MATHS

BOOKS - VIKRAM PUBLICATION (ANDHRA PUBLICATION)

TRIGONOMETRIC RATIOS UPTO TRANSFORMATIONS

Solved Problems

1. Find the values of

$\sin \frac{5\pi}{3}$

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2. Find the value of

(ii) $\tan(855^\circ)$

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3. Find the value of $\sec\left(13\frac{\pi}{3}\right)$

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4. Simplify $\cot\left(\theta - \frac{13\pi}{2}\right)$

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5. Simplify $\tan\left(-23\frac{\pi}{3}\right)$

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6. Find the value of $\sin^2\frac{\pi}{10} + \sin^2\frac{4\pi}{10} + \sin^2\frac{6\pi}{10} + \sin^2\frac{9\pi}{10}$.

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7. IF $\sin\theta = \frac{4}{5}$ and θ is not in the first quadrant, find the value of $\cos\theta$.

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8. If $\sec\theta + \tan\theta = 2/3$, then value of $\sin\theta$ and determine the quadrant in which θ lies .

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9. S.T$\cot.\frac{\pi}{16}.\cot.\frac{2\pi}{16}.\cot.\frac{3\pi}{16}\ldots..\cot.\frac{7\pi}{16} = 1$

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10. If $3\sin A + 4\cos A = 5$, then find the value of $4\sin\theta - 3\cos\theta$.

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

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12. Find the value of $2\left(\sin^6\theta + \cos^6\theta\right) - 3\left(\sin^4\theta + \cos^4\theta\right)$

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13. Prove that $(\tan\theta + \cot\theta)^2 = \sec^2\theta + \operatorname{cosec}^2\theta = \sec^2\theta.\ \operatorname{cosec}^2\theta.$

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14. If $\cos\theta > 0, \tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then show that $m^2 - n^2 = 4\sqrt{mn}$

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15. If $\tan 20^\circ = \lambda$ then show that $\frac{\tan 160^\circ - \tan 110^\circ}{1 + \tan 160^\circ . \tan 110^\circ} = \frac{1 - \lambda^2}{2\lambda}$.

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16. Find the values of

$\sin 75^\circ, \cos 75^\circ, \tan 75^\circ$ and $\cot 75^\circ$.

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17. If $0 < A, B < 90^\circ, \cos A = \frac{5}{13}$ and $\sin B = \frac{4}{5}$ then find $\sin(A + B)$.

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18. Prove that $\sin^2 52\frac{1}{2} - \sin^2 22\frac{1}{2}$.

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19. Prove that $\tan 70^\circ - \tan 20^\circ = 2\tan 50^\circ$.

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20. If $A + B = \frac{\pi}{4}$, then prove that $(1 + \tan A)(1 + \tan B) = 2$.

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21. If $A + B = \pi/4$, then prove that

$(\cot A - 1)(\cot B - 1) = 2$

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22. If $\sin = \frac{1}{\sqrt{10}}, \sin\beta = \frac{1}{\sqrt{5}}$ and α, β are acute, show that $\alpha + \beta = \pi/4$

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23. If $\sin A = \frac{12}{13}, \cos B = \frac{3}{5}$ and neither A nor B is in the first quadrant, then find the quadrant in which A+B lies.

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24. Find Tan $\left(\frac{\pi}{4} + A\right)$ in terms of Tan A

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25. Find $\cot\left(\frac{\pi}{4} + A\right)$ in terms of Cot A

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26. Prove that $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \cot 36^\circ$

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27. Show that $\cos 42^\circ + \cos 78^\circ + \cos 162^\circ = 0$

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28. Expres $\sqrt{3}\sin 0 + \cos 0$ as a sine of an angle .

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29. Prove that $\sin^2\theta + \sin^2\left(\theta + \frac{\pi}{3}\right) + \sin^2\left(\theta - \frac{\pi}{3}\right) = \frac{3}{2}$

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30. If A, B, C are angles of a triangle and if none of them is equal to $\frac{\pi}{2}$, then prove that

$\tan A + \tan B + \tan C = \tan A \tan B \tan C$

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31. If ABC are angle of a triangle then prove that $\cot A \cot B + \cot B \cot C + \cot C \cos tA = 1$

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32. In a triangle ABC, If $\cot A + \cot B + \cot C = \sqrt{3},$ then show that the triangle is equilateral.

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33. Find the values of

$\sin 22\frac{1_\circ}{2}$

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34. Find the values of

$\cos 22\frac{1_\circ}{2}$

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35. Find the values of

$\tan 22\frac{1}{2}^{\circ}$

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36. Find the values of

$\cot 22\frac{1}{2}^{\circ}$

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37. Find the values of

$\sin 67\frac{1}{2}^{\circ}$

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38. Find the values of

$$\cos\left(67\frac{1}{2}\right)^{\circ}$$

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39. Find the values of

$$\tan\left(67\frac{1}{2}\right)^{\circ}$$

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40. Find the values of

$$\cot\left(67\frac{1}{2}\right)^{\circ}$$

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41. Simplify $\frac{1-\cos 2\theta}{\sin 2\theta}$

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42. If $\cos A = \sqrt{\frac{\sqrt{2}+1}{2\sqrt{2}}}$, find the value of $\cos 2A$

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43. If $\cos\theta = \frac{-5}{13}$ and $\frac{\pi}{2} < \theta < \pi$, find the value of $\sin 2\theta$

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44. For what values of x in the first quadrant $\frac{2\tan x}{1-\tan^2 x}$ is positive ?

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45. If $\cos 0 = \frac{-3}{5}$ and $\pi < 0 < \frac{3\pi}{2}$, find the value of $\tan\theta/2$

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46. If A is not an intergral multiple of $\pi/2$, prove that $\tan A + \cot A = 2\text{cosec}2A$

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47. If A is not an integral multiple of $\frac{\pi}{2}$, prove that

(i) $\tan A + \cot A = 2\cos ec2A$

(ii) cot A - tan A = 2cot 2A`

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48. If A is not an intergral multiple of $\pi/2$, prove that $\tan A + \cot A = 2\text{cosec}2A$

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49. If A is not an integral multiple of $\frac{\pi}{2}$, prove that

(i) $\tan A + \cot A = 2\cos ec2A$

(ii) cot A - tan A = 2cot 2A`

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50. IF θ is not an integral muliple of $\frac{\pi}{2}$, prove that

$\tan\theta + 2\tan 2\theta + 4\tan 4\theta + 8\cot 8\theta = \cot\theta$

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51. For $A \in R$, P.T (i) $\sin A \sin\left(\frac{\pi}{3} + A\right)\sin\left(\frac{\pi}{3} - A\right) = \frac{1}{4}\sin 3A$ (ii)

$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = 3/16$

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52. Show that $\cos A \cos\left(\frac{\pi}{3} + A\right)\cos\left(\frac{\pi}{3} - A\right) = \frac{1}{4}\cos 3A$ Hence deduce that $\cos.\frac{\pi}{9}\cos.\frac{2\pi}{9}\cos.\frac{4\pi}{9} = \frac{1}{8}$

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53. For $A \in R$, prove that

$$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$$

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54. For $A \in R$, prove that

$$\cos \frac{\pi}{9} . \cos \frac{2\pi}{9} . \cos \frac{3\pi}{9} . \cos \frac{4\pi}{9} = \frac{1}{16}$$

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55. Prove that $\tan A . (\tan 60^\circ + A) . \tan(60^\circ - A) = \tan 3A$ and hence find the value of $\tan 6^\circ \tan 42^\circ \tan 66^\circ \tan 78^\circ$.

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56. For $\alpha, \beta \in R$, prove that

$$(\cos \alpha + \cos \beta)^2 + (\sin \alpha + \sin \beta)^2 = 4 \cos^2 . \frac{(\alpha - \beta)}{2}$$

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57. If α, β are solutions of $a\cos\theta + b\sin\theta = c$ where a, b, $c \in R$ and $a^2 + b^2 > 0, \cos\alpha \neq \cos\beta, \sin\alpha \neq \sin\beta$ then prove that

$$\sin\alpha + \sin\beta = \frac{2bc}{a^2 + b^2}$$

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58. $\dfrac{\sin\theta + \sin 2\theta}{1 + \cos\theta + \cos 2\theta}$

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59. $\sin^4\dfrac{\pi}{8} + \sin^4\dfrac{3\pi}{8} + \sin^4\dfrac{5\pi}{8} + \sin^4\dfrac{7\pi}{8} =$

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60. If none of 2A and 3A is an odd multiple of $\frac{\pi}{2}$, then prove that $\tan 3A.\tan 2A.\tan A = \tan 3A - \tan 2A - \tan A.$

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61. Prove that $\sin 78^\circ + \cos 132^\circ = \frac{\sqrt{5}-1}{4}.$

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62. Prove that $\sin 21^\circ \cos 9^\circ - \cos 84^\circ \cos 6^\circ = \frac{1}{4}.$

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63. Find the value of $\sin 34^\circ + \cos 64^\circ - \cos 4^\circ$

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64. Prove that $\cos^2 76^\circ + \cos^2 16^\circ - \cos 76^\circ \cos 16^\circ = \frac{3}{4}$

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65. If $a, b, \neq 0$ and $\sin x + \sin y = a$ and $\cos x + \cos y = b$, find two values of

$\tan\left(\frac{x+y}{2}\right)$

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66. $a \neq 0 \neq b, \sin x + \sin y = a, \cos x + \cos y = b$ అయితే 1) $\frac{\sin(x-y)}{2}$ విలువను a, b లలోకనుక్కోండి.

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67. Prove that $\cos 12^\circ + \cos 84^\circ + \cos 132^\circ + \cos 156^\circ = -1/2$

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68. ప్రతి $\theta \in R$ కి,

$4\sin 5\theta/2\cos 3\theta/2\cos 3\theta = \sin\theta - \sin 2\theta + \sin 4\theta + \sin 7\theta$ అని చూపండి.

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69. If none of A,B, A+B is an integral multiple of π, then prove that

$$\frac{1-\cos A+\cos B-\cos(A+B)}{1+\cos A-\cos B-\cos(A+B)} = \tan.\frac{A}{2}\cot.\frac{B}{2}$$

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70. For any $\alpha \in R$, prove that

$$\cos^2\left(\alpha-\frac{\pi}{4}\right)+\cos^2\left(\alpha+\frac{\pi}{12}\right)-\cos^2\left(\alpha-\frac{\pi}{12}\right)=\frac{1}{2}$$

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71. Suppose that $\alpha - \beta$ is not an odd multiple of $\frac{\pi}{2}, m \in R - \{0, -1\}$ an $\frac{\sin(\alpha+\beta)}{\cos(\alpha-\beta)} = \frac{1-m}{1+m}$. Then show that $\tan\left(\frac{\pi}{4} - \alpha\right) = m \tan\left(\frac{\pi}{4} + \beta\right)$

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72. If A, B, C are the angles of a triangle, prove that

$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

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73. If A, B, C are angles of a triangle , prove that

$\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C$

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74. IF A,B,C are angles of a triangle , Prove that $\cos 2A + \cos 2B + \cos 2C = -4\cos A \cos B \cos C - 1$

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75. If A, B, C are angles of a triangle , prove that $\cos 2A + \cos 2B - \cos 2C = 1 - 4\sin A \sin B \cos C$

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76. If A, B, C are angles in a triangle , then prove that $\sin A + \sin B + \sin C = 4\cos.\frac{A}{2}\cos.\frac{B}{2}\cos.\frac{C}{2}$

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77. If A,B,C are angles in a triangle , then prove that $\cos A + \cos B + \cos C = 1 + 4\sin.\frac{A}{2}\sin.\frac{B}{2}\sin.\frac{C}{2}$

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78. If $A+B+C=\frac{\pi}{2}$, then prove that $\sin^2 A+\sin^2 B+\sin^2 C=1-2A\sin B\sin C.$

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79. If $A+B+C=\frac{\pi}{2}$, then show that $\sin 2A+\sin 2B+\sin 2C=4\cos A\cos B\cos C$

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80. If $A+B+C=\frac{3\pi}{2}$, prove that $\cos 2A+\cos 2B+\cos 2C=1-4\sin A\sin B\sin C.$

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81. If A, B, C are angles of a triangle, then prove that

$$\sin^2\frac{A}{2}+\sin^2\frac{B}{2}-\sin^2\frac{C}{2}=1-2\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}.$$

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82. If $A+B+C=180^\circ$ then prove that

$$\sin A/2+\sin B/2+\sin\frac{C}{2}$$
$$=1+4\sin\left(\frac{\pi-A}{4}\right)\sin\left(\frac{\pi-B}{4}\right)\cos\left(\frac{\pi-C}{4}\right)$$

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83. If $A+B+C=0$, then prove that

$$\cos^2 A+\cos^2 B+\cos^2 C=1+2\cos A\cos B\cos C$$

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84. If A+B+C = 2S , then

P.T

$$\cos(S-A)+\cos(S-B)+\cos(S-C)+\cos S = 4\cos.\frac{A}{2}\cos.\frac{B}{2}\cos.\frac{C}{2}$$

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Exercise 6 A

1. Convert the following into simplest form

(i) $\tan(\theta - 14\pi)$

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2. Convert the following into simplest form

(ii) $\cot\left(\frac{21\pi}{2} - \theta\right)$

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3. Convert the following into simplest form

(iii) $\cos ec(5\pi + \theta)$

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4. Convert the following into simplest form

(iv) $\sec(4\pi - \theta)$

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5. Find the value of each of the following.

$\sin(-405^\circ)$

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6. Find the value of each of the following.

$\cos\left(-\frac{7\pi}{2}\right)$?

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7. Find the value of each of the following.

$\sec(2100^\circ)$

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8. Find the value of each of the following.

$\cot(-315^\circ)$

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9. Evaluate $\cos^2 45^\circ + \cos^2 135^\circ + \cos^2 225^\circ + \cos^2 315^\circ$.

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10. $\sin^2 \frac{2\pi}{3} + \cos^2 \frac{5\pi}{6} - \tan^2 \frac{3\pi}{4} =$

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11. Evaluate.

$\cos 225^\circ - \sin 225^\circ + \tan 495^\circ - \cot 495^\circ$

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12. Evaluate

(iv) $(\cos\theta - \sin\theta)$ if (a) $\theta = \frac{7\pi}{4}$ (b) $\theta = \frac{11\pi}{3}$

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13. IF $\sin\theta = -\frac{1}{3}$ and θ does not lie in the 3^{rd} quadrant, find the value of $\cos\theta$ and $\cot\theta$

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14. If $\cos\theta = t(0 < t < 1)$ and θ does not lies in the first quadrent , find $\sin\theta$ and $\tan\theta$.

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15. Find $\sin 330^\circ . \cos 120^\circ + \cos 210^\circ . \sin 300^\circ$

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16. If $\cos ec\theta + \cot\theta = 1/3$, then find $\cos\theta$ and determine the quadrant in which θ lies.

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17. If $\sin\alpha + \text{cosec}\alpha = 2$, find value of $\sin^n\alpha + \text{cosec}^n\alpha, n \in Z$.

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18. If $\sec\theta + \tan\theta = 5$, then find $\sin\theta$ and determine the quadrant in which θ lies.

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19. Prove that $\sin 780^\circ \sin 480^\circ + \cos 240^\circ . \cos 300^\circ = \frac{1}{2}$

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20. Show that

$$\cot . \frac{\pi}{20} . \cot . \frac{3\pi}{20} . \cot . \frac{5\pi}{20} . \cot . \frac{7\pi}{20} . \cot . \frac{9\pi}{20} = 1$$

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21. Simplify.

$$\frac{\sigma\tau v\left(-\frac{11\pi}{3}\right)\tau\alpha v\left(\frac{35\pi}{6}\right)\sigma\varepsilon\chi\left(-\frac{7\pi}{3}\right)}{\chi o\tau\left(\frac{5\pi}{4}\right)\chi o\tau\varepsilon\chi\left(\frac{7\pi}{4}\right)\chi o\sigma\left(\frac{17\pi}{6}\right)}$$

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22. If $\tan 20^\circ = p$ then prove that = $\frac{\tan 610^\circ + \tan 700^\circ}{\tan 560^\circ - \tan 470^\circ} = \frac{1 - p^2}{1 + p^2}$

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23. If α, β are complementry angles such that $b \sin \alpha = a$, the find the value of $(\sin \alpha \cos \beta - \cos \alpha \sin \beta)$.

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24. If $\cos A = \cos B = -\frac{1}{2}$ and A does not lie in the second quadrant and B does not lie in the third quadrant, then find the value of $\frac{4 \sin B - 3 \tan A}{\tan B + \sin A}$

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25. If $8\tan A = -15$ and $25\sin B = -7$ and neither A nor B is in the fourth quadrant, then show that $\sin A\cos B + \cos A\sin B = \frac{-304}{425}$.

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26. If A, B, C, D are angles of a cyclic quadrilateral then P.T $\sin A - \sin C = \sin D - \sin B$.

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27. If A,B,C,D are the angles of a cyclic quadrilateral then $\cos A + \cos B + \cos C + \cos D =$

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28. If $3\sin A + 5\cos A = 5$, then show that $5\sin A - 3\cos A = \pm 3$.

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29. If $\tan^2\theta = (1 - e^2)$ show that $\sec\theta + \tan^3.\ \text{cosec}\theta = (2 - e^2)^{3/2}$.

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30. Prove the following.

$(1 + \cot\theta - \cos ec\theta)(1 + \tan\theta + \sec\theta) = 2.$

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31. కింది వాటిని నిరూపించండి.

$3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4(\sin^6\theta + \cos^6\theta) = 13$

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32. కింది వాటిని నిరూపించండి.

$(\sin\theta + \cos ec\theta)^2 + (\cos\theta + \sec\theta)^2 - (\tan^2\theta + \cot^2\theta) = 7$

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33. కింది వాటిని నిరూపించంది.

$$\left(\cos^4\alpha + 2\cos^2\alpha\left[1 - \frac{1}{\sec^2\alpha}\right] = 1 - \sin^4\alpha\right)$$

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34. కింది వాటిని నిరూపించంది. $\frac{(1+\sin\theta-\cos\theta)^2}{(1+\sin\theta+\cos\theta)^2} = 1 - \cos\theta/1 + \cos\theta$

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35. If $\frac{2\sigma\tau\upsilon\theta}{(1+\chi o\sigma\theta+\sigma\tau\upsilon\theta)} = x$, then find the value of $\frac{(1-\chi o\sigma\theta+\sigma\tau\upsilon\theta)}{(1+\sigma\tau\upsilon\theta)}$

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36. Eliminating θ from the following

(i) $x = a\cos^3\theta \quad y = b\sin^3\theta$

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37. కింది వాటిలో θను లోపింప చేయండి. i) $x = a\cos^4\theta, y = b\sin^4\theta$

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38. Eliminating θ from the following

(ii) $x = a(\sec\theta + \tan\theta), y = b(\sec\theta - \tan\theta)$

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39. (ii) Eliminate $'\theta'$ from the equations

$x = \tan\theta + \cot\theta, y = \sec\theta - \cos\theta$

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Exercise 6 B

1. Find the periods for the given functions.

$\cos(3x + 5) + 7$

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2. Find the period of $\tan 5x$.

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3. Find the periods of the following functions

$\sin(5x + 3)$

$\sin(x + 11)$

$5 \sin 4x$

$\dfrac{\cos(4x + 9)}{5}$

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4. Find the periods for the given functions.

$|\sin x|$

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5. Find the period of $\tan\left(x + 4x + 9x + \ldots\ldots + n^2 x\right)$ (n any positive integer)

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6. Find a sine function whose period is $2/3$.

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7. Find a cosine function whose period is 7.

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8. Sketch the graph of tanx between 0 and $\pi / 4$

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9. Sketch the graph of $\cos 2x$ in the intervals $|0, \pi]$

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10. Sketch the graph of $\sin 2x$ in the intervals $(0, \pi)$

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11. Sketch the graph of $\sin x$ in the intervals $|-\pi, \pi]$

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12. Sketch the graph of $\cos^2 x$ in the intervals $[0, \pi]$

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Exercise 6 C

1. $\cos 100^\circ . \cos 40^\circ + \sin 100^\circ . \sin 40^\circ$ =.....

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2. Find the values of the following :

$\tan\left(\frac{\pi}{4} + \theta\right) . \tan\left(\frac{\pi}{4} - \theta\right)$

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3. Find the values of the following :

$\tan 75^\circ + \cot 75^\circ$

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4. Simplify the following :

$\sin 1140^\circ \cos 390^\circ - \cos 780^\circ \sin 750^\circ$

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5. Express $\frac{\left(\sqrt{3}\cos 25^\circ + \sin 25^\circ\right)}{2}$ as a sine of an angle.

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6. Express $(\cos\theta - \sin\theta)$ as a cosine of an angle.

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7. Express $\tan\theta$ in terms of $\tan\alpha$, if $\sin(\theta+\alpha) = \cos(\theta+\alpha)$.

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8. If $\tan\theta = \dfrac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$ and θ is the third quadrant find θ.

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9. If $0^\circ < A, B < 90^\circ$, such that $\cos A = \dfrac{5}{13}, \sin B = \dfrac{4}{5}$, find $\sin(A - B)$.

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10. Find $\tan 20^\circ + \tan 40^\circ + \sqrt{3}\tan 20^\circ \tan 40^\circ$.

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11. Find the value of $\tan 56^\circ - \tan 11^\circ - \tan 56^\circ . \tan 11^\circ$.

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12. Evaluate $\sum \frac{\sin(A+B)\sin(A-B)}{\cos^2 A \cos^2 B}$: if non of $\cos A$, $\cos B$, $\cos C$ is zero.

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13. Evaluate $\sum \frac{\sigma\tau v(X-A)}{\sigma\tau vX\sigma\tau vA}$ if none of $\sin A$, $\sin B$, $\sin C$ is zero.

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14. Prove that

$\cos 35^\circ + \cos 85^\circ + \cos 155^\circ = 0$

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15. Prove that $\tan 72^\circ = \tan 18^\circ + 2\tan 54^\circ$.

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16. Prove that

$$\sin 750^\circ \cos 480^\circ + \cos 120^\circ \cos 60^\circ = \frac{-1}{2}$$

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17. Prove that $\cos A + \cos\left(\frac{4\pi}{3} - A\right) + \cos\left(\frac{4\pi}{3} + A\right) = 0.$

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18. Prove that $\cos^2\theta + \cos^2\left(\frac{2\pi}{3} + \theta\right) + \cos^2\left(\frac{2\pi}{3} - \theta\right) = \frac{3}{2}$

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19. Find the value of $\sin^2 82\frac{1}{2} - \sin^2 22\frac{1}{2}.$

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20. Find the value of $\cos^2 112\frac{1}{2} - \sin^2 52\frac{1}{2}$.

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21. Evaluate

$$\sin^2\left(\frac{\pi}{8}+\frac{\theta}{2}\right) - \sin^2\left(\frac{\pi}{8}-\frac{\theta}{2}\right)$$

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22. Find the value of $\cos^2 52\frac{1^\circ}{2} - \sin^2 22\frac{1^\circ}{2}$

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23. Find the maximum and minimum value of $f(x) = 3\cos x + 4\sin x$

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24. Find the minimum and maximum values of

$\sin 2x - \cos 2x$

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25. Find the range of $7\cos x - 24\sin x + 5$

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26. Find the range of $13\cos x + 3\sqrt{3}\sin x - 4$

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27. If $\cos\alpha = \frac{-3}{5}$ and $\sin\beta = \frac{7}{25}$ where $\frac{\pi}{2} < \alpha < \pi$ and $0 < \beta < \frac{\pi}{2}$ then find the values of $\tan(\alpha+\beta)$ and $\sin(\alpha+\beta)$.

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28. If $0 < A < B < \frac{\pi}{4}$ and $\sin(A+B) = \frac{24}{25}$ and $\cos(A-B) = \frac{4}{5}$, then find the value of $\tan 2A$.

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29. If $A+B, A$ are acute angles such that $\sin(A+B) = \frac{24}{25}$ and $\tan A = \frac{3}{4}$, then find the value of $\cos B$.

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30. If $\tan\alpha - \tan\beta = m$ and $\cot\alpha - \cot\beta = n$, then prove that $\cot(\alpha-\beta) = \frac{1}{m} - \frac{1}{n}$

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31. If $\tan(\alpha-\beta) = \frac{7}{24}$ and $\tan\alpha = \frac{4}{3}$, where α and β are in the first quadrant prove that $\alpha + \beta = \pi/2$

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32. Find the expansion of $\sin(A+B-C)$.

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33. Find the expansion of $\cos(A-B-C)$.

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34. In a ΔABC, A is obtuse. If $\sin A = \frac{3}{5}$ and $\sin B = \frac{5}{13}$, then show that $\sin C = \frac{16}{65}$

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35. If $\frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)} = \frac{a+b}{a-b}$, then prove that a $\tan\beta = b\tan\alpha$.

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36. If $A - B = \frac{3\pi}{4}$, that show that $(1 - \tan A)(1 + \tan B) = 2$

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37. If $A + B + C = \pi/2$ then show that $\cot A + \cot B + \cot C = \cot A \cot B \cot C$

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38. If A + B + C = 90° and if none of A,B,C is an odd multipl of 90° then P.T. Tan A Tan B + Tan B Tan C + Tan C Tan A = 1 and hence S.T.

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39. Prove that $\sin^2\alpha + \cos^2(\alpha + \beta) + 2\sin\alpha \sin\beta \cos(\alpha + \beta)$ is independent of α.

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40. Prove that

$\cos^2(\alpha-\beta)+\cos^2\beta-2\cos(\alpha-\beta)\cos\alpha\cos\beta$ is independent of β.

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Exercise 6 D

1. Simplify

$$\frac{\sin 2\theta}{1+\cos 2\theta}$$

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2. Simplify

$$\frac{3\chi o\sigma\theta+\chi o\sigma 3\theta}{3\sigma\tau\upsilon\theta-\sigma\tau\upsilon 3\theta}$$

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3. Evaluate $6\sin 20^\circ - 8\sin^3 20^\circ$.

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4. Find the value of $\cos^2 72^\circ - \sin^2 54^\circ$.

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5. Find the value of $\sin^2 42^\circ - \sin^2 12^\circ$.

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6. Express $\frac{\sin 4\theta}{\sin \theta}$ in terms of $\cos^3 \theta, \cos \theta$.

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7. Express $\cos^6 A + \sin^6 A$ interms of $\sin 2A$.

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8. Express $\frac{1-\cos\theta+\sin\theta}{1+\cos\theta+\sin\theta}$ in terms of $\tan\theta/2$.

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9. If $\sin\alpha=\frac{3}{5}$, where $\frac{\pi}{2}<\alpha<\pi$, evaluate $\cos 3\alpha$ and $\tan 2\alpha$.

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10. If $\cos A=\frac{7}{25}$ and $\frac{3\pi}{2}<A<2\pi$, then find the value of $\cot A/2$.

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11. If $0<\theta<\frac{\pi}{8}$, show that $\sqrt{2+\sqrt{2+\sqrt{2+2\cos 4\theta}}}=2\cos$ (theta//2)`

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12. Find the extreme values of $\cos 2x + \cos^2 x$

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13. Find the extreme values of $3\sin^2 x + 5\cos^2 x$.

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14. If $a \leq \cos\theta + 3\sqrt{2}\sin\left[\theta + \frac{\pi}{4}\right] + 6 \leq b$, find largest value of a and smallest value of b.

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15. Find the periods for the following functions.

$\cos^4 x$

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16. Find the periods for the following functions.

$$2\sin\left[\frac{\pi\xi}{4}\right] + 3\cos\left[\frac{\pi\xi}{3}\right]$$

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17. Find the periods for the following functions.

$$\sin^2 x + 2\cos^2 x$$

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18. Find the periods for the following functions.

$$2\sin\left[\frac{\pi}{4} + \xi\right]\cos x$$

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19. Find the periods for the following functions.

$$\frac{5\sigma\tau\upsilon\xi + 3\chi o\sigma\xi}{4\sigma\tau\upsilon 2\xi + 5\chi o\sigma\xi}$$

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20. If $0 < A < \pi/4$ and $\cos A = 4/5$, then find the values of $\sin 2A$ and $\cos 2A$

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21. For what values of A in the first quardrant, the expression $\frac{\cot^3 A - 3\cot A}{3\cot^2 A - 1}$ is positive?

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22. Prove that $\frac{\cos 3A + \sin 3A}{\cos A - \sin A} = 1 + 2\sin 2A.$

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23. If θ lies in third Quardrant and $\sin\theta = \frac{-4}{5}$. Find the values of $\text{cosec}\left(\frac{\theta}{2}\right)$ and $\tan\left(\frac{\theta}{2}\right)$

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24. If $90^\circ < \theta < 180^\circ, \cos\theta = -12/13,$ then $\sin 2\theta =$

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25. $\frac{\cos^3\theta - \cos 3\theta}{\cos\theta} + \frac{\sin^3\theta + \sin 3\theta}{\sin\theta} = 3$

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26. Show that $\cos A = \frac{\cos 3A}{2\cos 2A - 1}$. Hence find the value of $\cos 15^\circ$

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27. Show that $\sin A = \dfrac{\sin 3A}{1 + 2\cos 2A}$. Hence find the value of $\sin 15^\circ$.

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28. Prove that $\tan\alpha = \dfrac{\sigma\tau v 2\alpha}{1 + \chi o\sigma 2\alpha}$ and hence deduce the values of $\tan 15^\circ$ and $\tan 22\dfrac{1^\circ}{2}$.

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29. Show that $\dfrac{1}{\sin 10^\circ} - \dfrac{\sqrt{3}}{\cos 10^\circ} = 4.$

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30. Prove that $\sqrt{3}\text{cosec}20^\circ - \sec 20^\circ = 4.$

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31. $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ =$

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32. In a ΔABC, If $\tan.\frac{A}{2} = \frac{5}{6}$ and $\tan.\frac{B}{2} = \frac{20}{37}$, then show that $\tan\left(\frac{C}{2}\right) = \frac{2}{5}$

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33. If $\cos\theta = \frac{5}{13}$ and $270^\circ < \theta < 360^\circ$, evaluate $\sin(\theta/2)$ and $\cos(\theta/2)$

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34. If $180^\circ < \theta < 270^\circ$ and $\sin\theta = \frac{-4}{5}$ calculate $\sin\left[\frac{\theta}{2}\right]$ and $\cos\left[\frac{\theta}{2}\right]$

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35. $\cos^2\frac{\pi}{8}+\cos^2 3\frac{\pi}{8}+\cos^2 5\frac{\pi}{8}+\cos^2 7\frac{\pi}{8}=2$ అని చూపండి.

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36. Show that $\cos^4\frac{\pi}{8}+\cos^4\frac{3\pi}{8}+\cos^4\frac{5\pi}{8}+\cos^4\frac{7\pi}{8}=\frac{3}{2}$

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37. $\tan x+\tan\left(x+\frac{\pi}{3}\right)+\tan\left(x+2\frac{\pi}{3}\right)=3$ అయితే , $\tan 3x=1$ అని చూపండి.

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38. Show that $\sin\frac{\pi}{5}.\sin\frac{2\pi}{5}.\sin\frac{3\pi}{5}.\sin\frac{4\pi}{5}=\frac{5}{16}.$

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39. $\cos^2\left(\frac{\pi}{10}\right)+\cos^2\left(2\frac{\pi}{5}\right)+\cos^2\left(3\frac{\pi}{5}\right)+\cos^2\left(9\frac{\pi}{10}\right)=2$ అని చూపండి.

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40. Prove that $\left(1+\cos\frac{\pi}{10}\right)\left(1+\cos\frac{3\pi}{10}\right)\left(1+\cos\frac{7\pi}{10}\right)\left(1+\cos\frac{9\pi}{10}\right)=\frac{1}{16}$

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41. Prove that $\cos\frac{2\pi}{7}.\cos\frac{4\pi}{7}.\cos\frac{8\pi}{7}=\frac{1}{8}.$

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42. If $\cos\alpha=\frac{3}{5}$ and $\cos\beta=\frac{5}{13}$ and α,β are acute angles, then prove that

(a) $\sin^2\left(\frac{\alpha-\beta}{2}\right)=\frac{1}{65}$ and

(b) $\cos^2\left(\frac{\alpha+\beta}{2}\right)=\frac{16}{65}$

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43. If cos alpha=3/5 and cos beta = 5/13 and alpha , beta are acute angles , then prove that $\cos^2\left(\frac{\alpha+\beta}{2}\right)=\frac{16}{65}$

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44. If A is not an integral multiple of (π), prove that $\cos A\cos 2A\cos 4A\cos 8A=\frac{\sin 16A}{16\sin A}$ Hence deduce that $\cos.\frac{2\pi}{15}.\cos.\frac{4\pi}{15}.\cos.\frac{8\pi}{18}.\cos.\frac{16\pi}{15}=\frac{1}{16}$

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Exercise 6 E

1. Prove that $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$

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2. Prove that $\frac{\sin 70^\circ - \cos 40^\circ}{\cos 50^\circ - \sin 20^\circ} = \frac{1}{\sqrt{3}}$.

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3. $\cos 55^\circ + \cos 65^\circ + \cos 175^\circ = 0$అని రుజువు చేయండి.

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4. Prove that $4(\cos 66^\circ + \sin 84^\circ) = \sqrt{3} + \sqrt{15}$.

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5. Prove that

$$\cos 20^\circ \cos 40^\circ - \sin 5^\circ \sin 25^\circ = \frac{\sqrt{3}+1}{4}$$

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6. Prove that $\cos 48^\circ . \cos 12^\circ = \frac{3+\sqrt{5}}{8}$.

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7. Prove that $\cos\theta + \cos\left[\frac{2\pi}{3}+\theta\right] + \cos\left[\frac{4\pi}{3}+\theta\right] = 0.$

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8. If $\sin x + \sin y = \frac{1}{4}, \cos x + \cos y = \frac{1}{3}$ then $\tan\left(\frac{x+y}{2}\right) =$

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9. $\sin x + \sin y = \frac{1}{4}$, $\cos x + \cos y = \frac{1}{3}$అయిలే ii) $\cot(x+y) = \frac{7}{24}$ అని చూపండి.

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10. Prove that

$4\cos 12^\circ \cos 48^\circ \cos 72^\circ = \cos 36^\circ$.

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11. $\sin 10^\circ + \sin 20^\circ + \sin 40^\circ + \sin 50^\circ - \sin 70^\circ - \sin 80^\circ =$

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12. If $\cos x + \cos y = \frac{4}{5}$ and $\cos x - \cos y = \frac{2}{7}$, then the value of $14\tan\left(\frac{x-y}{2}\right) + 5\cot\left(\frac{x+y}{2}\right)$

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13. If none of the denominators is zero, prove that.

$$\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^n+\left(\frac{\sin A-\sin B}{\cos A+\cos B}\right)^n=\begin{cases}2\cot^n\left(\frac{A-B}{2}\right) & \text{if } n\text{is eve}\\ 0 & \text{if } n\text{is odd}\end{cases}$$

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14. If $\sin A=\sin B$ and $coA=\cos B$ then A =

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15. $\dfrac{\sin(n+1)\alpha-\sin(n-1)\alpha}{\cos(n+1)\alpha+2\cos n\alpha+\cos(n-1)\alpha}=$

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16. If $\sec(\theta+\alpha)+\sec(\theta-\alpha)=2\sec\theta$ and $\cos\alpha\neq 1$, prove that $\cos\theta=\pm\sqrt{\cos\dfrac{\alpha}{2}}$

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17. If $\sin(y+z-x), \sin(z+x-y), \sin(x+y-z)$ are in A. P , then prove that $x, \tan y, \tan z$ are also in A.P.

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18. If x,y,z are non zero real numbers and if $x\cos\theta = y\cos\left(\theta+\frac{2\pi}{3}\right) = z\cos\left(\theta+\frac{4\pi}{3}\right)$ for some $\theta \in R$ then show that $xy+yz+zx=0$

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19. If $m\sin B = n\sin(2A+B)$ then show that $(m+n)\tan A = (m-n)\tan(A+B)$

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20. $\tan(A+B)=\lambda\tan(A-B)$ అయితే $(\lambda+1)\sin 2B=(\lambda-1)\sin 2A$ అని చూపండి.

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Exercise 6 F

1. If $A+B+C=\pi$ then prove that

$\sin 2A-\sin 2B+\sin 2C=4\cos A\sin B\cos C$

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2. If A, B, C are angles of a triangle , prove that

$\cos 2A-\cos 2B+\cos 2C=1-4\sin A\cos B\sin C$

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3. If A, B, C are angles in a triangle , prove that $\sin A + \sin B - \sin C = 4 \sin. \frac{A}{2} \sin. \frac{B}{2} \cos. \frac{C}{2}$

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4. IF A,B,C are angles in the triangle, then prove that

$\cos A + \cos B - \cos C = -1 + 4 \cos \frac{A}{2}. \cos \frac{B}{2}. \sin \frac{C}{2}$

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5. If A, B, C are angles in a triangle, then the

$\sin^2 A + \sin^2 B - \sin^2 C = 2 \sin A \sin B \cos C$

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6. If A, B, C are angles in a triangle , then prove that

$\cos^2 A + \cos^2 B - \cos^2 C = 1 - 2 \sin A \sin B \cos C.$

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7. If $A+B+C=\pi$, then prove that $\cos^2\left(\frac{A}{2}\right)+\cos^2\left(\frac{B}{2}\right)+\cos^2\left(\frac{C}{2}\right)=2\left(1+\sin.\frac{A}{2}\sin.\frac{B}{2}\sin.\frac{C}{2}\right)$

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8. If $A,B,C=\pi$, then prove that $\cos^2.\frac{A}{2}+\cos^2.\frac{C}{2}-\cos^2.\frac{C}{2}=2\left(\cos.\frac{A}{2}\cos.\frac{B}{2}\sin.\frac{C}{2}\right)$

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9. In triangle ABC, prove that $\cos.\frac{A}{2}+\cos.\frac{B}{2}+\cos.\frac{C}{2}=4\cos.\frac{\pi-A}{4}\cos.\frac{\pi-B}{4}\cos.\frac{\pi-C}{4}$

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10. In ΔABC, prove that

$$\cos.\frac{A}{2}+\cos.\frac{B}{2}-\cos.\frac{C}{2}=4\cos.\frac{\pi+A}{4}\cos.\frac{\pi+B}{4}\cos.\frac{\pi-C}{4}$$

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11. In triangle ABC , prove that

$$\sin.\frac{A}{2}+\sin.\frac{B}{2}-\sin.\frac{C}{2}=-1+4\cos.\frac{\pi-A}{4}\cos.\frac{\pi-B}{4}\sin.\frac{\pi-C}{4}$$

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12. If $A+B+C=\frac{\pi}{2}$, then prove that

$$\cos 2A+\cos 2B+\cos 2C=1+4\sin A\sin B\sin C.$$

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13. If $A+B+C=\frac{3\pi}{2}$, prove that

$$\cos^2 A+\cos^2 B-\cos^2 C=-2\cos A\cos B\sin C.$$

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14. If $A+B+C=270^\circ$ then show that

$\sin 2A+\sin 2B-\sin 2C=-4\sin A\sin B\cos C$

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15. If $A+B+C=270^\circ$ then show that

$\sin 2A+\sin 2B-\sin 2C=-4\sin A\sin B\cos C$

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16. If $A+B+C=0^\circ$ then prove that

$\sin A+\sin B-\sin C=-4\cos\frac{A}{2}\cos\frac{B}{2}\sin\frac{C}{2}$

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17. If $A+B+C+D=360^\circ$ then show that

$$\sin A-B+\sin C-\sin D=$$

$$-4\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A+D}{2}\right)\sin\left(\frac{A+C}{2}\right)$$

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18. If $A+B+C+D=360^\circ$, the prove that

$$\cos 2A+\cos 2B+\cos 2C+\cos 2D=4\cos(A+B)\cos(A+C)\cos(A+D$$

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19. If $A+B+C=2S$, then prove that

$$\sin(S-A)+\sin(S-B)+\sin C=4\cos\left(\frac{S-A}{2}\right)\cos\left(\frac{S-B}{2}\right)\frac{\sin C}{2}$$

.

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20. IF A+B+C=2S, then prove that

$$\cos(S-A)+\cos(S-B)+\cos C=-1+4\cos\frac{S-A}{2}\cos\frac{S-B}{2}\cos\frac{C}{2}$$

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