MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

TRIGNOMETRIC FUNCTIONS

Solved Examples

1. Convert 60° angle into radian.

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2. Convert $40^\circ, 20'$ into radians.

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3. Convert 11 radian into degree.

A. 600

B. 630

C. 660

D. 700

Answer: B

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4. Convert 6 radian into degree.

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5. The radius of a circle is 50 cm. Find the angle subtends by an arc of 22 cm length at the centerof the circle.

A. $25 degree 12 \text{ min}$

B. 25 degree 30 min

C. 30 degree 12 min

D. 35 degree 12 min

Answer: A

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6. A chord of a circle of diameter 30 cm is of length 15 cm. Find the length of mirror arc corresponding to this chord.

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7. Find the angle between the large hand and small hand of a clock at the time $4:30$.

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8. If tan A $= \frac{a}{b}$, then find the value of $\frac{\text{a sin A- b cos A}}{\text{a sin A} + \text{b cos A}}$.

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9. If sin A + cosec A= 2, then prove that: $\sin^n A + \text{cosec}^n A = 2$

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10. Prove the following identities:

$\sin^8\theta + \cos^8\theta = \left(\sin^2\theta - \cos^2\theta\right)\left(1 - 2\sin^2\theta\cos^2\theta\right)$

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

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12. Prove that:

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

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13. If $p = \frac{\sin A}{\sin B}$ and $q = \frac{\cos A}{\cos B}$

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14. If $\frac{\sin^4 \theta}{a} + \frac{\cos^4 \theta}{b} = \frac{1}{a+b}$ Prove that $\frac{\sin^8 \theta}{a^3} + \frac{\cos^8 \theta}{b^3} = \frac{1}{(a+b)^3}$

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15. If $\frac{\cos^4 A}{\cos^2 B} + \frac{\sin^4 A}{\sin^2 B} = 1$ then prove that

$$\sin^4 A + \sin^4 B = 2 \sin^2 A \sin^2 B \frac{\cos^4 B}{\cos^2 A} + \frac{\sin^4 B}{\sin^2 A} = 1$$

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16. If $\cot A = \frac{5}{12}$ and A lies in 3rd quadrant, then find the values of five other trignometric ratios.

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17. If $\sin A = -\frac{4}{5}$ and $\pi < A < \frac{3\pi}{2}$, find the value of $\frac{\cos ecA + \cot A}{\sec A - \tan A}$

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18. If $\sin A + \cos A = 0$ and A lies in 4th quadrant, find the values of $\sin A$ and $\cos A$.

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19. Prove that: $\sqrt{\frac{1-\sin A}{1+\sin A}} = \begin{cases} \sec A - \tan A & \text{if } -\frac{\pi}{2} < A < \frac{\pi}{2} \\ \tan A - \sec A & \text{if } \frac{\pi}{2} < A < \frac{3\pi}{2} \end{cases}$

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20. Find the values of of the following:

i) $\cos 135^\circ$

ii) $\sin(-780^\circ)$

iii) $\text{cosec} 1920^\circ$

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21. Find the values of the following :

i) $\tan \frac{19\pi}{3}$

ii) $\sec \frac{-22\pi}{3}$

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22. Evaluate: $\text{cosec}(-1410)^\circ$

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23. Evaluate: $\tan \frac{13\pi}{12}$

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24. Prove that:

i) $\sin 40^\circ \cos 50^\circ + \cos 40^\circ \sin 50^\circ = 1$

ii) $\cot(270^\circ - \theta)\cot(270^\circ + \theta)(\cot(540^\circ - \theta)\cot(540^\circ + \theta) = 1$

iii) $\frac{\cos \pi}{8} + \frac{\cos(3\pi)}{8} + \frac{\cos(5\pi)}{8} + \frac{\cos(7\pi)}{8} = 0$

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25. If A,B,C and D are the angles of cyclic quadrilateral, prove that:

i) $\cos A + \cos B + \cos C + \cos D$

ii) $\cos(180^\circ - A) + \cos(180^\circ + B) + \cos(180^\circ + C) - \sin(90^\circ)$

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26. Prove that: $\sin(-420^\circ)\cos 390^\circ + \cos(-660^\circ)\sin 330^\circ = -1$

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27. Find the values of $\sin 75^\circ$.

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28. Prove that:

$\cos(30^\circ - x) - \cos(30^\circ + x) = \sin x$

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29. If $\sin A = \frac{3}{5}, \cos B = -\frac{12}{13}$, where $A \in 0, \frac{\pi}{2}[, B \in]\pi, \frac{3\pi}{2}$,then evaluate the following:

i) $\sin(A - B)$

ii) $\cos(A - B)$

iii) $\tan(A + B)$

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30. Prove that:

$\sin(n+1)As \in (n+2)A + \cos(+1)A\cos(n+2)A = \cos A$

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31. If $\alpha and \beta$ are acute angles such that $tan\alpha = \frac{m}{m+1} and tan\beta = \frac{1}{2m+1}$, prove that $\alpha + \beta = \frac{\pi}{4}$.

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32. $0 < A, B < \frac{\pi}{4}, \cos(A+B) = \frac{4}{5}, \sin(A-B) = \frac{5}{13} \Rightarrow \tan 2A =$

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33. Prove that:

$$\tan\left(\frac{\pi}{4}+A\right).\tan\left(\frac{3\pi}{4}\right)+A=-1$$

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34. $\cos A+\cos(120^\circ+A)+\cos(120^\circ-A)=$

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35. Prove that $\cos^2\left(\frac{\pi}{8}-\frac{A}{2}\right)-\cos^2\left(\frac{\pi}{8}+\frac{A}{2}\right)$

$$\left[1-\sin^2\left(\frac{\pi}{8}-\frac{A}{2}\right)\right]-\left[1-\sin^2\left(\frac{\pi}{8}+\frac{A}{2}\right)\right]$$

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

$$=\sin\left\{\left(\frac{\pi}{8}+\frac{A}{2}\right)+\left(\frac{\pi}{8}-\frac{A}{2}\right)\right\}\sin\left\{\left(\frac{\pi}{8}+\frac{A}{2}\right)-\left(\frac{\pi}{8}-\frac{A}{2}\right)\right\}$$

$s=\frac{\sin\pi}{4}.\sin A=\frac{1}{\sqrt{2}}\sin A$=RHS Hence Proved.

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36. Prove that:

$\tan 7A - \tan 5A - \tan 2A = \tan 7A \tan 5A \tan 2A$

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37. Prove that: $tan70^0 = tan20^0 + 2tan50^0$.

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38. Prove that $\tan 56^\circ = \dfrac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ}$

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39. If $\dfrac{\sin(x+y)}{\sin(x-y)} = \dfrac{a+b}{a-b}$, then show that $\dfrac{\tan x}{\tan y} = \dfrac{a}{b}$.

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40. If $A + B = \frac{\pi}{4}$, prove that:

$(1 + \tan A)(1 + \tan B) = 2$

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41. If $\tan\theta + \tan(60^\circ + \theta) + \tan(120^\circ + \theta) = 3$, Prove that:

$$\frac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta} = 1$$

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42. Prove that:

$$\frac{\sin(A - B)}{\sin A \sin B} = \frac{\sin A \cos B - \cos A \sin B}{\sin A \sin B}$$

$$\frac{\sin A \cos B}{\sin A \sin B} - \frac{\cos A \sin B}{\sin C \sin A}$$

$$= \cot B - \cot A - \cot C$$

=0 = RHS Hence Proved.

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43. Prove that:

$$\frac{\cos(A-B)+\sin A-\cos(A+B)}{\sin(A+B)+\cos A-\sin(A-B)}=\tan A$$

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44. Prove that:

$$\cot A\cot 2A-\cot 2A\cot 3A-\cot 3A\cot A=1$$

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45. Prove that:

$$\cot 2A+\tan A=\cot A-\cot 2A$$

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46. Prove that:

$$s\in^2 A=\cos^2(A-B)+\cos^2 B-2\cos(A-B)\cos A\cos B\cdot$$

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47. If $\tan A = x \tan B$, prove that:

$(x+1)\sin(A-B) = (x-1)\sin(A+B)$

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48. If $\alpha and \beta$ are the solutions of the equation $a tan\theta + b sec\theta = c$, then show that $\tan(\alpha+\beta) = \dfrac{2ac}{a^2-c^2}$

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49. If $\sin A + \sin B = a$ and $\cos A + \cos B = b$ then prove that $\sin(A+B) = \dfrac{2ab}{a^2+b^2}$ and $\cos(A+B) = \dfrac{b^2-a^2}{a^2+b^2}$

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50. Express each of the following as a sum of difference of sine and cosine.

i) $2\sin 2A\cos A$

ii) $2\cos 5A\sin 2A$

iii) $2\cos 4A\cos A$

iv) $2\sin 3A\sin A$

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51. Find the value of

$$\sin 37\left(\frac{1}{2}\right).\sin 7\left(\frac{1}{2}\right)^{\circ}$$

A. $\frac{\sqrt{3}-\sqrt{2}}{4}$

B. $\frac{\sqrt{3}+\sqrt{2}}{4}$

C. $\frac{\sqrt{3}-\sqrt{2}}{2}$

D. None of these

Answer: A

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52. Prove that:

$$\sin(45^\circ - A) = \frac{1}{2}\cos 2A$$

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53. Prove that:

$$\sec(45^\circ + A)\sec(45^\circ - A) = 2\sec A$$

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54. Prove that:

$$\sin A.\ \sin(60^\circ + A).\ \sin(60^\circ - A) = \frac{1}{4}\sin A$$

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55. Prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$

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56. Prove that:

$\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$

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57. Prove that:

$\sin(A+2B)\sin A - \sin B \sin(2A+B)\sin B = \sin(A+B)\sin(A-B)$

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58. find

$\cos 175^\circ + \cos 65^\circ + \cos 55^\circ$

A. 1

B. 0

C. 2

D. none of these

Answer: B

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59. Prove that:

$$\frac{\cos\pi}{10} - \frac{\sin\pi}{10} = \sqrt{2}\frac{\sin(3\pi)}{20}$$

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60. Prove that:

$$\frac{\cos(60^\circ - A) + \sin(30^\circ - A)}{\cos(30^\circ - A) - \sin(60^\circ - A)} = \cot A$$

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61.

$$\frac{\cos 7A + \cos 5A}{\sin 7A - \sin 5A} =$$

A. tanA

B. cotA

C. sinA

D. None of these

Answer: B

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62.

$$\frac{\cos 5A + \cos 3A + \cos A}{\sin 5A - \sin 3A + \sin A} =$$

A. cotA

B. tanA

C. sinA

D. CosA

Answer: A

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63. Prove that:

$$\frac{\sin(A-C)+2\sin A+\sin(A+C)}{\sin(B-C)+2\sin B+\sin(B+C)}=\frac{\sin A}{\sin B}$$

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64. Prove that:

$$(\cos A+\cos B)^2+(\sin A+\sin B)^2=4\frac{\cos^2(A-B)}{2}$$

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65. Prove that:

$$\frac{\sin 3A\cos 4A-\sin A\cos 2A}{\sin 4A\sin A+\cos 6A\cos A}=\tan 2A$$

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66. Prove that:

$(\sin 5a - \sin 7A + \sin 8A - \sin 4a)(\cos 4A + \cos 7A - \cos 5A - \cos 8A) =$

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67. If n. $\sin(A + 2B) = \sin A$, then prove that: $\tan(A + B) = \frac{1+n}{1-n}.\tan B$

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68. If $\cos A = \frac{24}{25}$, evaluate the following, given that $0 < A < \frac{\pi}{2}$.

i) sin2A

ii) cos 2A

iii) tan 2A

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69. If $\sin A = -\frac{4}{5}$ and A lies in 3rd quadrant, find the values of $\sin 2A$

A. $\sin 2A = -\frac{4}{5}$

B. $\sin 2A = --\frac{4}{5}$

C. $\sin 2A = \frac{24}{25}$

D. $\sin 2A = \frac{7}{25}$

Answer: C

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70. Find the value of $\cos 15^\circ$ with the help of $\cos 2A = 2\cos^2 A - 1$

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71. Prove that:

$(i)\ \frac{\sin 2A}{1+\cos 2A} = \tan A$

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

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

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72. Prove that :

$\cos^2 A + \cos^2\left(A+\dfrac{\pi}{3}\right) + \cos^2\left(A-\dfrac{\pi}{3}\right)$

$= \dfrac{1}{2}\left[2\cos^2 A + 2\cos^2(A+60^\circ) + 2\cos^2(A-60^\circ)\right]$

$= \dfrac{1}{2}[1+\cos 2A + 1 + \cos(2A+120^\circ) + 1 + \cos(2A-120^\circ)]$

$\dfrac{1}{2}[3+\cos 2A + \cos(2A+120^\circ) + \cos(2A-120^\circ)]$

$\dfrac{1}{2}\left[3+\cos 2A + 2\dfrac{\cos(2A+120^\circ+2A-120^\circ)}{2}.\dfrac{\cos(2A+120^\circ-2A+\right.$

$= \dfrac{1}{2}[3+\cos 2A + 2\cos 2A\cos 120^\circ]$

$= \dfrac{1}{2}[3\cos 2A + 2\cos 2A\cos(90^\circ+30^\circ)]$

$= \dfrac{1}{2}\left[3+\cos 2A - 2.\cos 2A.\left(\dfrac{1}{2}\right)\right]$

$= \dfrac{1}{2}(3+\cos 2A - \cos 2A)$

$= \dfrac{3}{2}$ = RHS Hence Proved.

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73. Prove that:

$$\frac{\sec 4A - 1}{\sec 8A - 1} = \tan 2A.\ \cot 8A$$

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74. Prove that:

$$\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A} = \frac{\tan A}{2}$$

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75. Prove that:

$$\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$$

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76. Prove that:

$$\frac{\cot A}{2} - \frac{\tan A}{2} = \frac{\frac{\cos A}{2}}{\frac{\sin A}{2}} - \frac{\frac{\sin A}{2}}{\frac{\cos A}{2}}$$

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

$$= \frac{\cos A}{\frac{1}{2}\cdot\left(2\frac{\sin A}{2}\frac{\cos A}{2}\right)}$$

$$= \frac{2\cos A}{\sin A} = 2\cot A = \text{RHS. Hence Proved.}$$

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77. Prove that:

$$\frac{1+\sin 2A}{1-\sin 2A} = \tan^2\left(\frac{\pi}{4}+A\right)$$

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78. Prove that

$$\frac{\cos^4\pi}{8} + \frac{\cos^4(3\pi)}{8} + \frac{\cos^4(5\pi)}{8} + \frac{\cos^4(7\pi)}{8} = \frac{3}{2}$$

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79. $\tan(x+100^\circ)=\tan(x+50^\circ)\tan x\tan(x-50^\circ)$ Determine the smallest positive value of x

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80. Prove that:

$\sin 5A=5\sin A-20\sin^3 A+16\sin^5 A$

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81. Prove that:

$$\frac{\cos^3 A-\cos 3A}{\cos A}+\frac{\sin^3 A+\sin 3A}{\sin A}=3$$

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82. Prove that:

$$\cos^2 48^\circ-\sin^2 12^\circ=\frac{\sqrt{5}+1}{8}$$

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83. Prove that:

$$\sin 12^\circ \sin 48^\circ \sin 54^\circ = \frac{1}{8}$$

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84. Prove that:

$$\sin 6^\circ \sin 42^\circ \sin 66^\circ \sin 78^\circ = \frac{1}{16}$$

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85. In ΔABC, prove that:

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

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86. In ΔABC, prove that:

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

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87. In ΔABC, prove that:

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

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88. In ΔABC, Prove that:

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

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89. In ΔABC, prove that:

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

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

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

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91. In ΔABC, prove that:

$\sin^2 A + \sin^2 B + \sin^2 C$

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

$= 2 - \cos(A + B)\cos(A - B) - \cos^2 C$

$= 2 - \cos(180^\circ - C)\cos(A - B) - \cos C.\, coc\{180^\circ - (A + B)\}$

$= 2 + \cos C.\, \cos(A - B) + \cos(A + B)]$

$= 2 + \cos C.2 \cos A \cos B$

=RHS Hence proved.

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92. In ΔABC, prove that

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

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93. In ΔABC,

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

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94. If $x + y + z = xyz$, prove by trignometry that:

$$\frac{2x}{1-x^2} + \frac{2y}{1-y^2} + \frac{2z}{1-z^2} = \frac{2x}{1-x^2} \cdot \frac{2y}{1-y^2} \cdot \frac{2z}{1-z^2}$$

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95. Find the general values of θ which satisfy the following equations:

i) $\sin\theta = \frac{1}{\sqrt{2}}$, ii) $\cos\theta = \frac{1}{2}$, (iii) $\tan\theta = \sqrt{3}$, iv) $\cot\theta = 1$, v)

$\sec\theta = \frac{2}{\sqrt{3}}$, vi) $\operatorname{cosec}\theta = \sqrt{2}$

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96. Find the general solutions from the following equations:

i) $\sin\theta = -\frac{1}{2}$

ii) $\cos = -\frac{\sqrt{3}}{2}$

$\tan\theta = -\sqrt{3}$

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97. Find the general values of θ from the following equations:

i) $\sin^2\theta = \frac{3}{4}$

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

iii) $\tan^2\theta = \frac{1}{3}$

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98. Solve: $\sec 2\theta = \dfrac{2}{\sqrt{3}}$

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99. Solve: $\cos 2\theta = \cos^2 \theta$

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100. Solve: $\tan^3 \theta - 3\tan \theta = 0$

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101. Solve: $\cos 3\theta + 2\cos \theta = 0$

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102. Solve the equation $4\cos^2 \theta + \sqrt{3} = 2\left(\sqrt{3} + 1\right)\cos \theta.$

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103. Solve the equation

$\tan\theta - \cot\theta = \operatorname{cosec}\theta$

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104. Solve:

$\cos^2\theta - \sin\theta\cos\theta - \frac{1}{2} = 0$

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105. Solve:

$\sin^2\theta + 2\cos\theta + \frac{1}{4} = 0$

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106. Solve:

$3\tan(\theta - 15^\circ) = \tan(\theta + 15^\circ)$

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107. Solve: $\sin 3\alpha = 4\sin\alpha.\sin(\theta + \alpha).\sin(\theta - \alpha)$ where $\alpha \neq n\pi, n \in I$

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108. Solve:

$\sec\theta - 1 = \left(\sqrt{2} - 1\right)\tan\theta$

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109. Solve: $\tan 5\theta = \tan 3\theta$

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110. Solve: $\tan 3\theta + \tan \theta = 0$

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111. Solve: $\cos 3\theta + \cos \theta = 0$

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112. Solve: $\sin 3\theta = \sin 2\theta$

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113. Find the general value of θ from the equation $\sin p\theta = \cos q\theta$.

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114. Find the general value of θ from the equation $\tan 4\theta = \cot 3\theta$.

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115. Solve: $\sin 3\theta + \cos 2\theta = 0$

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116. Solve $\tan 2x = -\cot\left(x + \frac{\pi}{3}\right)$

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117. Find the general value of θ from the equation $\cos\theta + \cos 2\theta + \cos 3\theta = 0$.

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118. Find the general value of θ from the equation $\sin\alpha + \sin(\alpha+\theta) + \sin(\alpha+2\theta) = 0.$

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119. $\sin^2 n\theta - \sin^2(n-1)\theta = \sin^2\theta$ where n is constant and $n \neq 0, 1$

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120. Solve:

$\sin 2\theta + \sin 4\theta = \cos\theta + \cos 3\theta$

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121. Find the general value of θ from the equation $\tan\theta + \tan 2\theta + \tan 3\theta = \tan\theta \cdot \tan 2\theta \cdot \tan 3\theta.$

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122. Find the general value of θ from the equation $\tan\theta + \tan 3\theta = 2\tan 2\theta.$

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123. Solve: $\cot\frac{\theta}{2} - \cot\theta = \cos ec\frac{\theta}{2}$

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124. Solve: $\cos 3x + \cos x - \cos 2x = 0$

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125. Find the general value of θ from the equaion $\sqrt{3}\sin\theta + \cos\theta = 1$

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126. Solve the equation $4\cos\theta + 5\sin\theta = 5$ if $\tan 51^\circ 21' = \frac{5}{4}$

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127. if $(1+\tan\theta)(1+\tan\theta) = 2$, find the general value of $(\theta + \phi)$

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128. Find the general value of θ from the equation $\sin\theta + \cos\theta = \sqrt{2}\cos A$.

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129. Find the general value of θ from the equation $\tan\theta - \sqrt{2}\sec\theta = 1$.

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130. In ΔABC, a=16, b=12 and $\angle B = 30^\circ$, find sinA.

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131. The angles of ΔABC are in A.P. If $a : b = \sqrt{2} : \sqrt{3}$, find the value of $\angle A$.

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132. The sides of a triangle ABC are in the ratio $3 : 4 : 5$. If the perimeter of triangle ABC is 60, then its lengths of sides are:

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133. In ΔABC, prove that: $b \sin B - c \sin C = a \sin(B - C)$

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134. In ΔABC, $\frac{\tan A}{2} = \frac{5}{6}$ and $\frac{\tan B}{2} = \frac{20}{37}$, prove that a,b,c are in A.P.

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135. In ΔABC, prove that: $\frac{a-b}{c} = \frac{\frac{\sin(A-B)}{2}}{\frac{\cos C}{2}}$

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136. For any triangle ABC, prove that $\frac{a+b}{c} = \frac{\cos\left(\frac{A-B}{2}\right)}{\frac{\sin C}{2}}$

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137. In ΔABC, a=9,b=8 and c=4, prove that:

$\cos B - 2\cos C = -\frac{4}{3}$

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138. In ΔABC, a=7, b=5 and c=8, then find the value of cos2B.

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139. In ΔABC, prove that:

$$a(\cos C - \cos B) = 2(b-c)\frac{\cos^2 A}{2}$$

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140. In ΔABC, prove that:

$$(b+c)\frac{\cos(B+C)}{2} = a\frac{\cos(B-C)}{2}$$

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141. In ΔABC, a=4, b=5 and c=6, prove that the greatest angle is twice the least angle.

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142. In a triangle $ABC, \angle C = 60^0$, then prove that: $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$.

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143. In ΔABC, prove that:

$$\sin\left(A + \frac{B}{2}\right) \cdot \frac{\cos B}{2} = \frac{c+a}{a+b} \frac{\cos C}{2} \cdot \frac{\cos(A-B)}{2}$$

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144. In ΔABC, prove that:

$$\frac{b-c}{a} = \frac{\frac{\tan B}{2} - \frac{\tan C}{2}}{\frac{\tan B}{2} + \frac{\tan C}{2}}$$

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145. In ΔABC, prove that:

$a(b\cos C-(c)\cos B)=b^2-c^2$

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146. In ΔABC, prove that:

$a\sin(B-C)+b\sin(C-A)+c\sin A-B)=0$

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147. In a ΔABC, prove that :

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

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148. In ΔABC, a^2, b^2, c^2 are in A.P. Prove that cotA, cotB, cotC are also in A.P.

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149. In ΔABC, $a = 2$, $b = \sqrt{6}$ and $c = \sqrt{3} + 1$, find $\angle A$.

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150. In ΔABC, prove that:

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

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151. Prove that:

$$\left(b^2 + c^2 - a^2\right)\tan A = \left(c^2 + a^2 - b^2\right)\tan B$$

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152. Prove that in $\triangle ABC, a^3\cos(B-C)+b^3\cos(C-A)+c^3\cos(A-B)=3abc$

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153. In $\Delta ABC, a\frac{\cos^2 C}{2}+\cos^2\frac{A}{2}=\frac{3b}{2}$, then prove that the sides of ΔABC, are in A.P.

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154. In ΔABC, prove that:

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

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155. The angle of elevation of the highest point P of a vertical tower at point A on the horizontal ground is 45°. The height of tower is 'h'/ The

angle of a elevation of the tower becomes 60° from B on moving a distance 'd' at 30° angle from the horizontal. Prove that: $d = h\left(\sqrt{3} - 1\right)$

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156. A lamp post is situated at the middle point M of the side AC of a triangular plot of ABC with $BC = 7m,\ CA = 8\ and\ AB = 9m.$ Lamp post subtends an angle of 15^0 at the point B. determine the height of the lamp post.

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157. Two ships move from a point at the same time. First ship moves at the speed of 24 km/hr at 45° angle from north to east and second ship moves at the speed of 32 km/hr at 75° angle from south to east. Find the distance between them after 3 hours.

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158. Two trees, A and B are on the same side of a river. From a point C in the river the distance of the trees A and B is 250m and 300m, respectively. If the angle C is $45o$, find the distance between the trees (use $\sqrt{2} = 1.44$).

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159. In ΔABC, a =125, b=62 and c=123, find the value of sinB.

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160. In ΔABC, a=3,b=4,c=2, then prove that: $\frac{\cos A}{2} = \frac{3\sqrt{6}}{8}$

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161. In ΔABC, prove that:

$$\frac{a+b+c}{a-b+c} = \frac{\cot A}{2}\frac{\cot C}{2}$$

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162. In ΔABC, prove that:

$$a\frac{\sin^2 C}{2} + c\frac{\sin^2 A}{2} = \frac{a+c-d}{2}$$

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163. In ΔABC, prove that:

$$a\left(\frac{\cos^2 C}{3} - \frac{\cos^2 B}{2}\right) = (b-c).\frac{\cos^2 A}{2}$$

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164. In ΔABC, prove that:

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

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165. If a,b,c are in A.P, then prove that:

$$2\frac{\sin A}{2}\cdot\frac{\sin C}{2}=\frac{\sin B}{2}$$

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166. In ΔABC, a =125, b=62 and c=123, find the value of sinB.

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167. Find the area of ΔABC, if a=10, $b=7\sqrt{2}$m and $\sqrt{c}=45^\circ$

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168. Find the area of ΔABC, if a=6m and $\angle B$and $\angle C$ are respectively 30° and 90°.

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169. In any ABC, prove that: $= \frac{a^2 - b}{2} \frac{\sin A \sin B}{\sin(A - B)}$

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170. In ΔABC, prove that: $\cot \frac{A}{2} + \cot \frac{B}{2} + \cot \frac{C}{2} = \frac{(a + b + c)^2}{4\Delta}$

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Exercises 3 A

1. Convert the following angles into radians: a) 30° b) 135° c) 90°

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2. Convert the following angles into degrees: a) 2 radian b) 22 radian

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3. i) The radius of a circle is 40cm. Find the angle subtend by an arc of 22 cm at the center of circle in degrees.

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4. Find the anlge between the large hand and small hand of a clock at time $8:20$.

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5. Find the radius of a circle in which an arc of 37.4 cm subtends an angle of 60° at the center.

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6. The angles of a triangle are in A.P. The ratio of the smallest angle in an grades and largest angle in radian is $40:\pi$. Find all angles of the triangle

in degrees.

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7. A wheel makes 180 revoluations in 1 minutes. Through how many radians does it turn in 1 second ?

A. 4π

B. 5π

C. 6π

D. 7π

Answer: C

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8. The angles in a triangle are in A.P. and the ratio of the smallest angle in degrees to the greatest angle in radians is $60:\phi$ Find the angle of the

triangle in degrees and radians.

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9. The moons distance from the earth is $360,000 kms$ and its diameter subtends an angle of 31 at the eye of the observer. Find the diameter of the moon.

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10. A driver moves at a speed of 36 km/hr in a circle of radius 200 m. Find the angle in degree moved by the driver in 6 sec.

A. 16

B. 17

C. 18

D. 19

Answer: B

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11. The interior angles of a polygon are in A.P. The smallest anlge is $\left(\frac{2\pi}{3}\right)^c$ and common difference is 5°. Find the number of sides in the polygon.

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Exercises 3 B

1. Prove that:

i) $\sqrt{\frac{1-\cos A}{1+\cos A}} = \text{cosec}A - \cot A$

ii) $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A - \tan A$

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2. Prove that:

i) $\cot^2 A + \cot^4 A = \text{cosec}^4 A - \text{cosec}^2 A$

ii) $\tan^2 A + \tan^4 A = \sec^4 A - \sec^2 A$

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3. Prove that:

$(1 - \tan A)^2 + (1 - \cot A)^2 = (\sec A - \text{cosec} A)^2$

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4. i) Prove that: $\frac{1 + \tan^2 A}{1 - \tan^2 A} \times \left(2\cos^2 A - 1\right) = 1$

ii) Prove that:

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

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5. Prove that: $\sin A(1+\tan A)+\cos A(1+\cot A)=\sec A+\operatorname{cosec} A$

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6. Prove that: $\frac{1+\cos A+\sin A}{1+\cos A-\sin A}=\frac{1+\sin A}{\cos A}$

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7. Prove that:

$2\sec^2 A-\sec^4 A-2\operatorname{cosec}^2 A+\operatorname{cosec}^4 A=\cot^4 A-\tan^4 A$

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8. Prove that:

$1-\frac{\sin^2 A}{1+\cot A}-\frac{\cos^2 A}{1+\tan A}=\sin A.\cos A$

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9. i) Prove that: $\frac{\cot^2 A}{(1-\operatorname{cosec} A)^2} = \frac{1+\sin A}{1-\sin A}$

ii) Prove that: $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} = \sin\theta + \cos\theta$

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10. Prove that:

$(\sec A \sec B + \tan A \tan B)^2 - (\sec A \tan B + \tan A \sec B)^2 = 1$

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11. Prove that:

$3(\sin A - \cos A)^4 + 6(\sin A + \cos A)^2 + 4\left(\sin^6 A + \cos^6 A\right) = 13$

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12. i) Prove that: $\left[\frac{1-\sin A}{1-\sec A} - \frac{1+\sin A}{1+\sec A}\right] = 2\cot A(\cos A - \operatorname{cosec} A)$

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13. If $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$, then prove that:

$\cos\theta + \sin\theta = \sqrt{2}\cos\theta$

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14. If $a\sin^2\theta + b\cos^2\theta = c$, then prove that $\tan^2\theta = \frac{c-b}{a-c}$

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15. i) If $a\cos\theta + b\sin\theta = m$ and $a\sin\theta - b\cos\theta = n$, then prove that:

$a^2 + b^2 = m^2 + n^2$

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16. If $a\cos\theta - b\sin\theta = c$, then prove that:

$a\sin\theta + b\cos\theta = \pm\sqrt{a^2 + b^2 - c^2}$

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17. If $\cot\theta(1+\sin\theta)=4m$ and $\cot\theta(1-\sin\theta)=4n$, then prove that: $(m^2-n^2)^2=mn$

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18. If $\tan\theta+\sin\theta=m$ and $\tan\theta-\sin\theta=n$, then prove that: $m^2-n^2=4\sqrt{mn}$

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19. If $a\cos\theta+b\sin\theta=c$, then prove that:

$a\sin\theta-b\cos\theta=\pm\sqrt{a^2+b^2-c^2}$

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20. If

$(1-\sin A)(1-\sin B)(1-\sin C)=(1+\sin A)(1+\sin B)(1+\sin C)$

, then prove that each side is equal to $\pm\cos A\cos B\cos C$.

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21. If $\tan^2\theta=1-m^2$, then show that:

$\sec\theta+\tan^3\theta.\,\text{cosec}\theta=\left(2-m^2\right)^{3/2}$

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22. If $\sin\theta+\cos\theta=x$, then show that:

$\sin^6\theta+\cos^6\theta=1-\frac{3}{4}\left(x^2-1\right)^2$

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Exercises 3 C

1. If $\sin A = -\frac{3}{5}$ and A lies in third quadrant, find the remaining trignometric ratios.

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2. If $\cos A = \frac{5}{13}$ and A lies in fourth quadrant, find the remaining trignometric ratios.

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3. If $\tan A = -\frac{12}{5}$ and A lies in second quadrant, find the remaining trignometric ratios.

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4. If $\cot A = \frac{4}{3}$ and A lies in third quadrant, find the remaining trignometric ratios.

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5. If $\sec A = -\frac{17}{8}$ and A lies in second quadrant, find the remaining trignometric ratios.

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6. If $\text{cosec} A = \frac{5}{4}$ and A lies in first quadrant, find the remaining trignometric ratios.

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7. If $\text{cosec} A = -\sqrt{2}$ and $\frac{3\pi}{2} < A < 2\pi$, find the value of $\frac{\tan A + \text{cosec} A + 1}{\cot A - \text{cosecA} + 1}$.

A. 1

B. -1

C. 0

D. None of these

Answer: B

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8. If $\sec A = -2$ and A lies in third quadrant, find the value of $\left(4\cot^2 A - 3\sin^2 A\right)$.

A. $\frac{11}{12}$

B. $-\frac{11}{12}$

C. 1

D. None of these

Answer: B

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9. Prove that:

$$\sqrt{\frac{1+\cos A}{1-\cos A}} = \begin{matrix} \operatorname{cosec} A + \cot A & \text{if} \quad 0 < A < \pi \\ -\operatorname{cosec} A - \cot A & \text{if} \quad \pi < A < 2\pi \end{matrix}$$

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10. Evaluate the following:

i) $\tan 135^\circ$

ii) $\sec 150^\circ$

iii) $\cot 240^\circ$

iv) $\operatorname{cosec} 1950^\circ$

v) $\cos(-1125^\circ)$

vi) $\tan(-1470^\circ)$

vii) $\tan 1710^\circ$ viii) $\cot(-1770^\circ)$

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11. Prove that: $\tan 10^\circ \tan 20^\circ \tan 70^\circ \tan 80^\circ = 1$

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12. Prove that:

$$\frac{\cos 40^\circ + \cos 50^\circ}{\sin 40^\circ + \sin 50^\circ} = 1$$

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13. Prove that:

$$\text{cosec}(270^\circ - A)\text{cosec}(270^\circ + A) + \cot(270^\circ - A)\cot(270^\circ + A) = 1$$

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14. Prove that:

$$\frac{\sin \pi}{7} + \frac{\sin(2\pi)}{7} + \frac{\sin(8\pi)}{7} + \frac{\sin(9\pi)}{7} = 0$$

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15. Evaluate the following:

i) $\cos 120^\circ \sin 390^\circ + \cos 330^\circ \cos 150^\circ$

ii) $\frac{\sin^2(3\pi)}{4} + \frac{\cos^2 \pi}{4} + \frac{\sec^2 \pi}{3}$

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16. Prove that:

$$\frac{\cos(\pi + A)\cos(-A)}{\sin(\pi - A).\cos\left(\frac{\pi}{2} + A\right)} = \cot^2 A$$

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17. In equilibrium ABCD, prove thatL:

i) $\sin(A + B) + \sin(C + D) = 0$

ii) $\cos(A + D) - \cos(B + C) = 0$

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18. Find the value of x:

i) $x\cot(90^\circ+\theta)+\tan(90^\circ+\theta)\sin\theta+\operatorname{cosec}(90^\circ+\theta)=0$

ii) $\operatorname{cosec}(90^\circ+\theta)+x\cos\theta\cot(90^\circ+\theta)=\sin(90^\circ+\theta)$

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Exercises 3 D

1. Evaluate:

i) $\sin 48^\circ\cos 42^\circ+\cos 48^\circ\sin 42^\circ$

ii) $\cos 72^\circ\cos 12^\circ+\sin 72^\circ\sin 12^\circ$

ii) $\cos 72^\circ\cos 12^\circ+\sin 72^\circ\sin 12^\circ$

iii) $\dfrac{\tan 100^\circ+\tan 35^\circ}{1-\tan 100^\circ\tan 35^\circ}$

iv) $\sin A\cos(A-B)-\cos A\sin(A-B)$

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2. Evaluate: i) $\cos 75^\circ$, ii) $\cos 15^\circ$, iii) $\tan 75^\circ$, iv) $\tan 105^\circ$, v) $\sin 105^\circ$

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3. Prove that:

i) $\sin(A+B)\cos(A-B) - \cos(A+B)\sin(A-B) = \sin 2B$

ii)

$\cos(45^\circ - A)\cos(45^\circ - B) - \sin(45^\circ - A)\sin(45^\circ - B) = \sin(A+B)$

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4. If $\cos A = \frac{4}{3}$ and $\cos B = \frac{12}{13}$, then find the values of $\cos(A+B)$ and $\sin(A-B)$, where $\frac{3\pi}{2}$ lt A, B lt 2π.

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5. If $\tan A = 2, \sec B = -\frac{5}{3}$, where $\pi < A < \frac{3\pi}{2}, \frac{\pi}{2} < B < \pi$, then

i) Find the value of $\tan(A+B)$,

ii) find the quadrant in which (A+B) terminates.

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6. If $\cos A = -\frac{\sqrt{3}}{2}, \sin B = -\frac{5}{13}$, where $\frac{\pi}{2} < A < \pi, \frac{3\pi}{2} < B < 2\pi$, find the value of $\tan(A-B)$.

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7. If $\tan A = \frac{m}{m-1}$ and $\tan B = \frac{1}{2m-1}$, find the value of $(\tan A - B)$.

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8. If $\tan A = \frac{m}{m-1}$ and $\tan(B) = n$, find the values of $\tan 2A$ and $\tan 2B$.

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9. If $\tan A = m + 1$ and $\tan B = m - 1$, prove that $\tan(A - B) = \frac{2}{m^2}$.

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10. Prove that: $\frac{\tan\left(\frac{\pi}{4} + A\right)}{\tan\left(\frac{\pi}{4} - A\right)} = \left(\frac{1 + \tan A}{1 - \tan A}\right)^2$

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11. Prove that: $\cos\left(\frac{\pi}{4} + A\right) + \cos\left(\frac{\pi}{4} - A\right) = \sqrt{2}\cos A$

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12. Prove that:

$$\cos\left(\frac{3\pi}{4}+A\right)-\cos\left(\frac{3\pi}{4}-A\right)=-\sqrt{2}\sin A$$

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13. Prove that: $\sin^2\left(\frac{\pi}{8}+\frac{A}{2}\right)-\sin^2\left(\frac{\pi}{8}-\frac{A}{2}\right)=\frac{1}{\sqrt{2}}\sin A$

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14. Prove that:

$$\frac{\sin^2\pi}{8}+\frac{\sin^2(3\pi)}{8}+\frac{\sin^2(5\pi)}{8}+\frac{\sin^2(7\pi)}{8}=2$$

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15. Prove that:

$$\frac{\cos^2\pi}{8}+\frac{\cos^2(3\pi)}{8}+\frac{\cos^2(5\pi)}{8}+\frac{\cos^2(7\pi)}{8}=2$$

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16. Prove that: i) $\tan 36^\circ + \tan 9^\circ + \tan 36^\circ \tan 9^\circ = 1$

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17. Prove that:

$$\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \cot 53^\circ$$

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18. If $A - B = \frac{\pi}{4}$, then prove that:

$(1 + \tan A)$

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19. Prove that: $\frac{\cos(60^\circ - A) + \sin(30^\circ - A)}{\cos(30^\circ - A) - \sin(60^\circ - A)} = \cot A$

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20. i) If $A + B = \frac{\pi}{4}$ prove that: $(\cot A - 1)(\cot B - 1) = 2$

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21. Prove that:

$$\frac{\tan\left(\frac{\pi}{4} + A\right) + \tan\left(\frac{\pi}{4} - A\right)}{\tan\left(\frac{\pi}{4} + A\right) - \tan\left(\frac{\pi}{4} - A\right)} = \text{cosec}2A$$

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22. Prove that:

$$\frac{\sin(A - B)}{\cos A \cos B} + \frac{\sin(B - C)}{\cos B \cos c} + \frac{\sin(C - A)}{\cos C \cos A} = 0$$

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23. Prove that:

$$\sin A \sin(B - C) + \sin B \sin(C - A) + \sin C \sin(A - B) = 0$$

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24. Prove that:

$\cot 2A \cot 3A - \cot 3A \cot 5A - \cot 5A \cot 2A = 1$

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25. Prove that:

$\cot A - \cot 2A = \text{cosec} 2A$

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26. Prove that:

$\cos^2 A + \cos^2 B - 2\cos A \cos B \cos (A + B) = \sin^2 (A + B)$

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27. If $\tan B = \frac{n \sin A \cos A}{1 - n \sin^2 A}$, prove that:

$\tan(A - B) = (1 - n)\tan A$

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28. If 2tanB $+\cot B = \tan A$, prove that:

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

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29. i) If tan (A+B) = n tan (A-B), prove that: $\frac{n+1}{n-1} = \frac{\sin 2A}{\sin 2B}$

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30. If $A + B = 225^\circ$, prove that:

$\frac{\cot A}{1 + \cot A} \times \frac{\cot B}{1 + \cot B} = \frac{1}{2}$

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31. Prove that the value of $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right)$ lies between -7 and 7.

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32. Prove that:

$$\sin 2A + 2\sin 4A + \sin 6A = 4\cos^2 A.\ \sin 4A$$

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33. Prove that:

$$\frac{\sin 7A + \sin 5A + \sin 9A + \sin 3A}{\cos 3A + \cos 5A + \cos 7A + \cos 9A} = \tan 6A$$

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34. Prove that:

$$\sin A + \sin 2A + \sin 4A + \sin 5A = 4\sin 3A.\ \frac{\cos A}{2}.\ \frac{\cos(3A)}{2}$$

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35. Prove that:

$$\frac{\cos 5A.\cos 8A - \cos 12A.\cos 9A}{\sin 8A.\cos 5A + \cos 12A.\sin 9A} = \tan 4A$$

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36. If $\cos A = k\cos(A - 2B)$, prove that:

$$\tan(A - B)\tan B = \frac{1-k}{1+k}$$

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37. If $\text{cosec}A + \sec A = \text{cosec}A + \sec B$, prove that:

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

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38. If $\frac{\sin(A+B)}{\cos(A-B)} = \frac{1-m}{1+m}$, then $\tan\left(\frac{\pi}{4}-A\right)\tan\left(\frac{\pi}{4}-B\right) = ?$

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Exercises 3 E

1. Express each of the following as a sum or difference of sine and cosine.

i) $2\sin 7A\cos 3A$, ii) $2\cos 5A\sin 3A$, iii) $2\cos 8A\cos 5A$, iv) $2\sin 6A\sin 4A$

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2. Evaluate: $\frac{\sin 521}{2^\circ}\frac{\cos 71}{2^\circ}$

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3. Prove that: $\cos(45^\circ + A)\cos\left(45^2 - A\right) = \frac{1}{2}\cos 2A$

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4. Prove that:

$$\cos A.\cos(60^\circ + A)\cos\left(60^2 - A\right) = \frac{1}{4}\cos 3A$$

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5. Prove that:

$$\sin A.\sin\left(60^2 + A\right).\sin(120^\circ + A) = \frac{1}{4}\sin 3A$$

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6. Prove that:

$$\tan\left(\frac{\pi}{3} - A\right).\tan\left(\frac{\pi}{3} + A\right) = \frac{2\cos 2A + 1}{2\cos 2A - 1}$$

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7. Prove that:

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

ii) $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$

iii) $\sin 20^\circ \sin 40^\circ \sin 80^\circ = \frac{\sqrt{3}}{8}$

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8. Prove that:

i) $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$

ii) $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

iii) $4\cos 12^\circ \cos 48^\circ \cos 72^\circ = \cos 36^\circ$

iv) $\cos 40^\circ \cos 80^\circ \cos 160^\circ = -\frac{1}{8}$

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9. Prove that $\tan 20^0 \tan 40^0 \tan 80^0 = \tan 60^0$

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10. Prove that:

$$\frac{\tan(A+B)}{2}+\frac{\tan(A-B)}{2}=\frac{2\sin A}{\cos A+\cos B}$$

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11. Prove that:

i) $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$

ii) $\sin(60^\circ + A) + \sin(60^\circ - A) = \sqrt{3}\cos A$

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12. Prove that:

i) $\frac{\sin(5\pi)}{18} - \frac{\cos(4\pi)}{9} = \sqrt{3}\frac{\sin\pi}{9}$

ii) $\frac{\cos(3\pi)}{4} + A - \cos\left(\frac{3\pi}{4} - A\right) = -\sqrt{2}\sin A$

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13. Prove that:

$$\frac{\sin A + \sin B}{\sin A - \sin B} = \frac{\tan(A+B)}{2} \cdot \frac{\cot(A-B)}{2}$$

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14. Prove that:

$$\frac{\sin 9A - \sin 7A}{\cos 7A - \cos 9A} = \cot 8A$$

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15. Prove that:

$$\frac{\cos 2A + \cos 3A + \cos 4A}{\sin 2A + \sin 3A + \sin 4A} = \cot 3A$$

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16. Prove that:

$$\frac{\sin 7A - 2\sin 4A + \sin A}{\cos 7A - 2\cos 4A + \cos A} = \tan 4A$$

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17. Prove that:

$$\frac{\sin(A+B)-2\sin A+\sin(A-B)}{\cos(A+B)-2\cos A+\cos(A-B)}=\tan A$$

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18. Prove that:

$$(\cos A-\cos B)^2+(\sin A-\sin B)^2=4\frac{\sin^2(A-B)}{2}$$

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19. Prove that:

$$\cos 2\theta.\ \frac{\cos\theta}{2}-\cos 3\theta.\ \frac{\cos(9\theta)}{2}=\sin 5\theta.\ \frac{\sin(5\theta)}{2}$$

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Exercises 3 F

1. Evaluate $\sin 2A$, $\cos 2A$ and $\tan 2A$ if:

i) $\sin A = \frac{5}{13}$, ii) $\cos A = \frac{8}{17}$, iii) $\tan A = \frac{4}{3}$

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2. If $\cos A = -\frac{3}{5}$ and $\frac{\pi}{2} < A < \pi$, find the values of the following:

i) $\sin 2A$, ii) $\cos 2A$, iii) $\tan 2A$

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3. If $\tan A = \frac{12}{5}$ and $\pi < A < \frac{3\pi}{2}$, find the values of the following:

i) $\sin 2A$

ii) $\cos 2A$

iii) $\tan 2A$

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4. If $\tan A = \frac{1}{7}$ and $\tan B = \frac{1}{3}$, prove that:

$\cos 2A = \sin 4B$

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5. prove that $\frac{\sin 2A}{1 - \cos 2A} = \cot A$

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6. Prove that:

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

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7. Prove that:

$$\tan\left(\frac{\pi}{4} + A\right) + \tan\left(\frac{\pi}{4} - A\right) = 2\sec 2A$$

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8. Statement I : $\frac{\sin^2\pi}{8}+\frac{\sin^2(3\pi)}{8}+\frac{\sin^2(5\pi)}{8}+\frac{\sin^2(7\pi)}{8}=2$

Statement II $\frac{\cos^2\pi}{8}+\frac{\cos^2(3\pi)}{8}+\frac{\cos^2(5\pi)}{8}+\cos^2\left(7\frac{\pi}{8}\right)=2$

Statement III: $\frac{\sin^2\pi}{8}+\frac{\sin^{3\pi}}{8}+\frac{\sin^2(5\pi)}{8}\frac{\sin^2(7\pi)}{8}=\frac{3}{2}$

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9. Prove that:

$$\sin^2 A+\sin^2(60^\circ+A)+\sin^2(A-60^\circ)=\frac{3}{2}$$

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10. i) Prove that: $\frac{1-\sin 2A}{1+\sin 2A}=\tan^2\left(\frac{\pi}{4}-A\right)$

ii) If $\cos\theta=\frac{1}{2}\left(x+\frac{1}{x}\right)$, then prove that:

$\cos 2\theta=\frac{1}{2}\left(x^2+\frac{1}{x^2}\right)$ and $\cos 3\theta=\frac{1}{2}\left(x^3+\frac{1}{x^3}\right)$

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11. Prove that:

$\sqrt{3}\text{cosec}20^\circ - \sec 20^\circ = 4$

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12. Evaluate the following: i) $\sin\frac{\pi}{12}$ ii) $\sin\frac{\pi}{8}$, iii) $\cos\frac{\pi}{8}$, iv) $\cos\frac{\pi}{24}$

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13. Prove that: $\cot\frac{\pi}{24} = \sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$

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14. If sinA = $-\frac{5}{13}$ and $\pi < \quad < \frac{3\pi}{2}$, find the values of the following:

i) $\frac{\sin A}{2}$, ii) $\frac{\cos A}{2}$, iii) $\frac{\tan A}{2}$

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15. If $\tan A = -\frac{3}{4}$ and $\frac{\pi}{2} < A < \pi$, find the values of the following:

i) $\frac{\sin A}{2}$ ii) $\frac{\cos A}{2}$, iii) $\frac{\tan A}{2}$

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16. Prove that:

$$\frac{1+\sin A-\cos A}{1+\sin A+\cos A}=\frac{\tan A}{2}$$

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17. Prove that:

$$\frac{\tan A}{2}+\frac{\cot A}{2}=2\text{cosec}A$$

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18. Prove that: $s \in^4 \frac{\pi}{8} + s \in^4 \frac{3\pi}{8} + s \in^4 \frac{5\pi}{8} + s \in^4 \frac{7\pi}{8} = \frac{3}{2}$

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19. Prove that: $1 + \cos^2 2\theta = 2\left(\cos^4 \theta + \sin^4 \theta\right)$

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20. Prove that: $\tan A(1 + \sec 2A) = \tan 2A$

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21. Prove that: $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 8A}}} = 2\cos A$

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22. Prove that:

$\cos 6A = 32\cos^6 A - 48\cos^4 A + 18\cos^2 A - 1$

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23. Prove that:

$$\cos 5A = 16\cos^5 A - 20\cos^3 A + 5\cos A$$

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24. Prove that: $\cos^3 A + \cos^3\left(\frac{2\pi}{3} + A\right) + \cos^3\left(\frac{4\pi}{3} + A\right) = \frac{3}{4}\cos 3A$

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Exercises 3 G

1. Prove that: $s \in^2 24^0 - s \in^2 6^0 = \frac{\sqrt{5} - 1}{8}$

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2. Prove that:

$$\sin^2 42^2 - \cos^2 78^\circ = \frac{\sqrt{5} + 1}{8}$$

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3. Provet that:

$$\sin^2 72^2 - \sin^2 60^2 = \frac{\sqrt{5}-1}{8}$$

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4. Prove that: $\cos 78^0 \cos 42^0 \cos 36^0 = \frac{1}{8}$

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5. FInd

$$\sin\left(\frac{\pi}{10}\right).\cos\left(\frac{\pi}{5}\right)$$

A. 1/2

B. 1/3

C. 1/4

D. none of these

Answer: C

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6. Prove that:

$$\frac{\sin(9\pi)}{10} + \frac{\sin(13\pi)}{10} = -\frac{1}{2}$$

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7.

$$\left(1+\cos\left(\frac{\pi}{10}\right)\right)\left(1+\cos\left(\frac{3\pi}{10}\right)\right)\left(1+\cos\left(\frac{7\pi}{10}\right)\right)\left(1+\cos\left(\frac{9\pi}{10}\right)\right) =$$

$(i)\frac{1}{8}(ii)\frac{1}{16}(iii)\frac{1}{4}(iv)\frac{1}{6}$

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8. Prove that $\cos 6^\circ . \cos 42^\circ . \cos 66^\circ \cos 78^\circ = \frac{1}{16}$

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9. Prove that: $s \in \frac{\pi}{5} s \in \frac{2\pi}{5} s \in \frac{3\pi}{5} s \in \frac{4\pi}{5} = \frac{5}{16}$

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10. Prove that:$\tan 6^0 \tan 42^0 \tan 66^0 \tan 78^0 = 1.$

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11. Prove that $\frac{\cos(2\pi)}{15} \frac{\cos(4\pi)}{15} \frac{\cos(8\pi)}{15} \frac{\cos(14\pi)}{15} = \frac{1}{16}$

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Exercises 3 H

1. In ΔABC,prove that: $\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C$

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2. $A + B + C = 180^o$, $\cos 2A + \cos 2B + \cos 2C =$

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3. If $A + B + C = \pi$, 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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4. In ΔABC, prove that: a)

$$\frac{\sin 2A + \sin 2B + \sin 2C}{\sin A + \sin B + \sin C} = 8\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2}$$

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5.

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

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

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

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7. If $A+B+C=180$, prove that:

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

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8. In ΔABC, prove that

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

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9. In ΔABC, prove that:

$$\frac{\tan A}{2}\frac{\tan B}{2}+\frac{\tan B}{2}\frac{\tan C}{2}+\frac{\tan C}{2}\frac{\tan A}{2}=1$$

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10. In ΔABC, prove that:

$$\cot B\cot C+\cot C\cot A+\cot A\cot B=1$$

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11. In ΔABC, prove that:

$$\tan 2A+\tan 2B+\tan 2C=\tan 2A\tan 2B\tan 2C$$

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12. In ΔABC, prove that:

$$\tan B \tan C + \tan C \tan A + \tan A \tan B = 1 + \sec A \sec B \sec C$$

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Exercises 3 I

1. Find the geneal values of θ from the following equations:

i) $\sin\theta = \frac{\sqrt{3}}{2}$, ii) $\cos\theta = \frac{1}{\sqrt{2}}$, iii) $\tan\theta = \sqrt{3}$, iv) $\sec\theta = \frac{2}{\sqrt{3}}$, v) $\cot\theta = \frac{1}{\sqrt{3}}$, vi) $\text{cosec}\theta = \sqrt{2}$

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2. Find the general values of θ from the following equations:

i) $\sin\theta = -\frac{\sqrt{3}}{2}$

ii) $\sec\theta = -\sqrt{2}$

iii) $\cot\theta = -\frac{1}{\sqrt{3}}$, iv) $\text{cosec}\theta = -2$

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3. Find the general values of θ from the following equations:

i) $\cos^2\theta = \frac{1}{4}$, ii) $\sin^2\theta = 1$, iii) $\cot^2\theta = 3$, iv) $\sec^2\theta = \frac{4}{3}$

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4. Find the general values of θ from the following equations:

i) $\sin 3\theta = \frac{\sqrt{3}}{2}$, ii) $\cos 4\theta = \frac{1}{\sqrt{2}}$

iii) $\tan 2\theta = \sqrt{3}$

iv) $\text{cosec}3\theta = 2$

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5. Solve the following equations :

i) $\tan\theta = \cot\theta$, ii) $\cos 2\theta = 2\sin^2\theta$

iii) $\tan 3\theta = -\sqrt{3}$, iv) $\sin 2\theta - \cos\theta = 0$

v) $\sec^2 2\theta = 1 - \tan 2\theta$

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6. Solve the following equations:

i) $3\left(\tan^2\theta + \sec^2\theta\right) = 5$

ii) $\tan^2\theta + \cot^2\theta = 2$

iii) $7\cos^2\theta + 3\sin^2\theta = 4$

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7. Find the general values of θ from the following equations:

i) $2\cos^2\theta + \sin\theta = 0$

ii) $\sin^2\theta - 2\cos\theta + \frac{1}{4} = 0$

iii) $\tan\theta - \sin\theta = \sin\theta\tan\theta - 1$

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

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8. Find the general values of θ from the following equations:

i) $\sin 3\theta = \cos 3\theta$

ii) $2\cos^2\theta = 1 - 2\sin\theta\cos\theta$

iii) $\text{cosec}^2\theta + 2\text{cosec}\theta - 3 = 0$

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9. Solve the equation: $\sin 2\theta + \cos 3\theta = 0$

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10. Solve: $4\sin^4\theta + \cos^4\theta = 1$

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11. Solve: $(1 - \tan\theta)(1 + \sin 2\theta) = (1 + \tan\theta)$

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12. Solve: $\cos\theta + \sin\theta = \cos t2\theta + \sin 2\theta$

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13. If $\tan(\cot\theta) = \cot(\tan\theta)$, then prove that:

$\pi(2n+1)\sin 2\theta = 4$

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14. Solve:

$4\left(\sin^3\theta\cos\theta - \cos^3\theta\sin\theta\right) = 1$

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15. Solve: $\tan\theta + \sec\theta = 2\cos\theta$

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16. Solve: $2\sin^2\theta + \sin^2 2\theta = 2$

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Exercises 3 J

1. Solve: $\tan 4\theta = \tan 2\theta$

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2. Solve : $\tan 6\theta = \tan 3\theta$

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3. Solve: $\cos 5\theta = \cos 2\theta$

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4. Solve: $\sin 4\theta = \sin \theta$

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5. Solve: $\tan 2\theta \cot \theta = 1$

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6. Solve: $\cot 2\theta = \tan \theta$

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7. Solve: $\sin 2\theta = \sin\left(\frac{2\pi}{3} - \theta\right)$

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8. Solve: $\sin m\theta + \sin n\theta = 0$

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9. Solve: $\tan p\theta + \cot q\theta = 0$

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10. Solve: $\cos p\theta + \cos q\theta = 0$

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11. Solve: $\cot 5\theta = \cot 2\theta$

Watch Video Solution

12. Solve: $\tan 4\theta = -\cot\left(\frac{\pi}{6} + \theta\right)$

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13. Solve: $\tan^2 3\theta = \cot^2 \theta$

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Exercises 3 K

1. Find the general values of θ from the following equations:

$\sin 4\theta - \sin 2\theta = \cos 3\theta$

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2. $\sin 5\theta + \sin 3\theta + \sin \theta = 0$

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3. $\sin 2\theta - \sin 4\theta + \sin 6\theta = 0$

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4. $\cos \theta - \cos 2\theta = \sin 3\theta$

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5. $\frac{\sin 1}{2}(k+1)\theta - \frac{\sin 1}{2}(k-1)\theta = \sin \theta$

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6. $\sin 2\theta + \sin 4\theta = \sin 6\theta$

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7. $\sin \theta + \sin 7\theta = \sin 4\theta$

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8. $\sin\theta + \sin 2\theta + \sin 4\theta + \sin 5\theta = 0$

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9. $\cos 3\theta \cos 5\theta - \cos 7\theta \cos 9\theta = 0$

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10. $\cos\theta . \cos 2\theta . \cos 3\theta = \frac{1}{4}$

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11. $\tan\theta + \tan 2\theta = \tan\theta \tan 2\theta = 1$

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12. $\tan\theta + \tan 2\theta = \tan 3\theta$

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13. $\tan\theta + \tan 2\theta + \sqrt{3}\tan\theta\tan 2\theta = \sqrt{3}$

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

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15. $\tan\theta + \tan\left(\frac{\pi}{3} + \theta\right) + \tan\left(\frac{2\pi}{3} + \theta\right) = 3$

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16. $\cos\theta - \sin\theta = \cos\alpha - \sin\alpha$

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17. $\sqrt{3}\tan 2\theta + \sqrt{3}\tan 3\theta + \tan 2\theta \tan 3\theta = 1$

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18. $\tan\theta - \frac{\tan\theta}{2} = \frac{\sec\theta}{2}$

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Exercises 3 L

1. $\sin\theta + \cos\theta = \sqrt{2}$

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2. $\sqrt{3}\sin\theta - \cos\theta = \sqrt{2}$

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3. $\sqrt{3}\cos\theta + \sin\theta = 2$

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4. $\text{cosec}\theta + \cot\theta = \sqrt{3}$

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5. $1 + \cot\theta = \text{cosec}\theta$

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6. $\tan\theta + \sec\theta = \sqrt{3}$

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7. $3\cos\theta - \sqrt{7}\sin\theta = 2$, When $\sin 48^2 35' = \frac{3}{4}$.

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8. $6\cos\theta + 8\sin\theta = 9$, when $\tan 53^\circ 8' = \frac{4}{3}$ and $\cos 25^\circ 50' = \frac{9}{10}$

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9. $\sqrt{2}\sec\theta + \tan\theta = 1$

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10. $\sin\theta + \cos\theta = \frac{\sqrt{3}+1}{2}$

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Exercises 3 M

1. Find the general values of θ satisying the following two equations: $\sin\theta = \frac{1}{\sqrt{2}}$ and $\sec\theta = -\sqrt{2}$

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2. $\sin\theta = -\frac{1}{2}$ and $\cos\theta = -\frac{\sqrt{3}}{2}$

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3. $\cot\theta = -\sqrt{3}$ and $\text{cosec}\theta = 2$

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4. $\cos\theta = \frac{1}{\sqrt{2}}$ and $\tan\theta = -1$

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5. $\sin\theta = \frac{\sqrt{3}}{2}$ and $\tan\theta = -\sqrt{3}$

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6. $\sec\theta = \frac{2}{\sqrt{3}}$ and $\cot\theta = -\sqrt{3}$

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7. $\sin\theta = -\frac{1}{2}$ and $\tan\theta = -\frac{1}{\sqrt{3}}$

Watch Video Solution

8. $\tan\theta = \sqrt{3}$ and $\text{cosec}\theta = \frac{2}{\sqrt{3}}$

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Exercises 3 N

1. In ΔABC, a=4, b=6 and $\angle B = 30^\circ$, evaluate sinA.

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2. In ΔABC, $b = 2\sqrt{3}$, $c = 3\sqrt{2}$, $\angle C = 60^\circ$, evaluate $\angle A$.

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3. In ΔABC, $\angle A = 60^2$, $\angle B = 45^\circ$, find $a : b$.

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4. In ΔABC, $\angle B = 90^\circ$, $\angle A = 30^\circ$, $b = 20cm$, find a and c.

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5. If the ratio of angles of ΔABC is $1 : 2 : 3$, find the ratio of its sides.

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6. The angles of a triangle are in the ratio, $1:2:7$. Prove that the ratio of the longest and smallest side is $\left(\sqrt{5}+1\right):\left(\sqrt{5}-1\right)$.

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7. In ΔABC, a=3, b=4 and c=5, evaluate sin2C.

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8. In ΔABC, prove that: $\sin B+\sin C>\sin A$

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9. In ΔABC, show that $\frac{\sin A}{\sin(A+B)}=\frac{a}{c}$

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10. In ΔABC, prove that: $a\cos A + b\cos B = (c)\cos(A - B)$

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11. In ΔABC, prove that: $a\sin A - b\sin B = c\sin(A - B$

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12. In ΔABC, $C = 90^\circ$, $A = 30^\circ$, $b = 6$, find the remaining elements of the triangle.

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13. In ΔABC, prove that: $\frac{\sin(B - C)}{2} = \frac{b - c}{a} \cdot \frac{\cos A}{2}$

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14. In ΔABC, if a=2, b=3, c=4, find cosA.

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15. If in ΔABC, $a = 4, b = 6, c = 8$ then $2\cos A + 4\cos B + \cos C =$

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16. In ΔABC, if a=6, b=8, c=10, evaluate cos2A.

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17. In ΔABC, if b=7, c=24, a=25, find $\angle A$.

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18. In ΔABC, $a : b : c = 15 : 7 : 13$, find cosA.

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19. A triangle side are few $7cm, 4\sqrt{3}cm$ and $\sqrt{13}cm$ then the smallest angle is

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20. In $\Delta ABC, a = x^2 - 1, b = 2x + 1, \angle C = 120^\circ$, find c.

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21. In ΔABC, prove that: $a(\cos B + \cos C) = 2(b + c)\dfrac{\sin^2 A}{2}$.

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22. In ΔABC, prove that:

$$b(\cos A - \cos C) = 2(c - a)\frac{\cos^2 B}{2}$$

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23. In ΔABC, prove that: $\frac{a}{b+c} = \frac{1 - \frac{\tan B}{2}\frac{\tan C}{2}}{1 + \frac{\tan B}{2}\frac{\tan C}{2}}$

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24. In ΔABC, prove that: $a^2 \sin 2B + b^2 \sin 2A = 2| \in |C$

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25. If any triangle ABC, that: $\frac{a\sin(B-C)}{b^2-c^2} = \frac{b\sin(C-A)}{c^2-a^2} = \frac{c\sin(A-B)}{a^2-b^2}$

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26. In ΔABC, prove that: $c(a\cos B - b\cos A) = a^2 - b^2$

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27. In ΔABC, prove that:

$$\frac{a^2 \sin(B-C)}{\sin A} + \frac{b^2 \sin(C-A)}{\sin B} + \frac{c^2 \sin(A-B)}{\sin C} = 0$$

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28. In ΔABC, $\cos C = \frac{\sin A}{2 \sin B}$, prove that b=c.

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29. In $\triangle ABC$, $\cos A = \sin B - \cos C$,prove that ΔABC, is right angled.

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30. In ΔABC, $(\sin A)(\sin C) = \frac{\sin(A-B)}{\sin(B-C)}$, prove that a^2, b^2, c^2 are in A.P.

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31. In a triangle ABC, prove that for any angle θ, $b\cos(A-\theta)+a\cos(B+\theta)=C\cos\theta$.

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32. In ΔABC, $\frac{1}{a},\frac{1}{b},\frac{1}{c}$ are in A.P. prove that $\text{cosec}^2\frac{A}{2},\text{cosec}^2\frac{B}{2},\text{cosec}\frac{C}{2}$ are also in A.P.

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33. If a=5, b=12 and c=13, find tanA.

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34. The sides of a triangle are $x^2 + x + 1, 2x + 1$ and $x^2 - 1$. Prove that the greatest angle is 120^0

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35. i) In ΔABC, if b=17, c=11 and $\angle A = 60^\circ$, find $\frac{\tan(B - C)}{2}$

ii) In ΔABC, $\angle B = 90^\circ$, then prove that:

$$\frac{\tan A}{2} = \sqrt{\frac{b - c}{b + c}}$$

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36. In ΔABC, prove that:

$$(b^2 - c^2 + a^2)\tan C = (b^2 + c^2 - a^2)\tan A$$

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Exercises 3 O

1. In ΔABC, a=5, b=7, c=8, find $\frac{\cos B}{2}$

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2. In ΔABC, $a = 17, b = 8, c = 15$, find $\frac{\sin B}{2}$.

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3. In ΔABC, a=25,b=52, c=63, find $\frac{\cot A}{2}$.

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4. In ΔABC, prove that: $\frac{b\cos^2 C}{2} + \frac{c\cos^2 B}{2} = s$

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5. In ΔABC, prove that:

$$2\left[a\frac{\sin^2 B}{2}+b\frac{\sin^2 A}{2}\right]=a+b-c$$

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6. In any triangle ABC, prove that:

$$(b-c)\frac{\cot A}{2}+(c-a)\frac{\cot B}{2}+(a-b)\frac{\cot C}{2}=0$$

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7. In ΔABC, if $b+c=3a$, then prove that:

$$\frac{\cot B}{2}\cdot\frac{\cot C}{2}=2$$

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8. Find the area of ΔABC, if $a=2, b=3$ and c=5 cm

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9. Find the area of ΔABC, if a=10cm, $\angle B = 45^\circ$ and $\angle C = 45^\circ$

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10. Find the area of ΔABC, if a=10cm, $\angle B = 45^\circ$ and $\angle C = 45^\circ$

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11. In any ABC, prove that: $= \frac{a^2 - b}{2} \frac{\sin A \sin B}{\sin(A - B)}$

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12. In ΔABC, prove that:

$s^2 . \frac{\tan A}{2} \frac{\tan B}{2} \frac{\tan C}{2} = \Delta$

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Exercises 3 P

1. If x=$r\sin\theta\sin\phi$, $y = r\sin\theta\cos\phi$, $z = r\cos\theta$, then $x^2 + y^2 + z^2 = ?$

A. 1

B. r

C. r^2

D. None of these

Answer: C

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2. $\frac{\sin\pi}{10} + \frac{\sin(13\pi)}{10} = ?$

A. 1

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

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

D. None of these

Answer: C

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3. Find $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$.

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

B. $\frac{3}{16}$

C. $-\frac{3}{16}$

D. None of these

Answer: B

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4. $\sin^2 24^\circ - \cos^2 84^\circ = ?$

A. $\frac{\sqrt{5}-1}{8}$

B. $\frac{\sqrt{5}+1}{8}$

C. $\frac{\sqrt{5}-1}{4}$

D. None of these

Answer: A

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5. $\cos 175^\circ + \cos 65^\circ + \cos 55^\circ = ?$

A. 2

B. 0

C. 1

D. None of these

Answer: B

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6. Maximum value of $(3\sin\theta + 4\cos\theta)$ is:

A. 5

B. -5

C. 1

D. None of these

Answer: A

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7. If $\sin x + \sin y = \sqrt{3}(\cos y - \cos x)$, then $(\sin 3x + \sin 3y) = ?$

A. 1

B. -1

C. 0

D. None of these

Answer: C

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8. $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = ?$

A. $4\sin^2\left(\frac{x-y}{2}\right)$

B. $4\cos^2\left(\frac{x-y}{2}\right)$

C. $4\sin\left(\frac{x+y}{2}\right)\sin\left(\frac{x-y}{2}\right)$

D. $4\cos\left(\frac{x+y}{2}\right)\cos\left(\frac{x-y}{2}\right)$

Answer: A

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9. If $2\cos\theta = x + \frac{1}{x}$, then $2\cos 2\theta = ?$

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

B. $x^2 + \frac{1}{x^2}$

C. $x - \frac{1}{x}$

D. None of these

Answer: B

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10. If $A + B = 45^\circ$ then $(1 + \tan A)(1 + \tan B) =$

A. 2

B. -2

C. 1

D. 0

Answer: A

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11. $\frac{\sin^2\pi}{8}+\frac{\sin^2(3\pi)}{8}+\frac{\sin^2(5\pi)}{8}+\frac{\sin^2(7\pi)}{8}=?$

A. -1

B. 1

C. -2

D. 2

Answer: D

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12. If $\sin x+\sin^2 x=1$,then $\cos^4 x+\cos^2 x=?$

A. 2

B. -2

C. 1

D. -1

Answer: C

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13. If $4\sin^2\theta = 3,$ then general value of θ is:

A. $n\pi \pm \frac{\pi}{4}$

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

C. $n\pi \pm \frac{\pi}{6}$

D. None of these

Answer: B

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14. If $\sin 7\theta = \cos 5\theta$, then general value of θ is:

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

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

C. $n\pi + \frac{\pi}{4}$

D. None of these

Answer: C

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15. If $\tan 3\theta = \cot\theta$, then general value of θ is :

A. $\left(n + \frac{1}{3}\right)\frac{\pi}{2}$

B. $\left(n + \frac{1}{3}\right)\frac{\pi}{4}$

C. $\left(n + \frac{1}{4}\right)\frac{\pi}{2}$

D. $\left(n + \frac{1}{2}\right)\frac{\pi}{4}$

Answer: D

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16. Find the general value of θ from the equation $\tan\theta + \tan 2\theta + \tan 3\theta = \tan\theta.\tan 2\theta.\tan 3\theta.$

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

B. $\frac{n\pi}{4}$

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

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

Answer: A

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17. The solution of $\tan\theta + \cot\theta = 2$ is:

A. $n\pi + (-1)^n \frac{\pi}{2}$

B. $\frac{1}{2}\left[n\pi + (-1)^n \frac{\pi}{2}\right]$

C. $\frac{1}{3}\left[n\pi + (-1)^n \frac{\pi}{2}\right]$

D. None of these

Answer: B

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18. The solution of $\cos 2\theta = \cos^2 \theta$ is:

A. $n\pi$

B. $2n\pi$

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

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

Answer: A

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19. $\cot \theta = -\sqrt{3}$ and $\operatorname{cosec} \theta = 2$

A. $2n\pi + \frac{\pi}{6}$

B. $2n\pi + \frac{5\pi}{6}$

C. $2n\pi - \frac{7\pi}{6}$

D. None of these

Answer: B

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20. Solve: $2\sin^2\theta + \sin^2 2\theta = 2$

A. $\left(n\pi - \frac{\pi}{3}\right)$

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

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

D. $n\pi - \frac{\pi}{12}$

Answer: C

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21. If $\sqrt{3}\sin\theta - \cos\theta = 0$, then one general value of θ is:

A. $\frac{n\pi}{2}$

B. $\frac{n\pi}{4}$

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

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

Answer: D

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22. In ΔABC, a=12 m, $\angle B = 30^\circ$ and $\angle C = 90^\circ$, then area of $\Delta ABC = ?$

A. $2n\pi + \frac{5\pi}{12}$

B. $2n\pi - \frac{5\pi}{12}$

C. $n\pi + \frac{5\pi}{12}$

D. $n\pi - \frac{5\pi}{12}$

Answer: A

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23. In ΔABC, a=12 cm, $\angle B = 30^\circ$ and $\angle C = 90^\circ$, then area of $\Delta ABC = ?$

A. $6\sqrt{3}m^2$

B. $24\sqrt{3}m^2$

C. $36\sqrt{3}m^2$

D. None of these

Answer: B

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24. In ΔABC, $\frac{\cot A}{2}, \frac{\cot B}{2}, \frac{\cot C}{2}$ are in A.P., then the true statement is:

A. $b^2 = ac$

B. $c^2 = ab$

C. $2b = a + c$

D. $2a = b + c$

Answer: C

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25. If a, b, c are in A.P then $\cot\left(\frac{A}{2}\right), \cot\left(\frac{B}{2}\right), \cot\left(\frac{C}{2}\right)$ are in

A. 3

B. 6

C. 0

D. -3

Answer: A

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26. In ΔABC, $a = 9, b = 8$ and c=4, then $3\cos B - 6\cos C = ?$

A. 4

B. -4

C. 3

D. -3

Answer: B

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27. In ΔABC, If $\frac{1}{a+b} + \frac{1}{b+c} = \frac{3}{a+b+c}$, then $\angle B = ?$

A. 30°

B. 45°

C. 60°

D. 90°

Answer: C

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28. Prove that in $\triangle ABC, a^3\cos(B-C)+b^3\cos(C-A)+c^3\cos(A-B)=3abc$

A. abc

B. 2abc

C. 3abc

D. 4abc

Answer: C

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29. In ΔABC, $\frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$, prove that:

$\cos A : \cos B : \cos C = ?$

A. $25:19:17$

B. $9:7:25$

C. $7:9:25$

D. $7:19:25$

Answer: D

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30. In ΔABC,

$$(b-c)\cot\left(\frac{A}{2}\right) + (c-a)\cot\left(\frac{B}{2}\right) + (a-b)\cot\left(\frac{C}{2}\right) = ?$$

A. 0

B. 1

C. -1

D. abc

Answer: A

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31. In ΔABC, if $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{2} = \frac{a}{bc} + \frac{b}{ca}$, then $\angle A = ?$

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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32. In ΔABC, $a = 3, b = 4, c = 2$, then $\frac{\cos A}{2} = ?$

A. $\frac{3\sqrt{6}}{8}$

B. $\frac{\sqrt{10}}{8}$

C. $\frac{2\sqrt{6}}{9}$

D. $\frac{\sqrt{10}}{9}$

Answer: A

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Exercises 3 Q

1. The maximum value of $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3$ is:

A. 5

B. 11

C. 10

D. None of these

Answer: c

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2. If $A = \sin^2\theta + \cos^4\theta$, then for all real values of θ:

A. $\frac{3}{4} \leq A \leq \frac{13}{16}$

B. $\frac{3}{4} \leq A \leq 1$

C. $1 \leq A \leq 2$

D. $\frac{13}{16} \leq A \leq 1$

Answer: b

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3. $\sqrt{3}\ \text{cosec}\ 20^\circ - \sec 20^2 = ?$

A. 1

B. 2

C. 4

D. None of these

Answer: c

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4. If $\cos x = \tan y$, $\cos y = \tan z$ and $\cos z = \tan x$, then $\sin^2 x = ?$

A. $2\sin 18^\circ$

B. $\sin 18^\circ$

C. $2\cos 18^\circ$

D. None of these

Answer: a

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5. $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4\left(\sin^6\theta + \cos^6\theta\right) = ?$

A. 0

B. 1

C. -13

D. 13

Answer: d

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6. If $\sin x + \cos x = a$, then

(i) $\sin^6 x + \cos^6 x = \ldots.$

(ii) $|\sin x - \cos x| = \ldots.$

A. $\frac{4-3\left(m^2-1\right)^2}{4}$

B. $\frac{3+\left(m^2-1\right)^2}{4}$

C. $\frac{4+3\left(m^2-1\right)^2}{4}$

D. None of these

Answer: a

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7. If $\cos A+\cos B=m$ and $\sin A+\sin B=n$ then $\sin(A+B)=$

A. $\frac{mn}{m+n}$

B. $\frac{m^2+n^2}{2mn}$

C. $\frac{2mn}{m^2+n^2}$

D. $\frac{mn}{m^2+n^2}$

Answer: c

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8. The solution set of the equation $4\sin\theta.\cos\theta - 2\cos\theta - 2\sqrt{3}\sin\theta + \sqrt{3} = 0$ in the interval (0, 2T)ist (B) 13, 3 j (A) 4 4 (C) 4 3, 3 (D) All solutions of the equation 2 sino tann 0 ere obtained by taking a integral valuessof m and n in

A. $\frac{3\pi}{4}, \frac{7\pi}{4}$

B. $\left(\frac{\pi}{3}\right), \frac{5\pi}{3}$

C. $\frac{3\pi}{4}, \frac{7\pi}{4}, \frac{\pi}{3}, \frac{5\pi}{3}$

D. None of these

Answer: d

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9. Solutions of the equations $(2\cos x - 1)(3\cos x + 4) = 0$ is $[0, 2\pi]$ is:

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

B. $\frac{\pi}{3}, \frac{5\pi}{3}$

C. $\frac{\pi}{3}, \frac{5\pi}{3}, \cos^{-1}\left(-\frac{4}{3}\right)$

D. None of these

Answer: B

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10. If $\frac{\sin(A+B)}{\cos(A-B)} = \frac{1-m}{1+m}$,then $\tan\left(\frac{\pi}{4}-A\right)\tan\left(\frac{\pi}{4}-B\right) = ?$

A. m

B. 2m

C. 3m

D. 4m

Answer: a

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11. If $4\sin^2 x + \cos^4 x = 1$, then one general value is:

A. $\frac{n\pi}{12}$

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

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

D. $n\pi$

Answer: d

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12. If $\left(2+\sqrt{3}\right)\cos\theta = 1 - \sin\theta$, then one general value is:

A. $2n\pi + \frac{\pi}{2}$

B. $n\pi + \frac{\pi}{2}$

C. $n\pi + \frac{\pi}{3}$

D. None of these

Answer: a

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13. The general solution of equation $3\tan(\theta - 15^o) = \tan(\theta + 15^o)$ is:

A. $n\pi + (-1)^n \frac{\pi}{4}$

B. $\frac{n\pi}{2} + (-1)^n \frac{\pi}{4}$

C. $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6}$

D. None of these

Answer: b

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14. The solution of $\cos\theta.\cos 2\theta.\cos 3\theta = \frac{1}{4}, 0 < \theta < \frac{\pi}{4}$ is:

A. $\frac{\pi}{8}$

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

C. $\frac{\pi}{9}$

D. $\frac{\pi}{12}$

Answer: a

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15. If $\sec\theta - 1 = \left(\sqrt{2} - 1\right)\tan\theta$, then general value of θ is:

A. $\frac{n\pi}{2}$

B. $n\pi$

C. $2n\pi$

D. $3n\pi$

Answer: c

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16. If $4\sin\alpha \sin(x+\alpha)\sin(x-\alpha) = \sin 3\alpha$, then general value of x is:

A. $n\pi \pm \frac{\pi}{4}$

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

C. $2n\pi$

D. $n\pi$

Answer: b

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17. The number of solutions of the equation $\sin\theta + \cos\theta = 2$ are:

A. 1

B. 2

C. 0

D. infinite

Answer: c

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18. If $\sin\theta - 3\sin 2\theta + \sin 3\theta = \cos\theta - 3\cos 2\theta + \cos 3\theta$, then one of the general value is:

A. $\frac{n\pi}{2} + \frac{\pi}{8}$

B. $n\pi + \frac{\pi}{8}$

C. $n\pi - \frac{\pi}{8}$

D. $\frac{n\pi}{2} - \frac{\pi}{8}$

Answer: a

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19. If $3\tan^2\theta - 2\sin\theta = 0$, then general value of θ is:

A. $n\pi$

B. $\frac{n\pi}{2}$

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

D. $\frac{n\pi}{4}$

Answer: a

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20. If $\cos\theta + \cos 3\theta + \cos 5\theta + \cos 7\theta = 0$, then general value of θ is:

A. $(2n+1)\frac{\pi}{2}$

B. $(2n+1)\frac{\pi}{3}$

C. $(2n+1)\frac{\pi}{4}$

D. $(2n+1)\frac{\pi}{6}$

Answer: c

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21. Maximum value of $(3\sin\theta + 4\cos\theta)$ is:

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Exercises 3 1

1. Find the radian measures corresponding to the following degree measures:

A. 25°

B. $-47^\circ 30'$

C. 240°

D. 520°

Answer:

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2. Find the degree measures corresponding to the following radian measures (use $\pi = \frac{22}{7}$). (i) $\frac{11}{16}$ (ii) 4 (iii) $\frac{5\pi}{3}$ (iv) $\frac{7\pi}{6}$

A. $\frac{11}{16}$

B. -4

C. $\frac{5\pi}{3}$

D. $\frac{7\pi}{6}$

Answer:

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3. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?

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4. Find the degree measure of the angle subtended at the centre of a circle of radius 100cm by an are of length 22 cm $\left(use\pi = \frac{22}{7}\right)$

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5. In a circle of diameter 40 cm. the length of a chord is 20 cm. Find the length of minor arc of the chord.

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6. If arcs of same length in two circles subtend angles of $60^0 and 75^0$ at their centers, find the ratios of their radii.

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7. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip discribes an arc of length:

i) 10 cm ii) 15 cm iii) 21 cm

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Exercises 3 2

1. Find the values of trignometric functions in Questions 6 to 10.

$\sin 765^\circ$

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2. Find the value of other five trigonometric function $\sin x = \frac{3}{5}$, x lies in second quadrant.

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3. Find the value of other five trigonometric function $\cot x = \frac{3}{4}$, x lies in third quadrant.

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4. Find the value of other five trigonometric function $\sec x = \frac{13}{5}$, x lies in fourth quadrant.

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5. Find the value of other five trigonometric function $\tan x = -\frac{5}{12}$, x lies in second quadrant.

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6. Find the values of trignometric functions in Questions 6 to 10.

$\sin 765^\circ$

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7. $\cos ec(-1410^\circ)$

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8. Find the values of the following :

i) $\tan\left(\frac{19\pi}{3}\right)$

ii) $\sec\left(\frac{-22\pi}{3}\right)$

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9. $\frac{\sin(-11\pi)}{3}$

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10. $\frac{\cot(-15\pi)}{4}$

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Exercises 3 3

1. $\frac{\sin^2\pi}{6}+\frac{\cos^2\pi}{3}-\frac{\tan^2\pi}{4}=-\frac{1}{2}$

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2. $2\left(\sin^2\left(\frac{\pi}{6}\right)\right)+\operatorname{cosec}\frac{7\pi}{6}\frac{\cos^2\pi}{3}=\frac{3}{2}$

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3. $\frac{\cot^2\pi}{6}+\operatorname{cosec}\frac{5\pi}{6}+3\frac{\tan^2\pi}{6}=6$

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4. $2\frac{\sin^2(3\pi)}{4}+2\frac{\cos^2\pi}{4}+2\frac{\sec^2\pi}{3}=10$

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5. Find the value of: $\sin 75^\circ$

A. 0

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

C. $\sqrt{2}$

D. $\frac{\sqrt{3}+1}{2\sqrt{2}}$

Answer: D

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6. Find the value of $\tan 15^\circ$

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7. $\cos\left(\frac{\pi}{4}-x\right)\cos\left(\frac{\pi}{4}-y\right)-\sin\left(\frac{\pi}{4}-x\right)\sin\left(\frac{\pi}{4}-y\right)=\sin(x+y)$

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8. $\frac{\tan\left(\frac{\pi}{4}+x\right)}{\tan\left(\frac{\pi}{4}-x\right)}=\left(\frac{1+\tan x}{1-\tan x}\right)^2$

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9. $\frac{\cos(\pi-x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)}=\cot^2 x$

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10. $\cos\left(\frac{3\pi}{2}+x\right)\cos(2\pi+x)\left[\frac{\cot(3\pi)}{2}-x+\cot(2\pi+x)\right]=1$

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11. $\sin(n+1)x\sin(n+2)x+\cos(n+1)x\cos(n+2)x=\cos x$

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12. $\cos\left(\frac{3\pi}{4}+x\right)-\cos\left(\frac{3\pi}{4}-x\right)=-\sqrt{2}\sin x$

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13. Prove that:$\cos^2 2x-\cos^2 6x=\sin 4x\sin 8x$

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14. $\sin 2x+2\sin 4x+\sin 6x=4\cos^2 x\sin 4x$

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15. $\sin^2 6x-\sin^2 4x=\sin 2x\sin 10x$

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16. $\cot 4x(\sin 5x+\sin 3x)=\cot x(\sin 5x-\sin 3x)$

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17. $\frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = -\frac{\sin 2x}{\cos 10x}$

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18. $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$

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19. $\frac{\sin x - \sin y}{\cos x + \cos y} = \frac{\tan(x - y)}{2}$

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20. $\frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x$

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21. $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2\sin x$

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22. $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

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23. $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$

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24. Prove that:$\tan 4x = \frac{4\tan x\left(1 - \tan^2 x\right)}{1 - 6\tan^2 x + \tan^4 x}$

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25. Prove that:$\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1$

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Exercises 3 4

1. Find general solution of $\tan x = \sqrt{3}$

A. $x = n\pi + \frac{\pi}{6}$

B. $x = n\pi + \frac{\pi}{3}$

C. $x = n\pi \pm \frac{\pi}{6}$

D. $x = n\pi \pm \frac{\pi}{3}$

Answer: B

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2. $\sec x = 2$

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3. $\cot x = -\sqrt{3}$

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4. Solve: $\cos 4x = \cos 2x$

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5. Solve

$\cos 3x + \cos x - \cos 2x = 0$

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6. $\sin 2x + \cos x = 0$

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7. $\sec^2 2x = 1 - \tan 2x$

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8. $\sin x + \sin 3x + \sin 5x = 0$

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Miscellaneous Exercise

1. $2\cos\left(\frac{\pi}{13}\right)\cos\left(9\frac{\pi}{13}\right) + \cos\left(3\frac{\pi}{13}\right) + \cos\left(5\frac{\pi}{13}\right) = 0$

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2. (sin 3x + sin x) sin x + (cos 3x - cos x) cos x =0

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3. $(\cos x + \cos y)^2 \mid (\sin x - \sin y)^2 = 4\dfrac{\cos^2(x+y)}{2}$

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4. $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = ?$

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5. Prove that:

$$s \in x + s \in 3x + s \in 5x + s \in 7x = 4$$

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6. Prove that: $\dfrac{(\sin 7x + \sin 5x) + (\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x) + (\cos 9x + \cos 3x)} = \tan 6x$

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7. $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos\left(\frac{x}{2}\right)\cos\left(3\frac{x}{2}\right)$

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8. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ of the following : $\tan x = -\frac{4}{3}, x$ in quadrant II

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9. $\cos x = -\frac{1}{3}$, x in quadrant III. Find the values of other five trignometric functions

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10. $\sin x = \frac{1}{4}$, x in quadrant II. Find the values of other five trignometric functions

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