



## MATHS

### NCERT - NCERT MATHEMATICS(BENGALI)

### TRIGONOMETRIC FUNCTIONS

#### Example

1. Convert  $40^{\circ} 20'$  into radian measure.

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2. Convert 6 radians into degree measure.

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3. Find the radius of the circle in which a central angle of  $60^\circ$  intercepts an arc of length  $37.4\text{cm}$  use  $\pi = \frac{22}{7}$ .

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4. The minute hand of a watch is  $1.5\text{cm}$  long. How far does its tip move in 40 minutes? (Use  $\pi = 3.14$ ).

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5. If arcs of the same lengths in two circles subtend angles  $65^\circ$  and  $110^\circ$  at the centre, find the ratio of their radii.

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6. If  $\cos x = -\frac{3}{5}$ ,  $x$  lies in the third quadrant, find the values of other five trigonometric functions.

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7. If  $\cot x = -\frac{5}{12}$ ,  $x$  lies in second quadrant, find the values of other five trigonometric functions.

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8. Find the value of  $\sin \frac{31\pi}{3}$ .

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9. Find the value of  $\cos(-1710^\circ)$ .



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10. Prove that

$$3 \sin \frac{\pi}{6} \sec \frac{\pi}{3} - 4 \sin \frac{5\pi}{6} \cot \frac{\pi}{4} = 1$$

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11. Find the value of  $\operatorname{cosec} 15^\circ$

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12. Find the value of  $\tan \frac{13\pi}{12}$ .

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13. Prove that

$$\frac{\sin(x + y)}{\sin(x - y)} = \frac{\tan x + \tan y}{\tan x - \tan y}.$$



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14. Show that

$$\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$$



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15. Prove that

$$\cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2} \cos x$$



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16. Prove that  $\frac{\cos 7x + \cos 5x}{\sin 7x - \sin 5x} = \cot x$

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17. Prove that  $= \frac{\sin 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

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18. Find the principal solutions of the equation  $\sin x = \frac{\sqrt{3}}{2}$ .

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19. Find the principal solution of the equation  $\tan x = -\frac{1}{\sqrt{3}}$ .

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20. Find the solution of  $\sin x = -\frac{\sqrt{3}}{2}$ .

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21. Solve  $\cos x = \frac{1}{2}$ .

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22. Solve  $\tan 2x = -\cot\left(x + \frac{\pi}{3}\right)$

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23. Solve  $\sin 2x - \sin 4x + \sin 6x = 0$ .

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24. Solve  $2 \cos^2 x + 3 \sin x = 0$

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25. If  $\sin x = \frac{3}{5}$ ,  $\cos y = -\frac{12}{13}$ , where  $x$  and  $y$  both lie in second quadrant, find the value of  $\sin(x + y)$ .

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26. Prove that

$$\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{(9x)}{(2)} = \sin 5x \sin \frac{5x}{2}.$$

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27. Find the value of  $\tan \frac{\pi}{8}$ .

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28. If  $\tan x = \frac{3}{4}$ ,  $\pi < x < \frac{3\pi}{2}$ , find the value of  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$  and  $\tan \frac{x}{2}$ .

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29. Prove that  $\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}$ .

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### Exercise 3 1

1. Find the radian measures corresponding to the following degree measures:

(i)  $25^\circ$

(ii)  $-47^{\circ} 30$

(iii)  $240^{\circ}$

(iv)  $520^{\circ}$



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2. Find the degree measures corresponding to the following radian measures (Use  $\pi = \frac{22}{7}$  ).

(i)  $\frac{11}{16}$

(ii)  $-4$

(iii)  $\frac{5\pi}{3}$

(iv)  $\frac{7\pi}{6}$



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3. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second ?



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4. Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of length 22 cm (Use  $\pi = \frac{22}{7}$ ).



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5. In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord.



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6. If in two circles, arcs of the same length subtend angles  $60^\circ$  and  $75^\circ$  at the centre, find the ratio of their radii.



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7. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length

(i) 10 cm

(ii) 15 cm

(iii) 21 cm



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### Exercise 3 2

1. Find all other trigonometric ratios:

$$\cos x = -\frac{1}{2}, x \text{ lies in third quadrant.}$$



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2. Find all other trigonometric ratios:

$$\sin x = \frac{2}{5}, x \text{ lies in second quadrant.}$$

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3. Find all other trigonometric ratios:

$$\cot x = \frac{3}{4}, x \text{ lies in third quadrant.}$$

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4. Find all other trigonometric ratios:

$$\sec x = \frac{13}{5}, x \text{ lies in fourth quadrant.}$$

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5. Find all other trigonometric ratios:

$$\tan x = -\frac{5}{12}, x \text{ lies in second quadrant.}$$

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6.  $\sin 765^\circ$

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7.  $\operatorname{cosec}(-1410^\circ)$

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8.  $\tan \frac{19\pi}{3}$

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9.  $\sin\left(-\frac{11\pi}{3}\right)$

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10.  $\cot\left(-\frac{15\pi}{4}\right)$

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### Exercise 3 3

1.  $\sin^2\left(\frac{\pi}{6}\right) + \cos^2\left(\frac{\pi}{3}\right) - \tan^2\left(\frac{\pi}{4}\right) = -\frac{1}{2}$

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$$2. 2 \sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3} = \frac{3}{2}$$

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$$3. \cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6$$

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$$4. 2 \sin^2 \frac{3\pi}{4} + 2 \cos^2 \frac{\pi}{4} + 2 \sec^2 \frac{\pi}{3} = 10$$

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5. Find the value of:

(i)  $\sin 75^\circ$

(ii)  $\tan 15^\circ$





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6.

$$\cos\left(\frac{\pi}{4} - x\right)\cos\left(\frac{\pi}{4} - y\right) - \sin\left(\frac{\pi}{4} - x\right)\sin\left(\frac{\pi}{4} - y\right) = \sin(x + y)$$

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$$7. \frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$$

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$$8. \frac{\cos(\pi + x)\cos(-x)}{\sin(\pi - x)\cos\left(\frac{\pi}{2} + x\right)} = \cot^2 x$$

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9.

$$\cos\left(\frac{3\pi}{2} + x\right)\cos(2\pi + x)\left[\cot\left(\frac{3\pi}{2} - x\right) + \cot(2\pi + x)\right] = 1$$

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10.  $\sin(n + 1)x \sin(n + 2)x + \cos(n + 1)x \cos(n + 2)x = \cos x$

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11.  $\cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right) = -\sqrt{2}\sin x$

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12.  $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

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$$13. \cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$$

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$$14. \sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$$

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$$15. \cot 4x(\sin 5x + \sin 3x) = \cot x(\sin 5x - \sin 3x)$$

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$$16. \frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = - \frac{\sin 2x}{\cos 10x}$$

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$$17. \frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$$

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$$18. \frac{\sin x - \sin y}{\cos x + \cos y} = \tan \frac{x - y}{2}$$

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$$19. \frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x$$

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$$20. \frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$$

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$$21. \frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$$

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$$22. \cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$$

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$$23. \tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$$

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$$24. \cos 4x = 1 - 8 \sin^2 x \cos^2 x$$

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$$25. \cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$$

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### Exercise 3 4

1.  $\tan x = \sqrt{3}$

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2.  $\sec x = 2$

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3.  $\cot x = -\sqrt{3}$

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4.  $\cos ecx = -2$

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5.  $\cos 4x = \cos 2x$

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6.  $\cos 3x + \cos x - \cos 2x = 0$

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7.  $\sin 2x + \cos x = 0$

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$$8. \sec^2 2x = 1 - \tan 2x$$

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$$9. \sin x + \sin 3x + \sin 5x = 0$$

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## Miscellaneous Examples

$$1. 2 \cos \frac{\pi}{13} \cos \frac{9\pi}{13} + \cos \frac{3\pi}{13} + \cos \frac{5\pi}{13} = 0$$

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$$2. (\sin 3x + \sin x)\sin x + (\cos 3x - \cos x)\cos x = 0$$

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$$3. (\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x + y}{2}$$

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$$4. (\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \frac{x - y}{2}$$

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$$5. \sin x + \sin 3x + \sin 5x + \sin 7x = 4 \sin^2 \frac{x - y}{2}$$

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6. 
$$\frac{(\sin 7x + \sin 5x) + (\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x) + (\cos 9x + \cos 3x)} = \tan 6x$$

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7. 
$$\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$$

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8. 
$$\tan x = -\frac{4}{3}, x \text{ in quadrant II}$$

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9. 
$$\cos x = -\frac{1}{3}, x \text{ in quadrant III}$$

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10. Find solution of  $\sin x = \frac{1}{2}$ ,  $x$  in quadrant II



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