



## MATHS

### BOOKS - CBSE COMPLEMENTARY MATERIAL MATHS (HINGLISH)

#### INVERSE TRIGONOMETRIC FUNCTIONS

##### One Mark Questions

1. Principal value of  $\sin^{-1} \left( -\frac{\sqrt{3}}{2} \right)$  is

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2. Write the principal value of

$\cos^{-1}(\sqrt{3}/2)$

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3. Write the principal value of

$$\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$$



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4. Find the principal value of  $\cos^{-1}(-2)$



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5. Write the principal value of

$$\cot^{-1}\left(\frac{1}{\sqrt{3}}\right)$$



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6. Write the principal value of  $\sec^{-1}(-2)$



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7. What is the value of the following functions (using principal value)

$$\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) - \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$$

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8. What is the value of the following functions (using principal value)

$$\sin^{-1}\left(-\frac{1}{2}\right) - \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$$

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9. What is the value of the following functions (using principal value)

$$\tan^{-1}(1) - \cot^{-1}(-1)$$

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10. What is the value of the following functions (using principal value)

$$\operatorname{cosec}^{-1}(\sqrt{2}) + \sec^{-1}(\sqrt{2})$$

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11. What is the value of the following functions (using principal value)

$$\tan^{-1}(1) + \cot^{-1}(1) + \sin^{-1}(1)$$

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12. What is the value of the following functions (using principal value)

$$\sin^{-1}\left(\sin\frac{4\pi}{5}\right)$$

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13. What is the value of the following functions (using principal value)

$$\tan^{-1}\left(\tan\frac{5\pi}{6}\right)$$

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14. What is the value of the following functions (using principal value)

$$\operatorname{cosec}^{-1}\left(\operatorname{cosec}\frac{3\pi}{4}\right)$$

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15. If  $\tan^{-1}x + \tan^{-1}y = \frac{4\pi}{5}$ , find  $\cot^{-1}x + \cot^{-1}y$ .

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16. Find the values of

$$\sin\left\{\frac{\pi}{6} - \sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right\}$$

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17. Find the principal value of  $\tan^{-1}\left\{\sin\left(-\frac{\pi}{2}\right)\right\}$



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18. Find the values of

$$\tan\left(\cos^{-1}\frac{8}{17}\right)$$



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$$19. \sin^{-1}\left\{\cos\left(\frac{\sin^{-1}(\sqrt{3})}{2}\right)\right\}$$



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$$20. \sin(2\sin^{-1}0.8) =$$



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$$21. \text{The value of } \sin[2\tan^{-1}(0.75)] \text{ is}$$

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22. Evaluate

$$\sin\left(2 \cos^{-1}\left(-\frac{5}{15}\right)\right)$$

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23.  $\tan\left(\frac{1}{2}\left(\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right)\right)$

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24. If  $\tan^{-1} x + \tan^{-1} y = \frac{\pi}{4}$ , then write the value of  $x + y + xy$ .

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25. If  $3 \tan^{-1} x + \cot^{-1} x = \pi$ , then  $x$  equals to

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26. If  $\cos\left(\frac{\sin^{-1} 2}{5} + \cos^{-1} x\right) = 0$  find the value of  $x$ .

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27. If  $-1 \leq x, y \leq 1$  such that  $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$ , find the value of  $\cos^{-1} x + \cos^{-1} y$ .

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28. If  $\cos^{-1} \alpha + \cos^{-1} \beta + \cos^{-1} \gamma = 3\pi$ , then  $\alpha(\beta - \gamma) + \beta(\gamma + \alpha) + \gamma(\alpha + \beta)$  equal to

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29. If  $\tan^{-1} x - \cot^{-1} x = \frac{\tan^{-1} 1}{\sqrt{3}}$  find the value of  $x$ .

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30. The value of

$$\tan^2(\sec^{-1} 2) + \cot^2(\operatorname{cosec}^{-1} 3) \text{ is}$$

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31. Evaluate  $\sin\{\cot^{-1}(\cos(\tan^{-1} 1))\}$

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32. If  $a \leq 2 \sin^{-1} x + \cos^{-1} x \leq b$ , then find the value of  $a$  and  $b$ .

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33. Solve  $\cos^{-1}(\sin(\cos^{-1} x)) = \frac{\pi}{3}$

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34. Write the value of  $\tan\left(2\frac{\tan^{-1} 1}{5}\right)$ .

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35. The value of  $\sec^{-1}\left(\frac{\sec(8\pi)}{5}\right)$  is

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## Two Mark Questions

1. Find the value of

$$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \cos^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$$

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2. Find the value of

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

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3.  $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$  is equal to (A)  $\frac{1}{2}$  (B)  $\frac{1}{3}$  (C)  $\frac{1}{4}$  (D) 1

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4. Find the value of

$$\tan^{-1}\left(\tan\frac{7\pi}{6}\right) + \cos^{-1}\left(\cos\frac{7\pi}{6}\right)$$

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5. Simplify

$$\tan^{-1}\left(\frac{\sin x}{1 + \cos x}\right)$$

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6. Simplify

$$\cot^{-1}\left(\frac{1}{\sqrt{x^2 - 1}}\right), x < -1$$

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7. The value of  $\cos\left[\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \frac{\pi}{6}\right]$

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8. Simplify

$$\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{3}{\sqrt{11}}\right)\right]$$

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9. Express  $\sin^{-1}\left(\frac{\sin x + \cos x}{2}\right)$ , where  $-\frac{\pi}{4} < x < \frac{\pi}{4}$ , in the simplest form.

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10. Prove that:  $\frac{\tan^{-1} 2}{11} + \frac{\tan^{-1} 7}{24} = \frac{\tan^{-1} 1}{2}$

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11. Prove that:  $\tan^{-1} \frac{m}{n} - \tan^{-1} \left(\frac{m-n}{m+n}\right) = \frac{\pi}{4}$ .  $m, n > 0$

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12. Prove that:  $\tan^{-1} \left\{ \frac{a \cos x - b \sin x}{b \cos x + a \sin x} \right\} = \tan^{-1} \left(\frac{a}{b}\right) - x$

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13. For the principal values, evaluate each of the following:

$$\tan^{-1} \left\{ 2 \cos \left( 2s \in^{-1} \frac{1}{2} \right) \right\} \cot [\sin^{-1} \{ \cos (\tan^{-1} 1) \}]$$

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14. Show that:  $\tan \left( \frac{1}{2} \frac{\sin^{-1} 3}{4} \right) = \frac{4\sqrt{-7}}{3}$

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15.  $4(\cot^{-1} 3 + \operatorname{cosec}^{-1} \sqrt{5}) = \pi$

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16. Prove that:  $\sin [\cot^{-1} \{ \cos (\tan^{-1} x) \}] = \sqrt{\frac{x^2 - 1}{x^2 + 2}}$

$$\cos [\tan^{-1} \{ \sin (\cot^{-1} x) \}] = \sqrt{\frac{x^2 + 1}{x^2 + 2}}$$

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17. Prove that:  $\frac{\tan^{-1} 2}{3} = \frac{1}{2} \frac{\tan^{-1}(12)}{5}$

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## 4 Mark Questions

1. Show that:  $\tan^{-1} \left[ \frac{\sqrt{1 + \cos x} + \sqrt{1 - \cos x}}{\sqrt{1 + \cos x} - \sqrt{1 - \cos x}} \right] = \frac{\pi}{4} + \frac{x}{2}, x \in [0, \pi]$

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2. Prove that :

$$\tan^{-1} \left( \frac{\cos x}{1 - \sin x} \right) - \cot^{-1} \left( \sqrt{\frac{1 + \cos x}{1 - \cos x}} \right) = \frac{\pi}{4}, x \in (0, \pi/2).$$

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3. Prove that  $\tan^{-1} \left( \frac{x}{\sqrt{a^2 - x^2}} \right) = \sin^{-1} \frac{x}{a} = \cos^{-1} \left( \frac{\sqrt{a^2 - x^2}}{a} \right).$

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4. Prove that :

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

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5. Solve :

$$\cot^{-1} 2x + \cot^{-1} 3x = \frac{\pi}{4}$$

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6.

Prove

that:

$$\tan \left[ \frac{\pi}{4} + \frac{1}{2} \tan^{-1} \left( \frac{a}{b} \right) \right] + \tan \left[ \frac{\pi}{4} - \frac{1}{2} \tan^{-1} \left( \frac{a}{b} \right) \right] = \frac{2\sqrt{a^2 + b^2}}{b}$$

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7. Solve for  $x$ ,  $\cos^{-1}\left(\frac{x^2 - 1}{x^2 + 1}\right) + \tan^{-1}\left(\frac{-2x}{1 - x^2}\right) = \frac{2\pi}{3}$

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8. Prove that  $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} = \frac{\pi}{4}$

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9.  $\tan(\cos^{-1} x) = \sin(\tan^{-1} 2)$

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10. If  $y = \cot^{-1}(\sqrt{\cos x}) - \tan^{-1}(\sqrt{\cos x})$ , prove that  $\sin y = \frac{\tan^2 x}{2}$

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11.

$$\cot \left\{ \tan^{-1} x + \tan^{-1} \left( \frac{1}{x} \right) \right\} + \cos^{-1}(1 - 2x^2) + \cos^{-1}(2x^2 - 1) = \pi, x$$

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12.

Prove

that

$$\tan^{-1} \left( \frac{a-b}{1+ab} \right) + \tan^{-1} \left( \frac{b-c}{1+bc} \right) + \tan^{-1} \left( \frac{c-a}{1+ca} \right) = 0,$$

$$ab > (-1), bc > (-1), ca > (-1)$$

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13. Q. if  $\tan^{-1} a + \tan^{-1} b + \tan^{-1} c = \pi$ , then prove that

$$a + b + c = abc.$$

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14.

if

$$\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi, \text{ provethat } x^2 + y^2 + z^2 + 2xyz = 1.$$

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15.

if

$$\tan^{-1} \left( \frac{1}{1+1 \cdot 2} \right) + \tan^{-1} \left( \frac{1}{1+2 \cdot 3} \right) + \dots + \tan^{-1} \left( \frac{1}{1+n \cdot (n+1)} \right)$$

then find the value of  $\theta$

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16. If  $(\tan^{-1} x)^2 + (\cot^{-1} x)^2 = \frac{5\pi^2}{8}$ , then find  $x$ .

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17. If  $\sin\{\cot^{-1}(x+1)\} = \cos(\tan^{-1} x)$ , then find  $x$ .

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18. Solve the equation  $\sin^{-1} yx + \sin^{-1} 6\sqrt{3}x = \frac{-\pi}{2}$ .

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19. If  $\sin^{-1} x + \sin^{-1}(1 - x) = \cos^{-1} x$  then x equals

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20. Solve  $\sin^{-1}\left(\frac{5}{x}\right) + \sin^{-1}\left(\frac{12}{x}\right) = \frac{\pi}{2}$

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21. Solve the following for x

$$\sin^{-1}\left(\frac{x}{2}\right) + \cos^{-1} x = \frac{\pi}{6}$$

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22. If  $\cos^{-1}\left(\frac{x}{2}\right) + \cos^{-1}\left(\frac{y}{3}\right) = \theta$ , prove that

$$9x^2 - 12xy \cos \theta + 4y^2 = 36 \sin^2 \theta$$

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23. Prove that:  $\tan^{-1}\left[\frac{3 \sin 2\phi}{5 + 3 \cos 2\phi}\right] + \tan^{-1}\left[\frac{1}{4} \tan \phi\right] = \phi$

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24. The value of

$$\sin^{-1}\left\{\cot\left(\sin^{-1}\left(\sqrt{\frac{2-\sqrt{3}}{4}}\right) + \cos^{-1}\left(\frac{\sqrt{12}}{4}\right) + \sec^{-1}\sqrt{2}\right)\right\}$$

is

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25. prove that  $2 \tan^{-1}\left(\sqrt{\frac{a-b}{a+b}} \tan\left(\frac{\theta}{2}\right)\right) = \cos^{-1}\left(\frac{a \cos \theta + b}{a + b \cos \theta}\right)$

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26. Prove that :  $2 \tan^{-1}[\tan \alpha / 2 \tan \beta / 2] = \cos^{-1} \left[ \frac{\cos \alpha + \cos \beta}{1 + \cos \alpha \cos \beta} \right]$

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27.  $\tan\left(\frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2} \cos^{-1} \frac{a}{b}\right)$  is :

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28. Prove that :  $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$

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29. Show taht

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

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30. Solve:  $\frac{\tan^{-1}(x - 1)}{x + 1} + \frac{\tan^{-1}(2x - 1)}{2x + 1} = \frac{\tan^{-1}(23)}{36}$



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



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