MATHS

BOOKS - CENGAGE

TRIGONOMETRIC RATIOS AND TRANSFORMATION FORMULAS

Examples

1. Prove that: $\frac{\sin(B-C)}{\cos B \cos C}+\frac{\sin(C-A)}{\cos C \cos A}+\frac{\sin(A-B)}{\cos A \cos B}=0$

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2. Eliminate x from equation $\sin(a+x)2b$ and $\sin(a-x=2\cdot$

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3. Let A, B, C be the three angles such that $A+B+C=\pi$. If $TanA \tan B=2,$ then find the value of $\frac{\cos A . \cos B}{\cos c}$

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4. If $\sin \alpha \sin \beta-\cos \alpha \cos \beta+1=0,$ then prove that $1+\cot \alpha \tan \beta=0$

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5. If $\sin \alpha \cos \beta=-\frac{1}{2}$ then find the range of values of $\cos \alpha \sin \beta$

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6. Show that $\cos^2 \theta+\cos^2 \theta(\alpha+\theta)-2 \cos \alpha \cos \theta \cos(\alpha+\theta)$ is independent of θ.

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7. If $3\tan\theta\tan\phi = 1$, then prove that $2\cos(\theta+\phi) = \cos(\theta-\phi)$

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8. If $\triangle ABC$, if $\cot A + \cot B + \cot C = 0$ then find the value of $\cos A \cos B \cos C$.

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9. If $\alpha, \beta, \gamma, \in \left(0, \frac{\pi}{2}\right)$, then prove that $\frac{si(\alpha+\beta+\gamma)}{\sin\alpha+\sin\beta+\sin\gamma} < 1$

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10. Let $\alpha, \beta and \gamma$ satisfy $0 < \alpha < \beta < \gamma < 2\pi$. It $\cos(x+\alpha) + \cos(x+\beta) + \cos(x+\gamma) = 0$ for all$x \in R$, then find the possible values of $(\gamma - \alpha)$

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11. If in triangle $ABC, \angle C = 45^0$ then find the range of the values of $\sin^2 A + \sin^2 B$.

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12. Prove that: $\sum_{k=1}^{100} \sin(kx)\cos(101 - k)x = 50\sin(101x)$

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13. Find the maximum value of $4\sin^2 x + 3\cos^2 + \frac{\sin x}{2} + \frac{\cos x}{2}$.

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14. Prove that $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3$ lies between $-4 and 10$.

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15. Find the maximum vertical distance between the graphs $y = 2 + 3\sin x$ and $y = 4\cos x - 3$.

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16. Find the range of the expression $27^{\cos 2x} 81^{\sin 2x}$

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17. Find the range of $f(x) = \frac{1}{(\cos x - 3)^2 + (\sin x + 4)^2}$

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18. find the range of function $f(x) = \sin\left(x + \frac{\pi}{6}\right) + \cos\left(x - \frac{\pi}{6}\right)$

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19. If $\sin^2(\theta-\alpha)cas\alpha=\cos^2(\theta-\alpha)\sin\alpha=m\sin\alpha\cos\alpha,$ then prove that $|m|\geq\frac{1}{\sqrt{2}}$

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20. In $\triangle ABC$, if $\sqrt{3}\sin C=2\sec A-\tan A$, then prove that triangle is right angled.

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21. If $\tan\alpha=\frac{m}{m+1}$ and $\tan\beta=\frac{1}{2m+1}$. Find the possible values of $\tan(\alpha+\beta)$

A. 2

B. 1

C. -1

D. 0

Answer: B

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22. If

$\sin(A-B)=\frac{1}{\sqrt{10,}}\cos(A+B)=\frac{2}{\sqrt{29}}, f \in d the value of 2A where A and$

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23. Prove that $\frac{\cos 100 \sin 10^0}{\cos 10^0 - s \in 10^0} = \tan 55^0$

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24. Prove that tan $70^\circ = \tan\ 20^\circ + 2\tan\ 50^\circ$

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25. Find the value of $\frac{\cot 25^\circ + \cot 55^\circ}{\tan 25^\circ + \tan 55^\circ} + \frac{\cot 55^\circ + \cot 100^\circ}{\tan 55^\circ + \tan 100^\circ} + \frac{\cot 100^\circ + \cot 25^\circ}{\tan 100^\circ + \tan 25^\circ}$

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26. Prove that $(1 + \tan 1^\circ)(1 + \tan 2^\circ)...(1 + \tan 45^o) = 2^{23}$

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27. If $A = \frac{\pi}{5}$, then find the value of $\sum_{r=1}^{8} \tan(rA)\tan((r+1)A)$.

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28. In ABC, if $\angle A = \frac{\pi}{4}$, then find all possible values of $\tan B \tan C$.

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29. If $\tan^3 A + \tan^3 B + \tan^3 C = 3 \tan A \tan B \tan C$, then prove that triangle ABC is an equilateral triangle.

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30. In $\sin A = \sin B$ and $\cos A = \cos B$, then prove that $\frac{\sin(A - B)}{2} = 0$

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31. Prove that $\cos 55^0 + \cos 65^0 + \cos 175^0 = 0$

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32. Prove that: $\cos 18^0 - s \in 18^0 = \sqrt{2} \sin 27^0$

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33. Prove that: $\frac{\sin 5A - \sin 3A}{\cos 5A + \cos 3A} = \tan A \frac{\sin A - \sin 3A}{\cos A + \cos 3A} = \tan 2A$

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34. Prove that $\frac{\sin A + \sin 2A + \sin 4A + \sin 5A}{\cos A + \cos 2A + \cos 4A + \cos 5A} = \tan 3A.$

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35. Prove that

$\cos\alpha + \cos\beta + \cos\gamma + \cos(\alpha+\beta+\gamma) = 4\cos\left(\frac{\alpha+\beta}{2}\right)\cos\left(\frac{\beta+\gamma}{2}\right)\cos($

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36. Prove that:

$\left(\frac{\cos A + \cos B}{\sin A - s \in B}\right)^n + \left(\frac{\sin A + s \in B}{\cos A - \cos B}\right)^n = \left\{2\cot^n\left(\frac{A-B}{2}\right),\quad \text{if} \quad nise\right.$

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37. Prove that $(\cos\alpha + \cos\beta)^2 + (\sin\alpha - \sin\beta)^2 = 4\cos^2\left(\frac{\alpha+\beta}{2}\right)$

A. $4\cos^2\left(\frac{\alpha-\beta}{2}\right)$

B. $4\cos^2\left(\frac{\alpha+\beta}{2}\right)$

C. $4\cos^2(\alpha-\beta)$

D. $\cos^2\left(\frac{\alpha+\beta}{2}\right)$

Answer: A

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38. In quadrilateral $ABCD$, if $\sin\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right) + \sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right) = 2$ then find the value of $\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2}\frac{\sin D}{2}$.

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39. If $ABC, \sin C + \cos C + \sin(2B + C) - \cos(2B + C)) = 2\sqrt{2.}$

Prove that ABC is right-angled isosceles.

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40. If α and β are acute angles such that $\alpha + \beta = \lambda$, where constant, find the maximum possible value of the expression $\sin\alpha + \sin\beta + \cos\alpha + \cos\beta$.

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41. Prove that

$$\sum_{r=1}^{n}\left(\frac{1}{\cos\theta + \cos(2r+1)\theta}\right) = \frac{\sin n\theta}{2\sin\theta\cos\theta\cos(n+1)\theta}, (where n \in N).$$

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42. Prove that:

(a) $\dfrac{\sin 2\theta}{1+\cos 2\theta}=\tan\theta$ (b) $\dfrac{1+\sin 2\theta+\cos 2\theta}{1+\sin 2\theta-\cos 2\theta}=\cot\theta$

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43. Prove that $\dfrac{1+\sin 2\theta}{1-\sin 2\theta}=\left(\dfrac{1+\tan\theta}{1-\tan\theta}\right)^2$

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44. If $\alpha+\beta+90^0$, find the maximum and minimum values of $s\in\alpha s\in\beta$.

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45. If $\sin A=\dfrac{3}{5}, where 0^0<A<90^0$, then find the values of $\sin 2A, \cos 2A, \tan 2A and \sin 4A$

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46. Find the Value of $\sqrt{2+\sqrt{2+2\cos 4\theta}}$

A. $2\cos\theta$

B. $\cos\theta$

C. $2\cos\left(\frac{\theta}{2}\right)$

D. $2\cos\left(\frac{\theta}{4}\right)$

Answer: A

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47. Prove that $\frac{\sec 8\theta - 1}{\sec 4\theta - 1} = \frac{\tan 8\theta}{\tan 2\theta}$

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48. Prove that $\frac{\tan \pi}{16} + 2\frac{\tan \pi}{8} + 4 = \frac{\cot \pi}{16}$.

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49. 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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50. If `pi

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51. If $\sin\alpha+\sin\beta$ and $\cos\alpha+\cos\beta=b,$ prove that $\frac{\tan(\alpha-\beta)}{2}=\pm\sqrt{\frac{4-a^2-b^2}{a^2+b^2}}$.

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

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53. If $\frac{\tan\theta}{2} = \sqrt{\frac{2-b}{a+b}}\frac{\tan\phi}{2}$, prove that $\cos\alpha = \frac{1\cos\phi + b}{a+b\cos\phi}$

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54. If $(\cos\theta = \cos\alpha\cos\beta$, prove that $tan\frac{\theta+\alpha}{2}tan\frac{\theta-\alpha}{2} = tan^2\frac{\beta}{2}$.

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55. If $\tan\beta = \frac{\tan\alpha + \tan\gamma}{1+\tan\alpha\tan\gamma}$. prove that $s \in 2\beta = \frac{\sin 2\alpha + \sin 2\gamma}{1+\sin 2\alpha\sin 2\gamma}$.

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56. Prove that $\left(4\cos^2 9^0 - 3\right)\left(4\cos^2 27^0 - 3\right) = \tan 9^0$.

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57. Prove that $4\frac{\cos(2\pi)}{7}\frac{\dot{\cos}\,\pi}{7}-1=2\frac{\cos(2\pi)}{7}.$

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58. Evaluate $\cos\alpha\cos 2\alpha\cos 3\alpha\ldots\ldots\ldots\cos 999\alpha$, where $\alpha=\frac{2\pi}{1999}$

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59. prove that $\sin\theta\dot{\sec}\,3\theta+\sin 3\theta,\sec 3^2\theta+\sin 3^2\theta\dot{\sec}\,3^{3}\theta+up\to n$ terms $=\frac{1}{2}[\tan 3^n\theta-\tan\theta]$

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60. Let $f(x)=2\cos ec2x+\sec x+\cos ecx\cdot$ Then find the minimum value of $f(x)f\text{ or }x\in\left(0,\frac{\pi}{2}\right)\cdot$

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61. Find the maximum and minimum values of $\cos^2\theta - 6s\int h\eta\cos\theta + 3\sin^2\theta + 2.$

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62. If $\tan\alpha = \frac{1}{7}, \sin\beta = \frac{1}{\sqrt{10}}$, prove that $\alpha + 2\beta = \frac{\pi}{4}$

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63. Prove that $\frac{\tan\pi}{10}$ is a root of polynomial equation $5x^4 - 10x^2 + 1 = 0.$

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64. If x + y + z = xyz, then prove 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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65. Prove that `1+cot theta' =cot theta/2 for '0

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66. Find the angle θ whose cosine is equal to its tangent.

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67. Find the value of $\cos 12^\circ + \cos 84^\circ + \cos 156^\circ + \cos 132^\circ$

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68. Prove that $\cos 36^\circ \cos 72^\circ \cos 108^\circ \cos 144^\circ = 1/16.$

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69. Show that $4\sin 27^0 = (5+\sqrt{5})^{\frac{1}{2}} - (3-\sqrt{5})^{\frac{1}{2}}$

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70. Prove that $\frac{\tan \pi}{16} = \sqrt{4 + 2\sqrt{2}} - (\sqrt{2} + 1)$

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71. Find the quadratic equation whose roots are $\tan\left(\frac{\pi}{8}\right)$ and $\tan\left(\frac{5\pi}{8}\right)$

?

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72. Prove that cos$20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

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73. The value of $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$ is equal to .

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

B. $\frac{1}{32}$

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

D. $\frac{1}{12}$

Answer: C

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74. The value of $\tan 20^\circ \tan 40^\circ \tan 80^\circ$ is equal to

A. $\tan 60^\circ$

B. $\cot 60^\circ$

C. $\tan 45^\circ$

D. $\tan 80^\circ$

Answer: A

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75. If $\theta = \frac{\pi}{2^n + 1}$, prove that: $2^n \cos\theta \cos 2\theta \cos 2^2\theta .... \cos 2^{n-1}\theta = 1.$

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76. $\cos\frac{2\pi}{15}\cos\frac{4\pi}{15}\cos\frac{8\pi}{15}\cos\frac{16\pi}{15} = \frac{1}{16}$

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77. Prove that $\sin 6^0 \sin 42^0 \sin 66^0 \sin 78^0 - \frac{1}{16}$

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78. Find the value of $2\frac{\cos^2\pi}{7} - \frac{\cos^2\pi}{7} - \frac{\cos\pi}{7}$

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79. Find the value of $\frac{\cos(2\pi)}{7} + \frac{\cos(4\pi)}{7} + \frac{\cos(6\pi)}{7}$

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80. Prove that $\sin\theta + s \in 3\theta + \sin 5\theta + \quad + \sin(2n-1)\theta = \frac{\sin^2 n\theta}{\sin\theta}.$

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81. Prove that

$$\frac{\cos 3x}{\sin 2x \sin 4x} + \frac{\cos 5x}{\sin 4x \sin 6x} + \frac{\cos 7x}{\sin 6x \sin 8x} + \frac{\cos 9x}{\sin 8x \sin 10x}$$
$$= \frac{1}{2}(co\sec x)[co\sec 2x - co\sec 10x]$$

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82. Prove that

$2\sin 2^\circ + 4\sin 4^\circ + 6\sin 6^\circ + \ldots\ldots. + 180\sin 180^\circ = 90\cot 10^\circ.$

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83. If $A+B+C=\pi$ prove that $\cos^2 A+\cos^2 B+\cos^2 C=1\cos A\cos B\cos C.$

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84. If $A+B+C=180^0,$ prove that : $\cos^2 A+\cos^2 B-\cos^2 C=1-2\sin A\sin B\cos C$

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85. In triangle ABC, prove that $\sin(B+C-A)\sin(C+A-B)+\sin(A+B-C)=4s\in As\in Bs\in C$

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

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87. In any triangle ABC, prove that $\sin^3 A\cos(B-C)+\sin^{3B}\cos(C-A)+\sin^3 C\cos(A-B)=3s\in As\in$

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88. If $A+B+C=\pi$, prove that $\cot A+\cot B+\cot C-\cos ecA\cos ecB\cos ecC=\cot A\cot B\cot C$.

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89. If $A+B+C=\pi$, prove that $\frac{\tan A}{\tan B\tan C}+\frac{\tan B}{\tan A tan C}+\frac{\tan C}{\tan A\tan B}\tan A+\tan B+\tan C-2\cot A$

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90. In triangle ABC, if $\cot A \cot C = \frac{1}{2} and \cot B \cot C = \frac{1}{18}$, then the value of $\tan C$ is

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91. If $\cos(A+B+C) = \cos A \cos B \cos C$, then find the value of $\frac{8\sin(B+C)\sin(C+A)\sin(A+B)}{\sin 2A \sin 2B \sin 2C}$

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92. If $x+y+z=\frac{\pi}{2}$, then prove that $\left|\sin x \sin y \sin z \cos x \cos y \cos z \cos^3 x \cos^y y \cos^3 z\right| = 0$

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93. The product of the sines of the angles of a triangle is p and the product of their cosines is q. Show that the tangents of the angles are the roots of the equation $qx^3 - px^2 + (1+q)x - p = 0$.

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94. If $x^2 + yx^2 = 4$ then find the xamimum value of $\frac{x^3 + y^3}{x + y}$

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95. If $\frac{x^2}{4} + \frac{y^2}{9} = 1$, then find the range of $2 + y$.

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96. If $x^2 + y^2 = x^2y^2$ then find the range of $\frac{5x + 12y + 7xy}{xy}$.

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97. For all, $x, y \in R$. find the range of $\dfrac{(x+y)(1-xy)}{(1+x^2)(1+y^2)}$.

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98. If $x, y \in R$ and $x^2 + y^2 + xy = 1$, then find the minimum value of $x^3y + xy^3 + 4$.

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99. Prove that in a ABC, $\sin^3 A + \sin^2 B + \sin^2 C \leq \dfrac{9}{4}$.

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100. Prove that in $\triangle ABC$, $2\cos A \cos B \cos C \leq \dfrac{1}{8}$.

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101. In $\triangle ABC$, prove that $\cos^2 A + \cos^2 B + \cos^2 C \geq \frac{3}{4}$.

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102. In triangle ABC, prove that $\frac{\sin A}{2} + \frac{\sin B}{2} + \frac{\sin C}{2} \leq \frac{3}{2}$. Hence, deduce that $\frac{\cos(\pi + A)}{4} \frac{\cos(\pi + B)}{4} \frac{\cos(\pi_C)}{4} \leq \frac{1}{8}$

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103. Find the least value of $\sec A + \sec B + \sec C$ in an acute angled triangle.

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104. If $A + B + C = \pi$, prove that $\frac{\tan^2 A}{2} + \frac{\tan^2 B}{2} + \frac{\tan^2 C}{2} \geq 1$.

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105. In a ABC, if $\frac{\tan A}{2}, \frac{\tan B}{2}, \frac{\tan C}{2} are \in A\dot{P};$ then show that $\cos A, \cos B, \cos C$ are in $A\dot{P}$.

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106. if ABC is a triangle and $\tan\left(\frac{A}{2}\right), \tan\left(\frac{B}{2}\right), \tan\left(\frac{C}{2}\right)$ are in H.P. Then find the minimum value of $\cot\left(\frac{B}{2}\right)$

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107. In ABC, if $\sin^3\theta = \sin(A-\theta)\sin(B-\theta)\sin(C-\theta)$, then prove that $\cot\theta = \cot A + \cot B + \cot C$.

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108. Find the sum of series $co\sec\theta + co\sec 2\theta + co\sec 4\theta + \ldots\ldots.$ to n terms

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109. If $\frac{x}{\tan(\theta+\alpha)}=\frac{y}{\tan(\theta+\beta)}=\frac{z}{\tan(\theta+\gamma)}$, then show that $\sum\frac{x+y}{x-y}\sin^2(\alpha-\beta)=0$

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110. If $\tan 6\theta=\frac{p}{q}$, find the value of $\frac{1}{2}(p\cos ec2\theta - -q\sec 2\theta)$

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111. If `0

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112. Let A,B,C, be three angles such that $A=\frac{\pi}{4}$ and $\tan B, \tan C=p\cdot$

Find all possible values of p such that A, B, C are the angles of a triangle.

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113. If s in A=(12)/(13)a n dsinB=4/5,\ w h e r e\ pi/2 find cos a+b

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114. Prove that :

$$\frac{2\cos 2^n\theta + 1}{2\cos\theta + 1} = (2\cos\theta - 1)(2\cos 2\theta - 1)\left(2\cos 2^2\theta - 1\right)\dots\left(2\cos 2^{n-1}\theta -\right.$$

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115. If $\tan\left(\frac{\pi}{4} + \right) = \tan^3\left(\frac{\pi}{4} + \frac{x}{2}\right)\cdot$ Prove that $\frac{\sin y}{\sin x} = \frac{3 + \sin^2 x}{1 + 3\sin^2 x}$.

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116. If $(1_{\sin t})(1 + \cot t) = \frac{5}{4}$ then find the value of $(1 - \sin t)(1 - \cos t)\cdot$

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117. For all θ in $\left[0, \frac{\pi}{2}\right]$ show that the $\cos(\sin\theta) \geq \sin(\cos\theta)$

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118. Prove that $\frac{\tan 3x}{\tan x}$ never lies between $\frac{1}{3}$ and 3.

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119. Prove that

$$\sum_{k=1}^{n-1} (n-k)\frac{\cos(2k\pi)}{n} = -\frac{n}{2}, wheren \geq 3isan \in te \geq r$$

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Exercise 3.1

1. In $\triangle ABC$, if $\cos A + \sin A - \frac{2}{\cos B + \sin B} = 0$ then prove that triangle is isosceles right angled.

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2. If X is $A.M.$ of $\tan\left(\frac{\pi}{9}\right)$ and $\tan\left(\frac{5\pi}{18}\right)$ and y is $A.M.$ of $\tan\left(\frac{\pi}{9}\right)$ and $\tan\left(\frac{7\pi}{18}\right)$, then

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3. Find the value of

$$\cos\frac{\pi}{12}\left(\sin\frac{5\pi}{12} + \cos\frac{\pi}{4}\right) + \sin\frac{\pi}{12}\left(\cos\frac{5\pi}{12} - \sin\frac{\pi}{4}\right).$$

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4. If $\cos(\alpha + \beta) + \sin(\alpha - \beta) = 0$ and $\tan\beta \neq 1$, then find the value of $\tan\alpha$.

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5. If $\sin A + \cos 2A = 1/2$ and $\cos A + \sin 2A = 1/3$. Then find the value of $\sin 3A$.

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6. If $\sin x + \sin y + \sin z = 0 = \cos x + \cos y + \cos z$, then find the value of $\cos(\theta - x) + \cos(\theta - z)$

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7. In a triangle ABC, if $\sin A \sin(B - C) = s9nC \sin(A - B)$, then prove that $\cot A, \cot B, \cot Care \in A\dot{P}$.

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8. Find the value of $\frac{(\cos 1^\circ + \sin 1^\circ)(\cos 2^\circ + \sin 2^\circ)(\cos 3^\circ + \sin 3^\circ)...(\cos 45^\circ \sin 45^\circ)}{\cos 1^\circ \cos 2^\circ \cos 3^\circ ...\cos 45^\circ}$

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9. Find the maximum value of $\sqrt{3}\sin x + \cos x and x$ for which a maximum value occurs.

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10. The maximum value of $1 + \sin\left(\frac{\pi}{4} + \theta\right) + 2\cos\left(\frac{\pi}{4} - \theta\right)$ for real values of θ is

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11. show that $2^{\sin x} + 2^{\cos x} \geq 2^{1 - \frac{1}{\sqrt{2}}}$

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Exercise 3.2

1. If $A+B=225^{\circ}$, then find the value of $\frac{\cot A}{1+\cot A}\times\frac{\cot B}{1+\cot B}$

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2. If $\tan A-\tan B=x$, and $\cot B-\cot A=y$, then find the value of $\cot(A-B)$.

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

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4. If $A+B=45^{\circ}$, show that $(1+\tan A)(1+\tan B)=2$.

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5. If $\tan A = 1/2, \tan B = 1/3$, then prove that $\cos 2A = \sin 2B$.

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6. If $P + Q = \frac{7\pi}{6}$, then find the value of $\left(\sqrt{3} + \tan P\right) \times \left(\sqrt{3} + \tan Q\right)$.

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7. If $tan\beta = \frac{ns \in \alpha \cos \alpha}{1 - ns \in^2 \alpha}$, show that $\tan(\alpha - \beta) = (1 - n)tan\alpha\cdot$

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Exercise 3.3

1. (a) Prove that $\sin 65^\circ + \cos 65^\circ = \sqrt{2}\cos 20^\circ$

(b) Prove that $\sin 47^\circ + \cos 77^\circ = \cos 17^\circ$

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2. Prove that: $\cos 80^0 + \cos 40^0 - \cos 20^0 = 0$

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3. Prove that sin 10Âº + sin 20Âº + sin 40Âº + sin 50Âº=sin 70Âº + sin 80

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4. $\frac{\cos \pi}{5} + \frac{\cos(2\pi)}{5} + \frac{\cos(6\pi)}{5} + \frac{\cos(7\pi)}{5} = 0$

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5. If $\sin\alpha - \sin\beta = \frac{1}{3}$ and $\cos\beta - \cos\alpha = \frac{1}{2}$, show that $\frac{\cot(\alpha+\beta)}{2} = \frac{2}{3}$

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6. If $\cos ecA + \sec A = \cos ecB + secB$, prove that: $\text{tanAtanB} = \frac{\cot(A+B)}{2}$

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7. $\sin 25^\circ \cos 115^\circ = \frac{1}{2}(\sin 40^\circ - 1)$

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8. If x cos θ = y cos $\left(\theta + \frac{2\pi}{3}\right)$ = z cos $\left(\theta + \frac{4\pi}{3}\right)$, find the value of xy + yz + zx

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9. If $y\sin\phi = x\sin(2\theta+\phi)$ show that $(x+y)\cot(\theta+\phi) = (y-x)\cot\theta$.

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10. If $\cos(A+B)\sin(C+D) = \cos(A-B)\sin(C-D)$, prove that $\cot A\cot B\cot C = \cot D$.

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11. If $\tan(A+B) = 3\tan A$, prove that (a) $\sin(2A+B) = 2\sin B$

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12. if $\frac{x}{2} = \frac{\cos A}{\cos B}$ then prove that $\frac{x\tan A + y\tan B}{x+y} = \tan\frac{A+B}{2}$

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13. If $\frac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x} = 1$, then find the smallest positive value of x.

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Exercise 3.4

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

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

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3. Prove that $\cot\theta - \tan\theta = 2\cot 2\theta$.

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4. Prove that $\dfrac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \sec 2\theta - \tan 2\theta$.

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5. Prove that tan $\left(\frac{\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right) = 2\tan 2\theta$.

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6. Prove that $\cos ecA - 2\cot 2A\cos A = 2\sin A$.

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7. Prove that $\cos^3\theta\sin 3\theta + \sin^3\theta\cos 3\theta = \frac{3}{4}\sin 4\theta$.

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8. $\frac{\sin^2 3A}{\sin^2 A} - \frac{\cos^2 3A}{\cos^2 A}$ is

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9. Prove that $(1 + \sec 2\theta)(1 + \sec 4\theta)(1 + \sec 8\theta) = \frac{\tan 8\theta}{\tan \theta}$

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10. If in an isosceles triangle with base 'a', vertical angle 20° and lateral side each of length 'b' is given then value of $a^3 + b^3$ equals

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11. In $\Delta ABC, a = 3, b = 4$ and $c = 5,$ then value of $\sin A + \sin 2B + \sin 3C$ is

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12. If $\cos A = \frac{3}{4}$ then $\sin\frac{A}{2}. \sin 5\frac{A}{2}$ is

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13. Find the value of $\left(4\cos^2 9^\circ - 1\right)\left(4\cos^2 27^\circ - 1\right)$

$\left(4\cos^2 81^\circ - 1\right)\left(4\cos^2 243^\circ - 1\right)$.

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14. If θ is an acute angle and $\sin\left(\frac{\theta}{2}\right) = \sqrt{\frac{x-1}{2x}}$,then $\tan\theta$ is equal to

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15. In a triangle ABC, if $\sin A \sin(B - C) = \sin C \sin(A - B)$, then prove

that $\cos 2A$, $\cos 2B$ and $\cos 2C$ are in AP.

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16. Let $a = \frac{\pi}{7}$, then

(a) show that $\sin^2 3a - \sin^2 a = \sin 2a \sin 3a$

(b) show that $co\sec a = co\sec 2a + co\sec 4a$.

(c) Prove that $\cos a$ is a root of the equation $8x^3 + 4x^2 - 4x + 1 = 0$.

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

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18. Prove that

$2\sin^2\beta + 4\cos(\alpha+\beta)\sin\alpha\sin\beta + \cos 2(\alpha+\beta) = \cos 2\alpha$

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19. If $\tan x = \frac{a}{b}$ and $\tan 2x = \frac{b}{a+b}$ find the smallest positive value of x.

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20. $\tan\theta + \tan\left(60^0 + \theta\right) + \tan\left(120^0 + \theta\right) = 3\tan 3\theta$

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21. If $A = 110^\circ$, then prove that $\frac{1 + \sqrt{1 + \tan^2 2A}}{\tan 2A} = -\tan A.$

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22. If α and β are the two different roots of equations $\alpha\cos\theta + b\sin\theta = c$, prove that

(a) $\tan(\alpha - \beta) = \frac{2ab}{a^2 - b^2}$ (b) $\cos(\alpha + \beta) = \frac{a^2 - b^2}{a^2 + b^2}$

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23. If $\tan\beta = \cos\theta\tan\alpha$, then prove that $\tan^2\frac{\theta}{2} = \frac{\sin(\alpha-\beta)}{\sin(\alpha+\beta)}$.

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24. If $\cos\theta = \frac{a}{b+c}$, $\cos\phi = \frac{b}{a+c}$ and $\cos\psi = \frac{c}{a+b}$ where $\theta, \phi, \psi \in (0, \pi)$ and a, b, c are sides of triangle ABC then $\tan^2\left(\frac{\theta}{2}\right) + \tan^2\left(\frac{\phi}{2}\right) + \tan^2\left(\frac{\psi}{2}\right) =$

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25. If $\cos\theta = \frac{\cos\alpha - \cos\beta}{1 - \cos\alpha\cos\beta}$, prove that $\frac{\tan\theta}{2} = \pm\frac{\tan\alpha}{2}\frac{\cot\beta}{2}$.

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26. If $\tan\theta\tan\phi = \sqrt{\frac{a-b}{a+b}}$, prove that

$a - b\cos 2\theta)(a - b\cos 2\phi)$ is independent of θ and ϕ.

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Exercise 3.5

1. Find the value of $\left(\cos^2 66^\circ - \sin^2 6^\circ\right)\left(\cos^2 48^\circ - \sin^2 12^\circ\right)$.

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2. $4\left(\sin 24^0 + \cos 6^0\right) = \sqrt{3} + \sqrt{15}$

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3. $\sin 47^\circ + \sin 61^\circ - \sin 11^\circ - \sin 25^\circ =$

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4. Find the values of following . (a) $\frac{\tan^2 37\frac{1}{(7)}^\circ + 1}{\tan^2 37\frac{1}{(2)}^\circ - 1}$ (b) $\frac{3\tan^2 5^\circ - 1}{3\tan 5^\circ - \tan^3 5^\circ}$

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5. If the value of $\cot\left(11\frac{1}{4^\circ}\right) + \tan\left(112\frac{1}{2^\circ}\right) - \cot\left(112\frac{1}{2^\circ}\right) - \tan\left(11\frac{1}{4^\circ}\right) = \sqrt{n}$ where $n \in N$ then find the value of n

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6. Find the value of $\frac{\tan 9^\circ + \cot 9^\circ}{\tan 27^\circ + \cot 27^\circ}$.

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Exercise 3.6

1. Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$.

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2. Prove that: $\sin 10^0 \sin 30^0 \sin 50^0 \sin 70^0 = \frac{1}{16}$.

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3. Prove that $\sin 12^\circ \sin 18^\circ \sin 42^\circ \sin 48^\circ \sin 72^\circ \sin 78^\circ = \frac{\cos 18^\circ}{32}$.

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4. The value of $\frac{\sin \pi}{14} \frac{\sin(3\pi)}{14} \frac{\sin(5\pi)}{14} \frac{\sin(7\pi)}{14} \frac{\sin(9\pi)}{14} \frac{\sin(11\pi)}{14} \frac{\sin(13\pi)}{14}$ is equal to__________

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5. The value of $\frac{\sin \pi}{14} \frac{\sin(3\pi)}{14} \frac{\sin(5\pi)}{14} \frac{\sin(7\pi)}{14} \frac{\sin(9\pi)}{14} \frac{\sin(11\pi)}{14} \frac{\sin(13\pi)}{14}$ is equal to__________

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Exercise 3.7

1. The value of $\cos\frac{\pi}{11}+\cos\frac{3\pi}{11}+\cos\frac{5\pi}{11}+\cos\frac{7\pi}{11}+\cos\frac{9\pi}{11}$, is

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2. The average value of $\sin 2^\circ, \sin 4^\circ, \sin 6^\circ ....\sin 180^\circ$ is $(i)\frac{1}{90}\cos 1^0 (ii)\frac{1}{90}\sin 1^0 (iii)\frac{1}{90}\cot 1^0$ (iv) none of these

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3. $\sum_{r=0}^{n}\sin^2\frac{r\pi}{n}$ is equal to

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4. Sum the series: $\sqrt{1+\cos\alpha}+\sqrt{1+\cos 2\alpha}+\sqrt{1+\cos 3\alpha}$ +.......to n terms, where $0 < \alpha < \pi$

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5. The value of $\left(\cos^4 1^\circ + \cos^4 2^\circ + \ldots . + \cos^4 179^\circ\right) - \left(\sin^4 1^\circ + \sin^4 2^\circ + \ldots . . + \sin^4 1$ equals

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Exercise 3.8

1. If $A+B+C=180^0$, prove that : $\cos^2, \frac{A}{2}+\cos^2, \frac{B}{2}-\cos^2, \frac{C}{2}=2\cos, \frac{A}{2}\cos, \frac{B}{2}\sin, \frac{C}{2}$

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

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

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4. Prove that : $\cos^2(\beta-\gamma)+\cos^2(\gamma-\alpha)+\cos^2(\alpha-\beta)=1+2\cos(\beta-\gamma)\cos(\gamma-\alpha)\cos$

.

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5. If $A+B+C=\pi$, prove that $\cot A+\cot B+\cot C-\cos ecA\cos ecB\cos ecC=\cot A\cot B\cot C\cdot$

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6. If A+B+C=π,prove that $\cot\left(\frac{A}{2}\right)+\cot\left(\frac{B}{2}\right)+\cot\left(\frac{C}{2}\right)=\cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$

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7. If $A+B+C=\pi,$ prove that : $\frac{\cos A}{\sin b\sin C}+\frac{\cos B}{\sin C\sin}+\frac{\cos C}{\sin A\sin B}=2.$

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8. In a triangle ABC, $\cos 3A+\cos 3B+\cos 3C=1$ and $\angle A+\angle B<\angle C,$ then find possible measure of $\angle C.$

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9. In $\triangle ABC$ if $2\sin^2 C = 2 + \cos 2A + \cos 2B$, then prove that triangle is right angled.

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Exercise 3.9

1. Let $x, y \in R$, then find the maximum and minimum values of expression $\frac{x^2+y^2}{x^2+xy+4y^2}$.

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2. Let $a^2+b^2=\alpha^2+\beta^2=2$. Then show that the maximum value of $S=(1-\alpha)(a-b)+(1-\alpha)(1-\beta)$ is 8.

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3. Find the maximum distance of any point on the curve $x^2 + 2y^2 + 2xy = 1$ from the origin.

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4. If $\frac{x^2}{144} - \frac{y^2}{25} = 1$. Find the range of $\frac{144}{x} + \frac{25}{y}$.

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5. If $x^2 + y^2 + 6x - 4y - 12 = 0$ then find the ragne of 2x+y

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Exercise 3.10

1. In ABC Prove that $\frac{\cos^2 A}{2} + \frac{\cos^2 B}{2} + \frac{\cos^2 C}{2} \leq \frac{9}{4}$. In $\frac{\cos^2 A}{2} + \frac{\cos^2 B}{2} + \frac{\cos^2 C}{2} = y\left(x^2 + \frac{1}{x^2}\right)$ then find the maximum value of y.

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2. Let $\alpha, \beta, \gamma > 0 and \alpha + \beta + \gamma = \frac{\pi}{2}$. Then prove that $\sqrt{\tan \alpha \tan \beta} + \sqrt{tan \beta \tan \gamma} + \sqrt{\tan \alpha \tan \gamma} \leq \sqrt{3}$

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3. In acute angled $\triangle ABC$ prove that $\tan^2 A + \tan^2 B + \tan^2 C \geq 9$.

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4. In a $\Delta ABC \sin A \sin B \sin C \leq \frac{3\sqrt{3}}{8}$

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5. In triangle ABC, prove that $\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} \leq \frac{1}{8}$ and hence, prove that $co\sec\frac{A}{2} + co\sec\frac{B}{2} + co\sec\frac{C}{2} \geq 6.$

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Exercise (Single)

1. If $\cos(A-B) = \frac{3}{5} and tan A tan B = 2,$ then $\cos A \cos B = \frac{1}{5}$ (b) $s \in A s \in B = -\frac{2}{5}\cos A \cos B = -\frac{1}{5}$ (d) $s \in A s \in B = -\frac{1}{5}$

A. $\cos A \cos B = \frac{1}{5}$

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

C. $\cos A \cos B = -\frac{1}{5}$

D. $\sin A \sin B = 1/5$

Answer: A

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2. If $A = \sin 45^0 + \cos 45^0 and B = \sin 44^0,$ then A>B (b) A

A. $A > B$

B. $A < B$

C. $A = B$

D. none of these.

Answer: A

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3. $\tan 100^0 + \tan 125^0 + \tan 100^0 \tan 125^0$ **is equal to 0 (b)** $\frac{1}{2}$ **(c)** -1 **(d) 1**

A. 0

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

C. -1

D. 1

Answer: D

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4. If $\cot(\alpha+\beta=0,$ **then** $\sin(\alpha+2\beta$ **can be** $-\sin\alpha$ **(b)** $\sin\beta$ **(c)** $\cos\alpha$ **(d)** $\cos\beta$

A. $-\sin\alpha$

B. $\sin\beta$

C. $\cos\alpha$

D. $\cos\beta$

Answer: D

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5. In triangle $ABC,$ **if** $\sin A\cos B=\frac{1}{4}and3tanA=tanB, then\cot^2 A$ **is equal to 2 (b) 3 (c) 4 (d) 5.**

A. 2

B. 3

C. 4

D. 5

Answer: B

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6. Let $\frac{\sin(\theta-\alpha)}{\sin(\theta-\beta)}=\frac{a}{b}and\frac{\cos(\theta-\alpha)}{\cos(\theta-\beta)}=\frac{c}{d}then\frac{ac+bd}{ad+bc}=$ **(a)** $\cos(\alpha-\beta)$ **(b)** $\sin(\alpha-\beta)$ **(c)**$\sin(\alpha+\beta)$ **(d) none of these**

A. $\cos(\alpha-\beta)$

B. $\sin(\alpha-\beta)$

C. $\cos(\alpha+\beta)$

D. none of these.

Answer: A

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7. If A,B,C are angles of a triangle, then $2\frac{\sin A}{2}\cos ec\frac{B}{2}\frac{\sin C}{2}-\sin A\frac{\cot B}{2}-\cos Ais$ independent of A,B,C (b) function of A,B function of C (d) none of these

A. independent of A, B, C

B. function of A,B

C. function of C

D. none of these.

Answer: A

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8. If $a\leq 3\cos x+5\sin\left(x-\frac{\pi}{6}\right)\leq b$ for all x then (a, b) is (a) $\left(-\sqrt{19}, \sqrt{19}\right)$ (b) $(-17, 17)$ (c) $\left(-\sqrt{21}, \sqrt{21}\right)$ (b) none of these

A. $\left(-\sqrt{19}\sqrt{19}\right)$

B. $(-17, 17)$

C. $\left(-\sqrt{21}, \sqrt{21}\right)$

D. none of these.

Answer: A

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9. If $\frac{x}{\cos\theta} = \frac{y}{\cos\left(\theta - \frac{2\pi}{3}\right)} = \frac{z}{\cos\left(\theta + \frac{2\pi}{3}\right)}, then x + y + z =$

A. 1

B. 0

C. -1

D. none of these.

Answer: B

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10. Let $x = \sin 1^0$, then the value of the expression. $\frac{1}{\cos 0^0 \cos 1^0} + \frac{1}{\cos 1^0 \cos 2^0} + \frac{1}{\cos 2^0 \cos 3^0} + \frac{1}{\cos 44^0 \cos 45^0}$ is equal to x (b) $\frac{1}{x}$ (c) $\frac{\sqrt{2}}{x}$ (d) $\frac{x}{\sqrt{2}}$

A. x

B. $1/x$

C. $\sqrt{2}/x$

D. $x/\sqrt{2}$

Answer: B

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11. If θ is eliminated from the equations $x = a\cos(\theta - \alpha)$ and $y = b\cos(\theta - \beta)$, then $\sec^2(\alpha - \beta)$ (b) $\cos ec^2(\alpha - \beta)$ $\cos^2(- \beta)$ (d) $\sin^2(\alpha - \beta)$

A. $\sec^2(\alpha - \beta)$

B. $co\sec^2(\alpha - \beta)$

C. $\cos^2(- \beta)$

D. $\sin^2(\alpha - \beta)$

Answer: D

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12. The minimum vertical distance between the graphs of $y = 2 + s \in xandy = \cos x$ is 2 (b) 1 (c) $\sqrt{2}$ (d) $2 - \sqrt{2}$

A. 2

B. 1

C. $\sqrt{2}$

D. $2 - \sqrt{2}$

Answer: D

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13. If $\frac{\tan^2(\pi - A)}{4} + \frac{\tan^2(\pi - B)}{4} + \frac{\tan^2(\pi - C)}{4} = 1$, then ABC is equilateral (b) isosceles (c) scalene (d) none of these

A. equilateral

B. isosceles

C. scalene

D. none of these.

Answer: A

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14. If $(1 + \tan\alpha)(1 + \tan 4\alpha) = 2, \alpha \in \left(0, \frac{\pi}{16}\right)$, then α is equal to $\frac{\pi}{20}$ (b) $\frac{\pi}{30}$ (c) $\frac{\pi}{40}$ (d) $\frac{\pi}{60}$

A. $\frac{\pi}{20}$

B. $\frac{\pi}{30}$

C. $\frac{\pi}{40}$

D. $\frac{\pi}{60}$

Answer: A

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15. If $\cos 28^{0} + \sin 28^{0} = k^{3}, then \cos 17^{0}$ is equal to $\frac{k^{3}}{\sqrt{2}}$ (b) $-\frac{k^{3}}{\sqrt{2}}$ (c) $\pm\frac{k^{3}}{\sqrt{2}}$ (d) none of these

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

B. $-\frac{k^{3}}{\sqrt{2}}$

C. $\pm\frac{k^{3}}{\sqrt{2}}$

D. none of these.

Answer: A

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16. Let $f(\theta) = \frac{\cot\theta}{1+\cot\theta}$ and $\alpha+\beta = \frac{5\pi}{4}$ then the value $f(\alpha)f(\beta)$ is

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

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

C. 2

D. none of these.

Answer: A

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17. If $y = (1 + tanA)(1 - tanB)$, where $A - B = \frac{\pi}{4}$, then $(y+1)^{y-1}$ is equal to 9 (b) 4 (c) 27 (d) 81

A. 9

B. 4

C. 27

D. 81

Answer: C

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18. If $\frac{\sin x}{\sin y} = \frac{1}{2}, \frac{\cos x}{\cos y} = \frac{3}{2}$, where $x, y, \in \left(0, \frac{\pi}{2}\right)$, then the value of $\tan(x+y)$ is equal to $\sqrt{13}$ (b) $\sqrt{14}$ (c) $\sqrt{17}$ (d) $\sqrt{15}$

A. $\sqrt{13}$

B. $\sqrt{14}$

C. $\sqrt{17}$

D. $\sqrt{15}$

Answer: D

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19. If $\cot^2 x = \cot(x-y)(x-z), then \cot 2x$ is equal to $\left(wherex \neq \frac{\pi}{4}\right)$. $\frac{1}{2}(\tan y + \tan z)$ (b) $\frac{1}{2}(\cot y + \cot z)$ $\frac{1}{2}(\sin y + \sin z)$ **(d) none of these**

A. $\frac{1}{2}(\tan y + \tan x)$

B. $\frac{1}{2}(\cot y + \cot z)$

C. $\frac{1}{2}(\sin y + \sin z)$

D. none of these.

Answer: B

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20. In a ABC, if $\tan B : \tan C = 3:4:5$, then the value of $\sin A \sin B \sin C$ is equal to $\frac{2}{\sqrt{5}}$ (b) $\frac{2\sqrt{5}}{7}$ $\frac{2\sqrt{5}}{9}$ (d) $\frac{2}{3\sqrt{5}}$

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

B. $\frac{2\sqrt{5}}{7}$

C. $\frac{2\sqrt{5}}{9}$

D. $\frac{2}{3\sqrt{5}}$

Answer: B

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21. find the value of $\sin 27^\circ - \cos 27^\circ$ **?**

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

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

C. $-\frac{\sqrt{5}-1}{2\sqrt{2}}$

D. none of these.

Answer: B

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22. If $\cos\theta_1 2\cos\theta_2$, then $\frac{\tan(\theta_{1-\theta_2})}{2}\frac{\tan(\theta_1+\theta_2)}{2}$ is equal to $\frac{1}{3}$ (b) $-\frac{1}{3}$ 1 (d) -1

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

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

C. 1

D. -1

Answer: B

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23. Let α, β such that $\pi < \alpha - \beta < 3\pi$. If $\sin\alpha + \sin\beta = -21/65\cos\alpha + c$, then find the value of $\cos\frac{\alpha-\beta}{2}$.

A. $-\frac{3}{\sqrt{130}}$

B. $\frac{3}{\sqrt{130}}$

C. $\frac{6}{65}$

D. $-\frac{6}{65}$

Answer: A

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24. If $n=\frac{\pi}{4\alpha}$, then $\tan\alpha\tan2\alpha\tan3\alpha.......\tan(2n-1)\alpha$ is equal to

A. 1

B. $1/2$

C. 2

D. $1/3$

Answer: A

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25. $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta} isequa < o\ \tan 3\theta$ **(b)** $\cot 3\theta$ **(c)** $\tan 6\theta$ **(d)** $\cot 6\theta$

A. $\tan 3\theta$

B. $\cot 3\theta$

C. $\tan 6\theta$

D. $\cot 6\theta$

Answer: C

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26. If x, y, z **are in A.P., then** $\frac{\sin x - \sin z}{\cos z - \cos x}$ **is equal to** $\tan y$ **(b)** $\cot y$ **(c)** $\sin y$ **(d)** $\cot y$

A. $\tan y$

B. $\cot y$

C. $\sin y$

D. $\cos y$

Answer: B

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27. If $\frac{\cos x}{a}=\frac{\cos(x+\theta)}{b}=\frac{\cos(x+20)}{c}=\frac{\cos(x+3\theta)}{d}$ then $\frac{a+c}{b+d}$ is equal to $\frac{a}{d}$ (b) $\frac{c}{b}$ (c) $\frac{b}{c}$ (d) $\frac{d}{a}$

A. $\frac{a}{d}$

B. $\frac{C}{b}$

C. $\frac{b}{c}$

D. $\frac{d}{a}$

Answer: C

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28. If $\cos\alpha+\cos\beta=0=\sin\alpha+\sin\beta,$ then $\cos 2\alpha+\cos 2\beta$ is equal to

A. $-2\sin(\alpha+\beta)$

B. $-2\cos(\alpha+\beta)$

C. $2\sin(\alpha+\beta)$

D. $2\cos(\alpha+\beta)$

Answer: B

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29. Value of $\dfrac{3+\cot 80^0\cot 20^0}{\cot 80^0+\cot 20^0}$ is equal to $\cot 20^0$ (b) $\tan 50^0$ $\cot 50^0$ (d) $\cot\sqrt{20^0}$

A. $\cot 20^\circ$

B. $\tan 50^\circ$

C. $\cot 50^\circ$

D. $\cot\sqrt{20^\circ}$

Answer: B

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30. If $\tan\alpha$ is equal to the integral solution of the inequality $4x^2-16x+15<0$ and $\cos\beta$ is equal to the slope of the bisector of the first quadrant, then $\sin(\alpha+\beta)\sin(\alpha-\beta)$ is equal to $\frac{3}{5}$ (b) $\frac{3}{5}$ (c) $\frac{2}{\sqrt{5}}$ (d) $\frac{4}{5}$

A. $\frac{3}{5}$

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

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

D. $\frac{4}{5}$

Answer: D

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31. **Let** $f(n) = 2\cos nx \,\forall n \in N,$ **then** $f(1)f(n+1) - f(n)$ **is equal to** $f(n+3)$ **(b)** $f(n+2)$ $f(n+1)f(2)$ **(d)** $f(n+2)f(2)$

A. $f(n+3)$

B. $f(n+2)$

C. $f(n+1)f(2)$

D. $f(n+2)f(2)$

Answer: B

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32. **If** $\sin\theta_1 \sin\theta_2 - \cos\theta_1 \cos\theta_2 + 1 = 0,$ **then the value of** $\tan\left(\frac{\theta_1}{2}\right)\cot\left(\frac{\theta_2}{2}\right)$ **is equal to** -1 **(b) 1 (c) 2 (d)** -2

A. $a^2 + b^2 \geq 4$

B. $a^2 + b^2 \leq 4$

C. $a^2 + b^2 \geq 3$

D. $a^2 + b^2 \leq 2$

Answer: B

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33. $\dfrac{\sqrt{2} - \sin\alpha}{\sin\alpha\pi - \cos\alpha\pi}$ **is equal to** $\sec\left(\dfrac{\alpha}{2} - \dfrac{\pi}{8}\right)$ **(b)** $\cos\left(\dfrac{\pi}{8} - \dfrac{\alpha}{2}\right)$ $\tan\left(\dfrac{\alpha}{2} - \dfrac{\pi}{8}\right)$ **(d)** $\cot\left(\dfrac{\alpha}{2} - \dfrac{\pi}{2}\right)$

A. $\sec\left(\dfrac{\alpha}{2} - \dfrac{\pi}{8}\right)$

B. $\cos\left(\dfrac{\pi}{8} - \dfrac{\alpha}{2}\right)$

C. $\tan\left(\dfrac{\alpha}{2} - \dfrac{\pi}{8}\right)$

D. $\cot\left(\dfrac{\alpha}{2} - \dfrac{\pi}{2}\right)$

Answer: C

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34. If $x_1 and x_2$ are two distinct roots of the equation $a\cos x + b\sin x = c$, then tan $\frac{x_{1+x^2}}{2}$ is equal to $\frac{a}{b}$ (b) $\frac{b}{a}$ (c) $\frac{c}{a}$ (d) $\frac{a}{c}$

A. $\frac{a}{b}$

B. $\frac{b}{a}$

C. $\frac{c}{a}$

D. $\frac{a}{c}$

Answer: B

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35. If $\sin(y+z-x), \sin(z+x-y), \sin(x+y-z)$ are in A.P., then $tanx, \tan y, \tan z$ are in A.P. (b) G.P. (c) H.P. (d) none of these

A. AP

B. GP

C. HP

D. none of these.

Answer: A

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36. If $\frac{\tan(\alpha+\beta+\gamma)}{\tan(\alpha-\beta-\gamma)}=\frac{\tan\gamma}{\tan\beta},(\beta\neq\gamma)$ then $\sin 2\alpha+s\in 2\beta+s\in 2\gamma=$ **0 (b) 1 (c) 2 (d)**

A. 0

B. 1

C. 2

D. $1/2$

Answer: A

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37. If $\sin\theta_1 \sin\theta_2 - \cos\theta_1 \cos\theta_2 + 1 = 0$, then the value of $\tan\left(\frac{\theta_1}{2}\right)\cot\left(\frac{\theta_2}{2}\right)$ is equal to -1 (b) 1 (c) 2 (d) -2

A. -1

B. 1

C. 2

D. -2

Answer: A

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38. The value of expression $\left(2\frac{\sin 1^0 + \sin 2^0 + \sin 3^0 + \quad + \sin 89^0}{2\left(\cos 1^0 + \cos 2^0 + \quad + \cos 44^0\right) + 1}\right.$ $\sqrt{2}$

(b) $\frac{1}{\sqrt{2}}$ (c) $\frac{1}{2}$ (d) 0

A. $\sqrt{2}$

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

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

D. 0

Answer: A

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39. If A,B,C, are the angles of a triangle such that $\frac{\cot A}{2} = 3\frac{\tan C}{2}$, then $\sin A, \sin B, \sin C$ are in $A\dot{P}\cdot$ (b) $G\dot{P}\cdot$ (c) $H\dot{P}\cdot$ (d) none of these

A. AP

B. GP

C. HP

D. none of these.

Answer: A

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40. If $2\sec 2\theta = \tan\phi + \cot\phi$, then one of the values of $\theta + \phi$ is

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

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

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

D. none of these

Answer: B

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41. The roots of the equation $4x^2 - 2\sqrt{5}x + 1 = 0, are \ \sin 36^0, \sin 18^0$

(b) $\sin 18^0, \cos 36^0$ $\sin 36^0, \cos 18^0$ (d) $\cos 18^0, \cos 36^0$

A. $\sin 36^\circ, \sin 18^\circ$

B. $\sin 18^\circ, \cos 36^\circ$

C. $\sin 36^\circ, \cos 18^\circ$

D. $\cos 18^\circ, \cos 36^\circ$

Answer: B

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42. If $A and B$ are acute positive angles satisfying the equations $3 \sin^2 A + 2 \sin^2 B = 1 and 3 \sin 2A - 2 \sin 2B = 0, then A + 2B$ is equal to π (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

A. π

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

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

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

Answer: B

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43. If $\cos 25^0 + \sin 25^0 = p$, then $\cos 50^0$ is equal to

A. $\sqrt{2-p^2}$

B. $-\sqrt{2-p^2}$

C. $p\sqrt{2-p^2}$

D. $-p\sqrt{2-p^2}$

Answer: C

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44. The value of $\frac{\cot(7\pi)}{16}+2\frac{\cot(3\pi)}{8}+\frac{\cot(15\pi)}{16}$ **is 4 (b) 2 (c)** -2 **(d)** -4

A. 4

B. 2

C. -2

D. -4

Answer: D

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45. If $\alpha, \beta, \gamma, \delta$ are the smallest positive angles in ascending order of magnitude which have their sines equal to the positive quantity $k,$ then the value of $4\frac{\sin\alpha}{2}+3\frac{\sin\beta}{2}+2\frac{\sin\gamma}{2}+\frac{\sin\delta}{2}$ is equal to $2\sqrt{1-k}$ (b) $2\sqrt{1+k}$ $\frac{\sqrt{1-k}}{2}$ (d) none of these

A. $2\sqrt{1-k}$

B. $2\sqrt{1+k}$

C. $\frac{\sqrt{1+k}}{2}$

D. none of these.

Answer: B

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46. $\frac{\sin^2 A-\sin^2 B}{\sin A\cos A-\sin B\cos B} isequa < o\ \tan(A-B)$ **(b)** $\tan(A+B)$ $\cot(A-B)$ **(d)** $\cot(A+B)$

A. $\tan(A - B)$

B. $\tan(A + B)$

C. $\cot(A - B)$

D. $\cot(A + B)$

Answer: B

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47. If $\cos(\alpha - \beta) = 3\sin(\alpha + \beta), then \frac{1}{1 - 3\sin 2\alpha} + \frac{1}{1 - 3\sin 2\beta} =$ $\frac{1}{2}$ (b) $\frac{-1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{-1}{4}$

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

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

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

D. (-1)/(4)`

Answer: D

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48. The value of $\cos^2 10^0 - \cos 10^0 \cos 50^0 + \cos^2 50^0$ is equal to $\frac{4}{3}$ (b) $\frac{1}{3}$ (c) $\frac{3}{4}$ (d) 3

A. $\frac{4}{3}$

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

C. $\frac{3}{4}$

D. 3

Answer: C

Watch Video Solution

49. If $\tan^2\theta = 2\tan^2\varphi + 1, then \cos 2\theta + \sin^2\varphi$ equals -1 (b) 0 (c) 1 (d) none of these

A. -1

B. 0

C. 1

D. none of these.

Answer: B

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50. If $\sin x + \cos ecx + \tan y + \cot y = 4$ where x and y $\in \left[0, \frac{\pi}{2}\right]$,then tan(y/2) is a root of the equation (a)$\alpha^2 + 2\alpha + 1 = 0$ (b) 2 $\alpha^2 - 2\alpha - 1 = 0$ (c)$2\alpha^2 - 2\alpha - 1 = 0$ (d) $\alpha^2 - \alpha - 1 = 0$

A. $a^2 + 2\alpha + 1 = 0$

B. $a^2 + 2a = 0$

C. $2a^2 - 2a - 1 = 0$

D. $a^2 - \alpha - 1 = 0$

Answer: D

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51. If $2\sin 2\alpha = \tan\beta, \alpha, \beta, \in \left(\frac{\pi}{2}, \pi\right)$, then the value of $\alpha + \beta$ is

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

B. π

C. $\frac{3\pi}{2}$

D. $\frac{5\pi}{4}$

Answer: B

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52. If $2|\sin 2\alpha| = \tan\beta + \cot\beta\ |, \alpha, \beta \in \left(\frac{\pi}{2}\pi\right),$ then the value of $\alpha + \beta$ is $\frac{3\pi}{4}$ (b) π (c) $\frac{3\pi}{2}$ (d) $\frac{5\pi}{4}$

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

B. π

C. $\frac{3\pi}{2}$

D. $\frac{5\pi}{4}$

Answer: C

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53. The value of $\sin^3 10^0 + \sin^3 50^0 - \sin^3 70^0$ is equal to $-\frac{3}{2}$ (b) $\frac{3}{4}$ (c) $-\frac{3}{4}$ (d) $-\frac{3}{8}$

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

B. $\frac{3}{4}$

C. $-\frac{3}{4}$

D. $-\frac{3}{8}$

Answer: D

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54. Let $P(x)=\left(\frac{1-\cos 2x+\sin 2x}{1+\cos 2x+s\in 2x}\right)^2+\left(\frac{1+\cot x+\cot^2 x}{1+\tan x+\tan^2 x}\right),$ then the minimum value of $P(x)$ equal 1 (b) 2 (c) 4 (d) 16

A. 1

B. 2

C. 4

D. 16

Answer: B

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55. If $\frac{3-\frac{\tan^2\pi}{7}}{1-\frac{\tan^2\pi}{7}}=k\frac{\cos\pi}{7}$ then the value of k is 1 (b) 2 (c) 3 (d) 4

A. 1

B. 2

C. 3

D. 4

Answer: D

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56. $\cos ec\frac{360^0}{7}+\cos ec\frac{540^0}{7}=$ $\cos ec\frac{180^0}{7}$ (b) $\cos ec\frac{90^0}{7}$ $\frac{\sec(180^0)}{7}$ (d) $\frac{\sec(90^0)}{7}$

A. $co\sec\left(\frac{180^\circ}{7}\right)$

B. $co\sec\left(\frac{90^\circ}{7}\right)$

C. $\sec\left(\frac{180^\circ}{7}\right)$

D. $\sec\left(\frac{90^\circ}{7}\right)$

Answer: A

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57. If $\theta_1 andth\eta_2$ are two values lying in $[2, 2\pi]$ for which $tan\theta = \lambda,$ then $\frac{\tan(\theta_1)}{2}\frac{\tan(\theta_2)}{2}$ is equal to 0 (b) -1 (c) 2 (d) 1

A. 0

B. -1

C. 2

D. 1

Answer: B

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58. If $\tan\theta = \sqrt{n},$ where $n \in N, \geq 2, then \sec 2\theta$ is always a rational number (b) an irrational number a positive integer (d) a negative integer

A. a rational number

B. an irrational number

C. a positive integer

D. a negative integer.

Answer: A

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59. If $\sin 2\theta = \cos 3\theta andth\eta$ is an acute angle, then $\sin\theta$ equal $\frac{\sqrt{5}-1}{4}$ (b) $-\left(\frac{\sqrt{5}-1}{4}\right)$ $\frac{\sqrt{5}+1}{4}$ (d) $\frac{-\sqrt{5}-1}{4}$

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

B. $-\left(\frac{\sqrt{5}-1}{4}\right)$

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

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

Answer: A

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60. If $\cos x = \tan y, \cot y = \tan z, \cot z = \tan x,$ **then the value of** $\sin x$ **is (a)**$2\cos 18^0$ **(b)** $\cos 18^0$ **(c)** $\sin 18^0$ **(d)** $2\sin 18^0$

A. $2\cos 18^\circ$

B. $\cos 18^\circ$

C. $\sin 18^\circ$

D. $2\sin 18^\circ$

Answer: D

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61. **The value of** $70^0 + 4\cos 70^0$ **is** $\frac{1}{\sqrt{3}}$ **(b)** $\sqrt{3}$ **(c)** $2\sqrt{3}$ **(d)** $\frac{1}{2}$

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

B. $\sqrt{3}$

C. $2\sqrt{3}$

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

Answer: B

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62. If $\sin x + \cos x = \frac{\sqrt{7}}{2}$, where $x \in 1st$ quadrant, then $\frac{\tan x}{2}$ is equal to $\frac{3-\sqrt{7}}{3}$ (b) $\frac{\sqrt{7}-2}{3}$ (c) $\frac{4-\sqrt{7}}{4}$ (d) none of these

A. $\frac{3-\sqrt{7}}{3}$

B. $\frac{\sqrt{7}-2}{3}$

C. $\frac{4-\sqrt{7}}{4}$

D. none of these.

Answer: B

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63. If $\frac{\tan 3A}{\tan A} = k(k \neq 1)$ then which of the following is not true? $\frac{\cos A}{\cos 3A} = \frac{k-1}{2}$ (b) $\frac{\sin 3A}{\sin A} = \frac{2k}{k-1}$ $\frac{\cot 3A}{\cot A} = \frac{1}{k}$ (d) none of these

A. $\frac{\cos A}{\cos 3A} = \frac{k-1}{2}$

B. $\frac{\sin 2A}{\sin A} = \frac{2k}{k-1}$

C. $\frac{\cos 3A}{\cot A} = \frac{1}{k}$

D. none of these.

Answer: D

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64. If $x \in \left(\pi, \frac{3\pi}{2}\right), then 4\cos^2\left(\frac{\pi}{4} - \frac{x}{2}\right) + \sqrt{4\sin^4 x + \sin^2 2x}$ is always equal to 1 (b) 2 (c) -2 (d) none of these

A. 1

B. 2

C. -2

D. none of these.

Answer: B

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65. If $\cos x = \frac{2\cos y - 1}{2 - \cos y}$, where $x, y \in (0, \pi)$ then $\tan\left(\frac{x}{2}\right)\cot\left(\frac{y}{2}\right)$ is equal to $\sqrt{2}$ (b) $\sqrt{3}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{\sqrt{3}}$

A. $\sqrt{2}$

B. $\sqrt{3}$

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

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

Answer: B

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66. $\cot 16^0 \cot 44^0 + \cot 44^0 \cot 76^0 - \cot 76^0 \cot 16^0 =$ **1 (b) 2 (c) 3 (d) 4**

A. 1

B. 2

C. 3

D. 4

Answer: C

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67. If $\tan x = \frac{b}{a}$, **then** $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{1-b}{a+b}}$ **is equal to** $2s \in x / \sqrt{\sin 2x}$ **(b)** $2\cos x / \sqrt{\cos 2x}$ $2\cos x / \sqrt{\sin 2x}$ **(d)** $2s \in x / \sqrt{\cos 2x}$

A. $2\sin x / \sqrt{2\sin 2x}$

B. $2\cos x / \sqrt{\cos 2x}$

C. $2\cos x / \sqrt{\sin 2x}$

D. $2\sin x / \sqrt{\cos 2x}$

Answer: B

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68. **Given that** $(1+\sqrt{1+x})\tan y = 1+\sqrt{1-x}$ **. Then** $\sin 4y$ **is equal to** $4x$ **(b)** $2x$ **(c)** x **(d) none of these**

A. 4x

B. 2x

C. x

D. none of these.

Answer: C

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69. If $\cos 2B = \frac{\cos(A+C)}{\cos(A-C)}$, then $\tan A, tanB, \tan C$ are in A.P. (b) G.P. (c) H.P. (d) none of these

A. AP

B. GP

C. HP

D. none of these.

Answer: B

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70. If $\frac{\cos(x-y)}{\cos(+y)} + \frac{\cos(z+t)}{\cos(z-t)} = 0$, then the value of expression $\tan x \tan y \tan z \tan t$ is equal to 1 (b) -1 (c) 2 (d) -2

A. 1

B. -1

C. 2

D. -2

Answer: B

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71. If $\tan\beta = 2\sin\alpha\sin\gamma co\sec(\alpha+\gamma)$, then $\cot\alpha, \cot\beta, \cot\gamma$ are in

A. AP

B. GP

C. HP

D. none of these.

Answer: A

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72. the value of $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$ is equal to

A. 2

B. 3

C. 4

D. none of these.

Answer: C

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73. If $\cos^3 x \sin 2x = \sum_{r=0}^{n} a_x \sin(rx), \forall x \in R$ then

A. $n = 5, a_1 = 1/2$

B. $n = 5, \alpha_1 = 1/4$

C. $n = 5, a_2 = 1/8$

D. $n = 5, a_2 = 1/4$

Answer: B

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74. $\frac{\cos^6 \pi}{9} - 33\frac{\tan^4 \pi}{9} + 27\frac{\tan^2 \pi}{9}$ is equal to 0 (b) $\sqrt{3}$ (c) 3 (d) 9

A. 0

B. $\sqrt{3}$

C. 3

D. 9

Answer: C

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75. Given that $a, b, c,$ are the side of a ABC which is right angled at C, then the minimum value of $\left(\frac{c}{a} + \frac{c}{b}\right)^2$ is 0 (b) 4 (c) 6 (d) 8

A. 0

B. 4

C. 6

D. 8

Answer: D

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76. If $\theta = 3\alpha and \sin\theta = \frac{a}{\sqrt{a^2 + b^2}}$, the value of the expression $a\cos ec\alpha - b\sec\alpha$ is $\frac{a}{\sqrt{a^2 + b^2}}$ (b) $2\sqrt{a^2 + b^2}$ (c) $a + b$ (d) none of these

A. $\frac{a}{\sqrt{a^2 + b^2}}$

B. $2\sqrt{a^2 + b^2}$

C. a+b

D. none of these.

Answer: B

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77. $\tan 6^\circ . \tan 42^\circ . \tan 66^\circ . \tan 78^\circ$ **is**

A. 1

B. $1/2$

C. $1/4$

D. $1/8$

Answer: A

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78. In triangle ABC , if angle c is 90 and the area of triangle is 30 sq.units,then minimum possible value of hypotenuse c is equal to (a) $30\sqrt{2}$ **(b)** $60\sqrt{2}$ **(c)** $120\sqrt{2}$ **(d)** $2\sqrt{30}$

A. $30\sqrt{2}$

B. $60\sqrt{2}$

C. $120\sqrt{2}$

D. $2\sqrt{30}$

Answer: D

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79. **If**

$\sqrt{2}\cos A = \cos B + \cos^3 B, and \sqrt{2}\sin A = \sin B - \sin^3 B then \sin(A - B)$

± 1 **(b)** $\pm \frac{1}{2}$ **(c)** $\pm \frac{1}{3}$ **(d)** $\pm \frac{1}{4}$

A. ± 1

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

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

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

Answer: C

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80. In a right angled triangle the hypotenuse is $2\sqrt{2}$ times the perpendicular drawn from the opposite vertex. Then the other acute angles of the triangle are $\frac{\pi}{3} and \frac{\pi}{6}$ (b) $\frac{\pi}{8} and \frac{3\pi}{8}$ (c) $\frac{\pi}{4} and \frac{\pi}{4}$ (d) $\frac{\pi}{5} and \frac{3\pi}{10}$

A. $\frac{\pi}{3}$ and $\frac{\pi}{6}$

B. $\frac{\pi}{8}$ and $\frac{3\pi}{8}$

C. $\frac{\pi}{4}$ and $\frac{\pi}{4}$

D. $\frac{\pi}{5}$ and $\frac{3\pi}{10}$

Answer: B

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81. A circular ring of radius 3cm hangs horizontally form a point 4cm vertically above the centre by 4 strings attached at equal intervals to its circumference. If the angle between two consecutive strings be θ , then $\cos\theta$ is equal to $\frac{4}{5}$ (b) $\frac{4}{25}$ (d) $\frac{16}{25}$ (d) none of these

A. $\frac{4}{5}$

B. $\frac{4}{25}$

C. $\frac{16}{25}$

D. none of these.

Answer: C

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82. The distance between the two parallel lines is 1 unit. A point A is chosen to lie between the lines at a distance 'd' from one of them Triangle ABC is equilateral with B on one line and C on the other parallel line. The length of the side of the equilateral triangle is

A. $\frac{2}{3}\sqrt{d^2 + d + 1}$

B. $2\sqrt{\frac{d^2 - d + 1}{3}}$

C. $2\sqrt{d^2 - d + 1}$

D. $\sqrt{d^2 - d + 1}$

Answer: B

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83. **If** $\sin^{-1} a + \sin^{-1} b + \sin^{-1} c = \pi,$ **then** $a\sqrt{1 - a^2} + b\sqrt{1 - b^2} + c\sqrt{1 - c^2}$ **is equal to (a)**$a + b + c$ **(b)** $a^2b^2c^2$ **(c)** $2abc$ **(d)** $4abc$

A. a+b+c

B. $a^2b^2c^2$

C. 2abc

D. 4abc

Answer: C

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84. If $A+B+C=\frac{3\pi}{2}, then \cos 2A+\cos 2B+\cos 2C$ is equal to $1-4\cos A\cos B\cos C$ $4\sin A\sin B\sin C$ $1+2\cos A\cos B\cos C$ $1-4\sin A\sin B\sin C$

A. $1-4\cos A\cos B\cos C$

B. $4\sin A\sin B\sin C$

C. $1+2\cos A\cos B\cos C$

D. $1-4\sin A\sin B\sin C$

Answer: D

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85. If $\tan(\alpha+\beta)=\frac{\sin 2\beta,}{3-\cos 2\beta}$ then $\tan\alpha=2\tan\beta$ **(b)** $\tan\beta=2\tan\alpha$ $2\tan\alpha=3\tan\beta$ **(d)** $3\tan\alpha=2\tan\beta$

A. $\tan\alpha=2\tan\beta$

B. $\tan\beta=2\tan\alpha$

C. $2\tan\alpha=3\tan\beta$

D. $3\tan\alpha=2\tan\beta$

Answer: A

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86. **In any triangle** $ABC, \sin^2 A-\sin^2 B+\sin^2 C$ **is always equal to** $2\sin A\sin B\cos C$ **(b)** $2\sin A\cos B\sin C$ $2\sin A\cos B\cos C$ **(d)** $2\sin A\sin B\sin C$

A. $2\sin A\sin B\cos C$

B. $2\sin A\cos B\sin C$

C. $2 \sin A \cos B \cos C$

D. $2 \sin A \sin B \sin C$

Answer: B

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87. The value of $\sum_{r=0}^{10} \frac{\cos^3(r\pi)}{3}$ is equal to $\frac{1}{4}$ (b) $\frac{1}{8}$ (c) $-\frac{1}{4}$ (d) $-\frac{1}{8}$

A. $1/4$

B. $1/8$

C. $-1/4$

D. $-1/8$

Answer: D

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88. In triangle ABC, $\frac{\sin A+\sin B+\sin C}{\sin A+\sin B-\sin C}$ is equal to $\frac{\tan A}{2}\frac{\cot B}{2}$ (b) $\frac{\cot A}{2}\frac{\tan B}{2}$ $\frac{\cot A}{2}\frac{\cot B}{2}$ (d) $\frac{\tan A}{2}\frac{\tan B}{2}$

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

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

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

D. $\tan\left(\frac{A}{2}\right)\tan\left(\frac{B}{2}\right)$

Answer: C

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89. $\frac{\sin 2A+\sin 2B+\sin 2C}{\sin A+\sin B+\sin C} isequa < o$ $8\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2}$ (b) $8\frac{\cos A}{2}\frac{\cos B}{2}\frac{\cos C}{2}$ $8\frac{\tan A}{2}\frac{\tan B}{2}\frac{\tan C}{2}$ (d) $8\frac{\cot\left(\frac{A}{2}B\right)}{2}\frac{\cot C}{2}$

A. $8\sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)$

B. $8\cos\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\cos\left(\frac{C}{2}\right)$

C. $8 \tan\left(\frac{A}{2}\right)\tan\left(\frac{B}{2}\right)\tan\left(\frac{C}{2}\right)$

D. $8 \cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$

Answer: A

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90. If $\cos^2 A + \cos^2 B + \cos^2 C = 1$, then $\triangle ABC$ is

A. equilateral

B. isosceles

C. right angled

D. none of these.

Answer: C

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91. In a triangle $\tan A + \tan B + \tan C = 6$ and $\tan A \tan B = 2$, then the values of $\tan A$, $\tan B$ and $\tan C$ are

A. 1,2,3

B. $3, 2/3, 7/3$

C. $4, 1/2, 3/2$

D. none of these.

Answer: A

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92. If $\cos x + \cos y - \cos(x+y) = \frac{3}{2}$, then $x + y = 0$ (b) $x = 2y$ $x = y$ (d) $2x = y$

A. $x + y = 0$

B. x=2y

C. x=y

D. 2x=y

Answer: B

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93. If $a \sin x + b \cos(x + \theta) + b \cos(x - \theta) = d$, then the minimum value of $|\cos \theta|$ is equal to

A. $\frac{1}{2|b|}\sqrt{d^2 - a^2}$

B. $\frac{1}{2|a|}\sqrt{d^2 - a^2}$

C. $\frac{1}{2|d|}\sqrt{d^2 - a^2}$

D. none of these.

Answer: A

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94. If $u = \sqrt{a^2\cos^2\theta + b^2\sin^2\theta} + \sqrt{a^2\sin^2\theta + b^2\cos^2\theta}$

then the difference between the maximum and manimum values of ` u^2

is given by

A. $2(a^2 + b^2)$

B. $2\sqrt{a^2 + b^2}$

C. $(a+b)^2$

D. $(a-b)^2$

Answer: D

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95. If $\tan x = n \tan y, n \in R^+$, then the maximum value of $\sec^2(x-y)$

is equal to $\frac{(n+1)^2}{2n}$ (b) $\frac{(n+1)^2}{n}$ $\frac{(n+1)^2}{2}$ (d) $\frac{(n+1)^2}{4n}$

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

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

C. $\dfrac{(n+1)^2}{2}$

D. $\dfrac{(n+1)^2}{4n}$

Answer: D

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96. If $0 \leq x \leq \dfrac{\pi}{3}$ **then range of** $f(x) = \sec\left(\dfrac{\pi}{6} - x\right) + \sec\left(\dfrac{\pi}{6} + x\right)$ **is** $\left(\dfrac{4}{\sqrt{3}}, \infty\right)$ **(b)** $\left(\dfrac{4}{\sqrt{3}}, \infty\right)$ $\left(0, \dfrac{4}{\sqrt{3}}\right)$ **(d)** $\left(0, \dfrac{4}{\sqrt{3}}\right)$

A. $\left(\dfrac{4}{\sqrt{3}}, \infty\right)$

B. $\left[\dfrac{4}{\sqrt{3}}, \infty\right]$

C. $\left[0, \dfrac{4}{\sqrt{3}}\right]$

D. $\left(0, \dfrac{4}{\sqrt{3}}\right)$

Answer: B

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97. The maximum value of $\cos x \sin x+\sqrt{\sin^2 x+\sin^2\left(\frac{\pi}{6}\right)}$ is

A. $\frac{\sqrt{5}}{3}$

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

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

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

Answer: D

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98. If α, β, γ are ccute angles and $\cos\theta=\sin\beta / \sin\alpha, \cos\varphi=\sin\gamma \sin\alpha and \cos(\theta-\varphi)=\sin\beta \sin\gamma$, then the value of $\tan^2\alpha-\tan^2\beta-\tan^2\gamma$ is equal to -1 (b) 0 (c) 1 (d) 2

A. -1

B. 0

C. 1

D. 2

Answer: B

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99. about to only mathematics

A. $\frac{2}{\sin 2\theta} - \frac{1}{\theta}$

B. $\frac{2}{\sin 2\theta} + \frac{1}{\theta}$

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

D. $\frac{1}{\sin \theta} - \frac{1}{\theta}$

Answer: A

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100. **If** $x\sin a + y\sin 2a + z\sin 3a = \sin 4a$ $x\sin b + y\sin 2b + z\sin 3b = \sin 4b$ $x\sin c + y\sin 2c + z\sin 3c = \sin 4c$ **then the roots of the equation** $t^3 - \left(\frac{z}{2}\right)t^2 - \left(\frac{y+2}{4}\right)t + \left(\frac{z-x}{8}\right) = 0, a, b, c, \neq n\pi,$ **are** $\sin a, \sin b, \sin c$ **(b)** $\cos a, \cos b, \cos c$ $\sin 2a, \sin 2b, \sin 2c$ **(d)** $\cos 2a, \cos 2b \cos 2c$

A. $\sin a, \sin b, \sin c$

B. $\cos a, \cos b, \cos c$

C. $\sin 2a, \sin 2b, \sin 2c$

D. $\cos 2a, \cos 2b \cos 2c$

Answer: B

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Exercise (Multiple)

1. If $\cos\beta$ is the geometric mean between $\sin\alpha and \cos\alpha,$ where `0

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

B. $-2\cos^2\left(\frac{\pi}{4}+\alpha\right)$

C. $2\sin^2\left(\frac{\pi}{4}+\alpha\right)$

D. $2\cos^2\left(\frac{\pi}{4}-\alpha\right)$

Answer: A::B

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2. Which of the following statements are always correct (where Q denotes the set of rationals)? $\cos 2\theta \in Q and \sin 2\theta \in Q \tan\theta \in Q$ $(\text{ if } def \in ed)$ $\tan\theta \in Q \sin 2\theta, \cos 2\theta andtan 2\theta \in Q(\text{ if } def \in ed)$ $\text{ if } s\int h\eta \in Q and \cos\theta \in Q \tan 3\theta \in Q(\text{ if } def \in ed)$ **fi sin** $\theta \in Q \cos 3\theta \in Q$

A. $\cos 2\theta \in Q$ **and** $\sin 2\theta \in Q \Rightarrow \tan\theta \in Q$ **(if defined)**

B. $\tan\theta \in Q \Rightarrow \sin 2\theta, \cos 2\theta$ and $\tan 2\theta \in Q$ (if denied)

C. if $\sin\theta \in Q$ and $\cos\theta \in Q \Rightarrow \tan 3\theta \in Q$(if denied)

D. if $\sin\theta \in Q \Rightarrow \cos 3\theta \in Q$

Answer: A::B::C

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3. Which of the following quantities are rational? $\sin\left(\frac{11\pi}{12}\right)\sin\left(\frac{5\pi}{12}\right)$

(b) $\cos ec\left(\frac{9\pi}{10}\right)\sec\left(\frac{4\pi}{5}\right)$ $\sin^4\left(\frac{\pi}{8}\right)+\cos^4\left(\frac{\pi}{8}\right)$

$\left(1+\frac{\cos(2\pi)}{9}\right)\left(1+\frac{\cos(4\pi)}{9}\right)\left(1+\frac{\cos(8\pi)}{9}\right)$

A. $\sin\left(\frac{11\pi}{12}\right)\sin\left(\frac{5\pi}{12}\right)$

B. $co\sec\left(\frac{9\pi}{10}\right)\sec\left(\frac{4\pi}{5}\right)$

C. $\sin^4\left(\frac{\pi}{8}\right)+\cos^4\left(\frac{\pi}{8}\right)$

D. $\left(1+\cos\left(\frac{2\pi}{9}\right)\right)\left(1+\cos\left(\frac{4\pi}{9}\right)\right)\left(1+\cos\left(\frac{8\pi}{9}\right)\right)$

Answer: A::B::C::D

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4. In which of the following sets the inequality $\sin^6 x + \cos^6 x > \frac{5}{8}$ holds good? (a) $\left(-\frac{\pi}{3}, \frac{\pi}{8}\right)$ (b) $\left(\frac{3\pi}{8}, \frac{5\pi}{8}\right)$ (c) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$ (d) $\left(\frac{7\pi}{8}, \frac{9\pi}{8}\right)$

A. $(-\pi/8, \pi/8)$

B. $(3\pi/8, 5\pi/8)$

C. $(\pi/4, 3\pi/4)$

D. $(7\pi/8, 9\pi/8)$

Answer: A::B::D

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5. Let $f(x) = x^2 - 2\sqrt{(\sin\sqrt{3} - \sin\sqrt{2})}x - (\cos\sqrt{3} - \cos\sqrt{2})$ then $f(x) ispositive \forall x \in R$ $f(x)$ assumes both positive and negative values $f(x) = 0$ has no real roots $y = f(x)$ touches the line $y = 0$

A. f(x) is positive $\forall x \in R$

B. f(x) assumes both positive and negative values

C. f(x)=0 has no real roots

D. y=f(x) touches the line y=0.

Answer: A::C

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6. For $\alpha = \frac{\pi}{7}$ which of the following hold(s) good? $\tan\alpha\tan2\alpha\tan3\alpha = \tan3\alpha - \tan2\alpha - \tan\alpha$ $\cos ec\alpha = \cos ec2\alpha + \cos ec4\alpha$ $\cos\alpha - \cos2\alpha + \cos3\alpha = \frac{1}{2}$ $8\cos\alpha\cos2\alpha\cos4\alpha = 1$

A. $\tan\alpha\tan2\alpha\tan3\alpha = \tan3\alpha - \tan2\alpha - \tan\alpha$

B. $co\sec\alpha = co\sec2\alpha + co\sec4\alpha$.

C. $\cos\alpha - \cos2\alpha + \cos3\alpha = 1/2$

D. $8\cos\alpha\cos2\alpha\cos4\alpha = 1$

Answer: A::B::C

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7. Which of the following identities, wherever defined, hold(s) good?

$\cot\alpha - \tan\alpha = 2\cot 2\alpha \quad \tan(45^0 + \alpha) - \tan(45^0 - \alpha) = 2\cos ec2\alpha$

$\tan(45^0 + \alpha) + \tan(45^0 - \alpha) = 2\sec 2\alpha \tan\alpha + \cot\alpha = 2\tan 2\alpha$

A. $\cot\alpha - \tan\alpha = 2\cot 2\alpha$

B. $\tan(45^\circ + \alpha) - \tan(45^\circ - \alpha) = 2co\sec 2\alpha$

C. $\tan(45^\circ + \alpha) + \tan(45^\circ - \alpha) = 2\sec 2\alpha$

D. $\tan\alpha + \cot\alpha = 2\tan 2\alpha$.

Answer: A::C

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8. The expression $\left(\tan^4 x + 2\tan^2 x + 1\right)\cos^2 x, whenx = \frac{\pi}{12}$, can be equal to $4\left(2 - \sqrt{3}\right)$ (b) $4\left(\sqrt{2} + 1\right)$ $16\frac{\cos^2 \pi}{12}$ (d) $16\frac{\sin^2 \pi}{12}$

A. $4\left(2 - \sqrt{3}\right)$

B. $4\left(\sqrt{2} + 1\right)$

C. $16\cos^2 \pi / 12$

D. $16\sin^2 \pi / 12$

Answer: A::D

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9. Let $\alpha, \beta and \gamma$ be some angles in the first quadrant satisfying $\tan(\alpha + \beta) = \frac{15}{8} and \cos ec\gamma = \frac{17}{8}$, then which of the following hold(s) good? $\alpha + \beta + \gamma = \pi$ $\cot \alpha + \tan \beta + \tan \gamma = \tan \alpha \tan \beta \tan \gamma$

$\tan \alpha + \tan \beta + \tan \gamma = \tan \alpha \tan \beta \tan \gamma$

$\tan \alpha \tan \beta + \tan \beta \tan \gamma + \tan \gamma \tan \alpha = 1$

A. $\alpha + \beta + \gamma = \pi$

B. $\cot\alpha\cot\beta\cot\gamma = \cot\alpha + \cot\beta + \cot\gamma$

C. $\tan\alpha + \tan\beta + \beta\gamma = \tan\alpha\tan\beta\tan\gamma$

D. $\tan\alpha\tan\beta + \tan\beta\tan\gamma + \tan\gamma\tan\alpha = 1$

Answer: B::D

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10. Let $f_n(\theta) = \dfrac{\frac{\cos\theta}{2} + \cos 2\theta + \frac{\cos(7\theta)}{2} + + \cos(3n-2)^{\frac{\theta}{2}}}{\frac{\sin\theta}{2} + \sin 2\theta + \frac{\sin(7\theta)}{2} + + \sin(3n-2)^{\frac{\theta}{2}}}$ then $f_3\left(\frac{3\pi}{16}\right) = \sqrt{2} - 1$ (b) $f_5\left(\frac{\pi}{28}\right) = \sqrt{2} + 1$ $f_7\left(\frac{\pi}{60}\right) = \left(2 + \sqrt{3}\right)$ (d) none of these

A. $f_3\left(\frac{3\pi}{16}\right) = \sqrt{2} - 1$

B. $f_5\left(\frac{\pi}{28}\right) = \sqrt{2} + 1$

C. $f_7\left(\frac{\pi}{60}\right) = \left(2 + \sqrt{3}\right)$

D. none of these.

Answer: A::B::C

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11. If $\sin(x+20^0)=2\sin x \cos 40^0, whrex \in \left(0, \frac{\pi}{2}\right)$, then which of the following hold(s) good? $\cos 2x=\frac{1}{2}$ (b) $\cos ec4x=2\,\frac{\sec x}{2}=\sqrt{6}-\sqrt{2}$ (d) $\frac{\tan x}{2}=(2-\sqrt{3})$

A. $\cos 2x=1/2$

B. $co\sec 4x=2$

C. $\sec\left(\frac{x}{2}\right)=\sqrt{6}-\sqrt{2}$

D. $\tan\left(\frac{x}{2}\right)=(2-\sqrt{3})$

Answer: A::C::D

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12. The expression $\cos^2(\alpha+\beta)+\cos^2(\alpha-\beta)-\cos 2\alpha \cos 2\beta$, is independent of α (b) independent of β independent of $\alpha and \beta$ dependent on $\alpha and \beta$

A. independent of α

B. independent of β

C. independent of α and β

D. dependent on α and β.

Answer: A::B::C

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13. If $\cot^3\alpha+\cot^2\alpha+\cot\alpha=1$ then which of the following is/are correct

A. $\cos 2\alpha.\tan\alpha=-1$

B. $\cos 2\alpha.\tan\alpha=1$

C. $\cos 2\alpha - \tan 2\alpha = 1$

D. $\cos 2\alpha - \tan 2\alpha = 1.$

Answer: A::C

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14. If

$p = \sin(A - B)\sin(C - D), q = \sin(B - C)\sin(A - D), r = \sin(C - A)\text{s}$

then $p + q - r = 0$ **(b)** $p + q + r = 0$ $p - q + r = 0$ **(d)**

$p^3 + q^3 + r^3 = 3pqr$

A. $p + q - r = 0$

B. $p + q + r = 0$

C. $p - q + r = 0$

D. $p^3 + q^3 + r^3 = 3pqr$

Answer: B::D

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15. If $\cos x - \sin\alpha \cot\beta \sin x = \cos a$, then the value of $\tan\left(\frac{x}{2}\right)$ is $-\tan\left(\frac{\alpha}{2}\right)\cot\left(\frac{\beta}{2}\right)$ (b) $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)$ $-\cot\left(\frac{\alpha\beta}{2}\right)\tan\left(\frac{\beta}{2}\right)$ (d) $\cot\left(\frac{\alpha}{2}\right)\cot\left(\frac{\beta}{2}\right)$

A. $-\tan(\alpha 2)\cot(\beta 2)$

B. $\tan(\alpha/2)\tan(\beta/2)$

C. $-\cot(\alpha/2)\tan(\beta/2)$

D. $\cot(\alpha/2)\cot(\beta/2)$

Answer: A::B

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16. Let $f(x) = ab\sin x + b\sqrt{1-a^2}\cos x + c$, where $|a|\langle 1, b\rangle 0$ then (a) c-b,c+b (b) difference of maximum and minimum values of $f(x)$ is $2b$ (c) $f(x) = c$ if x=$-\cos^{-1} a$ (d) $f(x) = c$ if x=$\cos^{-1} a$

A. maximum value of $f(x) = -\cos^{-1} a$

B. $f(x) = c$ if $x = \cos^{-1}\alpha$

C. $f(x) = c$ if $x = -\cos^{-1}\alpha$

D. $f(x) = c$ if $x = \cos^{-1}\alpha$.

Answer: A::B::C

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17. **Let** $P(k) = \left(1 + \cos\left(\frac{\pi}{4k}\right)\right)\left(1 + \cos\left(\frac{(2k-1)\pi}{4k}\right)\right)\left(1 + \cos\left(\frac{(2k+1)\pi}{4k}\right)\right)\left(1 + \cos\left(\frac{(4k-1)\pi}{4k}\right)\right)$. **Then (a)** $P(3) = \frac{1}{16}$ **(b)** $P(4) = \frac{2-\sqrt{2}}{16}$ **(c)** $P(5) = \frac{3-\sqrt{5}}{32}$ **(d)** $P(6)\frac{2-\sqrt{3}}{16}$

A. $P(3) = \frac{1}{16}$

B. $P(4) = \frac{2-\sqrt{2}}{16}$

C. $P(5) = \frac{3-\sqrt{5}}{32}$

D. $P(6) = \frac{2-\sqrt{3}}{16}$

Answer: A::B::C::D

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18. If $3\sin\beta = \sin(2\alpha+\beta)$ then $\tan(\alpha+\beta) - 2\tan\alpha$ is independent of α independent of β dependent of both $\alpha and \beta$ independent of both $\alpha and \beta$

A. independent of α

B. independent of β

C. dependent of both α and β.

D. independent of both α and β.

Answer: A::B::D

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19. If $u = \sqrt{a^2 \cos^2 \theta + b^2 \sin^2 \theta} + \sqrt{a^2 \sin^2 \theta + b^2 \cos^2 \theta}$

then the difference between the maximum and manimum values of ` u^2

is given by

A. $\alpha^2 \cos^2 \alpha + b^2 \sin^2 \alpha$

B. $\alpha^2 \sin^2 \alpha + b^2 \cos^2 \alpha$

C. $\frac{1}{2}\left[\alpha^2 + b^2 + (\alpha^2 - b^2)\cos 2\alpha\right[$

D. $\frac{1}{2}\left[a^2 + b^2 - (a^2 - b^2)\cos 2\alpha\right]$

Answer: A::B::C::D

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20. If

$(x-a)\cos\theta + y\sin\theta = (x-a)\cos\varphi + y\sin\theta = aandtan\left(\frac{\theta}{2}\right) - \tan\left(\frac{\varphi}{2}\right.$

$y^2 = 2ax - (1-b^2)x^2$ $\frac{\tan\theta}{2} = \frac{1}{x}(y+bx)$ $y^2 = 2bx - (1-a^2)x^2$

$\frac{\tan\varphi}{2} = \frac{1}{x}(y-bx)$

A. $y^2 = 2ax - (1-b^2)x^2$

B. $\tan\left(\frac{\theta}{2}\right) = \frac{1}{x}(y+bx)$

C. $y^2 = 2bx - (1-a^2)x^2$

D. $\tan\left(\frac{\phi}{2}\right) = \frac{1}{x}(y-bx)$

Answer: A::B::D

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21. If $\cos(x-y), \cos x and \cos(x+y)$ **are in H.P., then** $\cos x \sec\left(\frac{y}{2}\right) =$

A. $-\sqrt{3}$

B. $-\sqrt{2}$

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: B::C

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22. Difference between maximum and minimum values of $(60 \sin \alpha + p \cos \alpha)$ is 122 then p can be

A. 61

B. 11

C. -61

D. -11

Answer: B::D

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Exercise (Comprehension)

1. If $\sin \alpha = A \sin(\alpha + \beta), A \neq 0$, then

The value of $\tan \alpha$ is

A. $\dfrac{A\sin\beta}{1-A\cos\beta}$

B. $\dfrac{A\sin\beta}{1+A\cos\beta}$

C. $\dfrac{A\cos\beta}{1-A\sin\beta}$

D. $\dfrac{A\sin\beta}{1+A\cos\beta}$

Answer: A

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2. If $\sin\alpha = A\sin(\alpha+\beta),\ A \neq 0$, then

The value of $\tan\alpha$ is

A. $\dfrac{\sin\alpha(1+A\cos\beta)}{A\cos\alpha\cos\beta}$

B. $\dfrac{\sin\alpha(1-A\cos\beta)}{A\cos\alpha\cos\beta}$

C. $\dfrac{\cos(1-A\sin\beta)}{A\cos\alpha\cos\beta}$

D. $\dfrac{\cos\alpha(1+A\sin\beta)}{A\cos\alpha\cos\beta}$

Answer: B

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3. If $\sin\alpha = A\sin(\alpha+\beta),\ A \neq 0$, then

Which of the following is not the value of $\tan(\alpha+\beta)$?

A. $\dfrac{\sin\beta}{\cos\beta - A}$

B. $\dfrac{\sin\alpha\cos\alpha}{A\cos\beta - \sin^2\alpha}$

C. $\dfrac{\sin\alpha\cos\alpha}{A\cos\beta + \sin^2\alpha}$

D. none of these.

Answer: C

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4. If $\alpha, \beta, \gamma, \delta$ are the four solutions of the equation $\tan\left(\theta + \frac{\pi}{4}\right) = 3\tan 3\theta$. No two of which have equal tangents, then the value of $\tan\alpha + \tan\beta + \tan\gamma + \tan\delta =$

A. $1/3$

B. $8/3$

C. $-8/3$

D. 0

Answer: D

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5. If α, β, γ are the solutions of the equation $\tan\left(\theta + \frac{\pi}{4}\right) = 3\tan 3\theta$, no two of which have equal tangents.

The value of $\tan\alpha + \tan\beta + \tan\gamma + \tan\delta$ is

A. $-1/3$

B. -2

C. 0

D. none of these

Answer: A

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6. If α, β, γ are the solutions of the equation $\tan\left(\theta + \frac{\pi}{4}\right) = 3\tan 3\theta$, no two of which have equal tangents.

The value of $\tan\alpha + \tan\beta + \tan\gamma + \tan\delta$ is

A. -8

B. 8

C. $2/3$

D. $1/3$

Answer: B

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7. $\sin\alpha + \sin\beta = \frac{1}{4}$ and $\cos\alpha + \cos\beta = \frac{1}{3}$ the value of $\sin(\alpha + \beta)$

A. $\frac{24}{25}$

B. $\frac{13}{25}$

C. $\frac{12}{13}$

D. none of these.

Answer: A

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8. $\sin\alpha + \sin\beta = \frac{1}{4}$ and $\cos\alpha + \cos\beta = \frac{1}{3}$ the value of $\sin(\alpha + \beta) = \frac{1}{3}$

A. $\frac{12}{25}$

B. $\frac{7}{25}$

C. $\frac{12}{13}$

D. none of these.

Answer: B

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9. $\sin\alpha + \sin\beta = \frac{1}{4}$ and $\cos\alpha + \cos\beta = \frac{1}{3}$ the value of $\sin(\alpha + \beta) = \frac{1}{3}$

A. $\frac{25}{7}$

B. $\frac{25}{12}$

C. $\frac{25}{13}$

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

Answer: D

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10. To find the sum $\sin^2\frac{2\pi}{7} + \sin^2\frac{4\pi}{7} + \sin^2\frac{8\pi}{7}$, we follow the following method.

Put $7\theta = 2n\pi$, where n is any integer. Then

$$\sin 4\theta = \sin(2n\pi - 3\theta) = -\sin 3\theta$$

This means that $\sin\theta$ takes the values

$0, \ \pm\sin(2\pi/7), \ \pm\sin(2\pi/7), \ \pm\sin(4\pi/7), \text{ and } \pm\sin(8\pi/7).$

From Eq. (i), we now get

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

or $4\sin\theta\cos\theta\left(1 - 2\sin^2\theta\right) = \sin\theta\left(4\sin^2\theta - 3\right)$

Rejecting the value $\sin\theta = 0$, we get

$$4\cos\theta\left(1 - 2\sin^2\theta\right) = 4\sin^2\theta - 3$$

or $16\cos^2\theta\left(1 - 2\sin^2\theta\right)^2 = \left(4\sin^2\theta - 3\right)^2$

or $16\left(1 - \sin^2\theta\right)\left(1 - 4\sin^2\theta + 4\sin^4\theta\right)$

$$= 16\sin^4\theta - 24\sin^2\theta + 9$$

or $$64\sin^6\theta - 112\sin^4\theta - 56\sin^2\theta - 7 = 0$$

This is cubic in $\sin^2\theta$ with the roots

$\sin^2(2\pi/7), \sin^2(4\pi/7), \text{ and } \sin^2(8\pi/7).$

The sum of these roots is

$$\sin^2\frac{2\pi}{7} + \sin^2\frac{4\pi}{7} + \sin^2\frac{8\pi}{7} = \frac{112}{64} = \frac{7}{4}.$$

The value of

$\left(\tan^2\frac{\pi}{7} + \tan^2\frac{2\pi}{7} + \tan^2\frac{3\pi}{7}\right) \times \left(\cot^2\frac{\pi}{7} + \cot^2\frac{2\pi}{7} + \cot^2\frac{3\pi}{7}\right)$ is

A. a. 105

B. b. 35

C. c. 210

D. d. none of these.

Answer: A

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11. To find the sum $\sin^2\frac{2\pi}{7}+\sin^2\frac{4\pi}{7}+\sin^2\frac{8\pi}{7}$, we follow the following method.

Put $7\theta = 2n\pi$, where n is any integer. Then

$$\sin 4\theta = \sin(2n\pi - 3\theta) = -\sin 3\theta$$

This means that $\sin\theta$ takes the values $0, \pm\sin(2\pi/7), \pm\sin(2\pi/7), \pm\sin(4\pi/7), \text{ and } \pm\sin(8\pi/7)$.

From Eq. (i), we now get

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

or $4\sin\theta\cos\theta\left(1-2\sin^2\theta\right) = \sin\theta\left(4\sin^2\theta - 3\right)$

Rejecting the value $\sin\theta = 0$, we get

$$4\cos\theta\left(1-2\sin^2\theta\right)=4\sin^2\theta-3$$

or $16\cos^2\theta\left(1-2\sin^2\theta\right)^2=\left(4\sin^2\theta-3\right)^2$

or $16\left(1-\sin^2\theta\right)\left(1-4\sin^2\theta+4\sin^4\theta\right)$

$$=16\sin^4\theta-24\sin^2\theta+9$$

or $$64\sin^6\theta-112\sin^4\theta-56\sin^2\theta-7=0$$

This is cubic in $\sin^2\theta$ with the roots $\sin^2(2\pi/7), \sin^2(4\pi/7), \text{ and } \sin^2(8\pi/7)$.

The sum of these roots is

$$\sin^2\frac{2\pi}{7}+\sin^2\frac{4\pi}{7}+\sin^2\frac{8\pi}{7}=\frac{112}{64}=\frac{7}{4}.$$

The value of $\dfrac{\tan^2\frac{\pi}{7}+\tan^2\frac{2\pi}{7}+\tan^2\frac{3\pi}{7}}{\cot^2\frac{\pi}{7}+\cot^2\frac{2\pi}{7}+\cot^2\frac{3\pi}{7}}$ is

A. a. 7

B. b. $35/3$

C. c. $21/5$

D. d. none of these

Answer: C

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12. To find the sum $\sin^2 \frac{2\pi}{7} + \sin^2 \frac{4\pi}{7} + \sin^2 \frac{8\pi}{7}$, we follow the following method.

Put $7\theta = 2n\pi$, where n is any integer. Then

$$\sin 4\theta = \sin(2n\pi - 3\theta) = -\sin 3\theta$$

This means that $\sin\theta$ takes the values

$$0, \pm\sin(2\pi/7), \pm\sin(2\pi/7), \pm\sin(4\pi/7), \text{ and } \pm\sin(8\pi/7).$$

From Eq. (i), we now get

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

or $4\sin\theta\cos\theta\left(1 - 2\sin^2\theta\right) = \sin\theta\left(4\sin^2\theta - 3\right)$

Rejecting the value $\sin\theta = 0$, we get

$$4\cos\theta\left(1 - 2\sin^2\theta\right) = 4\sin^2\theta - 3$$

or $16\cos^2\theta\left(1 - 2\sin^2\theta\right)^2 = \left(4\sin^2\theta - 3\right)^2$

or $16\left(1 - \sin^2\theta\right)\left(1 - 4\sin^2\theta + 4\sin^4\theta\right)$

$$= 16\sin^4\theta - 24\sin^2\theta + 9$$

or $$64\sin^6\theta - 112\sin^4\theta - 56\sin^2\theta - 7 = 0$$

This is cubic in $\sin^2\theta$ with the roots

$$\sin^2(2\pi/7), \sin^2(4\pi/7), \text{ and } \sin^2(8\pi/7).$$

The sum of these roots is

$$\sin^2\frac{2\pi}{7}+\sin^2\frac{4\pi}{7}+\sin^2\frac{8\pi}{7}=\frac{112}{64}=\frac{7}{4}.$$

The value of $\tan^2\frac{\pi}{7}\tan^2\frac{2\pi}{7}\tan^2\frac{3\pi}{7}$ is

A. a) -3

B. b) 7

C. c)-5

D. d) none of these

Answer: B

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13. In a ΔABC, if $\cos A\cos B\cos C=\frac{\sqrt{3}-1}{8}$ and $\sin A\sin B\sin C=\frac{3+\sqrt{3}}{8}$, then

The value of $\tan A+\tan B+\tan C$ is

A. $\frac{3+\sqrt{3}}{\sqrt{3}-1}$

B. $\frac{\sqrt{3}+4}{\sqrt{3}-1}$

C. $\dfrac{6-\sqrt{3}}{\sqrt{3}-1}$

D. $\dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-1}$

Answer: A

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14. In a ΔABC, if $\cos A \cos B \cos C = \dfrac{\sqrt{3}-1}{8}$ and $\sin A \sin B \sin C = \dfrac{3+\sqrt{3}}{8}$, then

The value of $\tan A + \tan B + \tan C$ is

A. $5-4\sqrt{3}$

B. $5+4\sqrt{3}$

C. $6+\sqrt{3}$

D. $6-\sqrt{3}$

Answer: B

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15. In a ΔABC, if

$\cos A \cos B \cos C = \frac{\sqrt{3}-1}{8}$ and $\sin A \sin B \sin C = \frac{3+\sqrt{3}}{8}$, then

The value of $\tan A + \tan B + \tan C$ is

A. $1, \sqrt{3}, \sqrt{2}$

B. $1, \sqrt{3}, 2$

C. $1, 2, \sqrt{3}$

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

Answer: D

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16. If the angles α, β, γ of a triangle satisfy the relation,

$\sin\left(\frac{\alpha-\beta}{2}\right) + \sin\left(\frac{\alpha-\gamma}{2}\right) + \sin\left(\frac{3\alpha}{2}\right) = \frac{3}{2}$, then

The measure of the smallest angle of the triangle is

A. 30°

B. 40°

C. 45°

D. 50°

Answer: B

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17. If the angles α, β, γ of a triangle satisfy the relation,

$$\sin\left(\frac{\alpha-\beta}{2}\right)+\sin\left(\frac{\alpha-\gamma}{2}\right)+\sin\left(\frac{3\alpha}{2}\right)=\frac{3}{2}, \text{ then}$$

The measure of the smallest angle of the triangle is

A. acute angled

B. right angled but not isosceles

C. isosceles

D. isosceles right angled

Answer: C

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18. A line OA of length r starts from its initial position OX and traces an angle AOB = α in the anitclockwise direction. It then traces back in the clockwise direction an angle BOC = 3θ (where $\alpha > 3\theta$). L is the foot of the perpendicular from C on OA. Also, $\frac{\sin^3\theta}{CL} = \frac{\cos^3\theta}{OL} = 1$

$\frac{1 - r\cos\alpha}{r\sin\alpha}$ is equal to

A. $\tan 2\theta$

B. $\cot 2\theta$

C. $\sin 2\theta$

D. $\sin 2\theta$

Answer: A

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19. A line OA of length r starts from its initial position OX and traces an angle AOB = α in the anitclockwise direction. It then traces back in the clockwise direction an angle BOC = 3θ (where $\alpha > 3\theta$). L is the foot of the perpendicular from C on OA. Also, $\frac{\sin^3\theta}{CL} = \frac{\cos^3\theta}{OL} = 1$

$\frac{1 - r\cos\alpha}{r\sin\alpha}$ is equal to

A. $\tan^2\theta$

B. $\cot^2\theta$

C. $\cot 2\theta$

D. $\tan 2\theta$

Answer: D

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20. A line OA of length r starts from its initial position OX and traces an angle AOB = α in the anitclockwise direction. It then traces back in the clockwise direction an angle BOC = 3θ (where $\alpha > 3\theta$). L is the foot of the

perpendicular from C on OA. Also, $\frac{\sin^3\theta}{CL}=\frac{\cos^3\theta}{OL}=1$

$\frac{1-r\cos\alpha}{r\sin\alpha}$ is equal to

A. $\sin\alpha$

B. $\cos\alpha$

C. $\sin\theta$

D. $\cos\theta$

Answer: B

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Exercise (Matrix Match Type)

1. If $\cos\theta-\sin\theta=\frac{1}{5}$, where $0<\theta<\frac{\pi}{4}$, then

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2. If $\cos\alpha + \cos\beta = 1/2$ and $\sin\alpha + \sin\beta = 1/3$, then

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3. If the circles $x^2 + y^2 + 2ax + b = 0$ and $x^2 + y^2 + 2cx + b = 0$ touch each other $(a \neq c)$

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4. If $\cos x + \sec x = -2$ for a positive odd integer n then $\cos^n x + \sec^n x$ is

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5. Points z in the complex plane satisfying $\text{Re}(z+1)^2 = |z|^2 + 1$ lie on

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6. Prove the following identities :

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

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

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8. Prove that $\sec A(1-\sin A)(\sec A+\tan A)=1$

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9. Prove that $\frac{1}{\sec A+\tan A}=\sec A-\tan A$

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Exercise (Numerical)

1. If $f(\theta)=\dfrac{1-\sin 2\theta+\cos 2\theta}{2\cos 2\theta}$, then value of $8f(11^0)f(34^0)$ is ___

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2. If $f(x)=2(7\cos x+24\sin x)(7\sin x-24\cos x),$ for every $x\in R,$ then maximum value of $f(x)^{\frac{1}{4}}$ is____

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3. In a triangle $ABC, \angle C=\frac{\pi}{2}$. If $\tan\left(\frac{A}{2}\right) and \tan\left(\frac{B}{2}\right)$ are the roots of the equation $ax^2+bx+c=0, (a\neq 0),$ then the value of $\frac{a+b}{c}$ (where $a, b, c,$ are sides of opposite to angles $A, B, C,$ respectively) is

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4. If $x, y \in R$ satisfies $(x+5)^2 + (y-12)^2 = (14)^2$, then the minimum value of $\sqrt{x^2 = y^2}$ is______

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5. Suppose x and y real number such that $\tan x \tan y = 42$ and $\cot x + \cot = 49$ the value of $\tan(x+y)$ is

____

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6. Let $0 \leq a, b, c, d \leq \pi$, where $b and c$ are not complementary, such that $2\cos a + 6\cos b + 7\cos c + 9\cos d = 0 and 2\sin a - 6\sin b + 7\sin c - 9 and d$

then the value of $3\frac{\cos(a+d)}{\cos(b+c)}$ is____

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7. Suppose A and B are two angles such that $A, B \in (0, \pi)$ and satisfy $\sin A + \sin B = 1$ and $\cos A + \cos B = 0$. Then the value of $12 \cos 2A + 4 \cos 2B$ is___

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8. $\alpha and \beta$ are the positive acute angles and satisfying equation $5 \sin 2\beta = 3 \sin 2\alpha$ and $\tan \beta = 3 \tan \alpha$ simultaneously. Then the value of $\tan \alpha + \tan \beta$ is ______

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9. The absolute value of the expression $\frac{\tan \pi}{16} + \frac{\tan(5\pi)}{16} + \frac{\tan(9\pi)}{16} + \frac{\tan(13\pi)}{16}$ is ____

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10. The greatest integer less than or equal to $\frac{1}{\cos 290^0} + \frac{1}{\sqrt{3} \sin 250^0}$ is

____

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11. The maximum value of $y = \frac{1}{\sin^6 x + \cos^6 x}$ is ____

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12. The maximum value of $\cos^2(45^0 + x) + (\sin x - \cos x)^2$ is ____

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13. Find the exact value of coses $10^\circ + \text{coses}50^\circ - \text{cosec}70^\circ$

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14. Number of triangles ABC if $\tan A = x, \tan B = x + 1, and tan C = 1 - x$ is ______

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15. If log_(10) sin x+log_(10)cos x=-1 and log_(10)(sinx+cosx)=(log_(10)n-1)/2 then the value of n is (a) 24 (b) 36 (c) 20 (d) 12_

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16. The value of $\dfrac{\sin 1^\circ + \sin 3^\circ + \sin 5^\circ + \sin 7^\circ}{\cos 1^\circ \cdot \cos 2^\circ \sin 4^\circ}$ is ________

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17. In a triangle ABC, if $A - B = 120^0 and \dfrac{\sin A}{2} \dfrac{\sin B}{2} \dfrac{\sin C}{2} = \dfrac{1}{32}$, then the value of $8 \cos C$ is_____

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18. If $\frac{\tan x}{2} = \frac{\tan y}{3} = \frac{\tan z}{5}, x + y + z = \pi and tan^2 x + \tan^2 y + \tan^2 z = \frac{38}{K}$

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19. If $\sin^3 x \cos 3x + \cos^3 x \sin 3x = \frac{3}{8}$, then the value of $8 \sin 4x$ is_

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20. The value of $\cos ec \frac{\pi}{18} - 4 \frac{\sin(7\pi)}{18}$ is

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21. If $\tan x + \tan 2x + \tan 3x = \tan x \tan 2x \tan 3x$ then value of $|\sin 3x + \cos 3x|$ is ________

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22.

$$16\left(\cos\theta - \frac{\cos\pi}{8}\right)\left(\cos\theta - \frac{\cos(3\pi)}{8}\right)\left(\cos\theta - \frac{\cos(5\pi)}{8}\right)\left(\cos\theta - \frac{\cos(7\pi)}{8}\right.$$

then the value of λ is ____.

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23. If $\frac{\tan(In6)\tan(In2)\tan(In3)}{\tan(In6)-\tan(In2)-\tan(In3)} = k,$ then the value of k is______

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24. If $\cot(\theta-\alpha), 3\cot\theta, \cot(\theta+\alpha)$ are in A.P. and θ is not an integral multiple of $\frac{\pi}{2}$, then the value of $\frac{4\sin^2\theta}{3\sin^2\alpha} =$ ______

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25. The value of $\frac{2\sin x}{\sin 3x} + \frac{\tan x}{\tan 3x}$ is______.

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26. If $\cot^2 A \cot^2 B = 3$, then the value of $(2 - \cos 2A)(2 - \cos 2B)$ is ___

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27. The value of $f(x) = x^4 + 4x^3 + 2x^2 - 4x + 7$, when $x = \frac{\cot(11\pi)}{8}$ is _______

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28. The value of $\sin^2 12^0 + \sin^2 21^0 + \sin^2 39^0 + \sin^2 48^0 - \sin^2 9^0 - \sin^2 18^0$ is _____

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29. Given that $f(n\theta)=\frac{2\sin 2\theta}{\cos 2\theta-\cos 4n\theta}$, and $f(\theta)+f(2\theta)+f(3\theta)+\;+f(n\theta)=\frac{\sin\lambda\theta}{\sin\theta\sin\mu\theta}$, then the value of $\mu-\lambda$ is _____

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30. Suppose $\sin^3 x\sin 3x=\sum_{m=0}^{n} C_m\cos mx$ is an identity in x, where C_0, C_1, C_n are constants and $C_n\neq 0$, the the value of n is ______

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31. If $\sec\alpha$ is the average of $\sec(\alpha-2\beta)$ and $\sec(\alpha+2\beta)$ then the value of $\left(2\sin^2\beta-\sin^2\alpha\right)$ where $\beta\neq n\pi$ is

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32. If A, B and C are three values lying in $[0, 2\pi]$ for which $\tan\theta = K$ then $\tan\frac{A}{3}\tan\frac{B}{3} + \tan\frac{B}{3}\tan\frac{C}{3} + \tan\frac{C}{3}\tan\frac{A}{3}$ is equal to ________.

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33. The value of $\left[\left(\sin\frac{\pi}{9}\right)\left(4 + \sec\frac{\pi}{9}\right)\right]^2$ is _____.

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34. $\left(\frac{\sin 33^\circ}{\sin 11^\circ \sin 49^\circ \sin 71^\circ}\right)^2 + \left(\frac{\cos 33^\circ}{\cos 11^\circ \cos 49^\circ \cos 71^\circ}\right)^2$ is equal to _____.

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35. If $f(\theta) = \sin^3\theta + \sin^3\left(\theta + \frac{2\pi}{3}\right) + \sin^3\left(\theta + \frac{4\pi}{3}\right)$ then the value of $f\left(\frac{\pi}{18}\right) + f\left(\frac{7\pi}{18}\right)$ is ________.

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36. The expression $\frac{1+\sin 22^{\circ} \sin 33^{\circ} \sin 35^{\circ}}{\cos^2 22^{\circ}+\cos^2 33^{\circ}+\cos^2 35^{\circ}}$ simplifies to

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37. If $A > 0, B > 0 and A + B = \frac{\pi}{3}$, the maximum value of $\tan A \tan B$ is_____

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38. If $\frac{\sin^3 \theta}{\sin(2\theta+\alpha)} = \frac{\cos^3 \theta}{\cos(2\theta+\alpha)}$ and $\tan 2\theta = \lambda \tan(3\theta+\alpha)$ then the value of λ is _________.

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JEE Main Previous Year

1. Let A and B denote the statements

$A: \cos\alpha + \cos\beta + \cos\gamma = 0$

$B: \sin\alpha + si \in \beta + \sin\gamma = 0$

If $\cos(\beta - \gamma) + \cos(\gamma - \alpha) + \cos(\alpha - \beta) = -\frac{3}{2}$,

then

A. A is true and B is false.

B. A is false and B is true.

C. Both A and B are true.

D. Both A and B are false.

Answer: C

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2. It $\cos(\alpha + \beta) = \frac{4}{5}, \sin(\alpha - \beta) = \frac{5}{13} and \alpha, \beta$ lie between $0 and \frac{\pi}{4}$, prove that $\tan 2\alpha = \frac{56}{33}$

A. $\frac{20}{7}$

B. $\frac{25}{16}$

C. $\frac{56}{33}$

D. $\frac{19}{12}$

Answer: C

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3. If $A = \sin^2 x + \cos^4 x$**, then for all real x :**

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

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

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

D. $1 \leq A \leq 2$

Answer: B

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4. In a ΔPQR. if $3\sin P + 4\cos Q = 6$ and $4\sin Q + 3\cos P = 1$, then the angle R is equal to:

A. $\frac{5\pi}{6}$

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

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

D. $\frac{3\pi}{4}$

Answer: B

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5. If $5\left(\tan^2 x - \cos^2 x\right) = 2\cos 2x + 9$, then the value of cos4x is

A. $-\frac{7}{9}$

B. $-\frac{3}{5}$

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

D. $\frac{2}{9}$

Answer: A

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JEE Advanced Previous Year

1. The value of $\sum_{k=1}^{13} \frac{1}{\sin\left(\frac{\pi}{4} + \frac{(k-1)\pi}{6}\right)\sin\left(\frac{\pi}{4} + \frac{k\pi}{6}\right)}$ is equal to

A. $3 - \sqrt{3}$

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

C. $2(\sqrt{3} - 1)$

D. $2(2 + \sqrt{3})$

Answer: C

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2. Let $f:(-1,1)\vec{R}$ be such that $f(\cos 4\theta)=\frac{2}{2-\sec^2\theta}$ for $\theta \in \left(0,\frac{\pi}{4}\right)\cup\left(\frac{\pi}{4},\frac{\pi}{2}\right)$. Then the value(s) of $f\left(\frac{1}{3}\right)$ is (are) $1-\sqrt{\frac{3}{2}}$ (b) $1+\sqrt{\frac{3}{2}}$ (c) $1-\sqrt{\frac{2}{3}}$ (d) $1+\sqrt{\frac{2}{3}}$

A. $1-\sqrt{\frac{3}{2}}$

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

C. $1-\sqrt{\frac{2}{3}}$

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

Answer: A::B

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3. If α and β are non-zero real number such that $2(\cos\beta-\cos\alpha)+\cos\alpha\cos\beta=1$. Then which of the following is treu?

A. $\tan\left(\frac{\alpha}{2}\right)+\sqrt{3}\tan\left(\frac{\beta}{2}\right)=0$

B. $\sqrt{3}\tan\left(\frac{\alpha}{2}\right)+\tan\left(\frac{\beta}{2}\right)=0$

C. $\tan\left(\frac{\alpha}{2}\right) - \sqrt{3}\tan\left(\frac{\beta}{2}\right) = 0$

D. $\sqrt{3}\tan\left(\frac{\alpha}{2}\right) - \tan\left(\frac{\beta}{2}\right) = 0$

Answer: A::C

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4. The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$

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5. The positive integer value of $n > 3$ **satisfying the equation** $\frac{1}{\sin\left(\frac{\pi}{n}\right)} = \frac{1}{\sin\left(\frac{2\pi}{n}\right)} + \frac{1}{\sin\left(\frac{3\pi}{n}\right)} is$

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Matrix Match Type

1. Refer to the following diagram :

	Column I		Column II
$a.$	Collinear vectors	$p.$	$\overrightarrow{a}$
$b.$	Coinitial vectors	$q.$	$\overrightarrow{b}$
$c.$	Equal vectors	$r.$	$\overrightarrow{c}$
$d.$	Unlike vectors (same initial point)	$s.$	$\overrightarrow{d}$

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