



MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

TRIGONOMETRIC RATIOS

Solved Examples

1. If $\sin A = \frac{8}{17}$, find other trigonometric ratios of $\angle A$.

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2. If $\cos A = \frac{9}{41}$, find other trigonometric ratios of $\angle A$.

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3. If $\tan A = \sqrt{3}$, find other trigonometric ratios of $\sin A$.

A. $\frac{2}{\sqrt{3}}$

B. $\frac{\sqrt{5}}{2}$

C. 2

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

Answer: D



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4. If $\sec \theta = \frac{25}{7}$, find all trigonometric ratios of θ .



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5. If $\cos \theta = \frac{3}{5}$, find the value of $\left(\frac{5\operatorname{cosec} \theta - 4\tan \theta}{\sec \theta + \cot \theta} \right)$.

A. $\frac{24}{29}$

B. $\frac{1}{29}$

C. $\frac{8}{29}$

D. $\frac{11}{29}$

Answer: D



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6. If $\sec \theta = \frac{5}{4}$, find the value of $\frac{(2 \cos \theta - \sin \theta)}{(\cot \theta - \tan \theta)} =$.

A. (12)/(7)

B. (12)/(5)

C. (1)/(7)

D. (2)/(5)

Answer: A



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7. In a right triangle ABC , right angled at B , the ratio of $AB:AC$ is

1: $\sqrt{2}$. Find the value of $\frac{2 \tan A}{1 + \tan^2 A}$

A. $\frac{1}{4}$

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

C. 4

D. 1

Answer: D



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8. If $3 \tan \theta = 4$, evaluate $\frac{3 \sin \theta + 2 \cos \theta}{3 \sin \theta - 2 \cos \theta}$.



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9. If $5 \cot \theta = 3$, find the value of $\left(\frac{5 \sin \theta - 3 \cos \theta}{4 \sin \theta + 3 \cos \theta} \right)$.

A. $\frac{11}{29}$

B. $\frac{16}{19}$

C. $\frac{16}{29}$

D. $\frac{34}{29}$

Answer: C



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10. If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$, Find the value of $\tan \theta$

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

B. $\frac{1}{\sqrt{3}}$

C. 1

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

Answer: B



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11. If $\cot \theta = \frac{15}{8}$, the \neq value $\frac{((2 + 2 \sin \theta)(1 - \sin \theta))}{((1 + \cos \theta)(2 - 2 \cos \theta))}$

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12. In $\triangle ABC$, right -angled at B , $AB = 5\text{cm}$ and $BC = 12\text{cm}$. find the values of $\sin A$, $\sec A$, $\sin C$ and $\sec C$.

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13. In a $\triangle ABC$, $\angle B = 90^\circ$, $AB = 5\text{cm}$ and $(BC + AC) = 25\text{cm}$. Find the values of $\sin A$, $\cos A$, $\operatorname{cosec} A$ and $\sec A$.

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14. In a $\triangle ABC$, $\angle B = 90^\circ$, $AB = 7\text{cm}$ and $(AC - BC) = 1\text{cm}$, find the values of $\sin A$, $\cos A$, $\sin C$ and C .

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15. In a $\triangle ABC$, $\angle C = 90^\circ$ and $\tan A = \frac{1}{\sqrt{3}}$. find the values of:

(i) $(\sin A \cdot \cos B + \cos A \cdot \sin B)$ (ii) $(\cos A \cdot \cos B - \sin A \cdot \sin B)$

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16. If $\angle A$ and $\angle B$ are acute angles such that $\cos A = \cos B$ then

A. $\angle A < \angle B$.

B. $\angle A \neq \angle B$.

C. $\angle A = \angle B$.

D.

Answer:



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17. Without using trigonometric tables, evaluate :

(i) $\frac{\cos 53^\circ}{\sin 37^\circ}$

(ii) $\frac{\tan 68^\circ}{\cot 22^\circ}$

(iii) $\frac{\sec 49^\circ}{\csc 41^\circ}$

(iv) $\frac{\sin 30^\circ 17'}{\cos 59^\circ 43'}$



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18. Without using trigonometric tables, evaluate :

(i) $\cos 48^\circ - \sin 42^\circ$

(ii) $\csc 31^\circ - \sec 59^\circ$

(iii) $\cot 34^\circ - \tan 56^\circ$

(iv) $\cos^2 13^\circ - \sin^2 77^\circ$



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19. Without using trigonometric tables, prove that :

$$(i) \sin 43^\circ \cos 47^\circ + \cos 43^\circ \sin 47^\circ = 1$$

$$(ii) \cos 38^\circ \cos 52^\circ - \sin 52^\circ = 0$$

$$(iii) \sec 50^\circ \sin 40^\circ + \cos 40^\circ \csc 50^\circ = 2$$

$$(iv) \sec 70^\circ \sin 20^\circ - \cos 20^\circ - \csc 70^\circ = 0$$



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20. Without using trigonometric tables, prove that :

$$(i) \tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = 1$$

$$(ii) \tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ = \sqrt{3}$$

$$(iii) \cot 12^\circ \cot 38^\circ \cot 52^\circ \cot 60^\circ \cot 78^\circ = \frac{1}{\sqrt{3}}$$



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$$21. \tan 1^\circ \tan 2^\circ \dots \tan 89^\circ =$$

A. 0

B. -1

C. 1

D. None

Answer: B



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22. Evaluate:

$$\frac{\cos 58^\circ}{\sin 32^\circ} + \frac{\sin 22^\circ}{\cos 68^\circ} - \frac{\cos 38^\circ \cos 52^\circ}{\tan 18^\circ \tan 35^\circ \tan 60^\circ \tan 72^\circ \tan 55^\circ}.$$

A. $\frac{1}{3}(6 - \sqrt{3})$

B. $\frac{2}{3}(6 - \sqrt{3})$

C. $\frac{1}{3}(3 - \sqrt{6})$

D. $\frac{2}{3}(3 - \sqrt{6})$

Answer: A



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23. Without using trigonometric tables, evaluate each of the following :

(i) $\sin^2 65^\circ + \sin^2 25^\circ$

(ii) $\cos^2 17^\circ - \sin^2 73^\circ$

(iii) $\sec^2 67^\circ - \tan^2 23^\circ$

(iv) $\sec^2 36^\circ - \cot^2 54^\circ$



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24. Evaluate : $\frac{2 \sin^2 63^\circ + 1 + 2 \sin^2 27^\circ}{3 \cos^2 17^\circ - 2 + 3 \cos^2 73^\circ}$



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25. Without using trigonometric tables, evaluate each of the following:

$\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 2 \csc^2 58^\circ - 2 \cot 58^\circ \tan 32^\circ - 4 \tan 13^\circ \tan 37^\circ \tan 4$



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

A. 25°

B. 35°

C. 45°

D. None

Answer: A



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

A. 40°

B. 45°

C. 37°

D. 35°

Answer: C



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28. If $\sec 5A = \csc(A - 30^\circ)$, where $5A$ is an acute angle then find the value of A .



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29. If $\sin(\theta + 34^\circ) = \cos \theta$ and $(\theta + 34^\circ)$ is acute then $\theta = ? ?$.

A. 28°

B. 38°

C. 36°

D. None

Answer: A



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30. Express each of the following in terms of trigonometric ratios of angle between 0° and 45° .

(i) $\sin 75^\circ + \operatorname{cosec} 75^\circ$.

(ii) $\tan 65^\circ + \cot 49^\circ$

(iii) $\sec 67^\circ + \operatorname{cosec} 58^\circ$

(iv) $\cos 83^\circ - \sec 76^\circ$.



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31. If A and B are acute angles such that $\sin A = \cos B$, prove that

$(A + B) = 90^\circ$.



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32. 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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Exercise 10

1. $\sin \theta = \frac{\sqrt{3}}{2}$, find other trigonometric ratios

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2. If $\cos \theta = \frac{7}{25}$, find other trigonometric ratios

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3. If $\tan \theta = \frac{15}{8}$, find the values of all T-ratios of θ .

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4. If $\cot \theta = 2$, find the values of all T - ratios of θ .



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5. If $\operatorname{cosec} \theta = \sqrt{10}$, find the values of all T-ratios of θ .



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6. If $\sin \theta = \frac{a^2 - b^2}{a^2 + b^2}$, find the values of other five trigonometric ratios.



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7. Given : $15 \cot A = 8$ find $\sin A$ and $\sec A$



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8. If $\sin A = \frac{9}{41}$, compute $\cos A$ and $\tan A$.



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9. If $\cos \theta = 0.6$ find $(5 \sin \theta - 3 \tan \theta)$.

A. 0

B. 1

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

D. $\sqrt{3}$

Answer: A



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



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11. If $\tan \theta = \frac{20}{21}$, write the value of $\frac{(\operatorname{cosec}^2 \theta - \sec^2 \theta)}{(\operatorname{cosec}^2 \theta + \sec^2 \theta)}$

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12. If $\tan \theta = \frac{20}{21}$, show that $\frac{1 - \sin \theta + \cos \theta}{1 + \sin \theta + \cos \theta} = \frac{3}{7}$

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13. If $\sec \theta = \frac{5}{4}$, show that $\frac{(2 \cos \theta - \sin \theta)}{(\cot \theta - \tan \theta)} = \frac{12}{7}$.

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14. If $\cot \theta = \frac{3}{4}$, show that $\sqrt{\frac{\sec \theta - \operatorname{cosec} \theta}{\sec \theta + \operatorname{cosec} \theta}} = \frac{1}{\sqrt{7}}$.

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15. If $\sin \theta = \frac{3}{4}$, then prove that $\sqrt{\frac{\cos \theta \sec^2 \theta - \cot^2 \theta}{\sec^2 \theta - 1}} = \frac{\sqrt{7}}{3}$

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16. If $\sin \theta = \frac{a}{b}$, find $\sec \theta + \tan \theta$ in terms of a and b .

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17. If $\cos \theta = \frac{3}{5}$, find the value of $\frac{\sin \theta - \frac{1}{\tan \theta}}{2 \tan \theta}$

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18. If $\tan \theta = \frac{4}{3}$, show that $(\sin \theta + \cos \theta) = \frac{7}{5}$.

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19. If $\tan \theta = \frac{a}{b}$, 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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20. If $3 \tan \theta = 4$, show that $\frac{(4 \cos \theta - \sin \theta)}{(a \cos \theta + \sin \theta)} = \frac{7}{25}$

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21. If $3 \cot \theta = 2$, show that $\frac{(4 \sin \theta - 3 \cos \theta)}{(2 \sin \theta + 6 \cos \theta)} = \frac{1}{3}$

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22. If $3 \cot \theta = 4$ then show that $\frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = (\cos^2 \theta - \sin^2 \theta)$

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23. 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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24. In the adjoining figure ,
 $\angle B = 90^\circ$, $\angle BAC = \theta^\circ$, $BC = CD = 4\text{cm}$ and $AD = 10\text{cm}$, Find (i)
 $\sin \theta$ and (ii) $\cos \theta$.



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25. In a $\triangle ABC$, $\angle B = 90^\circ$, $AB = 24\text{cm}$ and $BC = 7\text{cm}$.

Find (i) $\sin A$ (ii) $\cos A$ (iii) $\sin C$ (iv) $\cos C$.



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26. In a $\triangle ABC$, $\angle C = 90^\circ$, $\angle ABC = \theta^\circ$, $BC = 21$ units and $AB = 29$
units. Show that $(\cos^2 \theta - \sin^2 \theta) = \frac{41}{841}$.



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27. In a $\triangle ABC$, $\angle B = 90^\circ$, $AB = 12\text{cm}$ and $BC = 5\text{cm}$

find (i) $\cos A$

(ii) $\cos ecA$

(iii) $\cos C$

(iv) $\cos ecC$.



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28. If $\sin \alpha = \frac{1}{2}$, prove that $(3 \cos \alpha - 4 \cos^3 \alpha) = 0$.



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29. In a $\triangle ABC$, $\angle C = 90^\circ$ and $\tan A = \frac{1}{\sqrt{3}}$. find the values of :

(i) $(\sin A \cdot \cos B + \cos A \cdot \sin B)$

(ii) $(\cos A \cdot \cos B - \sin A \cdot \sin B)$



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30. If $\angle B$ and $\angle Q$ are acute angles such that $\sin B = \sin Q$. Then prove that $\angle B = \angle Q$.

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31. If $\angle A$ and $\angle P$ are acute angle such that $\tan A = \tan P$, then show that $\angle A = \angle P$.

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32. In a right triangle ABC right-angled at B. if $\tan A = 1$, then verify that $2s \sin A \cos A = 1$.

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33. In the figure of $\triangle PQR$, $\angle P = \theta^\circ$ and $\angle R = \phi$ Find (i) $(\sqrt{x+1}) \cot \phi$ (ii) $(\sqrt{x^3+x^2}) \tan \theta$ (iii) $\cos \theta$

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34. If $x = \cot A + \cos A$ and $y = \cot A - \cos A$, prove that

$$\left(\frac{x-y}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 = 1.$$

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35. If $x = \cot A + \cos A$ and $y = \cot A - \cos A$, prove that

$$\left(\frac{x-y}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 = 1.$$

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Exercise 12

1. Without using trigonometric tables, evaluate :

(i) $\frac{\sin 16^\circ}{\cos 74^\circ}$

(ii) $\frac{\sec 11^\circ}{\cos 79^\circ}$

$$(iii) \frac{\tan 27^\circ}{\cot 63^\circ}$$

$$(iv) \frac{\cos 35^\circ}{\sin 55^\circ}$$

$$(v) \frac{\cos ec 42^\circ}{\sec 48^\circ}$$

$$(vi) \frac{\cot 38^\circ}{\tan 52^\circ}$$



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2. Without using trigonometric tables, prove that :

$$(i) \cos 81^\circ - \sin 9^\circ = 0$$

$$(ii) \tan 71^\circ - \cot 19^\circ = 0$$

$$(iii) \cos ec 80^\circ - \sec 10^\circ = 0$$

$$(iv) \cos ec^2 72^\circ - \tan^2 18^\circ = 1$$

$$(v) \cos^2 75^\circ + \cos^2 15^\circ = 0$$

$$(vi) \tan^2 66^\circ - \cot^2 24^\circ = 0$$

$$(vii) \sin^2 48^\circ + \sin^2 42^\circ = 1$$

$$(viii) \cos^2 57^\circ - \sin^2 33^\circ = 0$$

$$(ix) (\sin 65^\circ + \cos 25^\circ)(\sin 65^\circ - \cos 25^\circ) = 0$$



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3. Without using trigonometric tables, prove that :

$$(i) \sin 53^\circ \cos 37^\circ + \cos 53^\circ \sin 37^\circ = 1$$

$$(ii) \cos 54^\circ \cos 36^\circ - \sin 54^\circ \sin 36^\circ = 0$$

$$(iii) \sec 70^\circ \sin 20^\circ + \cos 20^\circ \csc 70^\circ = 2$$

$$(iv) \sin 35^\circ \sin 55^\circ - \cos 35^\circ \cos 55^\circ = 0$$

$$(v) (\sin 72^\circ + \cos 18^\circ)(\sin 72^\circ - \cos 18^\circ) = 0$$

$$(vi) \tan 48^\circ \tan 23^\circ \tan 42^\circ \tan 67^\circ = 1$$



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4. Prove that :

$$(i) \frac{\sin 70^\circ}{\cos 20^\circ} + \frac{\csc 20^\circ}{\sec 70^\circ} - 2\cos 70^\circ \csc 20^\circ = 0$$

$$(ii) \frac{\cos 80^\circ}{\sin 10^\circ} + \cos 59^\circ \csc 31^\circ = 2$$

$$(iii) \frac{2\sin 68^\circ}{\cos 22^\circ} - \frac{2\cot 15^\circ}{5\tan 75^\circ} - \frac{3\tan 45^\circ \tan 20^\circ \tan 40^\circ \tan 50^\circ \tan 70^\circ}{5} = 1$$

$$(iv) \frac{\sin 18^\circ}{\cos 72^\circ} + \sqrt{3}(\tan 10^\circ \tan 30^\circ \tan 40^\circ \tan 50^\circ \tan 80^\circ) = 2$$

$$(v) \frac{7\cos 55^\circ}{3\sin 35^\circ} - \frac{4(\cos 70^\circ \csc 20^\circ)}{3(\tan 5^\circ \tan 25^\circ \tan 45^\circ \tan 65^\circ \tan 85^\circ)} = 1$$



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5. Prove that :

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

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

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

$$(iv) \frac{1 + \sin(90^\circ - \theta)}{\cos(90^\circ - \theta)} + \frac{\cos(90^\circ - \theta)}{1 + \sin(90^\circ - \theta)} = 2 \operatorname{cosec} \theta$$



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6. Prove that :

$$(i) \tan 5^\circ \tan 25^\circ \tan 30^\circ \tan 65^\circ \tan 85^\circ = \frac{1}{\sqrt{3}}$$

$$(ii) \cot 12^\circ \cot 38^\circ \cot 52^\circ \cot 60^\circ \cot 78^\circ = \frac{1}{\sqrt{3}}$$

$$(iii) \cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \cos 60^\circ \operatorname{cosec} 75^\circ = \frac{1}{2}$$

$$(iv) \cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 180^\circ = 0$$

$$(v) \left(\frac{\sin 49^\circ}{\cos 41^\circ} \right)^2 + \left(\frac{\cos 41^\circ}{\sin 49^\circ} \right)^2 = 2$$



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7. Prove that:

$$(i) \sin(70^\circ + \theta) - \cos(20^\circ - \theta) = 0$$

$$(ii) \tan(55^\circ - \theta) - \cot(35^\circ - \theta) = 0$$

$$(iii) \operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta) = 0$$

$$(iv) \operatorname{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) - \tan(55^\circ - \theta) + \cot(35^\circ + \theta) = 0$$

$$(v) \sin(50^\circ + \theta) - \cos(40^\circ - \theta) + \tan 1^\circ \tan 10^\circ \tan 80^\circ \tan 89^\circ = 1$$



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8. Express each of the following in terms of T-ratios of angles lying between 0^θ and 45° .

$$(i) \sin 67^\circ + \cos 75^\circ$$

$$(ii) \cot 65^\circ + \tan 49^\circ$$

$$(iii) \sec 78^\circ + \operatorname{cosec} 56^\circ$$

$$(iv) \operatorname{cosec} 54^\circ + \sin 72^\circ.$$



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9. If A, B, C are the angles of a $\triangle ABC$, prove that

$$\tan\left(\frac{C + A}{2}\right) = \frac{\cot(B)}{2}.$$

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10. If $\cos 2\theta = \sin 4\theta$, where 2θ and 4θ are acute angles, find the value of θ .

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11. If $\sec 2A = \operatorname{cosec}(A - 42^\circ)$, where $2A$ is an acute angle, find the value of A .

A. $A = 44^\circ$

B. $A = 54^\circ$

C. $A = 64^\circ$

D. $A = 74^\circ$

Answer: A

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12. If $\sin 3A = \cos(A - 26^\circ)$, where $3A$ is an acute angle, find the value of A .

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13. If $\tan 2A = \cot(A - 12^\circ)$, where $2A$ is an acute angle, find the value of A .

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14. If $\sec 4A = \csc(A - 15^\circ)$, where $4A$ is an acute angle, find the value of A .

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15. Prove that :

$$\frac{2}{3} \operatorname{cosec}^2 58^\circ - \frac{2}{3} \cot 58^\circ \tan 32^\circ - \frac{5}{3} \tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ$$



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