \sqrt{3})$ (b) $\frac{(2 + \sqrt{3})}{4}$
(c) $\frac{(2 + \sqrt{3})}{2}$ (d) $\frac{(1 + \sqrt{3})}{2}$

8. What is the value of $\operatorname{cosec}15^\circ \sec15^\circ$

SSC CGL 13/12/2022 (Shift- 02)

- (a) 0.5 (b) 4
(c) 2 (d) 1

9. What is the value of the expression $100(\sin 15^\circ \cos 15^\circ)$?

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

- (a) 50 (b) 75
(c) 100 (d) 25

10. Find the value of $\frac{1 - \tan^2 22\frac{1}{2}^\circ}{1 + \tan^2 22\frac{1}{2}^\circ}$ is :

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

11. $3 \sin A - 4 \sin^3 A = ?$

SSC CHSL 02/06/2022 (Shift- 01)

- (a) $\cot 3A$ (b) $\sin 3A$
(c) $\cos 3A$ (d) $\tan 3A$

12. Find the value of $\sqrt{\frac{1 - \sin 3\theta}{1 + \sin 3\theta}}$

SSC CGL TIER I 21/07/2023 (Shift-02)

- (a) $\sec 3\theta - \tan 3\theta$
(b) $(\sec 3\theta - \tan 3\theta)^2$
(c) $(\sec 3\theta - \tan 3\theta)^3$
(d) $\sec 3\theta + \tan 3\theta$

13. What is the value of $(4\sin^3 x - 3\sin x + \sin 3x)$?

SSC CHSL 31/05/2022 (Shift- 02)

- (a) 1 (b) 0
(c) 4 (d) 3

14. If $\sin \theta = \frac{\sqrt{3}}{2}$, and θ is an acute angle, find the value of $\cos 3\theta$.

SSC CHSL 10/06/2022 (Shift- 01)

- (a) $\frac{1}{2}$ (b) 1
(c) -1 (d) 0

15. If $\sin \theta = \frac{1}{2}$, then the value of $(3\cos \theta - 4\cos^3 \theta)$ is:

SSC CGL 06/12/2022 (Shift- 03)

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

16. What will be the value of $\sin 10^\circ - \frac{4}{3} \sin^3 10^\circ$?

SSC CGL 06/12/2022 (Shift-01)

- (a) $\frac{1}{3\sqrt{3}}$ (b) $\frac{1}{6}$
(c) $\frac{1}{2\sqrt{3}}$ (d) $\frac{\sqrt{3}}{6}$

Identities based on Sum & Difference of angle of T-Ratio

त्रिकोणमिति अनुपात के कोणों
का योग तथा अंतर पर आधारित सर्वसमिकाएँ

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

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

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

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

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

$$\cot(A + B) = \frac{\cot A \cot B - 1}{\cot B + \cot A}$$

$$\cot(A - B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$$

17. Which of the following options gives an expression equivalent to $\sin(A + B)$?

SSC CGL 24/07/2023 (Shift-2)

- (a) $\cos A \cos B - \sin A \sin B$
(b) $\sin A \cos B + \cos A \sin B$
(c) $\cos A \cos B + \sin A \sin B$
(d) $\sin A \cos B - \cos A \sin B$

18. If $\sin A = \frac{4}{5}$ and $\sin B = \frac{15}{17}$, what is the value of $\sin(A - B)$?

SSC CGL 02/12/2022 (Shift- 04)

- (a) $-\frac{32}{45}$ (b) $-\frac{13}{85}$
(c) $\frac{13}{85}$ (d) $\frac{32}{45}$

19. What is the value of $\cos 45^\circ \sin 15^\circ$?

SSC CGL 07/12/2022 (Shift- 02)

- (a) $\frac{(\sqrt{3} - 1)}{2}$ (b) $\frac{(\sqrt{3} - 1)}{4}$
(c) $(\sqrt{3} + 1)$ (d) $2\sqrt{3} - 1$

20. What is the value of $\sin 75^\circ + \sin 15^\circ$?

SSC CGL 09/12/2022 (Shift- 04)

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

21. Evaluate the following

$$\sin 25^\circ \sin 65^\circ - \cos 25^\circ \cos 65^\circ.$$

SSC CGL 14/07/2023 (Shift-2)

- (a) 40 (b) 4
(c) 0 (d) 1

22. Using $\cos(A + B) = \cos A \cos B - \sin A \sin B$, find the value of $\cos 75^\circ$

SSC CGL 17/07/2023 (Shift-03)

- (a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{\sqrt{5}+1}{4}$
(c) $\frac{\sqrt{6}-\sqrt{2}}{4}$ (d) $\frac{\sqrt{6}+\sqrt{2}}{4}$

23. Using $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$, find the value of $\tan 15^\circ$.

SSC CGL 18/07/2023 (Shift-04)

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

24. What will be the value of $\frac{\tan 45^\circ - \tan 15^\circ}{1 + \tan 45^\circ \tan 15^\circ}$?

SSC CGL 07/12/2022 (Shift-03)

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

25. If $\tan(\alpha + \beta) = a$, $\tan(\alpha - \beta) = b$, then the value of $\tan 2\alpha$ is:

SSC CGL 13/12/2022 (Shift- 04)

- (a) $\frac{1+b}{1-ab}$ (b) $\frac{1+b}{1+ab}$
(c) $\frac{1-b}{1+ab}$ (d) $\frac{1-b}{1-ab}$

26. Using $\cot(A - B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$, find the value of $\cot 15^\circ$.

SSC CGL 19/07/2023 (Shift-02)

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

27. If $\sin(A + B) = \cos(A + B)$, what is the value of $\tan A$?

SSC CGL 02/12/2022 (Shift- 01)

- (a) $\frac{1 - \tan B}{1 + \tan B}$ (b) $\frac{1 + \tan B}{1 - \tan B}$
(c) $\frac{1 + \sec B}{1 - \sec B}$ (d) $\frac{1 - \operatorname{cosec} B}{1 + \operatorname{cosec} B}$

Transformation of sum or difference into product

योग अथवा अन्तर का गुणन में परिवर्तन

$$\sin C + \sin D = 2 \sin\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$$

$$\sin C - \sin D = 2 \cos\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$$

$$\cos C + \cos D = 2 \cos\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$$

$$\cos C - \cos D = 2 \sin\left(\frac{C+D}{2}\right) \sin\left(\frac{D-C}{2}\right)$$

28. If $\sin C + \sin D = x$, then the value of x is :

(a) $2 \sin\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$

(b) $2 \sin\left(\frac{C-D}{2}\right) \cos\left(\frac{C+D}{2}\right)$

(c) $2 \cos\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$

(d) $2 \sin\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$

29. What is $\sin \alpha - \sin \beta$?

SSC CGL 01/12/2022 (Shift- 02)

(a) $2 \cos \frac{\alpha+\beta}{2} \sin \frac{\alpha-\beta}{2}$

(b) $2 \sin \frac{\alpha+\beta}{2} \sin \frac{\alpha-\beta}{2}$

(c) $2 \cos \frac{\alpha-\beta}{2} \sin \frac{\alpha+\beta}{2}$

(d) $2 \cos \frac{\alpha+\beta}{2} \cos \frac{\alpha-\beta}{2}$

30. If $\cos C - \cos D = y$, then the value of y is :

(a) $2 \sin\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$

(b) $2 \cos\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$

(c) $-2 \sin\left(\frac{C+D}{2}\right) \sin\left(\frac{C-D}{2}\right)$

(d) $-2 \cos\left(\frac{C+D}{2}\right) \cos\left(\frac{C-D}{2}\right)$

31. Find $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = ?$

- (a) $\cot 2x$ (b) $\cot 3x$
(c) $\cot x$ (d) $\cot 6x$

32. Find $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = ?$

- (a) $\tan 4x$ (b) $\tan 3x$
(c) $\tan 2x$ (d) $\tan x$

33. What is the value of

$$\frac{[(\sin x + \sin y)(\sin x - \sin y)]}{[(\cos x + \cos y)(\cos x - \cos y)]} \text{ is :}$$

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

34. What is the value of $\sin 75^\circ + \sin 15^\circ$?

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

35. Simplify the following:

$$\sin 2x + 2\sin 4x + \sin 6x$$

SSC CGL 18/07/2023 (Shift-02)

- (a) $4 \cos^2 x \sin 4x$ (b) $4 \cos^2 x \sin x$
(c) $2 \cos^2 x \sin 4x$ (d) $4 \sin^2 x \sin 4x$

**Transformation of a product
into sum or difference**

(गुणन का योग या अन्तर में परिवर्तन)

(i) $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$
 $= \cos^2 B - \cos^2 A$

(ii) $\cos(A+B) \cos(A-B) = \cos^2 A - \sin^2 B$
 $= \cos^2 B - \sin^2 A$

(iii) $2 \sin A \cos B = \sin(A+B) + \sin(A-B)$

(iv) $2 \cos A \sin B = \sin(A+B) - \sin(A-B)$

(v) $2 \cos A \cos B = \cos(A+B) + \cos(A-B)$

(vi) $2 \sin A \sin B = \cos(A-B) - \cos(A+B)$

36. Using $2\cos A \cos B = \cos(A+B) + \cos(A-B)$, find the value of $\cos 75^\circ \cos 15^\circ$.

SSC CHSL 01/06/2022 (Shift- 02)

- (a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{\sqrt{3}}{4}$

37. What will be value of $2\cos 45^\circ \cdot \sin 15^\circ$

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

38. Evaluate the following:

$$\cos(36^\circ + A) \cdot \cos(36^\circ - A) + \cos(54^\circ + A) \cdot \cos(54^\circ - A)$$

SSC CGL 14/07/2023 (Shift-2)

- (a) $\sin 2A$ (b) $\cos A$
(c) $\sin A$ (d) $\cos 2A$

39. If $A + B = C$, then $\tan A \tan B \tan C = ?$

SSC CGL 08/12/2022 (Shift- 01)

- (a) $\tan C + \tan A - \tan B$
(b) $\tan C + \tan A + \tan B$
(c) $\tan A - \tan B - \tan C$
(d) $\tan C - \tan A - \tan B$

40. What is the value of the expression $\cos 2A \cos 2B + \sin^2(A-B) - \sin^2(A+B)$?

SSC CGL 12/12/2022 (Shift- 01)

- (a) $\sin(2A - 2B)$ (b) $\sin(2A + 2B)$
(c) $\cos(2A + 2B)$ (d) $\cos(2A - 2B)$

41. If $\cot 75^\circ = 2 - \sqrt{3}$. Find the value of $\cot 15^\circ$.

SSC CHSL 24/05/2022 (Shift- 03)

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

➤ If $A + B = 45^\circ = 225^\circ$,

(i) $(1 + \tan A)(1 + \tan B) = 2$

(ii) $(1 - \cot A)(1 - \cot B) = 2$

42. The value of $(1 + \tan 10^\circ)(1 + \tan 35^\circ)$ is:

SSC CHSL 25/05/2022 (Shift- 03)

- (a) $\frac{1}{2}$ (b) $\frac{3}{4}$
(c) 1 (d) 2

43. $\left[1 + \tan\left(22\frac{1}{2}^\circ + x - y\right)\right] \left[1 + \tan\left(22\frac{1}{2}^\circ + y - x\right)\right]$

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

44. Find the value of $(1 + \tan 11^\circ)(1 + \tan 21^\circ)(1 + \tan 24^\circ)(1 + \tan 34^\circ)(1 + \tan 45^\circ)$

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

Some Important Results**(कुछ महत्वपूर्ण परिणाम)**

- (i) $\sin A \cdot \sin 2A \cdot \sin 4A = \frac{1}{4} \sin 3A$
(ii) $\cos A \cdot \cos 2A \cdot \cos 4A = \frac{1}{4} \cos 3A$
(iii) $\tan A \cdot \tan 2A \cdot \tan 4A = \tan 3A$
(iv) $\sin(60^\circ - A) \cdot \sin A \cdot \sin(60^\circ + A) = \frac{1}{4} \sin 3A$
(v) $\cos(60^\circ - A) \cdot \cos A \cdot \cos(60^\circ + A) = \frac{1}{4} \cos 3A$
(vi) $\tan(60^\circ - A) \cdot \tan A \cdot \tan(60^\circ + A) = \tan 3A$
(vii) $\sin^2(60^\circ - A) + \sin^2 A + \sin^2(60^\circ + A) = \frac{3}{2}$
(viii) $\cos^2(60^\circ - A) + \cos^2 A + \cos^2(60^\circ + A) = \frac{3}{2}$

45. Find $\sin 20^\circ \cdot \sin 40^\circ \cdot \sin 60^\circ \cdot \sin 80^\circ$.

- (a) $\frac{1}{16}$ (b) $\frac{5}{16}$
(c) $\frac{3}{16}$ (d) $\frac{1}{8}$

46. The value of $(\tan 20^\circ \cdot \tan 40^\circ \cdot \tan 80^\circ)$ is :

- (a) 1 (b) 0
(c) $\sqrt{3}$ (d) 3

47. Find $1 - \sin 10^\circ \cdot \sin 50^\circ \cdot \sin 70^\circ$.

- (a) $\frac{5}{8}$ (b) $\frac{7}{8}$
(c) $\frac{3}{8}$ (d) $\frac{1}{8}$

48. $\sin 6^\circ \sin 42^\circ \sin 66^\circ \sin 78^\circ = ?$

- (a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{1}{8}$ (d) $\frac{1}{16}$

49. Find $\sin 12^\circ \cdot \sin 48^\circ \cdot \sin 54^\circ$.

- (a) $\frac{5}{8}$ (b) $\frac{7}{8}$
(c) $\frac{3}{8}$ (d) $\frac{1}{8}$

50. The value of $(\cos 15^\circ \cdot \cos 45^\circ \cdot \cos 75^\circ)$ is :

- (a) $\frac{1}{3\sqrt{2}}$ (b) $\frac{1}{4\sqrt{2}}$
(c) $\frac{1}{8}$ (d) $\frac{\sqrt{3}}{8}$

51. $\cos 10^\circ \cdot \cos 30^\circ \cdot \cos 50^\circ \cdot \cos 70^\circ = ?$

- (a) $\frac{1}{16}$ (b) $\frac{3}{16}$
(c) $\frac{5}{16}$ (d) $\frac{1}{8}$

52. $\cos 42^\circ \cdot \cos 78^\circ \cdot \cos 36^\circ = ?$

- (a) $\frac{1}{2}$ (b) $\frac{1}{4}$
(c) $\frac{1}{8}$ (d) $\frac{1}{16}$

53. The value of $\tan 6^\circ \cdot \tan 42^\circ \cdot \tan 66^\circ \cdot \tan 78^\circ$ is :

- (a) 1 (b) $\frac{1}{2}$
(c) $\frac{1}{4}$ (d) $\frac{1}{8}$

54. $\tan 6^\circ \cdot \tan 42^\circ \cdot \tan 66^\circ \cdot \tan 78^\circ = ?$

- (a) 1 (b) $\frac{1}{4}$
(c) $\frac{1}{16}$ (d) $\frac{1}{9}$

55. If $\sin 6^\circ \sin 42^\circ \sin 54^\circ \sin 66^\circ \sin 78^\circ = \frac{\sqrt{a+b}}{c}$,
where a, b, c is relatively co-prime number,
then find a + b + c?

- (a) 60 (b) 58
(c) 72 (d) 70

ANSWER KEY

1.(d)	2.(a)	3.(a)	4.(a)	5.(d)	6.(b)	7.(b)	8.(b)	9.(d)	10.(b)
11.(b)	12.(a)	13.(b)	14.(c)	15.(a)	16.(b)	17.(b)	18.(b)	19.(b)	20.(b)
21.(c)	22.(c)	23.(c)	24.(c)	25.(a)	26.(a)	27.(a)	28.(d)	29.(a)	30.(c)
31.(c)	32.(d)	33.(c)	34.(c)	35.(a)	36.(b)	37.(c)	38.(d)	39.(d)	40.(c)
41.(b)	42.(d)	43.(c)	44.(d)	45.(c)	46.(c)	47.(b)	48.(d)	49.(d)	50.(b)
51.(b)	52.(c)	53.(a)	54.(a)	55.(d)					