# MATHS

## BOOKS - NCERT MATHS (ENGLISH)

## TRIGONOMETRIC FUNCTIONS

**Short Answer Type Questions**

**1.** Prove that $\dfrac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \dfrac{1 + \sin A}{\cos A}$.

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**2.** If $\dfrac{2\sin\alpha}{1 + \cos\alpha + \sin\alpha} = y$ , then prove that $\dfrac{1 - \cos\alpha + \sin\alpha}{1 + \sin\alpha}$ is also equal to y.

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**3.** If $m \sin \theta = n \sin(\theta + 2\alpha)$, then prove that $\tan(\theta + \alpha)\cot \alpha = \dfrac{m + n}{m - n}$.

**4.** If $\cos(\alpha + \beta) = \dfrac{4}{5}$ and $\sin(\alpha - \beta) = \dfrac{5}{13}$, where $\alpha$ lie between 0 and $\dfrac{\pi}{4}$, then find that value of $\tan 2\alpha$.

**5.** If $\tan x = \dfrac{b}{a}$, then find the value of $\sqrt{\dfrac{a + b}{a - b}} + \sqrt{\dfrac{a - b}{a + b}}$.

**6.** Prove that $\cos \theta \cos \dfrac{\theta}{2} - \cos 3\theta \cos \dfrac{9\theta}{2} = \sin 7\theta \sin 8\theta$.

**7.** If $a\cos\theta + b\sin\theta = m$ and $a\sin\theta - b\cos\theta = n$, then show that $a^2 + b^2 = m^2 + n^2$.

**8.** Find the value of $\tan 22°\,30'$.

**9.** Prove that $\sin 4A = 4\sin A \cos^3 A - 4\sin^3 A$

**10.** If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then prove that $m^2 - n^2 = 4\sin\theta\tan\theta$.

**11.** If $\tan(A + B) = p$ and $\tan(A - B) = q$, then show that

$\tan 2A = \dfrac{p + q}{1 - pq}$

**12.** If $\cos \alpha + \cos \beta = 0 = \sin \alpha + \sin \beta$, then prove that

$\cos 2\alpha + \cos 2\beta = -2\cos(\alpha + \beta)$.

**13.** If $\dfrac{\sin(x + y)}{\sin(x - y)} = \dfrac{a + b}{a - b}$, then show that $\dfrac{\tan x}{\tan y} = \dfrac{a}{b}$.

**14.** If $\tan\theta = \dfrac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha}$ then show that $\sin\alpha + \cos\alpha = \sqrt{2}\cos\theta$.

**15.** If $\sin\theta + \cos\theta = 1$, then find the general value of $\theta$.

A. $n\pi$

B. $\dfrac{n\pi}{2}$

C. 0

D. none of these

**Answer: B**

**16.** Find the most general value of $\theta$ satisfyingn the equation $\tan\theta = -1$ and $\cos\theta = \dfrac{1}{\sqrt{2}}$.

A. $\theta = 2n\pi + \dfrac{7\pi}{4}$.

B. $\theta = n\pi + \dfrac{7\pi}{4}$.

C. $\theta = 2n\pi + \dfrac{\pi}{4}$.

D. none of these

**Answer: A**

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**17.** If $\cot\theta + \tan\theta = 2\mathrm{cosec}\theta$, then find the general value of $\theta$.

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**18.** If $2\sin^2\theta = 3\cos\theta$, where $0 \le \theta \le 2\pi$, then find the value of $\theta$.

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**19.** If $\sec x \cos 5x + 1 = 0$, where $0 < x \leq \dfrac{\pi}{2}$, then find the value of x.

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## Long Answer Type Questions

**1.** If $\sin(\theta + \alpha) = a \, and \, \sin(\theta + \beta) = b$, prove that

$\cos 2(\alpha - \beta) - 4ab \cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$

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**2.** If $\cos(\theta + \phi) = m \cos(\theta - \phi)$, then prove that

$\tan \theta = \dfrac{1 - m}{1 + m} \cot \phi.$

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**3.** Find the value of the expression

$$3\left[\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi + \alpha)\right] - 2\left[\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)\right]$$

.

**4.** If $a\cos 2\theta + b\sin 2\theta = c$ has $\alpha$ and $\beta$ as its roots, then prove that

$$\tan\alpha + \tan\beta = \frac{2b}{a + c}.$$

**5.** If $x = \sec\phi - \tan\phi$ and $y = \mathrm{cosec}\phi + \cot\phi,$ then show that

$$xy + x - y + 1 = 0.$$

**6.** If $\theta$ lies in the first quardrant and $\cos\theta = \dfrac{8}{17}$, then find the value of $\cos(30° + \theta) + \cos(45° - \theta) + \cos(120° - \theta)$.

**7.** $\cos^4\left(\dfrac{\pi}{8}\right) + \cos^4\left(\dfrac{3\pi}{8}\right) + \cos^4\left(\dfrac{5\pi}{8}\right) + \cos^4\left(\dfrac{7\pi}{8}\right) =$

**8.** Find the general solution of the equation $5\cos^2\theta + 7\sin^2\theta - 6 = 0$.

**9.** Find the gereral of the equation $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$.

**10.** find the general solution of the equation

$$\left(\sqrt{3} - 1\right)\sin\theta + \left(\sqrt{3} + 1\right)\cos\theta = 2$$

## Objective Type Questions

**1.** If $\sin\theta + \cos ec\theta = 2$, then $\sin^2\theta + \cos ec^2\theta$ is equal to

A. 1

B. 4

C. 2

D. None of these

**Answer: C**

**2.** If $f(x) = \cos^2 x + \sec^2 x$, then

    A. f(x) $< 1$

    B. f(x) = 1

    C. 2 $<$ f(x) $< 1$

    D. f(x) $\geq 2$

**Answer: D**

**3.** If $\tan \theta = \dfrac{1}{2}$ and $\tan \phi = \dfrac{1}{3}$, then the value of $\theta + \phi$ is

    A. $\dfrac{\pi}{6}$

    B. $\pi$

C. 0

D. $\dfrac{\pi}{4}$

**Answer: D**

**4.** Which of the following is not correct ?

A. $\sin\theta = -\dfrac{1}{5}$

B. $\cos\theta = 1$

C. $\sec\theta = \dfrac{1}{2}$

D. $\tan\theta = 20$

**Answer: C**

**5.** The value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots \tan 89^\circ$ is

A. 0

B. 1

C. $\dfrac{1}{2}$

D. Not defined

**Answer: B**

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**6.** The value of $\dfrac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

A. 1

B. $\sqrt{3}$

C. $\dfrac{\sqrt{3}}{2}$

D. 2

**Answer: C**

**7.** The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 179^\circ$ is

A. $\dfrac{1}{\sqrt{2}}$

B. 0

C. 1

D. -1

**Answer: B**

**8.** If $\tan \theta = 3$ and $\theta$ lies in third quadrant then $\sin \theta =$

A. $\dfrac{1}{\sqrt{10}}$

B. $-\dfrac{1}{\sqrt{10}}$

C. $\dfrac{-3}{\sqrt{10}}$

D. $\dfrac{3}{\sqrt{10}}$

**Answer: C**

**9.** $\tan 75 - \cot 75 =$

A. $2\sqrt{3}$

B. $2 + \sqrt{3}$

C. $2 - \sqrt{3}$

D. 1

**Answer: A**

**10.** Which of the following is correct ?

A. $\sin 1^\circ > \sin 1$

B. $\sin 1^\circ < \sin 1$

C. $\sin 1^\circ = \sin 1$

D. $\sin 1^\circ = \dfrac{\pi}{18^\circ} \sin 1$

**Answer: B**

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**11.** If $\tan \alpha = \dfrac{m}{m+1}$ and $\tan \beta = \dfrac{1}{2m+1}$ , then $\alpha + \beta$ is equal to

A. $\dfrac{\pi}{2}$

B. $\dfrac{\pi}{3}$

C. $\dfrac{\pi}{6}$

D. $\dfrac{\pi}{4}$

**Answer: D**

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**12.** The minimum of $3\cos x + 4\sin x + 8$ is

A. 5

B. 9

C. 7

D. 3

**Answer: D**

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**13.** $\tan 3A - \tan 2A - \tan A =$ is equal to

A. $\tan 3A \tan 2A \tan A$

B. $-\tan 3A \tan 2A \tan A$

C. $\tan A \tan 2A - \tan 2A \tan 3A - \tan 3A \tan A$

D. None of the above

**Answer: A**

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**14.** The value of $\sin(45° + \theta) - \cos(45° - \theta)$ is

A. $2 \cos \theta$

B. $2 \sin \theta$

C. 1

D. 0

**Answer: D**

**15.** The value of $\cot\left(\dfrac{\pi}{4} + \theta\right)\cot\left(\dfrac{\pi}{4} - \theta\right)$ is

A. -1

B. 0

C. 1

D. Not defined

**Answer: C**

**16.** $\cos 2\theta \cos 2\phi + \sin^2(\theta - \phi) - \sin^2(\theta + \phi) =$

A. $\sin 2(\theta + \phi)$

B. $\cos 2(\theta + \phi)$

C. $\sin 2(\theta - \phi)$

D. $\cos 2(\theta - \phi)$

**Answer: B**

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**17.** The value of $\cos 12° + \cos 84° + \cos 156° + \cos 132°$ is

A. $\dfrac{1}{2}$

B. 1

C. $-\dfrac{1}{2}$

D. $\dfrac{1}{8}$

**Answer: C**

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**18.** If $\tan A = \dfrac{1}{2}$ and $\tan B = \dfrac{1}{3}$, then $\tan(2A + B)$ is equal to

A. 1

B. 2

C. 3

D. 4

**Answer: C**

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**19.** The value of $\sin \dfrac{\pi}{10} \sin \dfrac{13\pi}{10}$ is

A. $\dfrac{1}{2}$

B. $-\dfrac{1}{2}$

C. $-\dfrac{1}{4}$

D. 1

**Answer: C**

**20.** The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is

A. 1

B. 0

C. $\dfrac{1}{2}$

D. 2

**Answer: B**

**21.** If $\sin\theta + \cos\theta = 1$, then the value of $\sin 2\theta$ is

A. 1

B. $\dfrac{1}{2}$

C. 0

D. -1

**Answer: C**

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**22.** If $\alpha + \beta = \dfrac{\pi}{4}$ then $(1 + \tan\alpha)(1 + \tan\beta) =$

A. 1

B. 2

C. -2

D. Not defined

**Answer: B**

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**23.** If $\sin\theta = \dfrac{-4}{5}$ and $\theta$ lies in third quadrant, then the value of $\cos\dfrac{\theta}{2}$ is

A. $\dfrac{1}{5}$

B. $-\dfrac{1}{\sqrt{10}}$

C. $-\dfrac{1}{\sqrt{5}}$

D. $\dfrac{1}{\sqrt{10}}$

**Answer: C**

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**24.** The number of solutions of equation $\tan x + \sec x = 2\cos x$ lying in the interval $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

25. The value of $\sin\left(\dfrac{\pi}{18}\right) + \sin\left(\dfrac{\pi}{9}\right) + \sin\left(\dfrac{2\pi}{9}\right) + \sin\left(\dfrac{5\pi}{18}\right)$ is

A. $\sin\dfrac{7\pi}{18} + \sin\dfrac{4\pi}{9}$

B. 1

C. $\cos\dfrac{\pi}{6} + \cos\dfrac{3\pi}{7}$

D. $\cos\dfrac{\pi}{9} + \sin\dfrac{\pi}{9}$

**26.** If A lies in the second quadrant and $3 \tan A + 4 = 0$, then find the value of $2 \cot A - 5 \cos A + \sin A$.

A. $\dfrac{-53}{10}$

B. $\dfrac{23}{10}$

C. $\dfrac{37}{10}$

D. $\dfrac{7}{10}$

**Answer: B**

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**27.** The value of $\cos^2 48° - \sin^2 12°$ is

A. $\dfrac{\sqrt{5} + 1}{8}$

B. $\dfrac{\sqrt{5} - 1}{8}$

C. $\dfrac{\sqrt{5} + 1}{5}$

D. $\dfrac{\sqrt{5}+1}{2\sqrt{2}}$

**Answer: A**

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**28.** If $\tan\alpha = \dfrac{1}{7}$ and $\tan\beta = \dfrac{1}{3}$, *then*, $\cos 2\alpha$ is equal to

A. $\sin 2\beta$

B. $\sin 4\beta$

C. $\sin 2\beta$

D. $\cos 2\beta$

**Answer: B**

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**29.** If $\tan\theta = \dfrac{a}{b}$, then $b\cos 2\theta + a\sin 2\theta$ is equal to

A. $a$

B. $b$

C. $\dfrac{a}{b}$

D. None of these

**Answer: B**

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**30.** If for real values of x, $\cos\theta = x + \dfrac{1}{x}$, then

A. $\theta$ is an acute angle

B. $\theta$ is right angle

C. $\theta$ is an obtuse angle

D. No value of $\theta$ is possible

**Answer: D**

**31.** The value of $\dfrac{\sin 50^\circ}{\sin 130^\circ}$ is ..... .

A. 0

B. 1

C. $-1$

D. None of these

**Answer: B**

## Fillers

**1.** If $K = \sin\left(\dfrac{\pi}{18}\right)\sin\left(\dfrac{5\pi}{18}\right)\sin\left(\dfrac{7\pi}{18}\right)$, then the numerical value of $K$ is_____

**2.** If $\tan A = \dfrac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B$

**3.** If $\sin x + \cos x = a$, then

(i) $\sin^6 x + \cos^6 x = $ .... .

(ii) $|\sin x - \cos x| = $ .... .

**4.** In a triangle ABC, $C = 90°$, then the equation whose roots are $\tan A, \tan B$ is

**5.** The value of

$3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x \cos^6 x)$ is

**6.** Given x $>$ 0, then value of $f(x) = -3\cos\sqrt{3 + x + x^2}$ lie in the

interval ...... .

**7.** The maximum distance of a point on the graph of the function

$y = \sqrt{3}\sin x + \cos x$ from X-axis is

True False

**1.** If $\tan A = \dfrac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B$

**2.** The equality $\sin A + \sin 2A + \sin 3A = 3$ holds for some real value of A.

**3.** $\sin 10°$ is greater than $\cos 10°$.

**4.** $\cos \dfrac{2\pi}{15} \cos \dfrac{4\pi}{15} \cos \dfrac{8\pi}{15} \cos \dfrac{16\pi}{15} = \dfrac{1}{16}$

**5.** One value of $\theta$ which satisfies the equation $\sin^4 \theta - 2\sin^2 \theta - 1$ lies between 0 and $2\pi$.

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**6.** If $\text{cosec} x = 1 + \cot x$, then $x = 2n\pi, 2n\pi + \dfrac{\pi}{2}$

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**7.** If $\tan \theta + \tan 2\theta + \sqrt{3} \tan \theta \tan 2\theta = \sqrt{3}$, then $\theta = \dfrac{n\pi}{3} + \dfrac{\pi}{9}$.

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**8.** If $\tan(\pi \cos \theta) = \cot(\pi \sin \theta)$, then $\cos\left(\theta - \dfrac{\pi}{4}\right) = \pm \dfrac{1}{2\sqrt{2}}$.

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**9.** In the following match each item given under the Column I to its correct answer given under the Column II.

|  | Column I |  | Column II |
|---|---|---|---|
| $(i)$ | $\sin(x+y)\sin(x-y)$ | $(a)$ | $\cos^2 x - \sin^2 y$ |
| $(ii)$ | $\cos(x+y)\cos(x-y)$ | $(b)$ | $1 - \tan\theta/1 + \tan\theta$ |
| $(iii)$ | $\cot\left(\frac{\pi}{4} + \theta\right)$ | $(c)$ | $1 + \tan\theta/1 - \tan\theta$ |
| $(iv)$ | $\tan\left(\frac{\pi}{4} + \theta\right)$ | $(d)$ | $\sin^2 x - \sin^2 y$ |

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