MATHS

BOOKS - CALCUTTA BOOK HOUSE MATHS (BENGALI ENGLISH)

TRIGONOMETRIC RATIOS AND TRIGONOMETRIC IDENTITIES

Examples

1. The value of $\frac{\frac{1}{3}\cos 30^\circ}{\frac{1}{2}\sin 45^\circ} + \frac{\tan 60^\circ}{\cos 30^\circ} =$

A. $\frac{6+\sqrt{6}}{3}$

B. $\frac{6-\sqrt{6}}{\sqrt{3}}$

C. $\frac{6-\sqrt{6}}{3}$

D. $\frac{6-\sqrt{6}}{3}$

Answer:

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2. $\sin^2 45^\circ + \cos^2 45^\circ =$

A. 1

B. -1

C. 0

D. 2

Answer:

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3. find the value of $\frac{2\tan 30^\circ}{1-\tan^2 30^\circ}$

A. 1

B. 0

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer:

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4. $\tan^2\frac{\pi}{4}\sin\frac{\pi}{3}\tan\frac{\pi}{6}\tan^2\frac{\pi}{3} =$

A. 1

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

C. $1\frac{1}{3}$

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

Answer:

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5. Write true or false :

$\sin\theta$ is a product of sin and θ .

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6. Write true or false :

The value of $\cos\theta$ can never be greater than 1.

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7. Fill in the blanks :

$\tan\theta = \underline{\text{perpendicular}}$

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8. Fill in the blanks :

$\sec 45^\circ = \underline{\quad 1 \quad}$

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9. Fill in the blanks :

$\cot 0^\circ =$ _____.

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10. If $\cos\theta = 0.6$, then show that $(5\sin\theta - 3\tan\theta) = 0$.

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11. Find the value of $\sin^2 45^\circ - \text{cosec}^2 60^\circ + \sec^2 30^\circ$.

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12. Prove that $\cos 60^\circ = \cos^2 30^\circ - \sin^2 30^\circ$.

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13. Prove that $\sqrt{\frac{1+\cos 30^\circ}{1-\cos 30^\circ}} = \sec 60^\circ + \tan 60^\circ$.

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14. In the window of a house, there is a ladder at an angle of 60° with the ground. If the ladder is $2\sqrt{3}$ m long, then calculate with figure, the height of the window above the ground.

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15. ABC is a right-angled triangle with its $\angle B$ is 1 right angle. If AB $= 8\sqrt{3}$ cm and BC = 8 cm, then calculate the values of $\angle ACB$ and $\angle BAC$.

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16. In a right-angled triangle ABC, $\angle B = 90^\circ$, $\angle A = 30^\circ$ and AC = 20 cm. Determine the lengths of two sides BC and AB.

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17. In a right-angled trangle PQR, $\angle Q = 90^\circ$, $\angle R = 45^\circ$. If $PR = 3\sqrt{2}$, then find the lengths of two sides PQ and QR.

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18. Calculate : $\sin^2 45^\circ - \text{cosec}^2 60^\circ + \sec^2 30^\circ$.

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19. Calculate : $\sec^2 45^\circ - \cot^2 45^\circ - \sin^2 30^\circ - \sin^2 60^\circ$.

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20. Calculate :

$3\tan^2 45^\circ - \sin^2 60^\circ - \frac{1}{3}\cot^2 30^\circ - \frac{1}{8}\sec^2 45^\circ$.

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21. Calculate :

$$\frac{4}{3}\cot^2 30^\circ + 3\sin^2 60^\circ - 2\text{cosec}^2 60^\circ - \frac{3}{4}\tan^2 30^\circ.$$

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22. Calculate :

$$\cot^2 30^\circ - 2\cos^2 60^\circ - \frac{3}{4}\sec^2 45^\circ - 4\sin^2 30^\circ.$$

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23. Calculate : $\sec^2 60^\circ - \cot^2 30^\circ - \frac{2\tan 30^\circ \text{cosec} 60^\circ}{1+\tan^2 30^\circ}$.

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24. Calculate :

$$\frac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \tan 30^\circ} + \cos 60^\circ \cos 30^\circ + \sin 60^\circ \sin 30^\circ.$$

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25. Calculate :

$$\frac{1 - \sin^2 30^\circ}{1 + \sin^2 30^\circ} \times \frac{\cos^2 60^\circ + \cos^2 30^\circ}{\text{cosec}^2 90^\circ - \cot^2 90^\circ} \div (\sin 60^\circ \tan 30^\circ)$$

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26. Prove that :

$$\frac{2\tan^2 30^\circ}{1 - \tan^2 30^\circ} + \sec^2 45^\circ - \cot^2 45^\circ = \sec 60^\circ.$$

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27. Prove that : $\sin\frac{\pi}{3}\tan\frac{\pi}{6}+\sin\frac{\pi}{2}\cos\frac{\pi}{3}=2\sin^2\frac{\pi}{4}$.

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28. If $x\sin 45^\circ\cos 45^\circ\tan 60^\circ=\tan^2 45^\circ-\cos 60^\circ$, then determine the value of x.

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29. If $x\sin 60^\circ\cos^2 30^\circ=\frac{\tan^2 45^\circ\sec 60^\circ}{\text{cosec}60^\circ}$, then find the value of x.

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30. If $x^2 = \sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ$, determine the value of x.

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31. If $x\tan 30^\circ + y\cot 60^\circ = 0$ and $2x - y\tan 45^\circ = 1$, then calculate the values of x and y.

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32. If $A = B = 45^\circ$, then justify

$\sin(A + B) = \sin A \cos B + \cos A \sin B.$

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33. If $A = B = 45^\circ$, then justify

$\cos(A + B) = \cos A \cos B - \sin A \sin B.$

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34. In an equilateral triangle ABC, BD is a median. Prove that

tan $\angle ABD = \cot \angle BAD.$

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35. In an isoceles triangle ABC, AB = AC and $\angle BAC = 90^\circ$,

the bisector of $\angle BAC$ intersects the side BC at the point D.

Prove that $\frac{\sec \angle ACD}{\sin \angle CAD} = \text{cosec}^2 \angle CAD.$

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36. Determine the value/values of $\theta(0^\circ \leq \theta \leq 90^\circ)$ for which $2\cos^2\theta - 3\cos\theta + 1 = 0$ will be true.

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37. Prove that $\cot\frac{\pi}{8}\cot\frac{3\pi}{8}\cot\frac{5\pi}{8}\cot\frac{7\pi}{8} = 1.$

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38. If $\tan 42^\circ = 0.9$, then find the value of $\cot 492^\circ$.

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39. If $\sec(\alpha - \beta) = \sqrt{2}$ and $\sin(\alpha + \beta) = \frac{1}{2}$, then find the least positive values of α and β.

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40. If $3x = \text{cosec}\alpha$ and $\frac{3}{x} = \cot\alpha$, then the value of $3\left(x^2 - \frac{1}{x^2}\right)$ is

A. $\frac{1}{27}$

B. $\frac{1}{81}$

C. $\frac{1}{3}$

D. $\frac{1}{9}$

Answer:

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41. If $2x = \sec A$ and $\frac{2}{x} = \tan A$, then the value of $2\left(x^2 - \frac{1}{x^2}\right)$ is equal to

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

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

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer:

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42. If $\tan\alpha + \cot\alpha = 2$, then the value of $\tan^{13}\alpha + \cot^{13}\alpha$ is

A. 1

B. 0

C. 2

D. None of these

Answer:

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43. If $\sin\theta - \cos\theta = 0(0^\circ \leq \theta \leq 90^\circ)$ and $\sec\theta + \text{cosec}\theta = x$, then the value of x is

A. 1

B. 2

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer:

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44. If $2\cos 3\theta = 1$, then the value of θ is

A. 10°

B. 15°

C. 20°

D. 30°

Answer:

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45. Write 'true' or 'false':

If $0^\circ \leq \alpha \leq 90^\circ$, then the least value of $\left(\sec^2 \alpha + \cos^2 \alpha\right)$ is 2.

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46. Write 'true' or 'false':

The value of $\cos 0^\circ \times \cos 1^\circ \times \cos 2^\circ \times \cos 3^\circ \times \ldots . \times \cos 90^\circ$ is 1.

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47. Fill in the blanks :

The value of $\left(\frac{4}{\sec^2\theta}+\frac{1}{1+\cot^2\theta}+3\sin^2\theta\right)$ is _____ .

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48. Fill in the blanks :

If $\sin(\theta-30^\circ)=\frac{1}{2}$, then the value of value of $\cos\theta$ is _____ .

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49. Fill in the blanks :

if $\cos^2\theta - \sin^2\theta = \frac{1}{2}$. then the value of $\cos^4\theta - \sin^4\theta$ is

_____ .

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50. If $r\cos\theta = 2\sqrt{3}, r\sin\theta = 2$ and $0^\circ < \theta < 90^\circ$, then determine the value of both r and θ.

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51. If $\sin A + \sin B = 2$ where $0^\circ \leq A \leq 90^\circ$ and $0^\circ \leq B \leq 90^\circ$, then find the value of $(\cos A + \cos B)$.

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52. If $0^\circ < \theta < 90^\circ$, then calculate the least value of $\left(9\tan^2\theta + 4\cot^2\theta\right)$.

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53. Calculate the value of $\left(\sin^6\alpha + \cos^6\alpha + 3\sin^2\alpha\cos^2\alpha\right)$.

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54. If $\text{cosec}^2\theta = 2\cot\theta$ and $0^\circ < \theta < 90^\circ$. Then determine the value of θ.

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55. If $\tan\theta = \frac{3}{4}$, then show that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \frac{1}{2}$.

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56. Express $\text{cosec}\theta$ and $\tan\theta$ in term of $\sin\theta$.

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57. If $\sec\theta + \tan\theta = 2$, determine the value of $(\sec\theta - \tan\theta)$

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58. If $\operatorname{cosec}\theta - \cot\theta = \sqrt{2} - 1$, calculate the value of $(\operatorname{cosec}\theta + \cot\theta)$.

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59. If $\sin\theta + \cos\theta = 1$, then find the value of $\sin\theta \times \cos\theta$.

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60. If $\tan\theta + \cot\theta = 2$, then dtemine the value of $\tan\theta - \cot\theta$.

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61. If $\sin\theta - \cos\theta = \frac{7}{13}$, then determine the value of $(\sin\theta + \cos\theta)$.

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62. If $\sin\theta\cos\theta = \frac{1}{2}$, then calculate the value of $(\sin\theta + \cos\theta)$.

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63. If $\sec\theta - \tan\theta = \frac{1}{\sqrt{3}}$, then determine the values of both $\sec\theta$ and $\tan\theta$.

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64. If $\cos ec\theta + \cot\theta = \sqrt{3}$, then detemine the value of both $\text{cosec}\theta$ and $\cot\theta$.

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65. If $\dfrac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 7$, then the value of $\tan\theta$.

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66. If $\dfrac{\text{cosec}\theta + \sin\theta}{\text{cosec}\theta - \sin\theta} = \dfrac{5}{3}$, calculate the value of $\sin\theta$.

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67. If $\sec\theta + \cos\theta = \frac{5}{2}$, then calculate the value of $(\sec\theta - \cos\theta)$.

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68. Determine the value of $\tan\theta$ from the relation $5\sin^2\theta + 4\cos^2\theta = \frac{9}{2}$.

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69. If $\tan^2\theta + \cot^2\theta = \frac{10}{3}$, then determine the value of $(\tan\theta + \cot\theta)$ and $(\tan\theta - \cot\theta)$. Also find the value of $\tan\theta$.

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70. If $\sec^2\theta + \tan^2\theta = \frac{13}{12}$, then calculate the value of $\left(\sec^4\theta - \tan^4\theta\right)$

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71. In $\Delta PQR, \angle Q$ is right angle. If $PR = \sqrt{5}$ units and $PQ - RQ = 1$ unit, then determine the value of $\cos P - \cos R$.

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72. In $\Delta XYZ, \angle Y$ is right angle. If $XY = 2\sqrt{3}$ units and $XZ - YZ = 2$ units, then determine the value of $(\sec X - \tan X)$.

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73. Eliminate $\theta: x = 2\sin\theta, y = 3\cos\theta.$

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74. Eliminate $\theta: 5x = 3\sec\theta, y = 3\tan\theta.$

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75. If $\sin\alpha = \frac{5}{13}$, then show that $\tan\alpha + \sec\alpha = 1.5.$

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76. If $\tan A = \frac{n}{m}$, then determine the values of both sin A and sec A.

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77. If $\cos\theta = \frac{x}{\sqrt{x^2 + y^2}}$, then show that $x \sin\theta = y \cos\theta$.

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78. If $\sin\alpha = \frac{a^2 - b^2}{a^2 + b^2}$, then show that $\cot\alpha = \frac{2ab}{a^2 - b^2}$.

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79. If $\frac{\sin\theta}{x} = \frac{\cos\theta}{y}$, then show that $\sin\theta - \cos\theta = \frac{x-y}{\sqrt{x^2+y^2}}$.

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80. If $\left(1+4x^2\right)\cos A = 4x$, then show that $\operatorname{cosec} A + \cot A = \frac{1+2x}{1-2x}$.

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81. If $x = a\sin\theta$ and $y = b\tan\theta$, then prove that $\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$.

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82. If $\sin\theta + \sin^2\theta = 1$, then prove that $\cos^2\theta + \cos^4\theta = 1$.

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83. If $3\cot\theta = 4$, then find the value of $\dfrac{5\sin\theta + 3\cos\theta}{5\sin\theta - 3\cos\theta}$.

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84. If $3\tan\theta = 4$, then find the value of $\sqrt{\dfrac{1-\sin\theta}{1+\sin\theta}}$.

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85. If $\sec\theta + \tan\theta = p$, then find the value of $\cos\theta$.

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86. If $7\cos^2\theta + 3\sin^2\theta = 4$ and $0^\circ < \theta < 90^\circ$, then what is the value of $\tan\theta$?

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Exercise

1. If $\tan\theta = \frac{p}{q}$, what is the value of $\frac{p\sec\theta - q\ \ \text{cosec}\theta}{p\sec\theta + q\ \ \text{cosec}\theta} =$

A. 1

B. $\frac{p-q}{p+q}$

C. $\frac{q^2-p^2}{q^2+p^2}$

D. $\frac{p^2 - q^2}{p^2 + q^2}$

Answer: D

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2. In ΔABC, right angled at B, $AB : AC = 1 : \sqrt{2}$, then $\frac{2\tan A}{1 - \tan^2 A}$ is equal to

A. ∞

B. 0

C. -1

D. 1

Answer: A

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3. $\frac{\sin 30^\circ \cos 45^\circ}{\tan 60^\circ}$ is equal to

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

B. $\frac{\sqrt{6}}{12}$

C. $2\sqrt{3}$

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

Answer: B

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4. In ΔABC, If $\angle C = 90^\circ, \angle A = 60^\circ$ and $AB = 40cm$, then AC is equal to

A. 10 cm

B. 15 cm

C. 20 cm

D. 25 cm

Answer: C

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5. Write true of false :

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

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6. Write true of false :

$\sin\theta$ is a product of sin and θ.

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7. Fill in the blanks :

The trigonometric ratio $\cos\theta =$ _____base_____

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8. Fill in the blanks :

The value of $\sin\theta$ can never be greate than _____ .

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9. Fill in the blanks :

The value of $\cot 0^\circ$ is not _____.

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10. Find the value of $\cos(-1170^\circ)$.

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11. Calculate the value of $\sec(-1680^\circ)\sin 330^\circ$.

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12. Simplify :

$\sin 300^\circ \cos 390^\circ \tan(-855^\circ) + \cos(-120^\circ) \cdot \sin(-330^\circ)$

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13. Prove that $\tan 225^\circ \cot 405^\circ + \tan 765^\circ \cot 675^\circ = 0.$

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14. Evalute : $\sin^2 \frac{\pi}{4} + \cos^2 \frac{3\pi}{4} + \cos^2 \frac{5\pi}{4} + \sin^2 \frac{7\pi}{4}.$

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15. Prove that $\tan \frac{\pi}{12} \tan \frac{\pi}{16} \tan \frac{5\pi}{12} \tan \frac{7\pi}{16} = 1$

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16. If $\tan 35^\circ = x$, then prove that $\frac{\tan 145^\circ - \tan 125^\circ}{1 + \tan 145^\circ \tan 125^\circ} = \frac{1 - x^2}{2x}$

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17. Find the value of $\sin^3 60^\circ \cot 30^\circ - 2\sec^2 45^\circ + 3\cos 60^\circ \tan 45^\circ - \tan^2 60^\circ$.

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18. If $\frac{\cos\theta}{1 - \sin\theta} - \frac{\cos\theta}{1 + \sin\theta} = 2$, then find the value of θ.

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19. If $\frac{\cos x}{\cos y} = n$ and $\frac{\sin x}{\sin y} = m$, what is the value of $(m^2 - n^2)\sin^2 y$?

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20. If

$x\cos 60^\circ + y\cos 0^\circ = 3$ and $4x\sin 30^\circ - y\cot 45^\circ = 2,$

then what is the value of x ?

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21. In $\Delta PQR, \angle Q = 90^\circ$. If $\angle P = \alpha, \angle R = \beta, PQ = 3$ and $QR = 4$, then find the value of $\tan \beta$.

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22. If $\tan^2 45^\circ - \cos^2 60^\circ = x \sin 45^\circ \cos 45^\circ \tan 60^\circ$, then find the value of x.

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23. If $\sec(\alpha - \beta) = \sqrt{2}$ and $\sin(\alpha + \beta) = \frac{1}{2}$, then find the least positive values of α and β.

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24. If $\sin 27^\circ = 0.454$, then find the value of $\cos 243^\circ$.

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25. If $\tan A + \sin A = p$ and $\tan A - \sin A = q$, then which one of the following is correct ?

A. $p^2 + q^2 = 4\sqrt{pq}$

B. $p^2 - q^2 = 4\sqrt{pq}$

C. $p^2 - q^2 = \sqrt{pq}$

D. $p^2 + q^2 = \sqrt{pq}$

Answer: B

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26. If $\cos\theta \geq \frac{1}{2}$ in the first quardrant, which one of the followings is correct ?

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

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

C. $\theta \leq \frac{\pi}{6}$

D. $\theta \leq \frac{\pi}{6}$

Answer: A

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27. If $A = \sin^4\theta + \cos^4\theta$, then which one of the followings is correct?

A. $0 < A < \frac{1}{2}$

B. $0 < A \leq \frac{3}{2}$

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

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

Answer: C

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28. If $(1 + \tan A)(1 + \tan B) = 2$, then $\tan(A + B) =$

A. -1

B. 0

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

D. 1

Answer: D

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29. Write 'true' or 'false' :

$$\sec\theta = \frac{2xy}{x^2 + y^2}$$

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30. Write 'true' or 'false' :

$$\sin\theta = \frac{x^2 + y^2}{2xy}$$

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31. Fill in the blanks :

If $\sin^4 A + \sin^2 A = 1$, then $\cot^4 A + \cot^2 A =$ _____ .

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32. Fill in the blanks :

$\tan\frac{\pi}{16}\tan\frac{3\pi}{16}\tan\frac{5\pi}{16}\tan\frac{7\pi}{16} =$ _____ .

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33. Fill in the blanks :

$\tan\theta = \sqrt{3}, \cos\theta = -\frac{1}{2}$ and $0^\circ < \theta < 360^\circ$, then $\theta =$

_____ .

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34. If θ lies in the fourth quadrant and $\sec\theta = \frac{5}{3}$, then the value of $\frac{6\tan\theta + 5\cos\theta}{5\cot\theta + \text{cosec}\theta}$.

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35. If $\cos(A - B) = \frac{1}{2}$ and $\cot(A + B) = \sqrt{3}$, then find the least positive value A and B.

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36. If n be an integer, then find the value of $\tan\left\{\frac{n\pi}{2}+(-1)^n.\frac{\pi}{4}\right\}$.

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37. Find the least value of $\left(2\sin^2\theta+3\cos^2\theta\right)$.

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38. If $\cos\theta+\sec\theta=\sqrt{3}$, then prove that $\cos^3\theta+\sec^3\theta=0$.

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39. If $3\sin\theta + 4\cos\theta = 5$, then prove that $\sin\theta = \frac{3}{5}$.

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40. If $\sin\theta + \text{cosec}\theta = 2$, then prove that $\sin^7\theta + \text{cosec}^7\theta = 2$.

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

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42. If $(a^2 - b^2)\sin\theta + 2ab\cos\theta - (a^2 + b^2) = 0$, then prove that $\tan\theta = \frac{1}{2}\left(\frac{a}{b} - \frac{b}{a}\right)$.

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43. Prove that $\tan\theta + \sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}} = \sec\theta$.

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

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45. Prove that $\frac{\tan\theta}{\sec\theta-1}+\frac{\tan\theta}{\sec\theta+1}=2\text{cosec}\theta.$

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46. Prove that $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}}+\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}=2\ \ \text{cosec}\theta.$

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47. Prove that $\frac{\sin A+\sin B}{\cos B-\cos A}=\frac{\cos A+\cos B}{\sin A-\sin B}.$

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48. Prove that $\frac{\sec\theta-\tan\theta+1}{\sec\theta+\tan\theta+1}=\frac{1-\sin\theta}{\cos\theta}.$

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49. Prove that $\frac{1}{\operatorname{cosec}\alpha - \cot\alpha} - \frac{1}{\sin\alpha} = \frac{1}{\sin\alpha} - \frac{1}{\operatorname{cosec}\alpha + \cot\alpha}$.

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50. If $\operatorname{cosec}\theta - \sin\theta = m^3$ and $\sec\theta - \cos\theta = n^3$, then prove that $m^2n^2\left(m^2 + n^2\right) = 1$.

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51. eliminate

$\theta : a_1 \sec\theta + b_1 \tan\theta + c_1 = 0, a_2 \sec\theta + b_2 \tan\theta + c_2 = 0.$

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52. If $\tan\theta = \frac{a}{b}$, then find the value of $\frac{\sin\theta}{\cos^8\theta} + \frac{\cos\theta}{\sin^8\theta}$.

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53. If $a^2\sec^2\alpha - b^2\tan^2\alpha = c^2$, then prove that $\sin\alpha = \pm\sqrt{\frac{c^2-a^2}{c^2-b^2}}$.

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54. If $\tan\theta = k$, then show that $\sec\theta + \tan^3\theta\operatorname{cosec}\theta = \left(1+k^2\right)^{\frac{3}{2}}$.

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55. If $\tan^2\theta = 1 - e^2$, then prove that $\sec\theta + \tan^3\theta \operatorname{cosec}\theta = \left(2 - e^2\right)^{\frac{3}{2}}$.

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56. If $\operatorname{cosec}\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$, then prove that $\left(m^2 n\right)^{\frac{2}{3}} + \left(mn^2\right)^{\frac{2}{3}} = 1$.

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57. If $a\sin x = b\cos x = \dfrac{2c\tan x}{1 - \tan^2 x}$, then prove that $\left(a^2 - b^2\right)^2 = 4c^2\left(a^2 + b^2\right)$.

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58. If $\frac{\sin\alpha - \cos\alpha}{\sin\alpha + \cos\alpha} = \tan\theta$, then prove that $\sin \propto + \cos \propto = \pm\sqrt{2}\cos\theta.$

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59. If $\frac{\cos^4\alpha}{\cos^2\beta} + \frac{\sin^4\alpha}{\sin^2\beta} = 1$, then provet that $\frac{\cos^4\beta}{\cos^2\alpha} + \frac{\sin^4\beta}{\sin^2\alpha} = 1.$

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60. If $u_n = \sin^n\alpha + \cos^n\alpha$, then prove that $2u_6 - 3u_4 + 1 = 0.$

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61. If θ be a positive acute angle and $\tan\theta = \frac{a}{b}$, then find the value of $\frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}$.

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62. 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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63. If $k\tan\theta = \tan k\theta$, then prove that $\frac{\sin^2 k\theta}{\sin^2\theta} = \frac{k^2}{(k^2-1)\sin^2\theta + 1}$.

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64. If

$c\cos^3\theta + 3c\cos\theta\sin^2\theta = m$ and $c\sin^3\theta + 3c\cos^2\theta\sin\theta = n$

, then prove that $(m+n)^{\frac{2}{3}} + (m-n)^{\frac{2}{3}} = 2c^{\frac{2}{3}}$.

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65. If $x = r\cos\theta\cos\phi, y = r\cos\theta\sin\phi, z = r\sin\theta,$ then prove that $x^2 + y^2 + z^2 = r^2$.

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66. If $x = a\sec\theta\cos\phi, y = b\sec\theta\sin\phi$ and $z = c\tan\theta,$ then prove that

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2} = 1.$$

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