MATHS

BOOKS - NAVBODH MATHS (HINGLISH)

TRIGONOMETRIC FUNCTIONS

Solved Examples

1. Find the principal solutions of the following equations :

(1) $\cos ecx = 2$

(2) $\cot x = \sqrt{3}.$

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2. Find the principal solutions of the following equations :

(1) $\tan x = -\sqrt{3}$

(2) $\sqrt{3}\sec x + 2 = 0.$

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3. Find the general solutions of each of the following equations :

1. $\cos ecx = -\sqrt{2}$

(2) $\tan 3x = -1.$

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4. Find general solution of $4\cos^2 x = 1.$

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5. Find the general solution of $\sin x = \tan x$

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6. Find the general solution of the equation $\sin 2x + \sin 4x + \sin 6x = 0.$

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7. $\sin x \tan x - 1 = \tan x - \sin x$

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8. Find the general solution of :

$\cos x - \sin x = -1$

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9. In $\triangle ABC$, prove that $c = a\cos B + b\cos A$.

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10. With usual notatons , in $\triangle ABC$, prove that $a(b\cos C - c\cos B) = b^2 - c^2$.

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11. In a $\triangle ABC$, with usual notations , prove that $\frac{a - b\cos C}{b - a\cos C} = \frac{\cos B}{\cos A}$.

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12. In $\triangle ABC$, prove that $a(\cos C - \cos B) = 2(b - c)\cos^2 . \frac{A}{2}$.

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13. Using the sine rule , prove the cosine rule.

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14. In any $\triangle ABC$, if a^2, b^2, c^2 are in AP then that cot A , cot B , cot C are in are in A.P.

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15. The angles of $\triangle ABC$ are in A.P. and $b : c = \sqrt{3} : \sqrt{2}$ find $\angle A, \angle B, \angle C$.

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16. In $\triangle ABC$, with the usual notations , prove that $2\left\{a\sin^2.\frac{C}{2} + c\sin^2.\frac{A}{2}\right\} = a + c - b$

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17. In right angled triangle ABC, right angled at C, show that $\tan A + \tan B = \frac{c^2}{ab}$.

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18. In any $\triangle ABC$, prove that $\tan\left(\frac{A-B}{2}\right) = \left(\frac{a-b}{a+b}\right)\frac{\cot(C)}{2}$.

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19. Find the principal values of :

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

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

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

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20. $\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$ का मान ज्ञात कीजिए।

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21. Solve the equation $2\tan^{-1}(\cos x) = \tan^{-1}(2\cos ecx)$.

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22. Find the value of $\tan^{-1}\left(\sqrt{3}\right) - \sec^{-1}(-2)$.

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23. Show that $\frac{\sin^{-1}(12)}{13} + \frac{\cos^{-1}4}{5} + \frac{\tan^{-1}(63)}{16} = \pi.$

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

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25. Prove that: $\frac{\tan^{-1}4}{5} + \frac{\cos^{-1}(12)}{13} = \frac{\cos^{-1}(33)}{65}$

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26. If $-1 \leq x \leq -\frac{1}{\sqrt{2}}$, then prove that $\sin^{-1}\left(2x\sqrt{1-x^2}\right) = -2\pi + 2\cos^{-1}x.$

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Theory Questions

1. Using vectro mehod, prove that in a $\triangle ABC, \frac{a}{\sin A}, \frac{b}{\sin B} = \frac{c}{\sin C}$ where a,b,c are the lenths of the sides opposite to the angles A,B and C respectively of `/_\ABC.

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Examples For Practise

1. Find the principal solution of the following equations :

(1) $\sin x = \frac{1}{\sqrt{2}}$

(2) $\tan = -1$

(3) $\sqrt{3}\cos ecx + 2 = 0.$

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2. Find the general solutions of each of the following equations :

(1) $\sin x = \frac{\sqrt{3}}{2}$

(2) $\sec 3x = -2$

(3) $\cot 4x = -1.$

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3. Find the general solutions of each of the following equations :

(1) $\sin 4x = \frac{\sqrt{3}}{2}$

(2) $\cos 2x = -\frac{1}{2}$

(3) $\cos ec 3x = \frac{-2}{\sqrt{3}}$.

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4. Find the general soutions of each of the following equations :

(1) $\tan^2 x = 1$

(2) $4\sin^2 x - 3 = 0.$

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5. Find the general solutions of each of the following equations :

(1) $\cos 3x = \cos 2x$

(2) $\cos 3x = \sin 2x$.

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6. Find the general solution : $\sec^2 2x = 1 - \tan 2x$

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7. Find the general solution for each of the following equation: $\sin x + \sin 3x + \sin 5x = 0$

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8. Find the general solution of :

$\cos x + \sin x = 1$

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9. Find the general solution of :

$\cos x - \sin x = -1$

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10. Find the general solution of :

$\sqrt{3}\cos x - \sin x = 1$

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11. Find the general solution of :

$2\tan x - \cot x + 1 = 0.$

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12. Find the general solution of :

$\cot x + \tan x = 2\cos ecx.$

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13. In any triangle ABC prove that:

$c\cos B - bc\cos A = a^2 - b^2$

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14. In any ΔABC, prove that

$$\frac{c - b\cos A}{b - c\cos A} = \frac{\cos B}{\cos C}$$

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15. In $\triangle ABC$, prove that (1) $a = b\cos C + c\cos B$ (2) $b = a\cos C + c\cos A$.

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16. In $\triangle ABC$, prove that $2(bc\cos A + ac\cos B + ab\cos C) = a^2 + b\&2 + c^2$.

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17. In $\triangle ABC$, prove that $(b+c)\cos A + (c+a)\cos B + (a+b)\cos C = a+b+c.$

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18. In a ABC, if $\sin^2 A + \sin^2 B = \sin^2 C$, show that the triangle is right angled.

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19. In $\triangle ABC$, prove that $a^2 \sin(B-C) = \left(b^2 - c^2\right)\sin A.$

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20. In $\triangle ABC$, prove that $\tan\left(\frac{C-A}{2}\right) = \left(\frac{c-a}{c+a}\right)\frac{\cot(B)}{2}$.

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21. In $\triangle ABC$, prove that $\frac{\sin(A-B)}{\sin(A+B)} = \frac{a^2-b^2}{c^2}$.

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22. In $\triangle ABC$, prove that $b^2\sin 2C + c^2\sin 2B = 2bc\sin A$.

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23. $\frac{\cos^2\left(\frac{B-C}{2}\right)}{(b+c)^2}+\frac{\sin^2\left(\frac{B-C}{2}\right)}{(b-c)^2}=\frac{1}{a^2}$

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24. If $2b=a+c$, then prove that $3\tan.\frac{A}{2}.\tan.\frac{C}{2}=1.$

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25. In any $\triangle ABC$, prove that $a\left(\cos B+\cot\left(\frac{A}{2}\right).\sin B\right)=b+c.$

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26. In any $\triangle ABC$, prove that $a\sin A - b\sin B \equiv c\sin(A-B)$.

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27. In $\triangle ABC$, if $\angle C = \frac{\pi}{2}$, then prove $\sin(A-B) = \frac{a^2-b^2}{a^2+b^2}$.

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28. In a triangle ABC, if $a\cos A = b\cos B$, show that the triangle is either isosceles or right angled.

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29. In a triangle ABC, prove that $\cot\left(\frac{A}{2}\right)+\cot\left(\frac{B}{2}\right)+\cot\left(\frac{C}{2}\right)=\left(\frac{a+b+c}{b+c-a}\right)\cot\left(\frac{A}{2}\right)$

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30. In $tra \in g \leq ABC$, prove that $\cos\left(\frac{A-B}{2}\right)=\left(\frac{a+b}{c}\sin.\frac{C}{2}\right.$.

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31. Find the principal of :

(1) $\sin^{-1}\left(\frac{1}{2}\right)$ (2) $\tan^{-1}\left(-\sqrt{3}\right)$ (3) $\cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)$ (4) $\sin^{-1}\left(-\frac{1}{2}\right)$.

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32. Find the values of :

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

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

(3) $\cos ec^{-1}(-\sqrt{2})+\cot^{-1}(\sqrt{3})$.

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33. Find the value of :

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

(2) $\cos^{-1}\left(\cos.\frac{13\pi}{6}\right)$

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

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34. Show that $\tan^{-1}\left[\frac{\cos x + \sin x}{\cos x - \sin x}\right] = \frac{\pi}{4} + x.$

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35. सिद्ध कीजिए कि $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{2}{11} = \tan^{-1}\frac{3}{4}$

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

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37. Evaluate : $\tan^{-1}1+\tan^{-1}2+\tan^{-1}3.$

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38. Prove that :

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

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39. Prove that $\sin^{-1}\left(\frac{8}{17}\right)+\sin^{-1}\left(\frac{3}{5}\right)=\sin^{-1}\left(\frac{77}{85}\right)$

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40. Prove that: $\frac{\cos^{-1}(12)}{13}+\frac{\sin^{-1}3}{5}=\frac{\sin^{-1}(56)}{65}$

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41. Prove that: $2\frac{\sin^{-1}3}{5} = \frac{\tan^{-1}(24)}{7}$

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42. Prove that: `tan^(-1){(sqrt(1+x)-sqrt(1-x))/(sqrt(1+x)+sqrt(1-x))}=pi/4-1/2\ cos^(-1)x ,\ \ 0

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43. If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \cot^{-1}\left(\frac{x+2}{x+1}\right) = \frac{\pi}{4}$, find x.

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44. If $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$, then find the value of x.

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Multiple Choice Questions

1. The general solution of $\sin x = -\frac{\sqrt{3}}{2}$ is

A. $x = n\pi + (-1)^n\left(\frac{2\pi}{3}\right), n \in Z$

B. $x = n\pi + (-1)^n\left(\frac{4\pi}{3}\right), n \in Z$

C. $x = n\pi + (-1)^n\left(\frac{\pi}{3}\right), n \in Z$

D. $x = n\pi + (-1)^n\left(\frac{7\pi}{6}\right), n \in Z$

Answer:

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2. If $\tan 2x = \tan\left(\frac{x}{2}\right)$, then the value of x is

A. $2x\pi, n \in Z$

B. $\frac{n\pi}{3}, n \in Z$

C. $\frac{2n\pi}{3}, n \in Z$

D. $\frac{2n\pi}{3} + \frac{\pi}{4}, n \in Z$

Answer: B::C

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3. Find the principal and general solution of $\cot x = -\sqrt{3}$

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

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

C. $\frac{5\pi}{6}$

D. $-\frac{5\pi}{6}$

Answer:

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4. The general solution of the trigonometric equation $\tan^2\theta = 1$ is

A. $\theta = n\pi \pm \frac{\pi}{3}, n \in Z$

B. $\theta = n\pi \pm \frac{\pi}{6}, n \in Z$

C. $\theta = n\pi \pm \frac{\pi}{4}, n \in Z$

D. $\theta = n\pi, n \in Z.$

Answer: A::D

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5. The principal value of $\cos^{-1}\left(-\frac{1}{2}\right)$ is

A. $\frac{\pi}{3}$

B. $\frac{\pi}{6}$

C. $\frac{2\pi}{3}$

D. $\frac{3\pi}{2}$.

Answer: B::C

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6. The principal solutions of $\sec x = \frac{2}{\sqrt{3}}$ are

A. $\frac{\pi}{3}, \frac{11\pi}{6}$

B. $\frac{\pi}{6}, \frac{11\pi}{6}$

C. $\frac{\pi}{4}, \frac{11\pi}{4}$

D. $\frac{\pi}{6}, \frac{11\pi}{4}$

Answer: A

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7. $a(b\cos C - c\cos B) =$ .....

A. $b^2 - c^2$

B. $a^2 - b^2$

C. $c^2 - a^2$

D. $b^2 + c^2$.

Answer: B::C

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8. In $\triangle ABC, \sin\left(\frac{A}{2}\right)\sin\left(\frac{C}{2}\right) = \sin\left(\frac{B}{2}\right)$ and '2s' is the perimeter of the triangle. Then the value of s is

A. b

B. 2b

C. 3b

D. 4b.

Answer: B

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9. If in $\triangle ABC$, with usual notations , $a = 18, b = 24, c = 30$, then $\sin. \frac{A}{2}$ is equal to

A. $\frac{1}{\sqrt{5}}$

B. $\frac{1}{\sqrt{10}}$

C. $\frac{1}{\sqrt{15}}$

D. $\frac{1}{2\sqrt{5}}$.

Answer: A

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10. In $\triangle ABC$, if $a = 13, b = 14$ and $c = 15$, then $\sin. \frac{A}{2} =$ .....

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

B. $\sqrt{\frac{1}{5}}$

C. $\frac{4}{5}$

D. $\frac{2}{5}$.

Answer: B

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11. If $\sin^{-1}(1-x)\sin^{-1}x = \frac{\pi}{2}$ then x equal

A. $-\frac{1}{2}$

B. 1

C. 0

D. $\frac{1}{2}$.

Answer:

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12. Prove that

$$\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right) = \left(\frac{\pi}{4} - x\right), x < \pi.$$

A. $-x$

B. x

C. $\frac{\pi}{4} - x$

D. $\frac{\pi}{4} + x.$

Answer: D

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