# MATHS

## BOOKS - NAGEEN MATHS (HINGLISH)

## INTRODUCTION TO TRIGONOMETRY

**Solved Examples**

**1.** In $\Delta ABC, \angle B = 90^\circ$ , if $AB = 5cm, BC = 12$ cm , then find the vlaues of the following :

(a) Sin A

(b) Cos A

cot A

cosec C

( e) sec C

tan C

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**2.** In $\Delta ABC, \angle B = 90^\circ$ and $\sin A = \frac{4}{5}$, then find the values of all other trigonometric ratios for $\angle A$.

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**3.** If $\cos\theta = \frac{8}{17}$, find the other five trigonometric ratios.

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**4.** Given $\tan\alpha = \frac{5}{12}$, find other trigonometric ratios

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**5.** In $\Delta ABC$, $\angle C = 90^\circ$ and $\cos esA = \frac{13}{12}$, find the values of all other trigonometric ratios for $\angle A$,

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**6.** In $\Delta ABC$ , $\angle A$ is right - angled . If AB= 1 cm , AC =3 cm and BC = $\sqrt{10}$ cm , then find the values of cos B and sin C.

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**7.** If cos $A = \frac{1}{3}$,then find the values of sin A and tan A.

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**8.** In $\Delta ABC$, tan B $= \sqrt{3}$ , find the values of cosec B and cos B.

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**9.** If $\cos\theta = \frac{4}{5}$ then find the value of $\left(\sin\theta\cos\theta + \tan^2\theta\right)$.

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**10.** If sec A= 2, then find the value of $\frac{1}{\cot A} + \frac{\cos A}{1 + \sin A}$

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**11.** $In$DeltaABC, $< B = 90^\circ$, $\tan A = \frac{3}{4}$and length of BC =180 m, ten find the length of hypotenuse of $\Delta ABC$.

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**12.** If $\cot A = \frac{b}{a}$,then prove that :

$$\frac{a \sin - b \cos A}{\sin A + b \cos A} = \frac{a^2 - b^2}{a^2 + b^2}$$

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**13.** In the adjoining figure , AM =BM and $\angle B = 90^\circ$. If $\angle BCM = \theta$, then find the values of the following :

(i) $\sin \theta$ (ii) $\tan \theta$ (iii) $\sec \theta$

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**14.** In $\Delta PQR$ , right - angled at Q , PR +QR = 25 cm and PQ = 5cm . Determine the values of sin P , cos P and tan P.

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**15.** In $\Delta OPQ$ , right - angled at P , OP = 7 cm and OQ - PQ =1 cm . Determine the values of sinQ and cos Q .

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**16.** In the adjoining figure , $\angle BCD = \angle ADB$ (each $90^\circ$) . angle BC= 3 cm and length of side opposite $\angle C$ in $\Delta BCD$ is 5 cm , then find the squre root of length of side opposite to $\angle D$ in $\Delta ADB$.

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**17.** Evaluate : $\sin^2 60^\circ \tan 45^\circ - \cos^2 45^\circ \sec 60^\circ$

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**18.** Evaluate : $\cos 60^\circ \cos 30^\circ + \sin 60^\circ \sin 30^\circ$

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**19.** Show that : $\cos 60^\circ = 2\cos^2 30^\circ - 1$

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**20.** If A=30, then show that $\sin 3A = 3\sin A - 4\sin^3 A$

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**21.** If A $= A = 30^\circ$, then evaluate tan 2A.

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**22.** If $= 60^\circ$ and $B = 30^\circ$, then show that : sin A cos B+ cos A sin B= sin (A+B)

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**23.** If A $= 15^\circ$ , then find the value of sec 2A.

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**24.** If sin $x = 1$, then find the value of tan $\frac{x}{3}$.

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**25.** If$\sin(A + B) = 1$ and $\cos(A - B) = \frac{\sqrt{3}}{2}$, then find the values of A and B.

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**26.** In an acute angled $\Delta ABC$ , if tan (A+B-C) = 1 and sec (B+C-A)=2 , then find the value of cos (4B-3A) .

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**27.** If $\sin A = \cos A,$ then evaluate $\tan A + \sin^2 A + 1.$

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**28.** Show that : $\sin 30^\circ = \sqrt{\frac{1 - \cos 60^\circ}{2}}$

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**29.** given that $\tan(\theta_1 + \theta_2) = \frac{\tan\theta_1 + \tan\theta_2}{1 - \tan\theta_1 \cdot \tan\theta_2}$ find $(\theta_1 + \theta_2)$ when $\tan\theta_1 = \frac{1}{2}, \tan\theta_2 = \frac{1}{3}$

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**30.** $\cos 1^\circ . \cos 2^\circ . \cos 3^\circ \ldots\ldots\ldots \cos 179^\circ$ is equal to :

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**31.** In the adjoining frgure ,a right - angled triangle ABC is shown un which AM=CM=3m . If $\angle ACM = 15^\circ$ , then find AC.

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**32.** Smlplify : $\left(1 + \tan^2 \theta\right)(1 - \sin\theta)(1 + \sin\theta)$

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**33.** Prove that $\cos^2 \theta \cos ec^2 \theta + \sin^2 \theta = \cos ec^\circ \theta$

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**34.** Prove that : $\sec^4\theta - \tan^4\theta = 1 + 2\tan^2\theta$

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**35.** Prove that : $\frac{1 + \cos\theta - \sin^2\theta}{\sin\theta + \sin\theta\cos\theta} = \cot\theta$

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**36.** If $\tan\theta = \frac{4}{3}$, then find the value of $\frac{3\sin\theta - 2\cos\theta}{3\sin\theta + 5\cos\theta}$

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**37.** Prove that : $(\sec A + \tan A)(1 - \sin A) = \cos A$

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**38.** Prove that : $\cos ecA - \cot A = \frac{1}{\cos ecA + \cot A}$

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**39.** Prove that : $\frac{\sec A + 1}{\tan A} = \frac{\tan A}{\sec A - 1}$

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**40.** Prove that : $\frac{\tan \theta}{\sec \theta + 1} - \frac{\tan \theta}{1 - \sec \theta} = 2 \cos ec\theta$

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**41.** Prove that : $\frac{1 - \cos \theta}{1 + \cos \theta} = (\cot \theta - \cos ec\theta)^2$

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**42.** Prove that : $\sin \theta(1 + \tan \theta) + \cos \theta(1 + \cot \theta) = \cos ec\theta + \sec \theta$

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**43.** If $\sec\theta + \tan\theta = p$, prove that $\sin\theta = \dfrac{p^2 - 1}{p^2 + 1}$

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**44.** If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then prove that$\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

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

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**46.** $\dfrac{1 + \sec A}{\sec A} = \dfrac{\sin^2 A}{1 - \cos A}$

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**47.** Prove that $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \cos ecA + \cot A$ using the identity $\cos ec^2 A = 1 + \cot^2 A$.

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**48.** Porve that : (cosecA-sinA)(secA-cosA) $= \frac{1}{\tan A + \cot A}$

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**49.** prove that $\left(\frac{1 - \tan A}{1 - \cot A}\right)^2 = \tan^2 A$

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**50.** If $x = r \sin A \cos C$, $y = r \sin A \sin C$ and $z = r \cos A$ , prove that $r^2 = x^2 + y^2 + z^2$

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**51.** If $p\sin^3\alpha + q\cos^3\alpha = \sin\alpha\cos\alpha$ and $p\sin\alpha - q\cos\alpha = 0$, then prove that : $p^2 + q^2 = 1$

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**52.** if $3\sin\theta + 5\cos\theta = 5$ then prove that $5\sin\theta - 3\cos\theta$ = $|3|$

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**53.** If $\sin\alpha$ and $\cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0$ then prove that $a^2 + 2ac = b^2$

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**54.** If $\sec\alpha - \tan\alpha = p$ and $\cos ec\alpha + \cot\alpha = q$, then express p in terms of q and also q in terms p.

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**55.** if $x = a\cos^3\theta\sin^2\theta$ and $y = a\cos^2\theta\sin^3\theta$ and $\frac{(x^2+y^2)^p}{(xy)^q}$ is independent of $\theta$, then (A) $4p = 5q$ (B) $5p = 4q$ (C) $p + q = 9$ (D) $pq = 20$

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**56.** If $\sin x + \sin^2 x + \sin^3 x = 1$ then find the value of $\cos^6 x - 4\cos^4 x + 8\cos^2 x$

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**57.** Check whether the equation $\frac{\tan\phi + \sin\phi}{\tan\phi - \sin\phi} = \frac{\sec\phi + 1}{\sec\phi - 1}$ is an identity or not ?

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**58.** Check whether the following equation $\tan^4\theta + \tan^6\theta = \tan^3\theta \sec^2\theta$ is an identity or not ?

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**59.** Solve : $2\sin^2\theta = \frac{1}{2}, 0^\circ < \theta < 90^\circ$.

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**60.** Find the vlaue of $\theta$ if $2\cos 3\theta = 1$ and $0^\circ < \theta < 90^\circ$.

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**61.** Find the value of $\theta$ if $\sec^2\theta + \tan^2\theta = \frac{5}{3}$ and$\theta$ lies in first quadrant.

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**62.** If $0^\circ < \alpha < 90^\circ$, then solve the equation $\frac{\sin\alpha}{1-\cos\alpha} + \frac{\sin\alpha}{1+\cos\alpha} = 4.$

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**63.** If $0^\circ \angle \theta \angle 90^\circ$, then find the value of $\theta$ from the equation $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3.$

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**64.** Evaluate the following :

(i) $\frac{\sin 58^\circ}{\cos 32^\circ}$

(ii) $\frac{\sec 42^\circ}{\text{cosec}48^\circ}$

(iii) $\frac{\tan 37^\circ}{\cot 53^\circ}$

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**65.** Evaluate :

(i)$\tan 42^\circ - \cot 48^\circ$

(ii)$\sec 36^\circ - \text{cosec}54^\circ$

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**66.** Prove that : (i) $\sin 42^\circ \cos 48^\circ + \sin 48^\circ \cos 42^\circ = 1$

(ii)$\cos 70^\circ \cos 20^\circ - \sin 70^\circ \sin 20^\circ = 0$

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**67.** Prove that : $\text{cosec} \quad 65^\circ \cos 25^\circ + \text{cosec}20^\circ \cos 70^\circ = 2$

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**68.** Without using trigonometric tables , evaluate :

$$\left(\frac{\tan 20^\circ}{\cos ec70^\circ}\right)^2 + \left(\frac{\cot 20^\circ}{\sec 70^\circ}\right)^2 + 2\tan 15^\circ \tan 37^\circ \tan 53^\circ \tan 60^\circ \tan 75^\circ$$

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**69.** Without using trigonometric table, evaluate the following:

$$\frac{\cos ec^2(90-\theta)-\tan^2\theta}{4(\cos^2 48^\circ+\cos^2 42^\circ)}-\frac{2\tan^2 30^\circ \sec^2 52^\circ \sin^2 38^\circ}{\cos ec^2 70^\circ-\tan^2 20^\circ}$$

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**70.** Without using trigonometric tables , evaluate the following :

$$\frac{\cot(90^\circ-\theta)\cdot\sin(90^\circ-\theta)}{\sin\theta}+\frac{\cot 40^\circ}{\tan 50^\circ}-\left(\cos^2 20+\cos^2 70^\circ\right)$$

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**71.** Prove that

(i)$\sin(40^\circ-\theta)\cos(50^\circ+\theta)=0$

(ii) $1\sec(65^\circ+\theta)-\operatorname{cesec}(25^\circ-\theta)=0$

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**72.** Express each of the following in terms of trigonometric ratios of angles between $0^\circ$ and $45^\circ$

(i) $\sin 70^\circ + \sec 70^\circ$ " " (ii) $\tan 65^\circ + \text{cosec } 65^\circ$ " " (iii) cos81^(@)+cot80^(@)`

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**73.** If $\tan 2A = \cot(A - 21^\circ)$where 2A is an acute angel , then find the value of A.

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**74.** If $\sin 3A = \cos(A - 10^\circ)$ where 3A is an acute angle , then find the value of A.

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**75.** If $\sin(\theta + 24^\circ) = \cos\theta$ and $\theta + 24^\circ$ is an acute angle , then find the value of $\theta$ .

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**76.** If A and B are acute angles such that $\tan A = \cot B$ , then show that A+B $= 90^\circ$.

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**77.** If A, B and C are interior angles of a triangle ABC, then show that $\sin\left(\frac{B+C}{2}\right) = \frac{\cos A}{2}$.

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**78.** Using the formula $\cos(A + B) = \cos A \cos B - \sin A \sin B$. find the value of sin $15^\circ$.

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**79.** If $\sin 36^\circ = p$, then find sin $54^\circ$ in terms of p.

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**80.** If $\tan 1^\circ \tan 2^\circ \tan 3^\circ \tan 4^\circ \ldots \tan 89^\circ = x^2 - 8$, then find the value of x.

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## Problems From Ncert Exemplar

**1.** If $\tan A = \frac{3}{4}$, then show that sin A cos A`=(12)/(25)

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**2.** If $\sqrt{3}\tan\theta = 1$ then find value of $\sin^2\theta - \cos^2\theta$

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**3.** given : $15\cot A = 8$ find $\sin A$ and $\sec A$

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**4.** If $s \in A = \frac{3}{4}$, calculate cos A and tan A.

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**5.** If $\angle A$ and $\angle B$ are acute angles such that cos A= cos B, then show then show that $\angle A = \angle B$.

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6. $\frac{\cos 45}{\sec 30 + \cos ec30}$

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7. Choose the correct option and justify your choice : (i) $\frac{2\tan 30o}{1+\tan^2 30o} =$

$(a)\ \ s \in \ \ 60o\ (b)\ \ \cos\ \ 60o\ (c)\ \ tan\ \ 60o \qquad (d)\ \ s \in \ \ 30o$

(ii) $\frac{1-\tan^2 45o}{1+\tan^2 45o} =$ `(a)"\ "t a

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8. If $\tan(A+B) = \sqrt{3}$ and $tan(AB) = \frac{1}{\sqrt{3}}$; `0o B ,` find A and B.

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9. In $\Delta ABC$ , right-angled at B, $AB\ \ = \ \ 5\ \ cm$ and $\angle ACB = 30o$

(see figure). Determine the lengths of the sides BC and AC.

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**10.** In $PQR$ , right-angled at $Q$, $PQ = 3cm$ and $PR = 6cm$ . Determine $\angle P$ and $\angle R$ .

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**11.** Prove that : $\sqrt{(1-\cos^2\theta)\sec^2\theta} = \tan\theta$

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**12.** Prove $(\tan\theta + 2)(2\tan\theta + 1) = 5\tan\theta + 2\sec^2\theta.$

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**13.** If $\cos A + \cos^2 A = 1$, then prove that $\sin^2 A + \sin^4 A = 1.$

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**14.** Prove the following identity: $\sec^4\theta - \sec^2\theta = \tan^4\theta + \tan^2\theta$

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**15.** Prove that : $1 + \frac{\cot^2\alpha}{1+\text{cosec}\alpha} = \text{cesec}\alpha$

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**16.** Prove that : $(\sin\alpha + \cos\alpha)(\tan\alpha + \cot\alpha) = \sec\alpha + \text{cosec}\alpha.$

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**17.** Prove that : $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\text{cosec}\theta$

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**18.** If $2\sin^2\theta - \cos^2\theta = 2$, then find the value of $\theta$.

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**19.** if $\tan\theta + \sec\theta = l$ then prove that $\tan\theta = \frac{l^2+1}{2l}$

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**20.** If $a\sin\theta + b\cos\theta = c$ then prove that $a\cos\theta - b\sin\theta = \sqrt{a^2+b^2-c^2}$

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**21.** If $\sin\theta + \cos\theta = p$ and $\sec\theta + \text{cosec}\theta = q$ then prove that $q(p^2-1) = 2p.$

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**22.** Prove that : $\tan\theta + \tan\theta + \tan(90^\circ - \theta) = \sec\theta \cdot \sec(90^\circ - \theta)$

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**23.** Shown that : $\tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = 1$

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**24.** If tan A= cot B. prove that : A+B $= 90^\circ$

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**25.** Express $\sin 67^\circ + \cos 75^\circ$ in terms of trigononmertic ratios of angles between $0^\circ$ and $45^\circ$.

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**26.** If tan A $= \cot(A - 18^\circ)$ where 2A is an acute angle , find the value of A.

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**27.** If sec4A $= \operatorname{cosec}(A - 20^\circ)$ where 4A is an acute angle , find the value of A.

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**28.** The value of the expression $\cos ec(75^\circ + \theta) - \sec(15^\circ - \theta) - \tan(55^\circ + \theta) + \cot(35^\circ - \theta)$ is :

A. $-1$

B. 0

C. 1

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

**Answer: B**

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**29.** If $\cos(\alpha+\beta)=0$, then $\sin(\alpha-\beta)$canbe reduced to :

(a) $\cos\beta$

(b)$\cos 2\beta$

( c) $\sin\alpha$

(d) $\sin 2\alpha$

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## Exercise 8 A

**1.** In $\Delta ABC, \angle B=90^\circ$ and $\sin A=\frac{3}{5}$, then find all other trigonometric ratios for $\angle A$.

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**2.** In$\Delta ABC, \angle B=90^\circ$ and $\cos A=\frac{9}{41}$, then find all other trigonometric ratios for $\angle B$.

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**3.** In $\Delta ABC, \angle A = 90^\circ$ and $\tan B = \frac{5}{6}$, then find all other trigonometric ratios for $\angle B$.

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**4.** In $\Delta PQR, \angle R = 90^\circ$ and $\text{cosec} P = \frac{13}{5}$, then find all trigonometric ratios for $\angle Q$.

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**5.** In $\Delta ABC, \angle C = 90^\circ$ and $\sec B = \frac{5}{4}$, then find all other trigonometric ratios for $\angle B$.

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**6.** In $\Delta ABC, \angle A = 0 = 90^\circ, AB = 6cm$ and $AC = 8cm$, then find the values of the following :

(i) sinB

(ii)sinA

(iii) tanB

(iv)secB

(v)cotC

(vi) "cosec" C

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**7.** In $\Delta ABC, \angle B = 90^\circ, AB = 24cm$ and $AC$=26cm` then find the values of the following :

(i) tanA

(ii) cot C

(iii) cosC

(iv) sinC

(v) cosecA

(vi) sec A

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**8.** If $\tan\theta = 2$, then the find the value of $\frac{2\sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta}$.

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**9.** If $\sec\theta = \frac{3}{2}$,then find value of $\frac{2\cos\theta - \tan^2\theta}{\sin^2\theta + 1}$.

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**10.** If $\sin\theta = \frac{1}{3}$,then find the value of $\sin\theta \cdot \cos^2\theta + \text{cosec}\theta$.

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**11.** If $\sin\theta = \frac{a}{b}$,then find the value of (i) $\cos\theta$, (ii) $\tan\theta$

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**12.** (i) If $\tan\theta = \frac{a}{b}$,then find the value of $\frac{2\sin\theta - 3\cos\theta}{2\sin\theta + 3\cos\theta}$

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**13.** If $\sec\theta = \frac{13}{5}$,then show that $\frac{\tan\theta}{1+\tan^2\theta} = \frac{\sin\theta}{\sec\theta}$.

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**14.** If $\tan\theta = \frac{3}{4}$,then find the value of $\sec\theta + \tan\theta$.

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**15.** If $\tan\theta = \sqrt{2} - 1$,then find the value of $\cot\theta$.

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**16.** If $\tan A = \frac{1}{\sqrt{3}}$ and $\tan B = \sqrt{3}$,then find the value of $\cos A \cos B - \sin A \sin B$

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**17.** If $\cos\theta = \frac{3}{4}$,then find the value of $\sin\theta$ and $\tan\theta$.

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**18.** If $\cot\theta = \frac{12}{5}$,then find the value of$\sin\theta \cdot \sec\theta + \cos\theta \cdot \text{cosec}\theta$.

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**19.** If $\sin\theta = \frac{7}{25}$,then find the value of $\sqrt{\frac{-1\cos\theta}{1+\cos\theta}}$.

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**20.** $\sin\theta = \frac{1}{\sqrt{2}}$,then find the value of $3\sin^2\theta - 4\sin^3\theta \cdot \cos\theta$.

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## Exercise 8 B

**1.** Find the value of $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$.

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**2.** Find the vlaue of $\frac{2\tan 30^\circ}{1 - \tan^2 30^\circ}$.

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**3.** Find the value of $2\sin 30^\circ \cos 30^\circ$.

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**4.** Show that : $2\tan^2 60^\circ - 6\left(\sin^2 45^\circ - \tan^2 30^\circ\right) = 5$

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**5.** Find the vlaue of $4\sin^2 30^\circ + \tan^2 60^\circ + \sec^2 45^\circ$.

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**6.** Find the value of $\frac{\sin 30^\circ}{\cos^2 45^\circ} - \tan^2 60^\circ + 3\cos 90^\circ + \sin 0^\circ$.

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**7.** Evaluate : $\frac{\sin^2 30^\circ + \sin^2 45^\circ - 4\cot^2 60^\circ}{2\sin 30^\circ \cos 30^\circ + \frac{1}{2}\tan 60^\circ}$

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**8.** $\frac{2\tan 30^\circ}{1 - \tan^2 30^\circ}$

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**9.** Show that : $\cos^2 60^\circ - \sin^2 60^\circ = -\sin 30^\circ$

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**10.** $\dfrac{2\tan 30^\circ}{1-\tan^2 30^\circ}$

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**11.** Show that : $\cos 30^\circ = \sqrt{\dfrac{1+\cos 60^\circ}{2}}$

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**12.** Evaluate : $\dfrac{\tan 45^\circ}{2\sin 30^\circ - \cos 60^\circ}$

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**13.** If $A = 30^\circ$ verify that $\cos 3A = 4\cos^3 A - 3\cos A$

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**14.** If A $= 45^\circ$,then show that : $\cos 2A = \cos^2 A - \sin^2 A$

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**15.** If $A = 60^\circ, B = = 30^\circ$ then verify that $\cos(A + B) = \cos A.\cos B - \sin A.\sin B$

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**16.** If A $= 30^\circ$,then show that : $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

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**17.** If $\tan A = 1$,then find the value of $\sin^2 A + \cos^2 A + \cot A$.

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**18.** If $\cos\theta = \frac{\sqrt{3}}{3}$, then find the value of $\sin 3\theta$.

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**19.** If $\tan(A+B) = \sqrt{3}$ and $\sin(A-B) = \frac{1}{2}$,then find the value of $\tan(2A-3B)$.

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**20.** If $\cos(A+B) = 0$ and $\sin(A-B) = \frac{\sqrt{3}}{2}$then find the value of $\tan(A-3B)$.

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**21.** If $A + B = 90^\circ$ and $\tan A = \sqrt{3}$, then find the value of B.

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**22.** If $A - B = 30^\circ$ and $\sin A = \frac{\sqrt{3}}{2}$, then find the value of B.

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## Exercise 8 C

**1.** Prove that :

(i) $\frac{1}{1+\tan^2\theta} + \frac{1}{1+\cot^2\theta} = 1$

(ii) $\sin^2\theta + \frac{1}{1+\tan^2\theta} = 1$

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**2.** If $\cos\theta = \frac{15}{17}$, then find the value of $\sin\theta$.

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**3.** Prove that : (i) $1+\frac{\cos^2\theta}{\sin^2\theta}-\operatorname{cosec}^2\theta=0$

(ii) $\frac{1+\tan^2\theta}{\operatorname{cosec}^2\theta}=\tan^2\theta$

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**4.** Prove that $1+\frac{\tan^2 A}{1+\sec A}=\sec A$

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**5.** Prove that : $\frac{\cot A-1}{2-\sec^2 A}=\frac{\cot A}{1+\tan A}$

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**6.** $\tan^2\theta+\cot^2\theta+2=\sec^2\theta\cos ec^2\theta$

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**7.** Prove that : $(\tan A + \cot A)^2 = \sec^2 A + \text{cosec}^2 A$

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**8.** Prove that : $\left(\sec^2 A - 1\right)\left(\text{cosec}^2 A - 1\right) = 1$

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**9.** Prove the following identities: $\cos ec^4 A - \sec^2 A = \tan^4 A + \tan^2 A$

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**10.** Prove that : (i) $\tan^2 A - \sin^2 A = \tan^2 A \cdot \sin^2 A$

(ii) $\cot^2 \theta - \cos^2 \theta = \cot^2 \theta \cdot \cos^2 \theta.$

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**11.** Prove that : $\frac{1-\tan^2\theta}{\cot^2\theta-1}=\tan^2\theta$

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**12.** Prove that : $(\sec\theta-\tan\theta)^2=\frac{1-\sin\theta}{1+\sin\theta}$

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**13.** Prove that : $\sec^2\theta+\text{cosec}^2\theta=\sec^2\theta\cdot\text{cosec}^2\theta$

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**14.** Prove that : $(\sin A+\cos A)^2+(\sin A-\cos A)^2=2$

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**15.** Prove that : $\sin^4\theta-\cos^4\theta=2\sin^2\theta-1$

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**16.** Prove that : (i) $\frac{1-\cos A}{\sin A}=\frac{\sin A}{1+\cos A}$

(ii) $\frac{\cos\theta}{1-\sin\theta}=\frac{1+\sin\theta}{\cos\theta}$

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**17.** Prove that : $\frac{1+\sin\theta}{\cos\theta}+\frac{\cos\theta}{1+\sin\theta}=2\sec\theta$

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**18.** Prove that : $\frac{1-\cos\theta}{\sin\theta}+\frac{\sin\theta}{1-\cos\theta}=2\text{cosec}\ \ \theta$

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**19.** Prove that : (i) $\frac{1}{1-\cos A}+\frac{1}{1+\cos A}=2\text{cosec}^2A$ $(ii)\frac{1}{1-\sin A}-\frac{1}{1+\sin A}=2\sec$

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**20.** Prove that : (i) $\frac{1}{\sec\theta - \tan\theta} + \frac{1}{\sec\theta + \tan\theta} = 2\sec\theta$ $(ii)\frac{\text{cosec}\ \theta + \cot\theta}{\text{cosec}\ \theta - \cot\theta} = (\text{cosec}$

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**21.** Prove that : $\sin^6 A + \cos^6 A + 3\sin^2 A\cos^2 A = 1$

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**22.** Prove that : $(1 + \cot\theta + \text{cosec}\theta)(1 + \cot\theta - \text{cosec}\theta) = 2\cot\theta$

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**23.** Prove that : $\frac{\sec A + 1}{\tan A} = \frac{\tan A}{\sec A - 1}$

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**24.** Prove that : $(\sin A - \cos A)(\cot A + \tan A) = \sec A - \text{cosec} A$

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**25.** Prove that : $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} = 1 + \sec A \quad \text{cosec} A$

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**26.** $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$

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**27.** If $\tan A + \sin A = m$ and $\tan A - \sin A = n$, then prove that $m^2 - n^2 = 4\sqrt{mn}$.

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**28.** If $x = a\cos\theta - b\sin\theta$ and $y = a\sin\theta + b\cos\theta$, then show that : $x^2 + y^2 = a^2 + b^2$

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**29.** $(\sin A + \cos ecA)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$

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**30.** Prove that : $(1 - \tan A)^2 + (1 - \cot A)^2 = (\sec A - \operatorname{cosec} A)^2$

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**31.** Prove that : $\frac{\sec A - \tan A}{\sec A + \tan A} = 1 - 2\sec A\tan A + 2\tan^2 A$

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**32.** Prove that : $\sqrt{\frac{1+\cos A}{1-\cos A}}+\sqrt{\frac{1-\cos A}{1+\cos A}}=2\text{cosec}A$

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**33.** If $\tan^2\theta=1-e^2$ prove that $\sec\theta+\tan^3\theta\cos ec\theta=\left(2-e^2\right)^{\frac{3}{2}}$

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**34.** यदि $\frac{co\alpha}{\cos\beta}=n$ और $\frac{\cos\alpha}{\cos\beta}=m$, है तो $\cos^2\beta$ का मान क्या होगा?

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**35.** If $\sec\theta=x+\frac{1}{4x}$,prove that $\sec\theta+\tan\theta=2x$ or $\frac{1}{2x}$ .

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**36.** If $x = a\sec\theta\cos\phi$ ,$y = \sec\theta\sin\phi$ and $z = c\tan\theta$,show that $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1.$

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**37.** Prove: $\left(1+\tan^2 A\right) + \left(1 + \frac{1}{\tan^2 A}\right) = \frac{1}{\sin^2 A - \sin^4 A}$

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**38.** The value of $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$ is equal to

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**39.** Eliminate $\alpha$ from $x = a\sin\alpha + b\cos\alpha$ and $y = a\cos\alpha - b\sin\alpha.$

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**40.** If $7(\text{cosec}\ \theta - 1) = 3\cot\theta$,then prove that : $3(\text{cosec}\ \theta + 1) = 7\cot\theta$

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**41.** If $\frac{\cos A}{\cos B} = p, \frac{\sin A}{\sin B} = q$,then show that $\frac{p^2(1-q^2)}{p^2-q^2} = \cos^2 A.$

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**42.** If $x = \frac{2\sin\theta}{1+\cos\theta+\sin\theta}, then \frac{1-\cos\theta+\sin\theta}{1+\sin\theta}$ is equal to $1+x$ (b) $1-x$ (c) $x$ (d) $\frac{1}{x}$

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Exercise 8 D

**1.** Check whether the following equations are identities or not ?

(i) $\frac{\cos\theta}{1-\sin\theta} = \frac{1+\sin\theta}{\cos\theta}$

(ii) $\frac{1}{1+\cos\theta} + \frac{1}{1-\cos\theta} = 2\text{cosec}^2\theta$

(iii) $\frac{\sin^2\theta}{1-\sin^2\theta} = \frac{1}{3}$

(iv) $\sin^2\theta + \cos^2\theta = 1$

(v) $\frac{1+\cos\theta-\sin^2\theta}{\sin\theta+\sin\theta\cos\theta} = \cot\theta$

(vi) $1 + \frac{\tan^2\theta}{1+\sec\theta} = \sec\theta$

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**2.** Solve the following equations for $0^\circ \leq \theta \leq 90^\circ$ :

(i) $2\cos^2\theta = \frac{1}{2}$

(ii) $4\sin^2\theta - 3 = 0$

(iii) $\sin^2\theta - \frac{1}{2}\sin\theta = 0$

(iv) $\tan^2\theta - \left(\sqrt{3}+1\right)\tan\theta + \sqrt{3} = 0$

(v) $\sin\theta - \cos\theta = 0$

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**3.** If $0^\circ \leq \theta \leq 90^\circ$ , then solve the following equations :

(i) $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$

(ii) $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$

(iii) $\frac{\cos\theta}{\text{cosec}\theta + 1} + \frac{\cos\theta}{\text{cosec}\theta - 1} = 2$

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**4.** If $\tan\theta = \sin\theta$ and $0^\circ \leq \theta \leq 90^\circ$ ,then find the value of $\theta$.

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**5.** If $2\sin^2 A = \sin^2 60^\circ + \sin^2 45^\circ$ , then find the value of sin A.

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**6.** If $\cos^2 30^\circ + \cos^2 45^\circ + \cos^2 60^\circ = x$, then find the value of 'x'

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## Exercise 8 E

**1.** Without using trigonometric tables , evaluate :

(i) $\frac{\sin 11^\circ}{\cos 79^\circ}$

(ii) $\frac{\sec 15^\circ}{\text{cosec}75^\circ}$

(iii) $\frac{\tan 54^\circ}{\cot 36^\circ}$

(iv) $\frac{\cos 68^\circ}{\sin 22^\circ}$

(v) $\frac{\text{cosec}24^\circ}{\sec 66^\circ}$

(vi) $\frac{\cot 18^\circ}{\tan 72^\circ}$

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**2.** Without using trigonometric tables , evaluate :

(i) $\frac{\sin 40^\circ}{\cos 50^\circ} + \frac{3\tan 50^\circ}{\cot 40^\circ}$

(ii) $\frac{\sec 37^\circ}{\text{cosec}\ \ 53^\circ} - \frac{\tan 20^\circ}{\cot 70^\circ}$

(iii) $\frac{\cos 74^\circ}{\sin 16^\circ} + \frac{\sin 12^\circ}{\cos 78^\circ} - \sin 18^\circ \sec 72^\circ$

(iv) $\sin 35^\circ \sec 55^\circ + \frac{4\sec 32^\circ}{\text{cosec}\ \ 58^\circ}$

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**3.** Without using trigonometric tables , prove that :

(i) $\sin 50^\circ - \cos 40^\circ = 0$

(ii) $\tan 36^\circ - \cot 54^\circ = 0$

(iii) $\sec 25^\circ - \text{cosec}\ \ 65^\circ = 0$

(iv) $\sin^2 32^\circ + \sin^2 58^\circ = 1$

(v) $\text{cosec}^2 39^\circ \tan^2 51^\circ = 1$

(vi) $\sec^2 10^\circ - \cot^2 80^\circ = 1$

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**4.** Prove that :

(i) $\sin\theta \cos(90^\circ - \theta) + \sin(90^\circ - \theta)\cos\theta = 1$

(ii) $\sec\theta \ \ \text{cosec}(90^\circ - \theta) - \tan\theta \cot(90^\circ - \theta) = 1$

(iii) $\dfrac{\sin\theta \cdot \sec(90^\circ - \theta)\cot(90^\circ - \theta)}{\text{cosec}(90^\circ - \theta) \cdot \cos\theta \cdot \tan\theta} - \dfrac{\tan(90^\circ - \theta)}{\cot\theta} = 0$

(iv) $\dfrac{1 + \sin(90^\circ - \theta)}{\cos(90^\circ - 0)} + \dfrac{\cos(90^\circ - \theta)}{1 + \sin(90^\circ - 0)} = 2\text{cosec}\theta$

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**5.** Without using trigonometric tables , prove that :

(i) $\tan 20^\circ \tan 40^\circ \tan 45^\circ \tan 50^\circ \tan 70^\circ = 1$

(ii) $\tan 1^\circ \tan 2^\circ \tan 60^\circ \tan 88^\circ \tan 89^\circ = \sqrt{3}$

(iii) $\cot 5^\circ \cot 10^\circ \cot 30^\circ \cot 80^\circ \cot 85^\circ = \sqrt{3}$

(iv) $4\sin 10^\circ \sin 20^\circ \sin 30^\circ \sec 70^\circ \sec 80^\circ = 2$

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**6.** Express each of the following in terms of trigonometric ratios of angles lying between $0^\circ$ and $45^\circ$.

(i) $\sin 70^\circ + \cos 70^\circ$

(ii) $\sec 76^\circ \tan 48^\circ$

(iii) $\cot 68^\circ + \text{cosec} 62^\circ$

(iv) $\sin 85^\circ + \text{cosec} 82^\circ$

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**7.** Evaluate :

$$\sin^2 25^\circ + \sin^2 65^\circ + \sqrt{3}\tan 5^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 85^\circ$$

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**8.** Evaluate :

$$\tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ + \frac{\cot 54^\circ}{\tan 36^\circ} + \sin 20^\circ \sec 70^\circ - 2$$

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**9.** The value of $\cot 18^\circ \left( \cot 72^\circ \cos^2 22^\circ + \frac{1}{\tan 72^\circ \sec^2 68^\circ} \right)$ is

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**10.** Evaluate : $\frac{3\tan 25^\circ \tan 40^\circ \tan 50^\circ \tan 65^\circ - \frac{1}{2}\tan^2 60^\circ}{4\left(\cos^2 29^\circ + \cos^2 61^2\right)}$

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**11.** Evaluate : $\frac{\sec^2\theta - \cot^2(90^\circ - \theta)}{\text{cosec}^2 67^\circ - \tan^2 23^2} + \left(\sin^2 40^\circ + \sin^2 50^\circ\right)$

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**12.** Evaluate :

$2\left(\frac{\cos 65^\circ}{\sin 25^\circ}\right) - \frac{\tan 20^\circ}{\cot 70^\circ} - \sin 90^\circ + \tan 5^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 85^\circ$

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**13.** If $\sin 2A = \cos(A - 12^\circ)$ and $2A$ is an acute angle , find the value of A.

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**14.** If $\tan 3A = \cot(A - 10^\circ)$ where 3A is an angle , find A.

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**15.** If $\sec 5A = \text{cosec}(4A - 18^\circ)$ and $5A$ is an acute angle , find the vlaue of A.

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**16.** $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \ldots\ldots + \sin^2 85^\circ + \sin^2 90^\circ =$

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## Revision Exercise Very Short Answer Questions

**1.** If $\tan\theta = \frac{3}{4}$,then find the value of $\cos\theta$.

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**2.** If $\sec\theta = \frac{13}{12}$,then find the value of $\cot\theta$.

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**3.** if $\tan\theta = \frac{4}{3}$, then the value of $\frac{3\sin\theta + 2\cos\theta}{3\sin\theta - 2\cos\theta}$ is

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**4.** If $\sin\theta = \frac{3}{4}$,then find the value of $\left(2\cos^2\theta - 3\sin^2\theta\right)$.

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**5.** If $\tan\theta = \sqrt{3}$,then find the value of $\sin\theta$.

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**6.** If $\cos\theta = \frac{1}{\sqrt{2}}$,then find the value of $\left(\tan^2\theta + 1\right)$.

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**7.** If $\sin A = \frac{\sqrt{3}}{2}$ and $\sin B = \frac{1}{2}$, then find the value if sin AcosB +cosAsinB.

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**8.** If $\cos\theta = \frac{1}{2}$,then find the value of $4\cos^3 0 - 3\cos 0$.

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**9.** If $\sin\theta = \frac{7}{25}$,then find the value of $\tan^2\theta$.

A. $\frac{7}{24}$

B. $\frac{49}{576}$

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

D. $\frac{49}{625}$

**Answer: B**

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**10.** If $\operatorname{cosec}\theta = \sqrt{2}$,then find the value of $\left(\tan^2\theta - 1\right)$.

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**11.** If $\sin\theta = \frac{1}{2}$, then find the value of $\sin 2\theta$

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**12.** If $\cos\theta = \frac{1}{\sqrt{2}}$,then find the value of $\cos 2\theta$.

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**13.** Find the value of $\left(1 - 2\sin^2 30^\circ\right)$.

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**14.** If sinA=cosA,then find the value of sin 2A.

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**15.** If $\sec\theta = \frac{2}{\sqrt{3}}$,then find the value of$\sec 2\theta$.

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**16.** If $\text{cosec}\theta = 2$,then find the value of $\text{cosec}3\theta$

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**17.** Evaluate $\cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ$.

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**18.** Evaluate $\frac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \tan 30^\circ}$.

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**19.** Find the value of $\left(1-\sin^2 A\right)\left(1+\tan^2 A\right)$.

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**20.** Find the value of $\sin^2\theta \cdot \sec^2\theta$.

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**21.** Find the value of $\left(1-\cos^2 A\right) \cdot \operatorname{cosec}^2 A$.

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**22.** Find the value of $\left(\operatorname{cosec}^2 A-1\right) \cdot \tan^2 A$.

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**23.** Find the value of $\left(\sec^2 A - 1\right)$.

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**24.** Find the value of $\cot\theta \cdot \sin\theta \cdot \sec\theta$.

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**25.** Find the value of $\sqrt{1 - \cos^2 A}$.

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**26.** If $\sin A + \sin^2 A = 1$, then the value of $\cos^2 A + \cos^4 A$ is 2 (b) 1 (c) -2 (d) 0

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**27.** If $\tan\theta = \frac{a}{b}$,then find the value of $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$.

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**28.** If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$,then find the value of $\frac{\cos\theta - \sin\theta}{\sin\theta}$.

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**29.** Find the value of $\frac{\tan 25^\circ}{\cot 65^\circ}$.

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**30.** Find the value of $\sin 50^\circ - \cos 40^\circ$.

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**31.** Evaluate $\sin 10^\circ \sec 80^\circ + 4\tan 45^\circ$.

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**32.** Evaluate $\frac{\sin 35^\circ}{\cos 55^\circ} + \frac{\sec 20^\circ}{\text{cosec}70^\circ}$.

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**33.** Evaluate $\sin^2 26^\circ + \sin^2 64^\circ$.

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**34.** Evaluate $\tan 20^\circ \tan 25^\circ \tan 65^\circ \tan 70^\circ$.

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**35.** Evaluate $\text{cosec}^2 57^\circ - \tan^2 33^\circ$.

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**36.** Evaluate $2\left(\cos^2 28^\circ - \sin^2 62^\circ\right)$.

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**37.** Evaluate $\sin(30^\circ + \theta) - \cos(60^\circ - \theta)$.

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**38.** Evaluate $\sin\theta\cos(90^\circ - \theta) + \cos\theta\sin(90^\circ - \theta)$.

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## Revision Exercise Short Answer Questions

**1.** If $3\cot A = 4$, check whether $\dfrac{1-\tan^2 A}{1+\tan^2 A} = \cos^2 A - \sin^2 A$ or not.

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**2.** In $\Delta ABC, \angle C = 90^\circ$ and $\tan A = \frac{1}{\sqrt{3}}$,find the value of sin A cosB+cosAsinB.

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**3.** If $\text{cosec}\theta = 2$, show that $\left(\cot\theta + \frac{\sin\theta}{1+\cos\theta}\right) = 2.$

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**4.** If $\sin\theta = 0.8$,show that $5\sin\theta - 3\tan\theta = 0.$

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**5.** If $\cos\theta = \frac{8}{17}$,verify that $\frac{3 - 4\sin^2\theta}{4\cos^2\theta - 3} = \frac{3 - \tan^2\theta}{1 - 3\tan^2\theta}.$

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**6.** If $\sin\theta = \frac{3}{5}$,verify that $\frac{\tan\theta}{1+\tan^2\theta} = \sin\theta\cos\theta.$

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**7.** If $\cot\theta = \frac{b}{a}$,show that $\frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta} = \frac{a^2 - b^2}{a^2 + b^2}.$

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**8.** find the value of $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$

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**9.** Verify that : $\sin 60^\circ = 2\sin 30^\circ \cos 30^\circ$

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**10.** If A $= 30^\circ$,verify that cos2A $= \cos^2 A - \sin^2 A.$

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**11.** if A= $45^o$ then verify sin2A=2sinAcosA ,$\cos 2A = 1 - \sin^2 A$

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**12.** Using the formula cos A $= \sqrt{\frac{1+\cos 2A}{2}}$, find the value of $\cos 30^\circ$, it is given that $\cos 60^\circ = \frac{1}{2}$.

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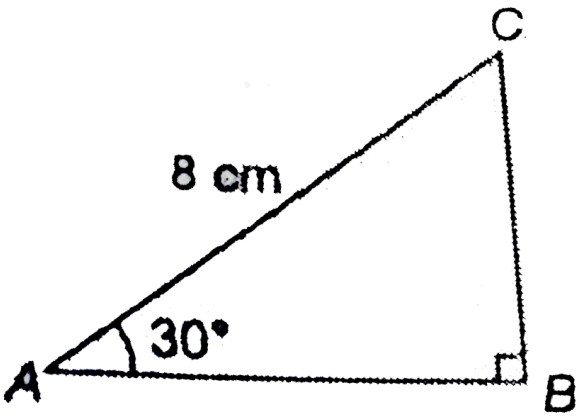
**13.** In the adjoining figure , $\Delta ABC$ is a right - angled triangle , right - angled at B. If $\angle A = 30^\circ$ and $AC = 8cm$, Find (i)BC (ii)AB.

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**14.** If $\sin(A-B)=\frac{1}{2}$, $\cos(A+B)=\frac{1}{2}$, `0o B`, find A and B.

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**15.** Find the value of $\sin 30^\circ$ geometrically.

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**16.** Find the value of $\sin 60^\circ$ geometrically.

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**17.** Prove that $\sqrt{\sec^2\theta + \cos ec^2\theta} = \tan\theta + \cot\theta.$

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**18.** Prove that : $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{cosec}\theta + \cot\theta$

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**19.** $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ is equal to

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**20.** Prove that : $\tan^2\theta - \sin^2\theta = \tan^2\theta\sin^2\theta$

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**21.** Prove that : $\frac{\tan A + \sin A}{\tan A - \sin A} = \frac{\sec A + 1}{\sec A - 1}$

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**22.** Prove that : $\sin^2 A \cos^2 B - \cos^2 A \sin^2 B = \sin^2 A - \sin^2 B$

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**23.** Prove that : $\sin^2 \theta + \cos^4 \theta = \cos^2 \theta + \sin^4 \theta$

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**24.** Prove that : $\sin^2 \theta + \frac{1}{1 + \tan^2 \theta} = 1$

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**25.** Prove that : $(1-\cos\theta)(1+\cos\theta)\left(1+\cot^2\theta\right)=1$

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**26.** Prove that : $\frac{\tan^2\theta}{1+\tan^2\theta}+\frac{\cot^2\theta}{1+\cot^2\theta}=1$

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**27.** If $\tan 3A=\cot(A-10^\circ)$ where 3A is an angle , find A.

Watch Video Solution

**28.** If $\cos 5A=\sin(A-30^\circ)$ where 5A is an acute angle , find A.

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**29.** Show that : $\frac{\cot(90^\circ-\theta)\cdot\sin(90^\circ-\theta)}{\sin\theta}+\frac{\cot 50^\circ}{\tan 40^\circ}=2$

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**30.** Prove the following:

$$\frac{\cos\left(90^0-\theta\right)\sec\left(90^0-\theta\right)tan\theta}{\cos ec\left(90^0-\theta\right)\sin\left(90^0-\theta\right)\cot\left(90^0-\theta\right)}+\frac{\tan\left(90^0-\theta\right)}{\cot\theta}=2$$

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**31.** Show that : $\cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \sin 30^\circ \operatorname{cosec} 75^\circ = \frac{1}{2}$

Watch Video Solution

**32.** Express $\cos 70^\circ + \sin 70^\circ + \tan 65^\circ$ in terms of trigonometric ratios of angles lying between $0^\circ$ and $45^\circ$

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**33.** Evaluate : $\sin 50^\circ \cos 40^\circ + \cos 40^\circ + \cos 50^\circ \sin 40^\circ$

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## Revision Exercise Long Answer Questions

**1.** Prove that : $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}=1+\sec\theta\ \ \text{cosec}\ \ \theta$

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**2.** Prove that : $\frac{\cos^2\theta}{1-\tan\theta}+\frac{\sin^3\theta}{\sin\theta-\cos\theta}=1+\sin\theta\cos\theta$

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**3.** Prove that : $\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}+\frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}=\frac{2}{2\sin^2\theta-1}$

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**4.** Prove that : $\frac{\sin\theta}{\sec\theta+\tan\theta-1}+\frac{\cos\theta}{\text{cosec}\theta+\cot\theta-1}=1$

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**5.** Prove the following identity:

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

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