MATHS

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TRIGONOMETRIC FUNCTIONS

Others

1. In $ABC, \ =$ if $(a+b+c)(a-b+c)=3ac,$ then find $\angle B^{\cdot}$

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2. In $ABC,$ prove that $(a-b)^2\frac{\cos^2 C}{2}+(a+b)^2\frac{\sin^2 C}{2}=c^{2^{\cdot}}$

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3. If the angles A,B,C of a triangle are in A.P. and sides a,b,c, are in G.P., then prove that a^2, b^2, c^2 are in A.P.

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4. If $a = \sqrt{3}, b = \frac{1}{2}\left(\sqrt{6} + \sqrt{2}\right)^{\cdot}$ and $c = 2,$ then find $\angle A$

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5. In a scalene triangle ABC, D is a point on the side AB such that $CD^2 = AD \cdot DB,$ sin $\sin A \cdot \sin B = \frac{\sin^2 C}{2}$ then prove that CD is internal bisector of $\angle C^{\cdot}$

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6. In a $\mathrm{DeltaA\ B\ C}, \backslash\ \angle \mathrm{C} = 60\backslash\ \&\ \angle A = 75.$ If D is a point on AC such that area of the"Delta"BAD is $\sqrt{3}$ times the area of the $\mathrm{DeltaB\ C\ D},$ then the

$\angle A B D = 60^0$ (b) 30^0 (c) 90^0 (d) none of these

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7. In a triangle $ABC, \angle A = 60^0 and b : c = (\sqrt{3} + 1) : 2,$ then find the value of $(\angle B - \angle C)^{.}$

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8. A tower subtends angles $\alpha, 2\alpha, 3\alpha$ respectively, at point $A, B, and C$ all lying on a horizontal line through the foot of the tower. Prove that $\frac{AB}{BC} = 1 + 2\cos 2\alpha^{.}$

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9. In a triangle, if the angles $A, B, and C$ are in A.P. show that $2\frac{\cos 1}{2}(A - C) = \frac{a + c}{\sqrt{a^2 - ac + c^2}}$

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

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11. Perpendiculars are drawn from the anglesA, B,C,of an acute angles Δ on the opposite sodes and products to meet the circumscribing circle. If these produced parts be $\propto, \beta, \gamma$respectively, show that $\frac{a}{\propto} + \frac{b}{\beta} + \frac{c}{\gamma} = 2(\tan A + \tan B + \tan C$

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12. If in triangle ABC, the median AD and the perpendicular AE from the vertex A to the side BC divide the angle A into three equal parts, show that $\frac{\cos A}{3} \frac{\sin^2 A}{3} = \frac{3a^2}{32bc}$.

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13. If p and q are perpendicular from the angular points A and B of ABC drawn to any line through the vertex C, then prove that $a^2b^2\sin^2C = a^2p^2 + b^2q^2 - 2abpq\cos C$.

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14. The two adjacent sides of a cyclic quadrilateral are 2 and 5 and the angle between them is 60^0. If the area of the quadrilateral is $4\sqrt{3}$, find the remaining two sides.

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15. In a circle of radius r, chords of length $a and b cm$ subtend angles $\theta and 3\theta$, respectively, at the center. Show that $r = a\sqrt{\frac{a}{3a - b}}cm$

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16. Let ABC be a triangle with incenter I and inradius r. Let $D, E, andF$ be the feet of the perpendiculars from I to the sides $BC, CA, andAB,$ respectively. If r_1, r_2andr_3 are the radii of circles inscribed in the quadrilaterals $AFIE, BDIF, andCEID,$ respectively, prove that

$$\frac{r_1}{r - 1_1} + \frac{r_2}{r - r_2} + \frac{r_3}{r - r_3} = \frac{r_1 r_2 r_3}{(r - r_1)(r - r_2)(r - r_3)}$$

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17. In $ABC,$ as semicircle is inscribed, which lies on the side $\cdot$ If x is the lengthof the angle bisector through angle $C,$ then prove that the radius of the semicircle is $x\sin\left(\frac{C}{2}\right)\cdot$

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18. D, E, F are three points on the sides $BC, CA, AB,$ respectively, such that $\angle ADB = \angle BEC = \angle CFA = \theta^{\cdot}$ $A', B' C'$ are the points of intersections of the lines AD, BE, CF inside the triangle. Show that are of $A'B'C' = 4\cos^2\theta$, where is the area of ABC

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19. Given the base of a triangle, the opposite angle A, and the product k^2 of other two sides, show that it is not possible for a to be less than $2k\sin\frac{A}{2}$

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20. In any $\triangle ABC,$ prove that $\left(b^2 - c^2\right)\cot A + \left(c^2 - a^2\right)\cot B + \left(c^2 - b^2\right)\cot C = 0$

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21. In a triangle ABC, angle A is greater than angle B. If the measures of angles A and B satisfy the equation $3\sin x - 4\sin^3 x - k = 0, 0 < k < 1$, then thje measure of angle C is

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22. In triangle $ABC, a:b:c = 4:5:6.$ The ratio of the radius of the circumcircle to that of the incircle is___.

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23. The set of all real numbers a such that $a^2 + 2a, 2a + 3, and a^2 + 3a + 8$ are the sides of a triangle is____

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24. ABC is a triangle with $\angle B$ greater than $\angle C, D and E$ are points on BC such that AD is perpendicular to $BC and AE$ is the bisector of angle A.

Complete the relation $\angle DAE = \frac{1}{2}() + \angle C\Big]$.

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25. A nine-side regular polygon with side length 2, is inscribed in a circle. The radius of the circle is

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26. In triangle ABC, if $\cot A, \cot B, \cot C$ are in $\ddot{AP}$, then a^2, b^2, c^2 are in __________ progression.

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27. If in a triangle ABC, $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ca}$, then prove that the triangle is right angled.

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28. If the angles of a triangle are $30^0 and 45^0$ and the included side is $(\sqrt{3}+1)cm$ then the area of the triangle is______.

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29. A circle is inscribed in an equilateral triangle of side length a. The area of any square inscribed in the circle is

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30. In triangle ABC, AD is the altitude from $\dot{A}$ If $b > c, \angle C = 23^0, andAD = \frac{abc}{b^2 - c^2}$, then $\angle B =$ ___

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31. If D is the mid-point of the side BC of triangle ABC and AD is perpendicular to AC , then $3b^2 = a^2 - c$^2 (b) $3a^2 = b^2 3c^2$ $b^2 = a^2 - c^2$ (d)

$a^2 + b^2 = 5c^2$

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32. In $ABC, A\frac{2\pi}{3}, b - c = 3\sqrt{3}cm$ and area of $ABC = \frac{9\sqrt{3}}{2}cm^2, thenBC =$ $6\sqrt{3}$ (b) $9cm$ (c) $18cm$ (d) $27cm$

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33. General solution of θ satisfying the equation $\tan^2\theta + \sec 2\theta = 1$ is

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34. In any triangle ABC, $\frac{a^2 + b^2 + c^2}{R^2}$ has the maximum value of 3 (b) 6 (c) 9 (d) none of these

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35. Solve $\sqrt{5 - 2\sin x} = 6\sin x - 1$

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36. In triangle $ABC, R(b + c) = a\sqrt{bc}, where R$ is the circumradius of the triangle. Then the triangle is a)isosceles but not right b)right but not isosceles c)right isosceles d)equilateral

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37. Solve $\sin^3\theta\cos\theta - \cos^3\theta\sin\theta = \frac{1}{4}\cdot$

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38. In ABC, P is an interior point such that $\angle PAB = 10^0 \angle PBA = 20^0, \angle PCA = 30^0, \angle PAC = 40^0$ then ABC is (a) isosoceles (b) right angled (c) obtuse angled

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39. Solve $4\cos\theta - 3\sec\theta = \tan\theta$

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40. In ABC, if $AB = c$ is fixed, and $\cos A + \cos B + 2\cos C = 2$ then the locus of vertex C is ellipse (b) hyperbola (c) circle (d) parabola

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41. Solve the equation $2\cos^2\theta + 3\sin\theta = 0$

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42. In ABC, if $b^2 + c^2 = 2a^2$, then value of $\frac{\cot A}{\cot B + \cot C}$ is

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

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

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

D. $\frac{7}{2}$

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43. Find the number of solution of $[\cos x] + |\sin x| = 1, x \in \pi \leq x \leq 3\pi$ (where [ ] denotes the greatest integer function).

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44. If $\sin\theta and - \cos\theta$ are the roots of the equation $ax^2 - bx - c = 0$, where $a, bandc$ are the sides of a triangle ABC, then $\cos B$ is equal to $1 - \frac{c}{2a}$ (b) $1 - \frac{c}{a}$ $1 + \frac{c}{ca}$ (d) $1 + \frac{c}{3a}$

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45. If the equation $a\sin x + \cos 2x = 2a - 7$ possesses a solution, then find the value of a

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46. In a triangle ABC, (a+b+c)(b+c-a)=kbc if

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47. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has

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48. If in $ABC, A = \frac{\pi}{7}, B = \frac{2\pi}{7}, C = \frac{4\pi}{7}$ then $a^2 + b^2 + c^2$ must be (a)R^2 (b) $3R^2$ (c) $4R^2$ (d) $7R^2$

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49. If $x \in (0, 2\pi) and y \in (0, 2\pi)$, then find the number of distinct ordered pairs (x, y) satisfying the equation $9\cos^2 x + \sec^2 y - 6\cos x - 4\sec y + 5 = 0$

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50. In a triangle ABC if $BC = 1$ and $AC = 2$, then what is the maximum possible value of angle A?

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51. Find the number of roots of the equation $16\sec^3\theta - 12\tan^2\theta - 4\sec\theta = 9$ in interval $(- \pi, \pi)$

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52. If a^2, b^2, c^2 are in A.P., then prove that $\tan A, \tan B, \tan C$ are in H.P.

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53. If $2\tan^2 x - 5\sec x = 1$ for exactly seven distinct value of $x \in \left[0, \frac{n\pi}{2}\right], n \in N$ then find the greatest value of n.

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54. If an a triangle $ABC, b = 3c, and\ C - B = 90^0$, then find the value of $\tan B$

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55. The real roots of the equation $\cos^7 x + \sin^4 x = 1$ in the interval $(-\pi, \pi)$ are ________, _______, and _______

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56. If the base angles of triangle are $\left(\frac{22}{12}\right)^{\circ}$ and $\left(112\frac{1}{2}\right)^{\circ}$, then prove that the altitude of the triangle is equal to $\frac{1}{2}$ of its base.

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57. The general solution of the trigonometric equation $\sin x + \cos x = 1$ is given by $x = 2n\pi, n0, \pm 1, \pm 2$ $x = 2n\pi + \frac{\pi}{2}; n = 0, \pm 1, \pm 2,$ $x = n\pi + (-1)^n\frac{\pi}{4} - \frac{\pi}{4}n = 0, \pm 1, \pm 2, noneofthese$

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58. 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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59. The equation $2\cos^2\left(\frac{x}{2}\right)\sin^2 x = x^2 + x^{-2}; 0$

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60. The perimeter of a triangle ABC is saix times the arithmetic mean of the sines of its angles. If the side $ais1$ then find angle $\dot{A}$

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61. One of the general solutions of $4\sin\theta\sin2\theta\sin4\theta = \sin3\theta$ is

$(3n \pm 1)\frac{\pi}{12}, \forall n \in Z$ $(4n \pm 1)\frac{\pi}{9}, \forall n \in Z$ $(3n \pm 1)\frac{\pi}{12}, \forall n \in Z$

$(3n \pm 1)\frac{\pi}{3}, \forall n \in Z$

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62. If $A = 75^\circ, B = 45^\circ,$ then prove that $b + c\sqrt{2} = 2a$

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63. The general solution of the equation $8\cos x\cos 2x\cos 4x = \frac{\sin 6x}{\sin x}$ is

$x = \left(\frac{n\pi}{7}\right) + \left(\frac{\pi}{21}\right), \forall n \in Z$ $x = \left(\frac{2\pi}{7}\right) + \left(\frac{\pi}{14}\right), \forall n \in Z$

$x = \left(\frac{n\pi}{7}\right) + \left(\frac{\pi}{14}\right), \forall n \in Z$ $x = (n\pi) + \left(\frac{\pi}{14}\right), \forall n \in Z$

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64. in $\triangle ABC$ if $\frac{a^2 + b^2}{a^2 - b^2} = \frac{\sin(A + B)}{\sin(A - B)}$ then prove that it is either a right angled or an isosceles triangle.

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65. $\frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta} - \frac{\cos\theta}{\sqrt{1 + \cot^2\theta}} - 2\tan\theta\cot\theta = -1$ if (a)$\theta \in \left(0, \frac{\pi}{2}\right)$ (b) $\theta \in \left(\frac{\pi}{2}, \pi\right)$ (c)$\theta \in \left(\pi, \frac{3\pi}{2}\right)$ (d) $\theta \in \left(\frac{3\pi}{2}, 2\pi\right)$

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66. ABCD is a trapezium such that AB,DC.are parallel and BC is perpendicular to them. If $\angle ADB = \theta, BC = p$ and $CD = q$, show that AB= $\frac{\left(p^2 + q^2\right)\sin\theta}{p\cos\theta + q\sin\theta}$

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67. For $0 < x, y < \pi$, the number of ordered pairs (x, y) satisfying system equations $\cot^2(x - y) - \left(1 + \sqrt{3}\right)\cot(x - y) + \sqrt{3} = 0$ and $\cos y = \frac{\sqrt{3}}{2}$ is

A. 0

B. 1

C. 2

D. 3

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68. In ABC with usual notations, if $r = 1, r_1 = 7$ and $R = 3$, the $(a) ABC$ is equilateral (b) acute angled which is not equilateral (c) obtuse angled (d) right angled

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69. The least positive solution of $\cot\left(\frac{\pi}{3\sqrt{3}}\sin 2x\right) = \sqrt{3}$

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70. If $2\sec^2 A - \sec^4 A - 2\cos ec^2 A + \cos ec^4 A = \frac{15}{4}$, *then* tan A is equal

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71. In $\Delta ABC, a^2(s - a) + b^2(s - b) + c^2(s - c) =$

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72. The minimum value of ((3sin x-4cosx-10)(3sinx+4cosx-10)) is ________

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73. The number of real roots of the equation $\cos ec\theta + \sec\theta - \sqrt{15} = 0$ lying in $[0, \pi]$ is.

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74. In triangle ABC, D is on AC such that $AD = BC'$ and $BD = DC, \angle DBC = 2x, and \angle BAD = 3x,$ all angles are in degrees, then find the value of `x

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75. If $0 \le x \le 2\pi,$ then the number of solutions of $3(\sin x + \cos x) - 2\left(\sin^3 x + \cos^3 x\right) = 8$ is

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76. If $a \in (0, 1) and f(a) = \left(a^2 - a + 1\right) + \frac{8\sin^2 a}{\sqrt{a^2 - a + 1}} + \frac{27\text{cosec}^2 a}{\sqrt{a^2 - a + 1}}$, then the least value of $\frac{f(a)}{2}$ is______

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77. Prove that the area of a regular polygon hawing $2n$ sides, inscribed in a circle, is the geometric mean of the areas of the inscribed and circumscribed polygons of n sides.

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78. If $2\sin^2\left((\pi/2)\cos^2 x\right) = 1 - \cos(\pi \sin 2x), x \neq (2n + 1)\pi/2, n \in I$, then $\cos 2x$ is equal to

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79. If $\frac{\sin^4 x}{2} + \frac{\cos^4 x}{3} = \frac{1}{5} then$ (a) $\tan^2 x = \frac{2}{3}$ (b) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{1}{125}$ (c) $\tan^2 x = \frac{1}{3}$ (d) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

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80. If $b = 3, c = 4, and B = \frac{\pi}{3},$ then find the number of triangles that can be constructed.

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81. The number of solutions of the equation $\cos 6x + \tan^2 x + \cos(6x)\tan^2 x = 1$ in the interval $[0, 2\pi]$ is (a)4 (b)5 (c) 6 (d) 7

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82. Prove that the sum of the radii of the circles, which are, respectively, inscribed and circumscribed about a polygon of n sides, whose side length is a, is $\frac{a}{2}\cot\frac{\pi}{2n}$

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83. If $A = 4\sin\theta + \cos^2\theta$, then which of the following is not true? (a) maximum value of $A is 5$. (b)minimum value of $A is$ - 4 (c) maximum value of A occurs when $\sin\theta = \frac{1}{2}$ (d) Minimum value of A occurs when $\sin\theta$=1

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84. The number of solutions of the equation $\sin^3 x\cos x + \sin^2 x\cos^2 x + \sin x\cos^3 x = 1$ in the interval $[0, 2\pi]$ is/are

A. 0

B. 2

C. 3

D. infinite

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85. Which of the following is the least? sin 3 (b) sin 2 (c) sin 1 (d) sin 7

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86. If the area of the circle is A_1 and the area of the regular pentagon inscribed in the circle is A_2, then find the ratio $\frac{A_1}{A_2}$.

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87. The general solution of the equation $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$ is $(n \in Z)$ $n\pi + \frac{\pi}{8}$ (b) $\frac{n\pi}{2} + \frac{\pi}{8}$ $(-1)^n\frac{n\pi}{2} + \frac{\pi}{8}$ (d) $2n\pi + \frac{\cos^{-1}2}{3}$

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88. Which of the following is the least? (a) sin 3 (b) sin 2 (c) sin 1 (d) sin 7

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89. In $ABC, sidesb, c$ and angle B are given such that a has two values a_1 and a_2. Then prove that $\left|a_1 - a_2\right| = 2\sqrt{b^2 - c^2\sin^2 B}$

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90. If $\theta \in [0, 5\pi]$ and $r \in R$ such that $2\sin\theta = r^4 - 2r^2 + 3$ then the maximum number of values of the pair (r, θ) is.....

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91. Find the least value of $\sec^6 x + \operatorname{cosec}^6 x + \sec^6 x\operatorname{cosec}^6 x$.

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92. In $ABC, a, candA$ are given and b_1, b_2 are two values of the third side b such that $b_2 = 2b_1$. Then prove that $\sin A = \sqrt{\frac{9a^2 - c^2}{8c^2}}$

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93. The solutions of the equation $1 + (\sin x - \cos x)\frac{\sin\pi}{4} = 2\frac{\cos^2(5x)}{2}$ is/are

$x = \frac{n\pi}{3} + \frac{\pi}{8}, n \in Z$

$x = \frac{n\pi}{2} + \frac{5\pi}{16}, n \in Z$

$x = \frac{n\pi}{3} + \frac{\pi}{4}, n \in Z$

$x = \frac{n\pi}{2} + \frac{7\pi}{8}, n \in Z$

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94. Find the values of a for which $a^2 - 6\sin x - 5a \leq 0, Aax \in R$.

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95. If $A = 30^0, a = 7,\ \text{and}\ b = 8$ in $ABC,$ then find the number of triangles that can be constructed.

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96. If $xandy$ are positive acute angles such that $(x + y)$ and $(x - y)$ satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0,$ then

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

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

C. $y = \frac{\pi}{6}$

D. $y = \frac{\pi}{4}$

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97. Find the minimum value of $2\cos\theta + \frac{1}{\sin\theta} + \sqrt{2}\tan\theta \in \left(0, \frac{\pi}{2}\right).$

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98. If in triangle ABC, $\left(a = \left(1 + \sqrt{3}\right)cm, b = 2cm, and\angle C = 60^0\right.$, then find the other two angles and the third side.

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99. Solve $\sin^4\left(\frac{x}{3}\right) + \cos^4\left(\frac{x}{3}\right) > \frac{1}{2}$

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100. If $\sin^4\alpha + \cos^4\beta + 2 = 4\sin\alpha\cos\beta, 0 \leq \alpha, \beta \leq \frac{\pi}{2}$ then find the value of $(\sin\alpha + \cos\beta)^{\cdot}$

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101. In $ABC, \angle A = 90^0 andAD$ is an altitude. Complete the relation $\frac{BD}{DA} = \frac{AB}{()}$.

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102. Solve $\sin x + \sin y = \sin(x + y) and|x| + |y| = 1$

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103. Find the values of p so that the equation $2\cos^2 x - (p + 3)\cos x + 2(p - 1) = 0$ has a real solution.

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104. ABC is a triangle, P is a point on $ABandQ$ is a point on AC such that $\angle AQP = \angle ABC^{\cdot}$ Complete the relation $\frac{AreaofAPQ}{AreaofABC} = \frac{\dot{()}}{AC^2}$.

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105. Solve $\sin x > -\frac{1}{2}$

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106. Let ABC be a triangle having O and I as its circumcentre and incentre, respectively. If R and r are the circumradius and the inradius respectively, then prove that (IO) 2 =R 2 −2Rr. Further show that the triangle BIO is right angled triangle if and only if b is the arithmetic mean of a and c.

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107. Which of the following is possible?

A. $\sin\theta = \frac{5}{3}$

B. $\tan\theta = 1002$

C. $\cos\theta = \frac{1 + p^2}{1 - p^2}, (p \neq \pm 1)$

D. $\sec\theta = \frac{1}{2}$

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108. Solve $2\cos^2\theta + \sin\theta \le 2$, where $\frac{\pi}{2} \le \theta \le \frac{3\pi}{2}\cdot$

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109. Evaluate the sine of each of the following angles without using a calculator: 300^0, -405^0, $\frac{7\pi}{6}, \frac{11\pi}{4}\cdot$

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110. Let ABC be a triangle with incenter I and inradius $\dot{r}$ Let $D, E, andF$ be the feet of the perpendiculars from I to the sides $BC, CA, andAB,$ respectively. If r_1, r_2andr_3 are the radii of circles inscribed in the quadrilaterals $AFIE, BDIF, and CEID,$ respectively, prove that

$$\frac{r_1}{r-1_1} + \frac{r_2}{r-r_2} + \frac{r_3}{r-r_3} = \frac{r_1 r_2 r_3}{(r-r_1)(r-r_2)(r-r_3)}$$

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111. Prove that the least positive value of $x,$ satisfying $\tan x = x + 1, lies$in thein$terval\left(\frac{\pi}{4}, \frac{\pi}{2}\right)^{\cdot}$

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112. Find the reference angles corresponding to each of the following angles. It may help if you sketch θ in standard position. θ(31pi)/9, theta=640^0`

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113. If Δ is the area of a triangle with side lengths $a, b, c,$ then show that as $\Delta \leq \frac{1}{4}\sqrt{(a+b+c)abc}$ Also, show that the equality occurs in the above inequality if and only if $a=b=c$.

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114. Suppose the point with coordinates (-12, 5) is on the terminal side of angle θ. Find the values of the six trigonometric functions of θ.

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115. If $mandn(n>m)$ are positive integers, then find the number of solutions of the equation $n|\sin x|=m|\cos x| f \text{ or } x \in [0, 2\pi]$ Also find the solution.

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116. I_n is the area of n sided refular polygon inscribed in a circle unit radius and O_n be the area of the polygon circumscribing the given circle, prove that $I_n = \frac{O_n}{2}\left(1 + \sqrt{1 - \left(\frac{2I_n}{n}\right)^2}\right)$

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117. Solve $3\tan 2x - 4\tan 3x = \tan^2 3x \tan 2x$.

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118. Assuming the distance of the earth from the moon to be 38,400 km and the angle subtended by the moon at the eye of a person on the earth to be 31', find the diameter of the moon.

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119. Let the angles $A, B and C$ of triangle ABC be in $\ddot{AP}$ and let $b:c$ be $\sqrt{3}:\sqrt{2}$. Find angle $\dot{A}$

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120. Find the angle between the minute hand and the hour hand of a clock when the time is 7:20 AM.

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121. For which values of a does the equation $4\sin\left(x+\frac{\pi}{3}\right)\cos\left(x-\frac{\pi}{6}\right)=a^2+\sqrt{3}\sin 2x-\cos 2x$ have solution? Find the solution for $a=0$, if any exists

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122. In a triangle of base a, the ratio of the other sides is $r(<1)$. Show that the attitude of the triangle is less than or equal to $\frac{ar}{1-r^2}$.

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123. Solve $\sin\theta + \sqrt{3}\cos\theta \geq 1, \ -\pi < \theta < \pi$

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124. For each natural number k, let C_k denotes the circle with radius k units and centre at the origin. On the circle C_k, a particle moves k units in the counter clockwise direction. After completing its motion on C_k, the particles moves to C_{k+l} , in some well defined manner, where $l > 0$. The motion of the particle continues in this manner.

Answer the following question based on above passage :

Let l= 1, the particles starts at (1, 0), if the particles crossing the positive direction of the x-axis for the first time on the circle C_n then n is equal to

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125. Let A,B,C, be three angles such that $A = \frac{\pi}{4}$ and $\tan B \tan C = p$. Find all possible values of p such that A, B, C are the angles of a triangle.

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126. Solve $\cos 2x > |\sin x|, x \in \left(\frac{\pi}{2}, \pi\right)$

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127. State if the given angles are coterminal. (i) $\alpha = 185^0, \beta = -545^0$ (ii) $\alpha = \frac{17\pi}{36}, \beta = \frac{161\pi}{36}$

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128. Prove that a triangle ABC is equilateral if and only if $\tan A + \tan B + \tan C = 3\sqrt{3}$.

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129. If $\sin A = \sin B$ and $\cos A = \cos B$, then find the value of A in terms of B.

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130. Express 1.2 rad in integer degree measure.

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131. In triangle ABC, if $\cos A + \cos B + \cos C = \frac{7}{4}$, *then* $\frac{R}{r}$ is equal to $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

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132. Find the number of solutions of $\sin^2 x - \sin x - 1 = 0 \xi n[-2\pi, 2\pi]$

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133. Find the length of an arc of a circle of radius 5cm subtending a central angle measuring $15^{0^{\cdot}}$

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134. In an equilateral triangle, the inradius, circumradius, and one of the exradii are in the ratio

A. 2:4:5

B. 1:2:3

C. 1:2:4

D. 2:4:3

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135. Solve : $(\log)\left(-x^2-6x\right)/10(\sin 3x+\sin x)=(\log)\left(-x^2-6x\right)/10(\sin 2x)$

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136. Find in degrees the angle subtended at the centre of a circle of diameter 50cm by an arc of length 11cm.

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137. The area of a regular polygon of n sides is (where r is inradius, R is circumradius, and a is side of the triangle (a) $\frac{nR^2}{2}\sin\left(\frac{2\pi}{n}\right)$ (b) $nr^2\tan\left(\frac{\pi}{n}\right)$ (c) $\frac{na^2}{4}\frac{\cot\pi}{n}$ (d) $nR^2\tan\left(\frac{\pi}{n}\right)$

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138. Find the value of θ which satisfy $r\sin\theta = 3$ and $r = 4(1 + \sin\theta),\ 0 \leq \theta \leq 2\pi$

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

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140. If the sides a, b, c of a triangle ABC form successive terms of G.P. with common ratio $r(>1)$ then which of the following is correct? (a) $A > \frac{\pi}{3}$' (b) B≥π/3' (c)C<π/3' (d)A < B < π/3`

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141. The number of solution of $16^{\sin^2 x} + 16^{\cos^2 x} = 10 : 0 \leq x \leq 2\pi$, is

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142. If $\sec x + \sec^2 x = 1$ then the value of $\tan^8 x - \tan^4 x - 2\tan^2 x + 1$ will be equal to

A. 0

B. 1

C. 2

D. 3

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143. In triangle ABC, if $\dot{P}Q, R$ divides sides BC, AC, and AB, respectively, in the ratio $k : 1(\in \text{ or } der)^{\cdot}$ If the ratio $\left(\frac{arEAPQR}{areaABC}\right)$ IS $\frac{1}{3}$, $thenk$ is equal to $\frac{1}{3}$ (b) 2 (c) 3 (d) none of these

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144. Find the general value of θ which satisfy both $\sin\theta = -\frac{1}{2}$ and $\tan\theta = 1/\sqrt{3}$ simultaneously.

A. $11\pi/6$

B. $7\pi/6$

C. $\pi/6$

D. $11\pi/6$, $7\pi/6$

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145. If sec α and α are the roots of $x^2 - px + q = 0$, then (a) $p^2 = q(q - 2)$ (b) $p^2 = q(q + 2)$ (c)$p^2q^2 = 2q$ (d) none of these

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146. Solve the equation $\sin x + \cos x = 1$

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147. In the given figure AB is the diameter of the circle, centred at O. If $\angle COA = 60^0, AB = 2r, AC = d,$ and $CD = l$

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148. The value of expression $\left(2\sin^2 91^0 - 1\right)\left(2\sin^2 92^0 - 1\right)......\left(2\sin^2 180^0 - 1\right)$ is equal to

A. 0

B. 1

C. 2^{90}

D. $2^{90} - 90$

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149. Solve $\frac{\tan 3x - \tan 2x}{1 + \tan 3x \tan 2x} = 1$

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150. In a ABC, if $AB = x, BC = x + 1, \angle C = \frac{\pi}{3}$, then the least integer value of x is

A. 6

B. 7

C. 8

D. none of these

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151. Solve $\tan x + \tan 2x + \tan 3x = \tan x \tan 2x \tan 3x, x \in [0, \pi]$

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152. The value of $\cos\left(\frac{\pi}{7}\right)+\cos\left(\frac{2\pi}{7}\right)+\cos\left(\frac{3\pi}{7}\right)+\cos\left(\frac{4\pi}{7}\right)+\cos\left(\frac{5\pi}{7}\right)$ $+\cos\left(\frac{6\pi}{7}\right)+\cos\left(\frac{7\pi}{7}\right)$ is

A. 1

B. -1

C. 0

D. none of these

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153. In a triangle $ABC, DandE$ are points on $BCandAC,$ respectivley, such that $BD=2DCandAE=3EC^{.}$ Let P be the point of intersection of $ADandBE^{.}$ Find BP/PE using the vector method.

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154. $A_0, A_1, A_2, A_3, A_4, A_5$ be a regular hexagon inscribed in a circle of unit radius ,then the product of $\left(A_0A_1 \cdot A_0A_2 \cdot A_0A_4\right.$ is equal to

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155. General solution of $\tan\theta + \tan 4\theta + \tan 7\theta = \tan\theta \tan 4\theta \tan 7\theta$ is

$\theta = \frac{n\pi}{12}, when n \in Z$ $\theta = \frac{n\pi}{9}, when n \in Z$ $\theta = n\pi + \frac{\pi}{12}, when n \in Z$

$none of these$

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156. In $\triangle ABC$,$\Delta = 6$, $abc = 60$, $r = 1$ Then the value of $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ is nearly

A. 0.5

B. 0.6

C. 0.4

D. 0.8

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157. The number of solution (s) of the equation $\sin^4 x + \cos^4 x = \sin x \cos x$ in $[0, 2\pi]$

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158. The value of $\tan\left(\frac{\pi}{3}\right) + 2\tan\left(\frac{2\pi}{3}\right) + 4\cot\left(\frac{4\pi}{3}\right) + 8\tan\left(\frac{8\pi}{3}\right)$ is

A. $-5\sqrt{3}$

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

C. $5\sqrt{3}$

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

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159. Let the area of triangle ABC be $(\sqrt{3} - 1)/2, b = 2$ and $c = (\sqrt{3} - 1),$ and $\angle A$ be acute. The measure of the angle A is

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160. A right triangle has perimeter of length 7 and hypotenuse of length $3.$ If θ is the larger non-right angle in the triangle, then the value of $\cos\theta equal$

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161. General solution of $\sin^2 x - 5\sin x\cos x - 6\cos^2 x = 0$

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162. In triangle ABC , base BC and area of triangle are fixed. The locus of the centroid of triangle ABC is a straight line that is a) parallel to side BC (b)right bisector of side BC (c)perpendicular to BC (d)inclined at an angle $\sin^{-1}\left(\frac{\surd}{BC}\right)$ to side BC

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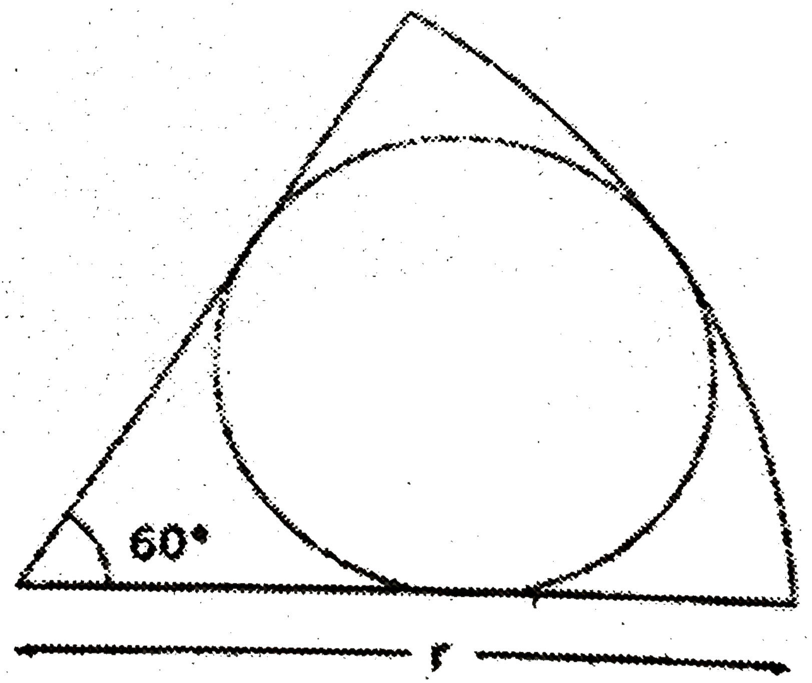
163. A circle is drawn in a sector of a larger circle of radius r, as shown in the adjacent figure. The smaller circle is tangent to the two bounding radii and the are of the sector. The radius of the small circle is-



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164. The sides of a triangle are three consecutive natural numbers and its largest angle is twice the smallest one determine the sides of the triangle

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165. The sum of all the solution of the equation

$$\cos\theta\cos\left(\frac{\pi}{3}+\theta\right)\cos\left(\frac{\pi}{3}-\theta\right)=\frac{1}{4}\theta \in [0, 6\pi]$$

A. 15π

B. 30π

C. $\frac{100\pi}{3}$

D. none of these

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166. The least value of $2\sin^2\theta + 3\cos^2\theta$ is

A. 1

B. 2

C. 3

D. 5

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167. In triangle ABC, prove that the maximum value of $\frac{\tan A}{2}\frac{\tan B}{2}\frac{\tan C}{2} is \frac{R}{2s}$

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168. Number of solutions of the equation $\cos^4(2x) + 2\sin^2(2x) = 17(\cos x + \sin x)^8$, $0 < x < 2\pi$ is

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169. Given that the side length of a rhombus is the geometric mean of the length of its diagonals. The degree measure of the acute angle of the rhombus is (a)15^0 (b) 30^0 (c) 45^0 (d) 60^0

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170. The number of solution of

$\sin x + \sin 2x + \sin 3x = \cos x + \cos 2x + \cos 3x, 0 \leq x \leq 2\pi,$ is

A. 7

B. 5

C. 4

D. 6

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171. Prove that $a\cos A + b\cos B + os C \leq \dot{s}$

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172. Minimum value of $\frac{\sec^4\alpha}{\tan^2\beta} + \frac{\sec^4\beta}{\tan^2\alpha}$, where $\alpha \neq \frac{\pi}{2}, \beta \neq \frac{\pi}{2}$,0

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173. A man observes that when he moves up a distance c metres on a slope, the angle of depression of a point on the horizontal plane from the base of the slope is 30^0, and when he moves up further a distance c metres, the angle of depression of that point is 45^0. The angle of inclination of the slope with the horizontal is.

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174. Which of the following is true for $z = (3 + 2i\sin\theta)(1 - 2\sin\theta) where i = \sqrt{-1}$? (a) z is purely real for $\theta = n\pi \pm \frac{\pi}{3}, n \in Z$ (b)z is purely imaginary for $\theta = n\pi \pm \frac{\pi}{2}, n \in Z$ (c) z is purely real for $\theta = n\pi, n \in Z$ (d) none of these

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175. Express $45^0 20' 10''$ in radian measure $(\pi = 3.1415)$

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176. The number of solution of $\sec^2\theta + \operatorname{cos}ec^2\theta + 2\operatorname{cos}ec^2\theta = 8, 0 \leq \theta \leq \frac{\pi}{2}$ is 4 (b) 3 (c) 0 (d) 2

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177. The base of a triangle is divided into three equal parts. If t_1, t_2, t_3 are the tangents of the angles subtended by these parts at the opposite vertex, prove that $\left(\frac{1}{t_1} + \frac{1}{t_2}\right)\left(\frac{1}{t_2} + \frac{1}{t_3}\right) = 4\left(1 + \frac{1}{t22}\right)$.

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178. A man observes when he has climbed up $\frac{1}{3}$ of the length of an inclined ladder, placed against a wall, the angular depression of an object on the floor is α. When he climbs the ladder completely, the angleof depression is β . If the inclination of the ladder to the floor is θ, then prove that $\cot\theta = \frac{3\cot\beta - \cot\alpha}{2}$

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179. Number of solutions of the equation $\sin^4 x - \cos^2 x\sin x + 2\sin^2 x + \sin x = 0 \in 0 \leq x \leq 3\pi$ is____

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180. If the median AD of triangle ABC makes an angle $\frac{\pi}{4}$ with the side BC, then find the value of $|\cot B - \cot C|$

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181. If $\sin\theta, \tan\theta, \cos\theta$ are in G.P. then $4\sin^2\theta - 3\sin^4\theta + \sin^6\theta = ?$

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182. The value of k if the equation $2\cos x + \cos 2kx = 3$ has only one solution is

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183. If I_1, I_2, I_3 are the centers of escribed circles of triangle ABC, show that area of triangle $I_1I_2I_3 = \frac{abc \cdot}{2r}$

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184. Let $f(\theta) = \frac{1}{1 + (\cot\theta)^2}$, and $S = \sum_{\theta = 1^0}^{89^0} f(\theta)$, then the value of $\sqrt{2S - 8}$ is__________

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185. The number of values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ satisfying the equation $\left(\sqrt{3}\right)^{\sec^2\theta} = \tan^4\theta + 2\tan^2\theta$ is 2 (b) 4 (c) 0 (d) 1

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186. If the distance between incenter and one of the excenter of an equilateral triangle is 4 units, then find the inradius of the triangle.

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187. The value of $3\frac{\sin^4 t + \cos^4 t - 1}{\sin^6 t + \cos^6 t - 1}$ is equal to ________

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188. Number of roots of the equation $2^{\tan\left(x - \frac{\pi}{4}\right)} - 2(0.25)^{\frac{\sin^2\left(x - \frac{\pi}{4}\right)}{\cos 2x}} + 1 = 0, is$ _ _ _

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189. If $\sin\theta - \cos\theta = 1,$ then the value of $\sin^3\theta - \cos^3\theta$ is ________

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190. Given a triangle ABC with sides a=7, b=8 and c=5. Find the value of expression $(\sin A + \sin B + \sin C)\left(\frac{\cot A}{2} + \frac{\cot B}{2} + \frac{\cot C}{2}\right)$

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191. The smallest positive value of x (in radians) satisfying the equation $(\log)_{\cos x}\left(\frac{\sqrt{3}}{2}\sin x\right) = 2 - (\log)_{\sec x}(\tan x)$ is (a) $\frac{\pi}{12}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{3}$

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192. In convex quadrilateral $ABCD, AB = a, BC = b, CD = c, DA = d$. This quadrilateral is such that a circle can be inscribed in it and a circle can also be circumscribed about it. Prove that $\frac{\tan^2 A}{2} = \frac{bc}{ad}\cdot$

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193. Suppose that for some angles $x and y$, the equations $\sin^2 x + \cos^2 y = \frac{3a}{2} and \cos^2 x + \sin^2 y = \frac{a^2}{2}$ hold simultaneously. the possible value of a is __________

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194. The number of distinct real roots of the equation $\frac{\tan(2\pi x)}{x^2 + x + 1} = -\sqrt{3}$ is (a) 4 (b) 5 (c) 6 (d) none of these

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195. In a cyclic quadrilateral PQRS, PQ= 2 units, QR= 5 units, RS=3 units and $\angle PQR = 60^0$, then what is the measure of SP?

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196. The number of solution of the equation $\sin 2\theta - 2\cos\theta + 4\sin\theta = 4 \in [0, 5\pi]$ is equal to 3 (b) 4 (c) 5 (d) 6

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197. If $0 < x < \frac{5}{4}$ and $\cos x + \sin x = \frac{5}{4}$ then the value of $16(\cos x - \sin x)^2$ is

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198. If Δ represents the area of acute angled triangle ABC, then $\sqrt{a^2b^2 - 4\Delta^2} + \sqrt{b^2c^2 - 4\Delta^2} + \sqrt{c^2a^2 - 4\Delta^2} =$ (a) $a^2 + b^2 + c^2$ (b) $\frac{a^2 + b^2 + c^2}{2}$ (c) $ab\cos C + bc\cos A + ca\cos B$ (d) $ab\sin C + bc\sin A + ca\sin B$

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199. In Triangle $ABC, BC = 8, CA = 6 and AB = 10$. A line dividing the triangle ABC into regions of equal area is perpendicular to AB at point X. Find the value of $BX\sqrt{2}$.

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200. If $\frac{1}{6}\sin\theta, \cos\theta, \tan\theta$ are in GP, then θ is equal to

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201. If the angles of a triangle are $30^0 and 45^0$ and the included side is $(\sqrt{3}+1)$ cm, then area of the triangle is $\frac{1}{2}(\sqrt{3}+1) sq units area of the \triangle is$ 1/2(sqrt(3)-1)sq units`

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202. The number of solutions of equation

$6\cos 2\theta + 2\cos^2\left(\frac{\theta}{2}\right) + 2\sin^2\theta = 0, \ -\pi < \theta < \pi$ is

A. 3

B. 4

C. 5

D. 6

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203. The circumference of a circle circumscribing an equilateral triangle is $24\pi units$. Find the area of the circle inscribed in the equilateral triangle.

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204. In $ABC, a, candA$ are given and b_1, b_2 are two values of the third side b such that $b_2 = 2b_1$. Then prove that $\sin A = \sqrt{\frac{9a^2 - c^2}{8c^2}}$

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205. Two circles of radii 4cm and 1cm touch each other externally and θ is the angle contained by their direct common tangents. Find $\sin\left(\frac{\theta}{2}\right) + \cos\left(\frac{\theta}{2}\right)$.

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206. Which of the following is not the general solution of $2^{\cos 2x} + 1 = 3.2^{-\sin^2 x}$? (a) $n\pi, n \in Z$ (b) $\left(n + \frac{1}{2}\right)\pi, n \in Z$ (c) $\left(n - \frac{1}{2}\right)\pi, n \in Z$ (d) none of these

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207. If area of $\Delta ABC(\Delta)$ and angle C are given and if the side c opposite to given angle is minimum, then $a = \sqrt{\frac{2\Delta}{\sin C}}$ (b) $b = \sqrt{\frac{2\Delta}{\sin C}}$ $a = \sqrt{\frac{4\Delta}{\sin C}}$ (d) $b = \sqrt{\frac{4\Delta}{\sin C}}$

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208. Let PQ and RS be tangent at the extremities of the diameter PR of a circle of radius r. If PS and RQ intersect at a point X on the circumference of the circle, then prove that $2r = \sqrt{PQ \times RS}$.

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209. The number of solutions of $12\cos^3 x - 7\cos^2 x + 4\cos x = 9$ is (a) 0 (b) 2 (c) infinite (d) none of these

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210. If the sines of the angles A and B of a triangle ABC satisfy the equation $c^2x^2 - c(a + b)x + ab = 0$, then the triangle (a) is acute angled (b) is right angled (c) is obtuse angled (d) satisfies the equation $\sin A + \cos A \dfrac{(a + b)}{c}$

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211. $\tan(\angle BAO) = 3,$ then find the ratio $BC : CA$

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212. The sum of all the solutions of $\cot\theta = \sin 2\theta(\theta \neq n\pi, n$ integer) , $0 \leq \theta \leq \pi,$ is

A. $\dfrac{3\pi}{2}$

B. π

C. $3\dfrac{\pi}{4}$

D. 2π

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213. In triangle, ABC if $2a^2b^2 + 2b^2c^2 = a^4 + b^4 + c^4$, then angle B is equal to 45^0 (b) 135^0 120^0 (d) 60^0

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214. If angle C of triangle ABC is 90^0, then prove that $\tan A + \tan B = \frac{c^2}{ab}$ (where, a, b, c, are sides opposite to angles A, B, C, respectively).

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215. The system of equations $\tan x = a\cot x, \tan 2x = b\cos y$ (a)cannot have a solution if $a = 0$ (b)cannot have a solution if $a = 1$ (c)cannot have a solution if $2\sqrt{a} > |b(1 - a)|$ (d)has a solution for all $a and b$

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216. The sides of ABC satisfy the equation $2a^2 + 4b^2 + c^2 = 4ab + 2ac$

Then a) the triangle is isosceles b) the triangle is obtuse c) $B = \cos^{-1}\left(\frac{7}{8}\right)$

d) $A = \cos^{-1}\left(\frac{1}{4}\right)$

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217. By geometrical interpretation, prove that

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}.$$

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218. The equation $2\sin^3\theta + (2\lambda - 3)\sin^2\theta - (3\lambda + 2)\sin\theta - 2\lambda = 0$ has exactly three roots in $(0, 2\pi)$, then λ can be equal to (a)0 (b) 2 (c)1 (d) -1

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219. If sides of triangle ABC are $a, bandc$ such that $2b = a + c$ then $\frac{b}{c} > \frac{2}{3}$

(b) $\frac{b}{c} > \frac{1}{3}\frac{b}{c} < 2$ (d) $\frac{b}{c} < \frac{3}{2}$

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220. By geometrical interpretation, prove that

(i) $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \sin\beta\cos\alpha$

(ii) $\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

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221. If $\theta = \frac{\pi}{2^n + 1}$, prove that: $2^n\cos\theta\cos2\theta\cos2^2\cos2^{n-1}\theta = 1$.

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222. Let $f(x) = \cos\left(a_1 + x\right) + \frac{1}{2}\cos\left(a_2 + x\right) + \frac{1}{2^2}\cos\left(a_3 + x\right) + \ldots\ldots. + \frac{1}{2^{n-1}}\cos\left(a_n + x\right)$ where $a\Big)1, a_2a_n \in R$ If $f\left(x_1\right) = f\left(x_2\right) = 0, then\left|x_2 - x_1\right|$

may be equal to (a) π (b) 2π (c) 3π (d) $\frac{\pi}{2}$

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223. Three circle touch one another externally. The tangents at their points of contact meet at a point whose distance from the point of contant is 4. If the ratio of the product of the radii to the sum of the radii of the circle is λ, then $\frac{\lambda}{2}$ is ....

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

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225. If $\cot\theta + \tan\theta = x$ and $\sec\theta - \cos\theta = y$, prove that $\left(x^2 y\right)^{\frac{2}{3}} - \left(xy^2\right)^{\frac{2}{3}} = 1$

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226. The solution of the system of equations $\sin x \sin y = \frac{\sqrt{3}}{4}, \cos x \cos y = \frac{\sqrt{3}}{4}$ are $x_1 = \frac{\pi}{3} + \frac{\pi}{2}(2n + k); n, k \in I$ $y_1 = \frac{\pi}{6} + \frac{\pi}{2}(k - 2n); n, k \in I$ $x_2 = \frac{\pi}{6} + \frac{\pi}{2}(2n + k); n, k \in I$ $y_2 = \frac{\pi}{3} + \frac{\pi}{2}(k - 2n); n, k \in I$

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

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228. In $\triangle ABC$ if cosAcosB +sinAsinB sinC=1 then prove that $a : b : c = 1 : 1 : \sqrt{2}$

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229. Let $f(x) = \sin^6 x + \cos^6 x + k\left(\sin^4 x + \cos^4 x\right)$ for some real number k. Determine(a) all real numbers k for which $f(x)$ is constant for all values of x.

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230. Number of values of p for which equation $\sin^3 x + 1 + p^3 - 3p\sin x = 0 (p > 0)$ has a root is _______

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231. In ABC , prove that $\cos A + \cos B + \cos C \leq \frac{3}{2}$.

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232. In a ΔABC, the median to the side BC is of length $\frac{1}{\sqrt{11 - 6\sqrt{3}}}$ and it divides the $\angle A$ into angles 30° and 45° Find the length of the side BC.

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233. If $p\operatorname{cosec}\theta + q\cot\theta = 2$ and $p^2\operatorname{cosec}^2\theta - q^2\cot^2\theta = 5$ then the value of $\sqrt{81p^{-2} - q^{-2}}$ is______

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234. If a, b and c are in G.P. then prove that $\frac{1}{a^2 - b^2} + \frac{1}{b^2} = \frac{1}{b^2 - c^2}$.

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235. In $\triangle ABC$ tan(A/2), tan(B/2) and tan (C/2)` are in A.P. then prove that cosA,cosB,cosC are in A.P.

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236. In $\triangle ABC$ (b+c)/11=(c+a)/12=(a+b)/13 then prove that (cosA)/7=(cosB)/19=(cosC)/25

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237. α, β, γ and δ are angles in I,II,II and IV quadrants, respectively and none of them is an integral multiple of $\pi/2$. They form an increasing arithmetic progression.

Which of the following does not hold?

A. a.) $\cos(\alpha+\delta) > 0$

B. b.) $\cos(\alpha+\delta) = 0$

C. c.) $\cos(\alpha+\delta) < 0$

D. d.) $\cos(\alpha+\delta) > 0$ or $\cos(\alpha+\delta) < 0$

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238. Solution of the equation $\sin\left(\sqrt{1 + \sin 2\theta}\right) = \sin\theta + \cos\theta is (n \in Z)$

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

B. $n\pi + \frac{\pi}{12}$

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

D. none of these

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239. If in $\triangle ABC$ cosA+cosB+cosC=3/2 then prove that triangle is equilateral

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240. Let $\alpha, \beta, \gamma > 0 and \alpha + \beta + \gamma = \frac{\pi \cdot}{2}$ 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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241. In $\Delta ABC,$ if BC is unity, $\sin\left(\frac{A}{2}\right) = x_1, \sin\left(\frac{B}{2}\right) = x_2,$ $\cos\left(\frac{A}{2}\right) = x_3, \cos\left(\frac{B}{2}\right) = x_4$ with $\left(\frac{x_1}{x_2}\right)^{2007} - \left(\frac{x_3}{x_4}\right)^{2007} = 0$, then the length of ACis ....

A. (a) 1/2 sq. units

B. (b) 1/3 sq. units

C. (c) 1 sq. units

D. (d) 2 sq. units

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242. Number of solutions of the equation $\sin^4 x - \cos^2 x \sin x + 2\sin^2 x + \sin x = 0 \in 0 \leq x \leq 3\pi$ is____

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243. The ex-radii r_1, r_2, r_3 or ΔABC are in H.P. Show that its sides a,b,c are in A.P.

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244. Solve $7\cos^2\theta + 3\sin^2\theta = 4$

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245. If $\sin\theta + \cos\theta = \frac{1}{5} \text{and} 0 \leq \theta < \pi$, then$\tan\theta$ is

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

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247. The exradii r_1, r_2 and r_3 of $\triangle ABC$ are in H.P. Show that its sides $a, bandc$ are in $AP^{..}$

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248. Find the number of roots of the equation $\tan\left(x + \frac{\pi}{6}\right) = 2\tan x, f \text{ or } x \in (0, 3\pi)^{.}$

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249. In triangle ABC, prove that $\cos ec\frac{A}{2} + \cos ec\frac{B}{2} + \cos ec\frac{C}{2} \geq 6.$

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250. If $x = \frac{2\sin\theta}{1 + \cos\theta + \sin\theta}$, *then* $\frac{1 - \cos\theta + \sin\theta}{1 + \sin\theta}$ is equal to

A. $1 + x$

B. $1 - x$

C. x

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

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251. CF is the internal bisector of angle C of ABC , then CF is equal to (a) $\frac{2ab}{a + b}\cos\left(\frac{C}{2}\right)$ (b) $\frac{a + b}{2ab}\frac{\cos C}{2}$ (c) $\frac{b\sin A}{\sin\left(B + \frac{C}{2}\right)}$ (d) none of these

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252. Solve the equation $2(\cos x + \cos 2x) + \sin 2x(1 + 2\cos x) = 2\sin x$ for $(-\pi \leq x \leq \pi)$

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253. Which of the following is not the quadratic equation whose roots are $cosec^2\theta and \sec^2\theta$? $(a)x^2 - 6x + 6 = 0$ (b) $x^2 - 7x + 7 = 0$ $(c)x^2 - 4x + 4 = 0$ (d) none of these

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

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255. In triangle ABC, line joining the circumcenter and orthocenter is parallel to side AC, then the value of tan A tan C is equal to

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256. Solve $8\sin x = \frac{\sqrt{3}}{\cos x} + \frac{1}{\sin x}$

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257. If $\cos ec\theta - \cot\theta = q$, then the value of $\cos ec\theta$ is

A. $q = \frac{1}{q}$

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

C. $\frac{1}{2}\left(q + \frac{1}{q}\right)$

D. none of these

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258. If $A+B+C=\pi$, prove that $\cot A+\cot B+\cot C-\operatorname{cosec} A \operatorname{cosec} B \operatorname{cosec} C=\cot A \cot B \cot C$

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259. Let D be the middle point of the side BC of a triangle ABC. If the triangle ADC is equilateral, then $a^2 : b^2 : c^2$ is equal to $1:4:3$ (b) $4:1:3$ (c) $4:3:1$ (d) $3:4:1$

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260. Solve $2\tan\theta-\cot\theta=-1$

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261. If $\sec^4\theta+\sec^2\theta=10+\tan^4\theta+\tan^2\theta,$ then $\sin^2\theta=$

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

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

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

D. $\frac{5}{6}$

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262. 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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263. In the given figure, what is the radius of the inscribed circle? $\frac{3}{2}$ (b) $\frac{5}{2}$ (c) $\frac{7}{5}$ (d) none of these

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264. Solve $\tan 3\theta = -1$

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265. If $\sin A = \sin^2 B and 2\cos^2 A = 3\cos^2 B$ then the triangle ABC is right angled (b) obtuse angled (c)isosceles (d) equilateral

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

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267. If in a triangle ABC, $\frac{1+\cos A}{a} + \frac{1+\cos B}{b} + \frac{1+\cos C}{c} = \left(k^2(1+\cos A)(1+\cos B)\frac{1+\cos C}{abc}\right.$, then k is equal to (a) $\frac{1}{2\sqrt{2}R}$ (b) $2R$ (c)

$\frac{1}{R}$ (d) none of these

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

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269. The product of the sines of the angles of a triangle is p and the product of their cosines is $\dot{q}$ 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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270. If $\frac{\sin x}{a} = \frac{\cos x}{b} = \frac{\tan x}{c} = k$, then $bc + \frac{1}{ck} + \frac{ak}{1 + bk}$ is equal to

A. $k\left(a + \frac{1}{a}\right)$

B. $1/k\left(a+\frac{1}{a}\right)$

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

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

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271. In $ABC, a=5, b=12, c=90^0 and D$ is a point on AB so that $\angle BCD=45^{0^{\cdot}}$ Then which of the following is not true? (a) $CD=\frac{60\sqrt{2}}{17}$ (b) $BD=\frac{65}{17}$ (c) $AD=\frac{60\sqrt{2}}{17}$ (d) none of these

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272. Solve $\tan 5\theta=\cot 2\theta$

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273. If $x + y + z = \frac{\pi}{2}$, then prove that $\begin{vmatrix} \sin x & \sin y & \sin z \\ \cos x & \cos y & \cos z \\ \cos^3 x & \cos^3 y & \cos^3 z \end{vmatrix} = 0$

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274. In a right-angled isosceles triangle, the ratio of the circumradius and inradius is

A. $2\left(\sqrt{2} + 1\right) : 1$

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

C. $2 : 1$

D. $\sqrt{2} : 1$

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275. If $\sin x + \operatorname{cosec} x = 2$, then $\sin^n x + \operatorname{cosec}^n x$ is equal to

A. 2

B. 2^{n}

C. 2^{n-1}

D. 2^{n-2}

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276. Solve $2\sin^{2}x - 5\sin x\cos x - 8\cos^{2}x = -2$

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

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278. In ABC, $\frac{\sin A(a - b\cos C)}{\sin C(c - b\cos A)} =$

A. -2

B. -1

C. 0

D. 1

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279. If $\sin x + \sin y + \sin z + \sin w = -4$, then the value of $\sin^{400} x + \sin^{300} y + \sin^{200} z + \sin^{100} w$ is

A. $\sin^{400} x \sin^{300} y \sin^{200} z + \sin^{100} w$

B. $\sin x \sin y \sin z \sin w$

C. 4

D. 3

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280. Prove that $\cos 20^0 \cos 40^0 \cos 60^0 \cos 80^0 = \frac{1}{16}$.

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281. Find common roots of the equations $2\sin^2 x + \sin^2 2x = 2 and \sin 2x + \cos 2x = \tan x$.

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282. The sides of a triangle are in A.P. and its area is $\frac{3}{5}th$ of the an equilateral triangle of the same perimeter, prove that its sides are in the ratio 3:5:7.

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283. If $1 + \sin x + \sin^2 x + \sin^3 x + \infty$ is equal to $4 + 2\sqrt{3}, 0 < x < \pi,$ then $x$is equal to

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284. If $K = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right),$ then the numerical value of K is_____

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285. One of the general solutions of $4\sin^4 x + \cos^4 x = 1$ is

$n\pi \pm \frac{\alpha}{2}, \alpha = \cos^{-1}\left(\frac{1}{5}\right), \forall n \in Z$

$n\pi \pm \frac{\alpha}{2}, \alpha = \cos^{-1}\left(\frac{3}{5}\right), \forall n \in Z$

$n\pi \pm \frac{\alpha}{2}, \alpha = \cos^{-1}\left(\frac{1}{3}\right), \forall n \in Z$

none of these

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286. The value of the expression $\frac{\tan^2 20^0 - \sin^2 20^0}{(\tan^2 20^0)(\sin^2 20^0)}$ is________

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287. A piece of paper is in the shape of a square of side 1m long. It is cut at the four corners to make a regular polygon of eight sides (octagon). The area of the polygon is

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288. If $\sin x + \cos x = \frac{\sqrt{7}}{2}$, where $x \in 1st$ quadrant, then $\tan\left(\frac{x}{2}\right)$ is equal to

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

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

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

D. none of these

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289. If $\tan\theta + \sec\theta = 1.5$, find $\sin\theta, \tan\theta$ and $\sec\theta$.

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290. Show that the line joining the incenter to the circumcenter of triangle ABC is inclined to the side BC at an angle $\tan^{-1}\left(\frac{\cos B + \cos C - 1}{\sin C - \sin B}\right)$

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291. For $n \in Z$, the general solution of $\left(\sqrt{3} - 1\right)\sin\theta + \left(\sqrt{3} + 1\right)\cos\theta = 2 is (n \in Z)$ $\theta = 2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12}$ $\theta = n\pi + (-1)^n\frac{\pi}{4} + \frac{\pi}{12}$ $\theta = 2n\pi \pm \frac{\pi}{4}$ $\theta = n\pi + (-1)^n\frac{\pi}{4} - \frac{\pi}{12}$

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292. The value of $\cot 70^0 + 4\cos 70^0$ is

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

B. $\sqrt{3}$

C. $2\sqrt{3}$

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

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293. In ABC, right-angled at C, if $\tan A = \sqrt{\frac{\sqrt{5} - 1}{2}}$, show that the sides $a, b and c$ are in G.P.

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294. If

$\operatorname{coses}\theta - \sin\theta = m, \sec\theta - \cos\theta = n, \text{eliminate}\theta$

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295. The solution of $4\sin^2 x + \tan^2 x + \operatorname{cosec}^2 x + \cot^2 x - 6 = 0 is (n \in Z)$ (a) $n\pi \pm \frac{\pi}{4}$ (b) $2n\pi \pm \frac{\pi}{4}$ $n\pi + \frac{\pi}{3}$ (d) $n\pi - \frac{\pi}{6}$

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296. The value of $\sin\left(\frac{\pi}{14}\right)\sin\left(3\frac{\pi}{14}\right)\sin\left(5\frac{\pi}{14}\right)\sin\left(7\frac{\pi}{14}\right)\sin\left(9\frac{\pi}{14}\right)\sin\left(11\frac{\pi}{14}\right)\sin\left(13\frac{\pi}{14}\right)$ is?

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

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298. In ABC, if $\frac{\sin A}{c\sin B}+\frac{\sin B}{c}+\frac{\sin C}{b}=\frac{c}{ab}+\frac{b}{ac}+\frac{a}{bc}$, then the value of angle A is 120^0 (b) 90^0 (c) 60^0 (d) 30^0

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299. The set of values of x satisfying the equation $\sin 3\alpha = 4\sin\alpha\sin(x+\alpha)\sin(x-\alpha)$ is (a) $n\pi \pm \frac{\pi}{4}, \forall n \in Z$ (b) $n\pi \pm \frac{\pi}{3}, \forall n \in Z$ (c) $n\pi \pm \frac{\pi}{9}, \forall n \in Z$ (d) $n\pi \pm \frac{\pi}{12}, \forall n \in Z$

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300. $\operatorname{cosec}\frac{360^0}{7}+\operatorname{cosec}\frac{540^0}{7}$

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301. If $(\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C) = (\sec A - \tan A)(\sec B - \tan B)(\sec C - \tan C)$, prove that the value of each side is +-1.

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302. In a triangle ABC, the altitude from A is not less than BC and the altitude from B is not less than AC. (a)The triangle is right angled (b) isosceles obtuse angled (d) equilateral

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

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304. If $\tan(A - B) = 1 and \sec(A + B) = \frac{2}{\sqrt{3}}$, then the smallest positive values of B, respectively, is (a) $\frac{25\pi}{24}$ (b) $\frac{19\pi}{24}$ (c) $\frac{31\pi}{24}$ (d) $\frac{13\pi}{24}$

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

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306. If in ABC, AC is double of AB , then the value of $\cot\left(\frac{A}{2}\right)\cot\left(\frac{B - C}{2}\right)$ is equal to

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

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

C. 3

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

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307. If $3\tan\left(\theta - 15^0\right) = \tan\left(\theta + 15^0\right)$, then θ is equal to $n \in Z)$

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

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

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

D. none of these

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

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309. prove that $\frac{1}{\sec A - \tan A} - \frac{1}{\cos A} = \frac{1}{\cos A} - \frac{1}{\sec A + \tan A}$

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310. Number of solution(s) satisfying the equation $\frac{1}{\sin x} - \frac{1}{\sin 2x} = \frac{2}{\sin 4x}$ in $[0, 4\pi]$ equals 0 (b) 2 (c) 4 (d) 6

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311. If in ABC , side a, b, c are in A.P. then $B > 60^0$ (b) $B < 60^0$ $B \leq 60^0$ (d) $B = |A - C|$

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

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313. Prove that

$$2\left(\sin^6\theta + \cos^6\theta\right) - 3\left(\sin^4\theta + \cos^4\theta\right) + 1 = 0$$

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314. If the hypotenuse of a right-angled triangle is four times the length of the perpendicular drawn from the opposite vertex to it, then the difference of the two acute angles will be 60^0 (b) 15^0 (c) 75^0 (d) 30^0

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315. The number of roots of $(1 - \tan\theta)(1 + \sin 2\theta) = 1 + \tan\theta f \text{ or } \theta \in [0, 2\pi]$ is (a)3 (b) 4 (c) 5 (d) none of these

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

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317. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n,$ then

A. $m^2 - n^2 = 4mn$

B. $m^2 + n^2 = 4mn$

C. $m^2 - n^2 = m^2 + n^2$

D. $m^2 - n^2 = 4\sqrt{mn}$

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318. If one side of a triangle is double the other, and the angles on opposite sides differ by $60^0,$ then the triangle is

A. equilateral

B. obtuse angled

C. right angled

D. acute angled

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319. Number of roots of the equation $(3 + \cos x)^2 = 4 - 2\sin^8 x, x \in [0, 5\pi] are$ ________

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320. The side of a triangle inscribed in a given circle subtends angles α, β and γ at the centre. The minimum value of the arithmetic mean of $\cos\left(\alpha + \frac{\pi}{2}\right), \cos\left(\beta + \frac{\pi}{2}\right)$, and $\cos\left(\gamma + \frac{\pi}{2}\right)$ is equal to ____

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321. If $\sin 2\theta = \cos 3\theta$ and θ is an acute angle, then $\sin\theta$ equal

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

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

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

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

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322. With usual notations, in triangle ABC, $a\cos(B - C) + b\cos(C - A) + c\cos(A - B)$ is equal to(a) $\frac{abc}{R^2}$ (b) $\frac{abc}{4R^2}$ (c) $\frac{4abc}{R^2}$ (d) $\frac{abc}{2R^2}$

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323. $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4\left(\sin^6\theta + \cos^6\theta\right)$ is equal to 11 (b) 12 (c) 13 (d) 14

A. 11

B. null

C. null

D. null

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

A. a rational number

B. an irrational number

C. null

D. null

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325. The value of $\cos y \cos\left(\frac{\pi}{2} - x\right) - \cos\left(\frac{\pi}{2} - y\right)\cos x + \sin y \cos\left(\frac{\pi}{2} - x\right) + \cos x \sin\left(\frac{\pi}{2} - y\right)$ is zero if (A) $x = 0$ (B) $y = 0$ (C) $x = y$ (D) $n\pi + y - \frac{\pi}{4}(n \in Z)$

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326. If P is a point on the altitude AD of the triangle ABC such the $\angle CBP = \frac{B}{3}$, then AP is equal to $2a\frac{\sin C}{3}$ (b) $2b\frac{\sin C}{3}$ (c) $2c\frac{\sin B}{3}$ (d) $2c\frac{\sin C}{3}$

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327. If θ_1 and θ_2 are two values lying in $[0, 2\pi]$ for which $tan\theta = \lambda$, then $\tan\left(\frac{\theta_1}{2}\right)\tan\left(\frac{\theta_2}{2}\right)$ is equal to (a)0 (b) -1 (c) 2 (d) 1

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328. If $\tan\theta = -\frac{4}{3}, then \sin\theta$ is

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329. Let ABC be a triangle with $\angle A = 45^{0^{\cdot}}$ Let P be a point on side BC with PB=3 and PC=5. If O is circumcenter of triangle ABC, then length OP is $\sqrt{18}$ (b) $\sqrt{17}$ (c) $\sqrt{19}$ (d) $\sqrt{15}$

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330. If $\cos\theta - \sin\theta = \frac{1}{5}$, where 0 lt $\theta < \frac{\pi}{4}$, *then* Column I Column II $(\cos\theta + \sin\theta)/2$ p. $\frac{4}{5}$ $\sin 2\theta$ q. $\frac{7}{10}$ $\cos 2\theta$ r. $\frac{24}{25}$ $\cos\theta$ s. $\frac{7}{25}$

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331. One of the general solutions of $\sqrt{3}\cos\theta - 3\sin\theta = 4\sin 2\theta\cos 3\theta$ is $m\pi + \frac{\pi}{18}, m \in Z$ $\frac{m\pi}{2} + \frac{\pi}{6}, \forall m \in Z$ $m\frac{\pi}{3} + \frac{\pi}{18}, m \in Z$ none of these

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332. Let $\theta \in \left(0, \frac{\pi}{4}\right)$ and $t_1 = (\tan\theta)^{\tan\theta}$, $t_2 = (\tan\theta)^{\cot\theta}$, $t_3 = (\cot\theta)^{\tan\theta}$, $t_4 = (\cot\theta)^{\cot\theta}$, then

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333. Sum of roots of the equation $x^4 - 2x^2\sin^2\left(\pi\frac{x}{2}\right) + 1 = 0$ is 0 (b) 2 (c) 1

(d) 3

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334. Let n be a positive integer such that $\frac{\sin\pi}{2n} + \frac{\cos\pi}{2n} = \frac{\sqrt{n}.}{2}$

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335. Let O be the circumcenter, H be the orthocentre, I be the incenter, and I_1, I_2, I_3 be the excenters of acute-angled ABC Column I Column II Angle subtended by OI at vertex A p. $|B - C|$ Angle subtended by HI at vertex A q. $\left|\frac{B - C}{2}\right|$ Angle subtended by OH at vertex A r. $\frac{B + C}{2}$ Angle subtended by $I_2I_3atI_1$ A q. $\frac{B}{2} - C$

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336. $\sec^2\theta = 4x\frac{y}{(x+y)^2}$ is true if and only if

A. $x + y \neq 0$

B. $x = y, x \neq 0$

C. $x = y$

D. $x \neq 0, y \neq 0$

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337. Prove that in a ABC, $\sin^2 A + \sin^2 B + \sin^2 C \leq \frac{9}{4}\cdot$

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338. The number of solution of the pair of equations $2\sin^2\theta - \cos 2\theta = 0 and 2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is 0 (b) 1 (c) 2 (d) 4

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339. The rational number which equals the number 2.357 with recurring decimal is

A. $\frac{2355}{1001}$

B. $\frac{2379}{997}$

C. $\frac{2355}{999}$

D. none of these

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340. It $\frac{\cos^4 A}{\cos^2 B} + \frac{\sin^4 A}{\sin^2 B} = 1$ then show that $\frac{\cos^4 B}{\cos^2 A} + \frac{\sin^4 B}{\sin^2 A} = 1$

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341. Prove that $r_1 + r_2 + r_3 - r = 4R$

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342. Number of solution of equation $2\frac{\sin x}{2}\cos^2 x - 2\frac{\sin x}{2}\sin^2 x = \cos^2 x - \sin^2 x f$ or $x \in [0, 4\pi]$ is (a) 6 (b) 10 (c) 2 (d) 3

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343. 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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344. If $x = \sec\theta - \tan\theta$ and $y = \operatorname{cosec}\theta + \cot\theta$, then prove that $xy + 1 = y - x$

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

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346. prove that cosA +cosB+cosC=1+r/R.

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347. denote the positive solution of the equation $3 + 3\cos\theta = 2\sin^2\theta$. The value of $\theta_3 + \theta_7$ is 3π (b) 4π (c) 5π (d) 6π

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348. If $\frac{\sec^4\theta}{a} + \frac{\tan^4\theta}{b} = \frac{1}{a+b}$, then prove that $|b| \leq |a|$.

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349. Prove that:

$$\left(\frac{\cos A+\cos B}{\sin A-\sin B}\right)^n+\left(\frac{\sin A+\sin B}{\cos A-\cos B}\right)^n=\left\{2\cot^n\left(\frac{A-B}{2}\right),\ \text{if}\ \ niseven0,\ \ \text{if}\ \ nisod\right.$$

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350. Prove that $\frac{a\ c\ o\ sA+b\cos B+c\cos C}{a+b+c}=\frac{r}{R}\cdot$

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351. Find the number of solution of the equation $1+e^{\cot^2 x}=\sqrt{2|\sin x|-1}+\frac{1-\cos 2x}{1+\sin^4 x}f\ \text{or}\ x\in(0,5\pi)^{\cdot}$

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352. If $a^2 + b^2 + 2ab\cos\theta = 1, c^2 + d^2 + 2cd\cos\theta = 1$ and $ac + bd + (ad + bc)\cos\theta = 0$, then prove that $a^2 + c^2 = \operatorname{cosec}^2\theta$

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353. If $r_1 = r_2 + r_3 + r$, prove that the triangle is right angled.

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354. Find the number of solution of $\theta \in [0, 2\pi]$ satisfying the equation $\left((\log)_{\sqrt{3}}\tan\theta\left(\sqrt{(\log)_{\tan\theta}3 + (\log)_{\sqrt{3}}3\sqrt{3}} = -1\right.\right.$

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

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356. Let $A = \sin x + \cos x$. Then find the value of $\sin^4 x + \cos^4 x$ in terms of A.

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357. ABC is an acute angled triangle with circumcenter O and orthocentre H. If AO=AH, then find the angle A.

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358. If $\sin\theta = \frac{1}{2} and \cos\theta = -\frac{\sqrt{3}}{2}$, then the general value of θ is $(n \in Z)$.

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

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

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

D. $2n\pi + \frac{\pi}{4}$

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359. 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 $\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2}\frac{\sin D}{2}\cdot$

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360. Find the range of $y=\sin^3 x-6\sin^2 x+11\sin x-6.$

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361. A ladder rest against a wall making an angle α with the horizontal. The foot of the ladder is pulled away from the wall through a distance x, so that it slides a distance y down the wall making an angle β with the horizontal. Prove that $x=y\frac{\tan(\alpha+\beta)}{2}\cdot$

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362. Let ABC be an acute angled triangle whose orthocentre is at H. If altitude from A is produced to meet the circumcircle of triangle ABC at D, then prove $HD = 4R\cos B\cos C$

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363. The most general value for which $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$ is ($n \in Z$)

A. $n\pi + \frac{7\pi}{4}$

B. $n\pi + (-1)^n\frac{7\pi}{4}$

C. $2n\pi + \frac{7\pi}{4}$

D. none of these

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364. The equation $\sin^2\theta = \frac{x^2 + y^2}{2xy}, x, y \neq 0$ is possible if

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

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366. In a acute angled triangle ABC, proint D, E and F are the feet of the perpendiculars from A,B and C onto BC, AC and AB, respectively. H is orthocentre. If $\sin A = \frac{3}{5} and BC = 39,$ then find the length of AH

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367. The number of solutions of the equation $\cos^2\left(x + \frac{\pi}{6}\right) + \cos^2 x - 2\cos\left(x + \frac{\pi}{6}\right)\cos\left(\frac{\pi}{6}\right) = \sin^2\left(\frac{\pi}{6}\right)$ in interval $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

is________

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368. Which of the following is correct ? (a) $\sin 1^{\circ} > \sin 1$(b) $\sin 1 > \sin 1^{\circ}$ (c) $\sin 1 = \sin 1^{\circ}$ (d) $\sin 1^{\circ} = \left(\frac{\pi}{180}\right)\sin 1$

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

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370. For triangle $ABC, R = \frac{5}{2}$ and $r = 1.$ Let I be the incenter of the triangle and D, E and F be the feet of the perpendiculars from $I \rightarrow BC, CA$ and $AB,$ respectively. The value of $\frac{ID \cdot IE \cdot IF}{IA \cdot IB \cdot IC}$ is equal to (a) $\frac{5}{2}$ (b) $\frac{5}{4}$ (c) $\frac{1}{10}$ (d) $\frac{1}{5}$

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371. If $5\tan\theta = 4$, then $\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 2\cos\theta}$ is equal to

A. 0

B. 1

C. $\frac{1}{6}$

D. 6

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372. Prove that $\frac{r_1 + r_2}{1 + \cos C} = 2R$

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373. Number of solutions of the equation $\left(\sqrt{3}+1\right)^{2x}+\left(\sqrt{3}-1\right)^{2x}=2^{3x}$ is________

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

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375. If $x=\frac{\sin^3P}{\cos^2P}, y=\frac{\cos^3P}{\sin^2P}$ and $\sin P+\cos P=\frac{1}{2}$ then find the value of x + y.

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376. Number of solution(s) of the equation $\frac{\sin x}{\cos 3x} + \frac{\sin 3x}{\cos 9x} + \frac{\sin 9x}{\cos 27x} = 0$ in the interval $\left(0, \frac{\pi}{4}\right)$ is__________

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377. prove that (sinA+sin3A+sin5A+sin7A)/(cosA+cos3A+cos5A+cos7A)=tan4A

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378. Prove that (r+r1)tan((B-C)/2)+(r+r2)tan((C-A)/2)+(r+r3)tan((A-B)/2)=0

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379. $(a+2)\sin\alpha + (2a-1)\cos\alpha = (2a+1)$ if $\tan\alpha i s$ (a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $2a\left(a^2+1\right)$ (d) $\frac{2a}{a^2-1}$

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380. If $x, y \in [0, 2\pi] and \sin x + \sin y = 2,$ then the value of x+y is

A. π

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

C. 3π

D. none of these

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381. Find the value of

$$\left(1 + \cos\left(\frac{\pi}{8}\right)\right)\left(1 + \cos\left(3\frac{\pi}{8}\right)\right)\left(1 + \cos\left(5\frac{\pi}{8}\right)\right)\left(1 + \cos\left(7\frac{\pi}{8}\right)\right)$$

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382. Let ABC be a triangle with incentre at I Also, let P and Q be the feet of perpendiculars from A to BI and CI respectively. Then which of the following results are correct? $\frac{AP}{BI} = \frac{\sin\frac{B}{2}\cos\frac{C}{2}}{\sin\frac{A}{2}}$ (b) $\frac{AQ}{CI} = \frac{\sin\frac{C}{2}\cos\frac{B}{2}}{\sin\frac{A}{2}}$ $\frac{AP}{BI} = \frac{\sin\frac{C}{2}\cos\frac{B}{2}}{\sin\frac{A}{2}}$ (d) $\frac{AP}{BI} + \frac{AQ}{CI} = \sqrt{3}$ if $\angle A = 60^0$

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383. Let $f(x) = \log(\log)_{\frac{1}{3}}\left((\log)_7(\sin x + a)\right)\Big)$ be defined for every real value of x, then the possible value of a is 3 (b) 4 (c) 5 (d) 6

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384. Number of roots of $\cos^2 x + \frac{\sqrt{3} + 1}{2}\sin x - \frac{\sqrt{3}}{4} - 1 = 0$ which lie in the interval $[-\pi, \pi]$ is 2 (b) 4 (c) 6 (d) 8

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385. In ABC, on the side BC, D and E are two points such that $BD = DE = EC$. Also $\angle ADE = \angle AED = \alpha$, then (a) $3(\tan B + \tan c) = 2\tan\alpha$ (b) $\tan B + \tan C = 3\tan\alpha$ (c) $\tan A = \dfrac{6\tan\alpha}{9 - \tan^2\alpha}$ (d) $\tan A = \dfrac{6\tan\alpha}{\tan^2\alpha - 9}$

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386. Column I Column II In ABC, if $\cos 24 + \cos 2B + \cos 2C = -1$ then we can conclude that triangle is p. Equilateral triangle In ABC if $\tan A > 0, \tan B > 0 and tan A \tan B < 1$, then triangle is q. Right angled triangle In ABC if $\cos^3 A + \cos^3 B + \cos^3 C = 3\cos A\cos B\cos C$ then triangle is r. Acute angled triangle In ABC if $\cot A > 0, \cot B > 0 and \cot A\cot B < 1$, then triangle is s. Obtuse angled triangle

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387. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to

A. 3

B. 2

C. 1

D. 0

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388. Number of integral values of a for which the equation $\cos^2 x - \sin x + a = 0$ has roots when $x \in \left(0, \frac{\pi}{2}\right)$ is__________

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

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390. A circle of radius 4cm is inscribed in ABC, which touches the side $BCatD$ If $BD = 6cm, DC = 8cm$ then (a) the triangle is necessarily acute angled (b) $\tan\left(\frac{A}{2}\right) = \frac{4}{7}$ (c) perimeter of the triangle ABC is $42cm$ (d) area of ABC is $84cm^2$

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391. If $\sin^2\theta = \frac{x^2 + y^2 + 1}{2x}$, then x must be -3 (b) -2 (c) 1 (d) none of these

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392. If $\cos 4x = a_0 + a_1\cos^2 x + a^2\cos^4 x$ is true for all values of $x \in R$, then the value of $5a_0 + a_1 + a_2$ is______

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393. 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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394. In a triangle ABC,$\angle C = 90^\circ$, r and R are the inradius and circumradius of the triangle ABC respectively, then 2(r+R) is equal to

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395. Suppose ABCD (in order) is a quadrilateral inscribed in a circle. Which of the following is/are always true? $\sec B = \sec D$ (b) $\cot A + \cot C = 0$ $\cos ec A = \cos ec C$ (d) $\tan B + \tan D = 0$

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396. Solve $\sec 4\theta - \sec 2\theta = 2$

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397. Prove that

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

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398. ABC is an isosceles triangle inscribed in a circle of radius $\dot{r}$ If $AB=AC$ and h is the altitude from A to BC, then triangle ABC has perimeter $P=2\left(\sqrt{2hr-h^2}+\sqrt{2hr}\right)$ and area A= __________ and = ________ and also $(\lim)_{h\vec{0}}\frac{A}{P^3}=\_\ \_\_\_$

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399. Find which of the following functions is even or odd ?

$f(x)=x^2+|\sin x|+\cos x$

A.

B.

C.

D.

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400. Solve : $5\cos 2\theta + 2\cos^2\left(\frac{\theta}{2}\right) + 1 = 0, \; -\pi < \theta < \pi$

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

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402. In triangle ABC, if $\cos A + \cos B + \cos C = \frac{7}{4}$, $then \frac{R}{r}$ is equal to $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

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403. If $3\tan A + 4 = 0$, then the value of $2\cot A - 5\cos A + \sin A$ is equal to

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404. Solve $\sin 2\theta + \cos\theta = 0$

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405. Two medians drawn from the acute angles of a right angled triangle intersect at an angle $\frac{\pi}{6}$. If the length of the hypotenuse of the triangle is 3 units, then the area of the triangle (in sq. units) is (a) $\sqrt{3}$ (b) 3 (c) $\sqrt{2}$ (d) 9

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406. For all, $x, y \in R^{\cdot}$ find the range of $\frac{(x+y)(1-xy)}{\left(1+x^2\right)\left(1+y^2\right)}$.

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407. A circle centred at 'O' has radius 1 and contains the point A. Segment AB is tangent to the circle at A and $\angle AOB = \theta$. If point C lies on OA and BC bisects the angle ABO then OC equals

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408. Solve that equation : $\cos\theta + \cos 3\theta - 2\cos 2\theta = 0$

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

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410. If inside a big circle exactly $n(n \leq 3)$ small circles, each of radius r, can be drawn in such a way that each small circle touches the big circle and also touches both its adjacent small circles, then the radius of big circle is $r\left(1 + \operatorname{cosec}\frac{\pi}{n}\right)$ (b) $\left(\frac{1 + \frac{\tan\pi}{n}}{\frac{\cos\pi}{\pi}}\right)$ $r\left[1 + \operatorname{cosec}\frac{2\pi}{n}\right]$ (d) $\frac{r\left[s \in \frac{\pi}{2n} + \frac{\cos(2\pi)}{n}\right]^2}{\frac{\sin\pi}{n}}$

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411. If $b > 1, \sin t > 0, \cos t > 0 and (\log)_b(\sin t) = x, then (\log)_b(\cos t)$ is equal to

$\frac{1}{2}(\log)_b\left(a - b^{2x}\right)$ (b) $2\log\left(1 - b^{\frac{x}{2}}\right)$ $(\log)_b\sqrt{1 - b^{2x}}$ (d) $\sqrt{1 - x^2}$

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412. Find the general values of x and y satisfying the equations

$5\sin x\cos y = 1; 4\tan x = \tan y$

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

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414. If A is the area and $2s$ is the sum of the sides of a triangle, then

$A \leq \frac{s^2}{4}$ (b) $A \leq \frac{s^2}{3\sqrt{3}}$ $2R\sin A\sin B\sin C$ (d) $none of these$

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415. Find the general solution of : $\sqrt{3}\sec 2\theta = 2$

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416. Find the value of $2\cos^3\left(\frac{\pi}{7}\right) - \cos^2\left(\frac{\pi}{7}\right) - \cos\left(\frac{\pi}{7}\right)$

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417. In acute angled triangle ABC, AD is the altitude. Circle drawn with AD as its diameter cuts $ABandACatPandQ,$ respectively. Length of PQ is equal to $/(2R)$ (b) $\frac{abc}{4R^2}$ $2R\sin A\sin B\sin C$ (d) Δ/R

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418. Show that $\sin^2 5^0 + \sin^2 10^0 + \sin^2 15^0 + ... + \sin^2 90^0 = 9\frac{1}{2}$.

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419. Solve $\frac{\frac{\sin^3 x}{2} - \frac{\cos^3 x}{2}}{2 + \sin x} = \frac{\cos x}{3}$

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

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421. Suppose $\alpha, \beta, \gamma and \delta$ are the interior angles of regular pentagon, hexagon, decagon, and dodecagon, respectively, then the value of $|\cos\alpha\sec\beta\cos\gamma cosec\delta|$ is ________

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422. Find the value of $\frac{\cos^2\pi}{16}+\frac{\cos^2(3\pi)}{16}+\frac{\cos^2(5\pi)}{16}+\frac{\cos^2(7\pi)}{16}\cdot$

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423. Solve $\frac{\sqrt{5}-1}{\sin x}+\frac{\sqrt{10+2\sqrt{5}}}{\cos x}=8, x\in\left(0,\frac{\pi}{2}\right)$

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424. Prove that $\cos\left(\frac{2\pi}{15}\right)\cos\left(\frac{4\pi}{15}\right)\cos\left(\frac{8\pi}{15}\right)\cos\left(\frac{16\pi}{15}\right)=\frac{1}{16}$

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425. Let L be the line of intersection of the planes $2x+3y+z=1$ and $x+3y+2z=2$. If L makes an angles α with the positive x-axis, then $\cos\alpha$ equals

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426. If sin(120° – α) = sin(120° – β) and 0 < α, β < π then find the relation between α and β.

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427. Solve $\cos x \cos 2x \cos 3x = \frac{1}{4}$

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

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429. If the since of the angles A and B of a triangle ABCsatisfy the equation $c^2x^2 - c(a+b)x + ab = 0$, then the triangle

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430. Find the sign of the values of $\tan 113^0 - \cos 107^0 = a$ and $\tan 107^0 - \cos 105^0 = b$

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431. Solve the equation $\frac{\sqrt{3}}{2}\sin x - \cos x = \cos^2 x$

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432. Each question contains statements given in two columns which have to be matched. Statements (a,b,c,d) in column I have to be matched with statements (p,q,r,s) in column II. If the correct match are a-p, s, b-r c-p, q. and d-s, then the correctly bubbled $4x4$ matrix should be as follows: figure Column I, a) If $\int \frac{2^x}{\sqrt{1-4^x}}dx = k\sin^{-1}(f(x)) + C,$ then $k$is greater than, b) If $\int \frac{(\sqrt{x})^5}{(\sqrt{x})^7 + x^6}dx = a\frac{\ln(x^k)}{x^k+1} + c,$ then $ak$is less than, c) If

$\int \frac{x^4+1}{x\left(x^2+1\right)^2}dx = k\ln|x| + \frac{m}{1+x^2} + n,$ where $n$is the constant of integration, then $mk$is greater than, d) If $\int \frac{dx}{5+4\cos x} = k\tan^{-1}\left(m\tan\frac{x}{2}\right) + C,$ then $k/m$is greater than, COLUMN II p) 0 q) 1 r) 3 s)4

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433. 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 (a)$\sin a, \sin b, \sin c$ (b) $\cos a, \cos b, \cos c$ (c)$\sin 2a, \sin 2b, \sin 2c$ (d) $\cos 2a, \cos 2b \cos 2c$

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

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435. The lengths of the medians through acute angles of a right-angled triangle are 3 and 4. Find the area of the triangle.

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436. If $2\tan^2 x - 5\sec x = 1$ is satisfied by exactly seven distinct values of $x \in \left[0, \frac{(2n+1)\pi}{2}\right], n \in N,$ then the greatest value of n is_______.

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

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438. If $2\cos x + \sin x = 1,$ then find the value of $7\cos x + 6\sin x$

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439. If $\sin x + \sin y \geq \cos a \cos x \forall \in R$, then $\sin y + \cos a$ is equal to ___

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440. If α, β, γ are acute 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 (a)-1 (b) 0 (c) 1 (d) 2

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441. 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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442. Find the values of $x and y$ for which cosec $\theta = \frac{x^2 - y^2}{x^2 + y^2}$ is satisfied.

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443. The set of all x in the interval $[0, \pi]$ for which $2\sin^2 x - 3\sin x + 1 \geq 0$ is_____

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444. If in a triangle $\left(1 - \frac{r_1}{r_2}\right)\left(1 - \frac{r_1}{r_3}\right) = 2$, then the triangle is

A. right angled

B. isosceles equilateral

C. none of these

D. null

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445. Let α and β be the roots of the quadratic equation x^2 sin

$\theta - x(\sin\theta\cos\theta + 1) + \cos\theta = 0\left(0 < \theta < 45^\circ\right)$, and $\alpha < \beta$.

Then $\sum_{n=0}^{\infty}\left(\alpha^n + \frac{(-1)^n}{\beta^n}\right)$ is equal to

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446. A parallelogram containing a 60^0 angle has perimeter p and its longer diagonal is of length d Find its area.

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447. If $\frac{r}{r_1} = \frac{r_2}{r_3}$, then

A. $A = 90^0$

B. $B = 90^0$

C. $C = 90^0$

D. none of these

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448. If $\sin(\sin x + \cos x) = \cos(\cos x - \sin x)$, and largest possible value of $\sin x is \frac{\pi}{k}$, then the value of k is_____.

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449. If $0 \le x \le \frac{\pi}{3}$ then range of $f(x) = \sec\left(\frac{\pi}{6} - x\right) + \sec\left(\frac{\pi}{6} + x\right)$ is

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450. For each natural number $n \ge 2$, prove that $\sin x_1 \cos x_2 + \sin x_2 \cos x_3 + \ldots + \sin x_n \cos x_1 \le \frac{n}{2}$ (where $x_1, x_2, , x_n$ are arbitrary real numbers).

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451. The values of x_1 between 0 and 2π , satisfying the equation $\cos 3x + \cos 2x = \dfrac{\sin(3x)}{2} + \dfrac{\sin x}{2}$ are

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452. If $y = \dfrac{\sin^4 x - \cos^4 x + \sin^2 x\cos^2 x}{\sin^4 x + \cos^4 x + \sin^2 x\cos^2 x}, x \in \left(0, \dfrac{\pi}{2}\right)$, then (a)-$\dfrac{3}{2} \le y \le \dfrac{1}{2}$ (b) $1 \le y \le \dfrac{1}{2}$ (c)-$\dfrac{5}{3} \le y \le 1$ (d) none of these

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453. In an acute angled triangle $ABC, r + r_1 = r_2 + r_3 and \angle B > \dfrac{\pi}{3}$, then (a) $b + 2c < 2a < 2b + 2c$ (b) $b + 4c < 4a < 2b + 4c$ (c) $b + 4c < 4a < 4b + 4c$ (d) $b + 3c < 3a < 3b + 3c$

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454. If $u_n = \sin^n\theta + \cos^n\theta$, then prove that $\frac{u_5 - u_7}{u_3 - u_5} = \frac{u_3}{u_1}$.

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455. 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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456. The general solution of the equation $\sin^{100}x - \cos^{100}x = 1$ is

A. $2n\pi + \frac{\pi}{3}, n \in I$

B. $n\pi + \frac{\pi}{2}, n \in I$

C. $n\pi + \frac{\pi}{4}, n \in I$

D. $2n\pi = \frac{\pi}{3}, n \in I$

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457. If in triangle ABC, $\sum \sin\left(\frac{A}{2}\right) = \frac{6}{5} and \sum II_1 = 9$ (where $I_1, I_2 and I_3$ are excenters and I is incenter, then circumradius R is equal to $\frac{15}{8}$ (b) $\frac{15}{4}$ (c) $\frac{15}{2}$ (d) $\frac{4}{12}$

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458. Prove that in ABC, $\tan A + \tan B + \tan C \geq 3\sqrt{3}$, where A, B, C are acute angles.

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459. In triangle ABC, $\angle A = 60^0, \angle B = 40^0, and \angle C = 80^0$. If P is the center of the circumcircle of triangle ABC with radius unity, then the radius of the circumcircle of triangle BPC is (a)1 (b) $\sqrt{3}$ (c) 2 (d) $\sqrt{3}$ 2

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460. If $\cos 3x + \sin\left(2x - \frac{7\pi}{6}\right) = -2$, then show that x is of the form π / 3(6n+1) .

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461. Prove that sin2A + sin2B + sin2C = 4sinA · sinB · sin C

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462. If H is the othrocenter of an acute angled triangle ABC whose circumcircle is $x^2 + y^2 = 16$, then circumdiameter of the triangle HBC is 1 (b) 2 (c) 4 (d) 8

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463. The number of solutions of the equation $1 + \cos x + \cos 2x + \sin x + \sin 2x + \sin 3x = 0$, which satisfy the condition

$\frac{\pi}{2} < \left|3x - \frac{\pi}{2}\right| \leq \pi$ is

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464. Let us consider the equation $\frac{\cos^4 x}{a} + \frac{\sin^4 x}{b} = \frac{1}{a+b}, x \in \left[0, \frac{\pi}{2}\right], a, b > 0$

the value of $\frac{\sin^8 x}{b^3} + \frac{\cos^8 x}{a^3}$ is

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465. If $\tan A = \frac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B^{\cdot}$

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466. The total number of solution of $\cos x = \sqrt{1 - \sin 2x}$ in $[0, 2\pi]$ is equal to

(a) 2 (b) 3 (c) 5 (d) none of these

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467. The maximum value of $x^4 e \hat{-} x^2$ is e^2 (b) e^{-2} (c) $12e^{-2}$ (d) $4e^{-2}$

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468. Four numbers $n_1, n_2, n_3 and n_4$ are given as $n_1 = \sin 15^0 - \cos 15^0, n_2 = \cos 93^0 + \sin 93^0, n_3 = \tan 27^0 - \cot 27^0, n_4 = \cot 127^0 +$

$n_1 < 0$ (b) $n_2 < 0$ (c) $n_3 < 0$ (d) $n_4 < 0$

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469. 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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470. The equation $\sin^4 x + \cos^4 x + \sin 2x + \alpha = 0$ is solvable for

A. $-\frac{5}{2} \le \alpha \le \frac{1}{2}$

B. $-3 \le \alpha < 1$

C. $-\frac{3}{2} \le \alpha \le \frac{1}{2}$

D. $-1 \le \alpha \le 1$

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471. In triangle ABC, if $r_1 = 2r_2 = 3r_3$, then $a:b$ is equal to $\frac{5}{4}$ (b) $\frac{4}{5}$ (c) $\frac{7}{4}$ (d) $\frac{4}{7}$

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472. If $\cos\alpha = \frac{1}{2}\left(x + \frac{1}{x}\right)$, $\cos\beta = \frac{1}{2}\left(y + \frac{1}{y}\right)$ then evaluate $\cos(\alpha - \beta)$

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473. In triangle ABC, $\frac{\sin A + \sin B + \sin C}{\sin A + \sin B - \sin C}$ is equal to

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474. The radii r1,r2,r3 of enscribed circles of triangle ABC are in HP . If area =24, perimeter =24cm, find a,b,c.

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475. Let $\alpha and \beta$ be any two positive values of x for which $2\cos x, |\cos x|,$ and $1 - 3\cos^2 x$ are in G.P. The minimum value of $|\alpha - \beta|$ is $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{2}$ (d) none of these

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476. If $\frac{y + 3}{2y + 5} = \sin^2 x + 2\cos x + 1,$ then the value of y lies in the interval $\left(-\infty, -\frac{8}{3}\right)$ (b) $\left(-\frac{12}{5}, \infty\right)$ $\left(-\frac{8}{3}, -\frac{12}{5}\right)$ (d) $\left(-\frac{8}{3}, \infty\right)$

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477. If $\alpha+\beta+\gamma=2\pi,$ then (a) $\tan\left(\frac{\alpha}{2}\right)+\tan\left(\frac{\beta}{2}\right)+\tan\left(\frac{\gamma}{2}\right)=\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)\tan\left(\frac{\gamma}{2}\right)$ (b) $\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)+\tan\left(\frac{\beta}{2}\right)\tan\left(\frac{\gamma}{2}\right)+\tan\left(\frac{\gamma}{2}\right)\tan\left(\frac{\alpha}{2}\right)=1$ (c) $\tan\left(\frac{\alpha}{2}\right)+\tan\left(\frac{\beta}{2}\right)+\tan\left(\frac{\gamma}{2}\right)= - \tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)\tan\left(\frac{\gamma}{2}\right)$ (d)none of these

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478. The total number of solution of $|\cot x|=\cot x+\frac{1}{\sin x}, x\in[0,3\pi]$, is equal to 1 (b) 2 (c) 3 (d) 0

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479. The value of $f(\alpha)=\sqrt{\operatorname{cosec}^2\alpha-2\cot\alpha}+\sqrt{\operatorname{cosec}^2\alpha+2\cot\alpha}$ can be

A. $2\cot\alpha$

B. $-2\cot\alpha$

C. 2

D. -2

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480. If I is the incenter of a triangle ABC, then the ratio $IA:IB:IC$ is equal to (a) $\operatorname{cosec}\frac{A}{2}:\operatorname{cosec}\frac{B}{2}:\operatorname{cosec}\frac{C}{2}$ (b) $\frac{\sin A}{2}:\frac{\sin B}{2}:\frac{\sin C}{2}$ (c) $\frac{\sec A}{2}:\frac{\sec B}{2}:\frac{\sec C}{2}$ (d) none of these

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481. 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

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482. The number of solution the equation $\cos(\theta).\cos(\pi\theta) = 1$ has 0 (b) 2 (c) 4 (d) 2

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483. Let ABC be a triangle with incenter I and inradius r. Let $D, E, andF$ be the feet of the perpendiculars from I to the sides $BC, CA, andAB,$ respectively. If $r_1, r_2 andr_3$ are the radii of circles inscribed in the quadrilaterals $AFIE, BDIF, andCEID,$ respectively, prove that

$$\frac{r_1}{r - 1_1} + \frac{r_2}{r - r_2} + \frac{r_3}{r - r_3} = \frac{r_1 r_2 r_3}{\left(r - r_1\right)\left(r - r_2\right)\left(r - r_3\right)}$$

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484. If $x = \sec\varphi - \tan\varphi andy = \mathrm{cosec}\varphi + \cot\varphi,$ then

A. $x = \dfrac{y + 1}{y - 1}$

B. $x = \frac{y - 1}{y + 1}$

C. $y = \frac{1 + x}{1 - x}$

D. $xy + x - y + 1 = 0$

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

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486. The general solution of $\cos x \cos 6x = -1$ is

A. $x = (2n + 1)\pi, n \in Z$

B. $x = 2n\pi, n \in Z$

C. $x = n\pi, n \in Z$

D. none of these

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487. Let ABC be an acute angled triangle whose orthocentre is at H. If altitude from A is produced to meet the circumcircle of triangle ABC at D, then prove $HD = 4R\cos B\cos C$

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488. If $f(x) = \sin^6 x + \cos^6 x$, then range of $f(x)$ is

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489. Which of the following number(s) is/are rational?

A. $\sin 15^0$

B. $\cos 15^0$

C. $\sin 15^0 \cos 15^0$

D. $\sin 15^0 \cos 75^0$

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490. The number of solutions of $\sum_{r=1}^{5} \cos rx = 5$ in the interval $[0, 2\pi]$ is (a) 0 (b) 2 (c) 5 (d) 10

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491. The minimum value of $a\tan^2 x + b\cot^2 x$ equals the maximum value of $a\sin^2\theta + b\cos^2\theta$ where $a > b > 0$. The $\frac{a}{b}$ is 2 (b) 4 (c) 6 (d) 8

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492. If a, b and c are in G.P. then prove that $\frac{1}{a^2 - b^2} + \frac{1}{b^2} = \frac{1}{b^2 - c^2}$.

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493. Which of the following statements are always correct (where Q denotes the set of rationals)? (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 defined) (c) if $\sin\theta \in Q$ and $\cos\theta \in Q \Rightarrow \tan 3\theta \in Q$ (if defined) (d)if $\sin\theta \in Q \Rightarrow \cos 3\theta \in Q$

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494. The greatest value of $\sin^4\theta + \cos^4\theta is$

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

B. 1

C. 2

D. 3

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495. In ABC, the bisector of the angle A meets the side BC at D andthe circumscribed circle at E. Prove that $DE = \frac{a^2 \frac{\sec A}{2}}{2(b+c)}$

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496. Let $\theta \in [0, 4\pi]$ satisfy the equation $(\sin\theta + 2)(\sin\theta + 3)(\sin\theta + 4) = 6.$ If the sum of all the values of θ is of the form $k\pi$, then the value of k is 6 (b) 5 (c) 4 (d) 2

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497. 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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498. Given a right triangle with $\angle A = 90°$. Let M be the mid-point of BC. If the radii of the triangle ABM and ACM are r_1 and r_2 then find the range of $\frac{r_1}{r_2}$.

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499. If $f(x) = \cos^2\theta + \sec^2\theta$, then

A. $f(x) < 1$

B. $f(x) = 1$

C. $2 > f(x) > 1$

D. $f(x) \geq 2$

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

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501. The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is :

A. 0

B. 5

C. 6

D. 10

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502. The maximum value of the expression $\left|\sqrt{\sin^2 x + 2a^2} - \sqrt{2a^2 - 1 - \cos^2 x}\right|$, where $a and x$ are real numbers, is $\sqrt{3}$ (b) $\sqrt{2}$ (c) 1 (d) $\sqrt{5}$

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503. In ABC, the three bisectors of the angle A, B and C are extended to intersect the circumcircle at D,E and F respectively. Prove that $AD\frac{\cos A}{2} + BE\frac{\cos B}{2} + CF\frac{\cos C}{2} = 2R(\sin A + \sin B + \sin C)$

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

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505. The set of values of $\lambda \in R$ such that $\sin^2\theta + \cos\theta = \lambda\cos^2\theta$ holds for some θ, is $(- \infty, 1]$ (b) $(-\infty, - 1]$ φ (d) $[- 1, \infty)$

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506. If in ΔABC, the distance of the vertices from the orthocenter are x,y, and z then prove that $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = \frac{abc}{xyz}$

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507. Let $2\sin^2 x + 3\sin x - 2 > 0 and x^2 - x - 2 < 0$($x$ is measured in radians). Then x lies in the interval $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (b) $\left(-1, \frac{5\pi}{6}\right)$ $(-1, 2)$ (d) $\left(\frac{\pi}{6}, 2\right)$

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508. Show that $\cos^2\theta + \cos^2(\alpha + \theta) - 2\cos\alpha\cos\theta\cos(\alpha + \theta)$ is independent of $\dot{\theta}$

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509. Prove that the distance between the circumcenter and the incenter of triangle ABC is $\sqrt{R^2 - 2Rr}$

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510. The number of all the possible triplets $\left(a_1, a_2, a_3\right)$ such that $a_1 + a_2\cos(2x) + a_3\sin^2(x) = 0$ for all x is (a) 0 (b) 1 (c) 3 (d) infinite

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511. Range of $f(\theta) = \cos^2\theta\left(\cos^2\theta + 1\right) + 2\sin^2\theta$ is

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

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513. If $0 < \theta < \pi,$ then minimum value of $3\sin\theta + cosec^3\theta$ is

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514. In ABC, let L, M, N be the feet of the altitudes. The prove that $\sin(\angle MLN) + \sin(\angle LMN) + \sin(\angle MNL) = 4\sin A\sin B\sin C$

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515. The value of θ lying between $\theta = 0$ and $\theta = \frac{\pi}{2}$ and satisfying the equation

$\left|1 + \sin^2\theta\cos^2\theta 4\sin 4\theta\sin^2\theta 1 + \cos^2\theta 4\sin 4\theta\sin^2\theta\cos^2\theta 1 + 4\sin 4\theta\right| = 0 are$ $\frac{7\pi}{24}$

(b) $\frac{5\pi}{24}$ (c) $\frac{11\pi}{24}$ (d) $\frac{\pi}{24}$

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516. If $\sin(A - B) = \frac{1}{\sqrt{10}}$, $\cos(A + B) = \frac{2}{\sqrt{29}}$, find the value of $\tan 2A$ where A and B lie between 0 and $\frac{\pi}{4}$

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517. Prove that he distance between the circum-centre and the ortho-centre of a triangle ABC is $R\sqrt{1 - 8\cos A\cos B\cos C.}$

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518. One value of θ which satisfies the equation $\sin^4\theta - 2\sin^2\theta - 1$ lies between 0 and 2π.

A. True

B. False

C. null

D. null

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519. If $A = \sin^8\theta + \cos^{14}\theta$, then for all values of θ,

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

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521. Minimum value of $y = 256\sin^2 x + 324\operatorname{cosec}^2 x, \ \forall x \in R$ is

A. 432

B. 504

C. 576

D. 776

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522. If $\left(\cos^2 x + \frac{1}{\cos^2 x}\right)\left(1 + \tan^2 2y\right)(3 + \sin 3z) = 4,$ then x is an integral multiple of π x cannot be an even multiple of π z is an integral multiple of π y is an integral multiple of $\frac{\pi}{2}$

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523. A circle is inscribed in a triangle ABC touching the side AB at D such that $AD = 5, BD = 3, \quad \text{if} \quad \angle A = 60^0$ then length BC equals. (a) 4 (b) $\frac{120}{13}$ (c) 13(d) 12

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524. In a triangle ABC, if $\sin A \sin(B - C) = \sin C \sin(A - B),$ then prove that $\cot A, \cot B, \cot C$ are in $\ddot{AP}$

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525. The minimum value of the expression $\sin\alpha + \sin\beta + \sin\gamma$, where α, β, γ are real numbers satisfying $\alpha + \beta + \gamma = \pi$ is

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526. In ABC, $\frac{\cot A}{2} + \frac{\cot B}{2} + \frac{\cot C}{2}$ is equal to $\frac{\Delta}{r^2}$ (b) $\frac{(a+b+c)^2}{abc}2R$ (c) $\frac{\Delta}{r}$ (d) $\frac{\Delta}{Rr}$

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527. The value of $\theta \in (0, 2\pi)$ for which $2\sin^2\theta - 5\sin\theta + 2 > 0$ is $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, 2\pi\right)$ (b) $\left(\frac{\pi}{8}, \frac{\pi\pi}{6}\right)$ $\left(0, \frac{\pi}{8}\right) \cup \left(\frac{\pi}{6}\frac{\pi}{6}\right)$ (d) $\left(\frac{41\pi}{48}, \pi\right)$

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528. In ABC, if $\cot A + \cot B + \cot C = 0$ then find the value of $\cos A\cos B\cos C$

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529. Prove that $\tan 1^\circ \tan 2^\circ \tan 3^\circ .... \tan 88^\circ \tan 89^\circ = 1$

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530. In triangle ABC, the line joining the circumcenter and incenter is parallel to side BC, then $\cos A + \cos C$ is equal to -1 (b) 1 (c) -2 (d) 2

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531. The number of solutions of the pair of equations $2\sin^2\theta - \cos(2\theta) = 0, 2\cos^2\theta - 3\sin\theta = 0$ in the interval $[0, 2\pi]$ is

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

A. $1 \le A \le 2$

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

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

D. $\frac{3}{4} \le A \le \frac{13}{16}$

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533. If ABCD is a cyclic quadrilateral then the value of cosA+cosB+cos C+cos D is

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534. The number of distinct roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ is

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535. $D, E, and F$ are the middle points of the sides of the triangle ABC , then (a) centroid of the triangle DEF is the same as that of ABC (b) orthocenter of the tirangleDEF is the circumcentre of ABC

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536. If $\cos(A - B) = \frac{3}{5}$ and $\tan A \tan B = 2,$ then (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) $\sin A \sin B = -\frac{1}{5}$

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537. The number of ordered pairs (α,β), where α,β∈(−π,π) satisfying cos (α−β)=1 and cos(α+β)=1/e is

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538. The base BC of ABC is fixed and the vertex A moves, satisfying the condition $\cot\left(\frac{B}{2}\right) + \cot\left(\frac{C}{2}\right) = 2\cot\left(\frac{A}{2}\right)$, then (a) $b + c = a$ (b) $b + c = 2a$ (c) vertex A moves along a straight line (d) Vertex A moves along an ellipse

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539. For $0 < \varphi \geq \frac{\pi}{2}$, if $x = \sum_{n=0}^{\infty} \cos^{2n}\varphi, y = \sum_{n=0}^{\infty} \sin^{2n}\varphi, then$ (a)$xyz = xz + y$ (b) $xyz = xy + z$ (c)$xyz = x + y + z$ (d) $xyz = yz + x$

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540. In a right angled triangle, acute angle A and B satisfy $\tan A + \tan B + \tan^2 A + \tan^2 B + \tan^3 A + \tan^3 B = 70$. Find the angle A and B in radians.

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541. Solve $\sin^2 x + \cos^2 y = 2\sec^2 z$ for $x, y, and z$

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542. if $0 < \alpha < \beta < \gamma < \frac{\pi}{2}$, then prove that $\tan\alpha < \frac{\sin\alpha + \sin\beta + \sin\gamma}{\cos\alpha + \cos\beta + \cos\gamma} < \tan\gamma$

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543. Given $b = 2, c = \sqrt{3}, \angle A = 30^0$, then inradius of ABC is $\frac{\sqrt{3} - 1}{2}$ (b) $\frac{\sqrt{3} + 1}{2}$ (c) $\frac{\sqrt{3} - 1}{4}$ (d) $none of these$

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544. If A,B,C are angles of a triangle, then $2\sin\left(\frac{A}{2}\right)cosec\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right) - \sin A\cot\left(\frac{B}{2}\right) - \cos A$ is (a)independent of A,B,C (b) function of A,B (c)function of C (d) none of these

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545. Solve $\cos^{50}x - \sin^{50}x = 1$

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546. $\sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}} = \sec\theta - \tan\theta$

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547. If two sides of a triangle are roots of the equation $x^2 - 7x + 8 = 0$ and the angle between these sides is 60^0 then the product of inradius and circumradius of the triangle is $\frac{8}{7}$ (b) $\frac{5}{3}$ (c) $\frac{5\sqrt{2}}{3}$ (d) 8

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548. Prove that

$(1+\sec 2\theta)\left(1+\sec 2^2\theta\right)\left(1+\sec 2^3\theta\right)\ldots.\left(1+\sec 2^n\theta\right)=\tan 2^n\theta.\cot\theta$

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549. If $3\sin x+4\cos ax=7$ has at least one solution, then find the possible values of a

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550. Prove that $\dfrac{\cos\left(90^0+\theta\right)\sec(-\theta)\tan\left(180^0-\theta\right)}{\sec\left(360^0-\theta\right)\sin\left(180^0+\theta\right)\cot\left(90^0-\theta\right)}=-1$

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551. A sector $OABO$ of central angle θ is constructed in a circle with centre O and of radius 6. The radius of the circle that is circumscribed about the triangle OAB, is $6\frac{\cos\theta}{2}$ (b) $6\frac{\sec\theta}{2}$ $3\frac{\sec\theta}{2}$ (d) $3\left(\frac{\cos\theta}{2}+2\right)$

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552. Prove that:

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

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553. Find the number of solution of $\sin^2 x\cos^2 x = 1 + \cos^2 x\sin^4 x$ in the interval $[0, 2\pi]$.

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554. Prove that $\sin\left(-420^0\right)\cos\left(390^0\right) + \cos\left(-660^0\right)\left(\sin 330^0\right) = -1$

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555. If R_1 is the circumradius of the pedal triangle of a given triangle ABC, and R_2 is the circumradius of the pedal triangle of the pedal triangle formed, and so on $R_3, R_4 \ldots,$ then the value of $\sum^{\infty} i = 1 R_i,$ where R (circumradius) of ΔABC is 5 is

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556. If $x = \sin\left(\theta + \frac{7\pi}{12}\right) + \sin\left(\theta + \frac{\pi}{12}\right) + \sin\left(\theta + \frac{3\pi}{12}\right)$. $Y = \cos\left(\theta + \frac{7\pi}{12}\right) + \cos\left(\theta + \frac{\pi}{12}\right) + \cos\left(\theta + \frac{3\pi}{12}\right)$. then prove that $\frac{X}{Y} - \frac{Y}{X} = 2\tan 2\theta$

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557. In any triangle, the minimum value of $r_1 r_2 r_3 / r^3$ is equal to

A. 1

B. 9

C. 27

D. none of these

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558. Solve the equation for x:

$$\cos^2\left[\frac{\pi}{4}\left(\sin x + \sqrt{2}\cos^2 x\right)\right] - \tan^2\left[x + \frac{\pi}{4}\tan^2 x\right] = 1$$

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559. Which of the following is the greates? $\operatorname{cosec}1$ (b) $\operatorname{cosec}2$ $\operatorname{cosec}4$ (d) $\operatorname{cosec}(-6)$

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

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561. Find the value of x for which $f(x) = \sqrt{\sin x - \cos x}$ is defined, $x \in [0, 2\pi)$.

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562. In triangle $ABC, b^2 \sin 2C + c^2 \sin 2B = 2bc where b = 20, c = 21,$ then inradius= (a) 4 (b) 6 (c) 8 (d) 9

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563. Solve for x and $y: \sqrt{3}\sin x + \cos x = 8y - y^2 - 18, where 0 \leq x \leq 4\pi, y \in R$

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564. Show that $\frac{1 + \sin A}{\cos A} + \frac{\cos B}{1 - \sin B} = \frac{2\sin A - 2\sin B}{\sin(A - B) + \cos A - \cos B}$

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565. The ratio of the area of a regular polygon of n sides inscribed in a circle to that of the polygon of same number of sides circumscribing the same is 3:4. Then the value of n is

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566. Solve $\cos 4\theta + \sin 5\theta = 2$

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567. Solve $\tan x > \cot x$, where $x \in [0, 2\pi]$

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568. If $\frac{\tan(\theta + \alpha)}{a} = \frac{\tan(\theta + \beta)}{b} = \frac{\tan(\theta + \gamma)}{c}$ then prove $\frac{a+b}{a-b}\sin^2(\alpha - \beta) + \frac{b+c}{b-c}\sin^2(\beta - \gamma) + \frac{c+a}{c-a}\sin^2(\gamma - \alpha) = 0$

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569. Solve $1 + \sin x\frac{\sin^2 x}{2} = 0$

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570. The area of the circle and the area of a regular polygon inscribed the circle of n sides and of perimeter equal to that of the circle are in the ratio of

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571. If in a triangle ABC,tanA+tanB+tanC=6 and tanAtanB=2, then the triangle is acute angled triangle.

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572. If the inequality $\sin^2 x + a\cos x + a^2 > 1 + \cos x$ holds for any $x \in R$, then the largest negative integral value of a is -4 (b) -3 (c) -2 (d) -1

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573. If $x, y and z$ are the distances of incenter from the vertices of the triangle ABC , respectively, then prove that $\frac{abc}{xyz} = \cot\left(\frac{A}{2}\right)\cot\left(\frac{B}{2}\right)\cot\left(\frac{C}{2}\right)$

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574. The general values of θ satisfying the equation $2\sin^2\theta - 3\sin\theta - 2 = 0$ is $(n \in Z)$`

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

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

C. $n\pi + (-1)^n \frac{5\pi}{6}$

D. $n\pi + (-1)^n \frac{7\pi}{6}$

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575. A right angle is divided into three positive parts $\alpha, \beta and \gamma^{\cdot}$ Prove that for all possible divisions $tan\alpha + \tan\beta + \tan\gamma > 1 + \tan\alpha\tan\beta\tan\gamma^{\cdot}$

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576. The number of solutions of the equation $\tan x + \sec x = 2\cos x$ lying in the interval $[0, 2\pi]$ is

A. 0

B. 1

C. 2

D. 3

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577. Incircle of ABC touches the sides BC, CA and AB at D, E and F, respectively. Let r_1 be the radius of incircle of BDF. Then prove that

$$r_1 = \frac{1}{2}\frac{(s-b)\sin B}{\left(1+\sin\left(\frac{B}{2}\right)\right)}$$

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578. If $\cos^2 x - (c-1)\cos x + 2c \geq 6$ for every $x \in R$, then the true set of values of c is (a) $(2, \infty)$ (b) $(4, \infty)$ (c) $(-\infty, -2)$ (d) $(-\infty, -4)$

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579. If f(x)=sin −1 (2 3 x− 2 1 1−x 2),− 2 1 ≤x≤1, then f(x) is equal to

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580. Find the number of roots of equation $\sin x + \sin 5x = \sin 2x + \sin 4x$

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581. Let ABC be a triangle with $\angle B = 90^0$. Let AD be the bisector of $\angle A$ with D on BC. Suppose AC=6cm and the area of the triangle ADC is $10cm^2$. Find the length of BD.

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582. If $\pi < \alpha < \frac{3\pi}{2}$ then $\sqrt{\frac{1 - \cos\alpha}{1 + \cos\alpha}} + \sqrt{\frac{1 + \cos\alpha}{1 - \cos\alpha}}$ is equal to

A. $\frac{2}{\sin\alpha}$

B. $-\frac{2}{\sin\alpha}$

C. $\frac{1}{\sin\alpha}$

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

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583. 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) $\left(\frac{7\pi}{8}, \frac{9\pi}{8}\right)$

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584. Find the number of solutions of $\sin x = \frac{x}{10}$

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585. If the distances of the vertices of a triangle =ABC from the points of contacts of the incercle with sides are $\alpha, \beta and \gamma$ then prove that $r^2 = \frac{\alpha\beta\gamma}{\alpha + \beta + \gamma}$

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586. If $3\pi/4<\alpha<\pi$, then $\sqrt{2\cot\alpha + \frac{1}{\sin^2\alpha}}$ is equal to

A. $1 + \cot\alpha$

B. $-1 - \cot\alpha$

C. $1 - \cot\alpha$

D. $-1 + \cot\alpha$

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

$(a)\cot\alpha - \tan\alpha = 2\cot2\alpha$ $(b)\tan\left(45^0 + \alpha\right) - \tan\left(45^0 - \alpha\right) = 2\cos ec2\alpha$

$(c)\tan\left(45^0 + \alpha\right) + \tan\left(45^0 - \alpha\right) = 2\sec2\alpha$ $(d)\tan\alpha + \cot\alpha = 2\tan2\alpha$

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588. Find the coordinates of the points of intersection of the curves y = cos x , y = sin 3x : if $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$

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589. If $y = (\sin x + \operatorname{cosec} x)^2 + (\cos x + \sec x)^2$, then the minimum value of $y, \forall x \in R,$

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590. A triangle ABC is inscribed in a circle with centre at $O,$ The lines $AO, BOandCO$ meet the opposite sides at $D, E, andF,$ respectively. Prove that $\frac{1}{AD} + \frac{1}{BE} + \frac{1}{CF} = \frac{a\cos A + b\cos B + \operatorname{os} C}{\triangle}$

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591. If $\sin\left(x + 20^0\right) = 2\sin x\cos 40^0, whre x \in \left(0, \frac{\pi}{2}\right)$, then which of the following hold(s) good? $\cos 2x = \frac{1}{2}$ (b) $\cos ec 4x = 2$ $\frac{\sec x}{2} = \sqrt{6} - \sqrt{2}$ (d) $\frac{\tan x}{2} = \left(2 - \sqrt{3}\right)$

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592. PQ is a vertical tower having P as the foot. A,B,C are three points in the horizontal plane through P. The angles of elevation of Q from A,B,C are equal and each is equal to θ . The sides of the triangle ABC are a,b,c, and area of the triangle ABC is $\triangle$. Then prove that the height of the tower is (abc) $\frac{\tan\theta}{4' \triangle '}$.

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593. The equation $(\cos p - 1)^x \wedge 2 + (\cos p)x + s \in p = 0$ in the variable x has real roots. The p can take any value in the interval $(0, 2\pi)$ (b) $(- \pi)$ (c)

$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ (d) $(, \pi)$

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594. If a and b are positive quantities, $(a > b)$ find minimum positive value of $(a\sec\theta - b\tan\theta)$

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595. The distance between two parallel lines is unity. A point P lies between the lines at a distance a from one of them. Find the length of a side of an equilateral triangle PQR, vertex Q of which lies on one of the parallel lines and vertex R lies on the other line.

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596. If the equation $\cot^4 x - 2\mathrm{cos}ec^2 x + a^2 = 0$ has at least one solution, then the sum of all possible integral values of a is equal to

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597. The smallest positive x satisfying the equation $(\log)_{\cos x}\sin x + (\log)_{\sin x}\cos x = 2$ is

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

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

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

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

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598. O is the circumcenter of $ABC and R_1, R_2, R_3$ are respectively, the radii of the circumcircles of the triangle OBC, OCA and OAB. Prove that $\frac{a}{R_1} + \frac{b}{R_2} + \frac{c}{R_3} = \frac{abc}{R_3}$

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

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600. If roots of the equation $2x^2 - 4x + 2\sin\theta - 1 = 0$ are of opposite sign, then θ belongs to $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$ (b) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, \pi\right)$ $\left(\frac{13\pi}{6}, \frac{17\pi}{6}\right)$ (d) $(0, \pi)$

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601. The variable x satisfying the equation $|\sin x \cos x| + \sqrt{2 + \tan^2 + \cot^2 x} = \sqrt{3}$ belongs to the interval $\left[0, \frac{\pi}{3}\right]$ (b) $\left(\frac{\pi}{3}, \frac{\pi}{3}\right)$ (c) $\left[\frac{3\pi}{4}, \pi\right]$ (d) none-existent

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602. In $ABC, C = 60^0 and B = 45^{0^{\cdot}}$ Line joining vertex A of triangle and its circumcenter (O) meets the side BC in D Find the ratio $BD:DC$ and $AO:OD$

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603. If $A + B + C = \pi$, prove that $\tan^2\left(\frac{A}{2}\right) + \tan^2\left(\frac{B}{2}\right) + \tan^2\left(\frac{C}{2}\right) \geq 1.$

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604. A triangle has sides 6,7, and 8. The line through its incenter parallel to the shortest side is drawn to meet the other two sides at P and Q. Then find the length of the segment PQ.

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605. P(9,2) = P(x,2).Find x.

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606. If $|2\sin\theta - \cos ec\theta| \geq 1$ and $\theta \neq \frac{n\pi}{2}, n \in Z,$ then $\cos 2\theta \geq \frac{1}{2}$ (b) $\cos 2\theta \geq \frac{1}{4}$ $\cos 2\theta \leq \frac{1}{2}$ (d) $\cos 2\theta \leq \frac{1}{4}$

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607. Let $f_n(\theta) = \dfrac{\cos\left(\frac{\theta}{2}\right) + \cos 2\theta + \cos\left(\frac{7\theta}{2}\right) + \ldots + \cos(3n-2)\left(\frac{\theta}{2}\right)}{\sin\left(\frac{\theta}{2}\right) + \sin 2\theta + \sin\left(\frac{7\theta}{2}\right) + \ldots + \sin(3n-2)\left(\frac{\theta}{2}\right)}$ then (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

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608. Each side of triangle ABC is divided into three equal parts. Find the ratio of the area of hexagon $PQRSTU$ to the area of the triangle ABC.

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609. Which of the following is not the solution of the equation $\sin 5x = 16\sin^5 x (n \in Z)$? (a)$n\pi$ (b) $n\pi + \frac{\pi}{6}$ (c) $n\pi - \frac{\pi}{6}$ (d) none of these

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610. $(1 + \tan\alpha\tan\beta)^2 + (\tan\alpha - \tan\beta)^2 =$

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611. If $\cot^3\alpha + \cot^2\alpha + \cot\alpha = 1$ then (a) $\cos 2\alpha . \tan\alpha = -1$ (b)$\cos 2\alpha . \tan\alpha = 1$ (c) $\cos 2\alpha - \tan 2\alpha = 1$ (d)$\cos 2\alpha - \tan 2\alpha = -1$

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612. Find the range of $f(x) = \sqrt{\sin^2 x - 6\sin x + 9} + 3$

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613. The number of solution of the equation $\left|2\sin x - \sqrt{3}\right|^{2\cos^2 x - 3\cos x + 1} = 1 \in [0, \pi]$ is

(a) 2

(b) 3

(c) 4

(d) 5

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614. In triangle $ABC, let R = circumradius, r = inradius$. If r is the distance between the circumcenter and the incenter, the ratio $\frac{R}{r}$ is equal to (a) $\sqrt{2} - 1$ (b) $\sqrt{3} - 1$ (c)$\sqrt{2} + 1$ (d) $\sqrt{3} + 1$

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615. The expression $\cos^2(\alpha + \beta) + \cos^2(\alpha - \beta) - \cos 2\alpha . \cos 2\beta,$ is

A. independent of α

B. independent of β

C. independent of $\alpha and \beta$

D. dependent on $\alpha and \beta$

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616. In triangle ABC, if $A - B = 120$ and $R = 8r$, where R and r have their usual meaning, then cos C equals

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617. The sum of all the solution in $[0, 4\pi]$ of the equation $\tan x + \cot x + 1 = \cos\left(x + \frac{\pi}{4}\right) is$ (a) 3π (b) $\frac{\pi}{2}$ (c) $\frac{7\pi}{2}$ (d) 4π

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618. If $f(x, y)$ satisfies the equation $1 + 4x - x^2 = \sqrt{9\sec^2 y + 4\operatorname{cosec}^2 y}$ then find the value of $x\tan^2 y^{\cdot}$

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619. Show that $16\cos\left(\frac{2\pi}{15}\right)\cos\left(\frac{4\pi}{15}\right)\cos\left(\frac{8\pi}{15}\right)\cos\left(\frac{16\pi}{15}\right) = 1$

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620. ABC is an equilateral triangle of side $4cm^{\cdot}$ If R, r, and, h are the circumradius, inradius, and altitude, respectively, then $\frac{R + r}{h}$ is equal to

(a) 4 (b) 2 (c) 1 (d) 3

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621. The total number of solutions of $\log_e|\sin x| = -x^2 + 2x \in [0, \pi]$ is equal to

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622. If $\sin^2\theta_1 + \sin^2\theta_2 + \sin^2\theta_3 = 0,$ then which of the following is not the possible value of $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$? (a) 3 (b) -3 (c) -1 (d) -2

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623. The length of the shadow of a vertical pole of height $h,$ thrown by the suns rays at three different moments are $h, 2h$ and $3h$. Find the sum of the angles of elevation of the rays at these three moments.

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624. For real values of 'x' , Which of the following is/are always positive? (a) sin(cosx) (b) sin(sinx)

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625. The total number of solution of $\sin\{x\} = \cos\{x\}$ (where $\{\}$ denotes the fractional part) in $[0, 2\pi]$ is equal to 5 (b) 6 (c) 8 (d) none of these

A. 5

B. 6

C. 8

D. None of these

Answer: option 2

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626. In triangle ABC, let $\angle c = \frac{\pi}{2}\cdot$ If r is the inradius and R is circumradius of the triangle, then $2(r + R)$ is equal to $a + b$ (b) $b + c$ $c + a$ (d) $a + b + c$

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

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628. Find the value of x for which $3\cos x = x^2 - 8x + 19$ holds good.

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629. The set of all x in $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ satisfying $|4\sin x - 1| < \sqrt{5}$ is given by

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630. a triangle ABC with fixed base BC , the vertex A moves such that $\cos B + \cos C = 4\sin^2\left(\frac{A}{2}\right)$. If a, b and $c,$ denote the length of the sides of the triangle opposite to the angles A, B and C , respectively, then (a)

$b+c=4a$ (b) $b+c=2a$ (c) the locus of point A is an ellipse (d) the locus of point A is a pair of straight lines

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

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632. Show that the equation $\sin\theta = x + \frac{1}{x}$ is not possible if x is real.

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633. Solve: $2\sin^2 x + \sin^2 2x = 2$

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634. In a triangle PQR, P is the largest angle and $\cos P = \frac{1}{3}$. Further the incircle of the triangle touches the sides PQ, QR and RP at N, L and M respectively, such that the lengths of PN, QL and RM are consecutive even integers. Then possible length(s) of the side(s) of the triangle is (are)

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635. The upper $\frac{3}{4}$ th portion of a vertical pole subtends an angle θ such that $\tan\theta = \frac{3}{5}$ at a point in the horizontal plane through its foot and at a distance 40m from the foot. Find the possible height of the vertical pole.

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636. Solve $(\log)_{\tan x}\left(2 + 4\cos^2 x\right) = 2$

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637. If $f(x) = \cos^2 x + sec^2 x, then$

A. $f(x) < 1$

B. $f(x) = 1$

C. $2 < f(x) < 1$

D. $f(x) \geq 2$

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638. Match the statements/expressions given in Column I with the values given in Column II. Column I, Column II $\sum_{i=1}^{\infty} \tan^{-1}\left(\frac{1}{2i^2}\right) = 1, thentant =$, Sides a, b, c for a triangle ABC are in A.P. and $\cos\theta_1 = \frac{a}{b+c}$, $\cos\theta_2 = \frac{b}{a+c}$, $\cos\theta_3 = \frac{c}{a+b}$, then $\tan^2\left(\frac{\theta_1}{2}\right) + \tan^2\left(\frac{\theta_3}{2}\right) =$, 1 A line is perpendicular to $x + 2y + 2z = 0$ and passes through (0,10). The perpendicular distance of this line from the origin is , $\frac{\sqrt{5}}{3}$

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639. prove that $\sin\theta.\ \sec3\theta + \sin3\theta.\ \sec3^2\theta + \sin3^2\theta.\ \sec3^3\theta + up \rightarrow n$ terms $= \frac{1}{2}\left[\tan3^n\theta - \tan\theta\right]$

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640. Solve $4\cot2\theta = \cot^2\theta - \tan^2\theta$

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641. Find the range of $f(x) = \sin^2x - 3\sin x + 2$

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642. In a triangle ΔXYZ, let a,b and c be the lengths of the sides opposite to the angles X,Y and Z, respectively. If $2\left(a^2 - b^2\right) = c^2$ and $\lambda = \frac{\sin(X - Y)}{\sin Z,}$

then possible values of n for which $\cos(n\pi\lambda) = 0$ is (are)

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643. Prove that $\dfrac{\cos 10^0 + \sin 10^0}{\cos 10^0 - \sin 10^0} = \tan 55^0$

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644. Find the range of $f(x) = \dfrac{1}{4\cos x - 3}$.

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645. Find the general solutions of:

$2^{1 + |\cos x| + |\cos x|^2 + |\cos x|^3 + \dots \dots \to \infty} = 4$

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646. Let $ABC and ABC'$ be two non-congruent triangles with sides $AB = 4, AC = AC' = 2\sqrt{2}$ and angle $B = 30^0$. The absolute value of the difference between the areas of these triangles is

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

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

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649. Find the range of $f(x) = \dfrac{1}{5\sin x - 6}$

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650. Two parallel chords of a circle of radius 2 are at a distance. $\sqrt{3} + 1$ apart. If the chord subtend angles $\frac{\pi}{k}$ and $\frac{2\pi}{k}$ at the center, where $k > 0$, then the value of [k] is

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

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652. The expression $3\left\{\sin^4\left(\left(3\frac{\pi}{2}\right) - \alpha\right) + \sin^4(3\pi - \alpha)\right\} - 2\left\{\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)\right\}$ is equal to

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653. Solve $\sqrt{3}\cos\theta - 3\sin\theta = 4\sin2\theta\cos3\theta$.

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654. Consider a triangle ABC and let $a, b and c$ denote the lengths of the sides opposite to vertices $A, B, and C$, respectively. Suppose $a = 6, b = 10$, and the area of triangle is $15\sqrt{3}$. If $\angle ACB$ is obtuse and if r denotes the radius of the incircle of the triangle, then the value of r^2 is

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

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656. Find the number of integral value of n so that $\sin x(\sin x + \cos x) = n$ has at least one solution.

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657. In triangle ABC, $\angle C = \frac{2\pi}{3}$ and CD is the internal angle bisector of $\angle C$ meeting the side AB at D. If Length CD is equal to

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658. Let $P = \left[\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\right)$ and $Q = \{\theta : \sin\theta + \cos\theta = 12\sin\theta\}$ be two sets. Then:

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659. C(10,2) = C(n,2).Find n.

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660. Find the smallest positive values of $x and y$ satisfying $x - y = \frac{\pi}{4} and \cot x + \cot y = 2$

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661. Let C be incircle of ABC. If the tangents of lengths t_1, t_2 and t_3 are drawn inside the given triangle parallel to sidese a, b and c , respectively, the $\frac{t_1}{a} + \frac{t_2}{b} + \frac{t_3}{c}$ is equal to 0 (b) 1 (c) 2 (d) 3

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662. if cos(x-y)cosx and cos(x+y) are in H.P then evaluate $\left|\cos x. \frac{\sec y}{2}\right|$

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663. For what value of k the equation $\sin x + \cos(k + x) + \cos(k - x) = 2$ has real solutions?

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664. $\tan^6\left(\frac{\pi}{9}\right) - 33\tan^4\left(\frac{\pi}{9}\right) + 27\tan^2\left(\frac{\pi}{9}\right)$ is equal to

A. 0

B. $\sqrt{3}$

C. 3

D. 9

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665. If $x, y \in [0, 2\pi]$ then find the total number of order pair (x, y) satisfying the equation $\sin x . \cos y = 1$

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666. For +ve integer n, let

$f_n(\theta) = \tan\left(\frac{\theta}{2}\right)(1 + \sec\theta)(1 + \sec 2\theta)(1 + \sec 4\theta)\ldots.\left(1 + \sec 2^n\theta\right)$ then

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667. If area of a triangle is 2 sq. units, then find the value of the product of the arithmetic mean of the lengths of the sides of a triangle and harmonic mean of the lengths of the altitudes of the triangle.

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668. Find the values of $x \in (-\pi, \pi)$ which satisfy the equation

$8^{1 + |\cos x| + \left|\cos^2 x\right| + \left|\cos^3 x\right| + \ldots)} = 4^3$

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669. 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

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670. In equilateral triangle ABC with interior point D, if the perpendicular distances from D to the sides of 4,5, and 6, respectively, are given, then find the area of $\triangle ABC$

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671. If $(\sin\alpha)x^2 - 2x + b \geq 2$, for all real values of $x \leq 1 and \alpha \in \left(0, \frac{\pi}{2}\right) \cup (\pi/2, \pi)$, then possible real value of b is /are $a2$ b. 3 c. 4 d. 5

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672. Let $f(\theta) = \sin\theta(\sin\theta + \sin3\theta)$ Then $f(\theta)$ is (a) ≥ 0 only when $\theta \geq 0$ (b) ≤ 0 for all real θ (c) ≥ 0 for all real θ (d) ≤ 0 only when $\theta \leq 0$

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673. In ABC, $\left(\cot\left(\frac{A}{2}\right) + \cot\left(\frac{B}{2}\right)\right)\left(a\sin^2\left(\frac{B}{2}\right) + b\sin^2\left(\frac{A}{2}\right)\right) =$ (a) $\cot C$ (b) $c\cot C$ (c) $\cot\left(\frac{C}{2}\right)$ (d) $c\cot\left(\frac{C}{2}\right)$

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674. The value of x in $\left(0, \frac{\pi}{2}\right)$ satisfying $\frac{\sqrt{3} - 1}{\sin x} + \frac{\sqrt{3} + 1}{\cos x} = 4\sqrt{2}$ is / are

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675. Without using tables prove that $($\sin 12^{\circ}$)(\sin 48^{\circ})(\sin 54^{\circ})$=1/8`

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676. If $\cos 3\theta = \cos 3\alpha$, then the value of $\sin\theta$ can be given by $\pm\sin\alpha$ (b) $\sin\left(\frac{\pi}{3} \pm \alpha\right)$ $\sin\left(\frac{2\pi}{3} + \alpha\right)$ (d) $\sin\left(\frac{2\pi}{3} - \alpha\right)$

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677. If the sides a, b and $cofABC$ are in $\dot{AP}$, prove that $2\frac{\sin A}{2}\frac{\sin C}{2} = \frac{\sin B}{2}$

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678. α and β 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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679. If $a = 9, b = 4andc = 8$ then find the distance between the middle point of BC and the foot of the perpendicular form $\dot{A}$

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680. Which of the following sets can be the subset of the general solution of $1 + cos3x = 2\cos2x(n \in Z)$?

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

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

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

D. $2n\pi$

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681. Given both $\theta and \phi$ are acute angles and $\sin\theta = \frac{1}{2}, \cos\varphi = \frac{1}{3},$ then the value of $\theta + \varphi$ belongs to

A. $\left(\frac{\pi}{3}, \frac{\pi}{2}\right)$

B. $\left(\frac{\pi}{2}, \frac{2\pi}{3}\right)$

C. $\left(\frac{2\pi}{3}, \frac{5\pi}{6}\right)$

D. $\left(\frac{5\pi}{6}, \pi\right)$

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682. If the cotangents of half the angles of a triangle are in A.P., then prove that the sides are in A.P.

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683. $e^{|\sin x|} + e^{-|\sin x|} + 4a = 0$ will have exactly four different solutions in $[0, 2\pi]$. Find the value of a. (a) $a \in R$ (b) $a \in \left[-\frac{3}{4}, -\frac{1}{4}\right]$ (c) $a \in \left[\frac{-1-e^2}{4e}, \infty\right]$ (d) none of these

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684. If the sides of a triangle are $17, 25 and 28,$ then find the greatest length of the altitude.

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685. If both the distinct roots of the equation $|\sin x|^2 + |\sin x| + b = 0 \in [0, \pi]$ are real, then the values of b are $[-2, 0]$ (b) $(-2, 0)$ $[-2, 0]$ (d) $none of these$

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686. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\frac{\sin\pi}{18}$ is a root of $8x^3 - 6x + 1 = 0$ Statement 2: For any $\theta \in R, \sin 3\theta = 3\sin\theta - 4\sin^3\theta$

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687. In triangle ABC, prove that $\sin(B + C - A) + \sin(C + A - B) + \sin(A + B - C)$

$= 4\sin A\sin B\sin C^{\cdot}$

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688. The number of values of $y \in [-2\pi, 2\pi]$ satisfying the equation $|\sin 2x| + |\cos 2x| = |\sin y|$ is 3 (b) 4 (c) 5 (d) 6

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689. If $\alpha + \beta = \left(\frac{\pi}{2}\right)$ and $\beta + \gamma = \alpha$, then the $\tan\alpha$ equals:

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690. prove that $a^2\sin 2B + b^2\sin 2A = 4\Delta$

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691. The equation $\cos^8 x + b\cos^4 x + 1 = 0$ will have a solution if b belongs to

A. $(-\infty, 2]$

B. $[2, \infty]$

C. $[-\infty, -2]$

D. none of these

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692. Let $f(n) = 2\cos nx \forall n \in N$, then $f(1)f(n+1) - f(n)$ is equal to`

A. $f(n+3)$

B. $f(n+2)$

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

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

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693. If in triangle $ABC, \delta = a^2 - (b - c)^2$, then find the value of $\tan A$

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694. The number of solutions of $[\sin x + \cos x] = 3 + [- \sin x] + [- \cos x](where[]$ denotes the greatest integer function), $x \in [0, 2\pi]$, is 0 (b) 4 (c) infinite (d) 1

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695. If $\sin\theta_1 - \sin\theta_2 = a and \cos\theta_1 + \cos\theta_2 = b,$ then (a)$a^2 + b^2 \geq 4$ (b) $a^2 + b^2 \leq 4$ (c)$a^2 + b^2 \geq 3$ (d) $a^2 + b^2 \leq 2$

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696. If $a, b and c$ are the side of a triangle, then the minimum value of $\frac{2a}{b + c - a} + \frac{2b}{c + a - b} + \frac{2c}{a + b - c} is$ (a) 3 (b) 9 (c) 6 (d) 1

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697. $\sin x + \cos x = y^2 - y + a$ has no value of x for any value of y if a belongs to (a) $\left(0, \sqrt{3}\right)$ (b) $\left(-\sqrt{3}, 0\right)$ (c) $\left(-\infty, -\sqrt{3}\right)$ (d) $\left(\sqrt{3}, \infty\right)$

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698. If $\frac{\cos x}{a} = \frac{\cos(x+\theta)}{b} = \frac{\cos(x+2\theta)}{c} = \frac{\cos(x+3\theta)}{d}$ then $\frac{a+c}{b+d}$ is equal to (a) $\frac{a}{d}$ (b) $\frac{c}{b}$ (c) $\frac{b}{c}$ (d) $\frac{d}{a}$

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699. Let PQR be a triangle of area Δ with $a = 2, b = \frac{7}{2}$ and $c = \frac{5}{2}$, where a,b and c are the lengths of the sides of the triangle opposite to the angles at P,Q and R respectively. Then $\left(\frac{2\sin P - \sin 2P}{2\sin P + \sin 2P}\right)$ equals

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700. If the inequality $\sin^2 x + a\cos x + a^2 > 1 + \cos x$ holds for any $x \in R$, then the largest negative integral value of a is -4 (b) -3 (c) -2 (d) -1

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701. 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) $2\cos(\alpha + \beta)$

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702. If the angle $A, BandC$ of a triangle are in an arithmetic propression and if $a, bandc$ denote the lengths of the sides opposite to $A, BandC$ respectively, then the value of the expression $\frac{a}{c}\sin 2C + \frac{c}{a}\sin 2A$ is (a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\sqrt{3}$

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703. The equation $\sin^4 x - 2\cos^2 x + a^2 = 0$ can be solved if

A. $-\sqrt{3} \leq a \leq \sqrt{3}$

B. $-\sqrt{2} \leq a \leq \sqrt{2}$

C. $-1 \leq a \leq 1$

D. none of these

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

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705. Let ABC be a triangle such that $\angle ACB = \dfrac{\pi}{6}$ and let a , b and c denote the lengths of the side opposite to A, B ,and C respectively. The value(s) of x for which $a = x^2 + x + 1, b = x^2 - 1,$ and $c = 2x + 1$ is(are) $-\left(2 + \sqrt{3}\right)$ (b) $1 + \sqrt{3}$ (c)$2 + \sqrt{3}$ (d) $4\sqrt{3}$

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706. 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 (a)$\frac{3}{5}$ (b) $\frac{3}{5}$ (c) $\frac{2}{\sqrt{5}}$ (d) $\frac{4}{5}$

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707. Consider the system of linear equations in $x, yandz$: $(\sin 3\theta)x - y + z = 0$, $(\cos 2\theta)x + 4y + 3z = 0,\ 2x + 7y + 7z = 0$ Which of the following can be the value of θ for which the system has a non-trivial solution (A) $n\pi + (-1)^n\frac{\pi}{6}, \forall n \in Z$ (B) $n\pi + (-1)^n\frac{\pi}{3}, \forall n \in Z$ (C) $n\pi + (-1)^n\frac{\pi}{9}, \forall n \in Z$ (D)none of these

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708. Let $ABCD$ be a quadrilateral with area 18 , side AB parallel to the side $CD, andAB = 2CD$. Let AD be perpendicular to $ABandCD$. If a circle is drawn inside the quadrilateral $ABCD$ touching all the sides, then its radius is $a = 3$ (b) 2 (c) $\frac{3}{2}$ (d) 1

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709. The number of ordered pairs which satisfy the equation $x^2 + 2x\sin(xy) + 1 = 0$ are (where $y \in [0, 2\pi]$) (a) 1 (b) 2 (c) 3 (d) 0

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710. Let α, β be such that $\pi < \alpha - \beta < 3\pi$. If $\sin\alpha + \sin\beta = \frac{-21}{65}$ and $\cos\alpha + \cos\beta = \frac{-27}{65}$, then the value of $\cos\left(\frac{\alpha - \beta}{2}\right)$ is

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

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

C. $\frac{6}{25}$

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

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711. Let $A_0A_1A_2A_3A_4A_5$ be a regular hexagon inscribed in a circle of unit radius. Then the product of the lengths of the line segments A_0A_1, A_0A_2 and A_0A_4 is

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712. If $\alpha = \frac{\pi}{14}$, then the value of $(\tan\alpha\tan2\alpha + \tan2\alpha\tan4\alpha + \tan4\alpha\tan\alpha)$ is 1 (b) $1/2$ (c) 2 (d) $1/3$

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713. The equation $(\cos p - 1)x^2 + (\cos p)x + \sin p = 0$ in the variable x has real roots. The p can take any value in the interval (a)$(0, 2\pi)$ (b) $(- \pi, 0)$ (c) $\left(- \frac{\pi}{2}, \frac{\pi}{2} \right)$ (d) $(0, \pi)$

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714. In $ABC,$ the median AD divides $\angle BAC$ such that $\angle BAD : \angle CAD = 2 : 1$. Then $\cos\left(\frac{A}{3}\right)$ is equal to $\frac{\sin B}{2\sin C}$ (b) $\frac{\sin C}{2\sin B}$ $\frac{2\sin B}{\sin C}$ (d) none of these

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715. If $0 \le x \le 2\pi and|\cos x| \le \sin x,$ then (a) then set of all values of x is $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$ (b)the number of solutions that are integral nultiple of $\frac{\pi}{4}$ is four (C)the number of the largest and the smallest solution is π (D)the set of all values of x is $x \in \left[\frac{\pi}{4}, \frac{\pi}{2}\right] \cup \left[\frac{\pi}{2}, \frac{3\pi}{4}\right]$

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716. $\dfrac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta} is equal$

A. $\tan 3\theta$

B. $\cot 3\theta$

C. $\tan 6\theta$

D. $\cot 6\theta$

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717. In a triangle, the lengths of the two larger sides are 10 and 9, respectively. If the angles are in A.P, then the length of the third side can be (a) $5 - \sqrt{6}$ (b) $3\sqrt{3}$ (c) 5 (d) $5 + \sqrt{6}$

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718. If x, y, z are in A.P., then $\frac{\sin x - \sin z}{\cos z - \cos x}$ is equal to

A. $\tan y$

B. $\cot y$

C. $\sin y$

D. $\cos y$

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719. The expression $\cos 3\theta + \sin 3\theta + (2\sin 2\theta - 3)(\sin\theta - \cos\theta)$ is positive for all θ in $(a)\left(2n\pi - \frac{3\pi}{4}, 2n\pi + \frac{\pi}{4}\right), n \in Z$ $(b)\left(2n\pi - \frac{\pi}{4}, 2n\pi + \frac{\pi}{6}\right), n \in Z$ $(c)\left(2n\pi - \frac{\pi}{3}, 2n\pi + \frac{\pi}{3}\right), n \in Z$ $(d)\left(2n\pi - \frac{\pi}{4}, 2n\pi + \frac{3\pi}{4}\right), n \in Z$

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720. There exists a triangle ABC satisfying the conditions

$(A) b\sin A = a, A < \frac{\pi}{2}$ $(B) b\sin A > a, A > \frac{\pi}{2}$ $(C) b\sin A > a, A < \frac{\pi}{2}$

$(D) b\sin A < a, A < \frac{\pi}{2}, b < a$

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

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722. The number of all possible values of θ where 0 < θ < π, for which the system of equations $(y + z)\cos\theta = (xyz)\sin 3\theta$

$\sin 3\theta = 2\cos\left(\frac{3\theta}{y}\right) + 2\sin\left(\frac{3\theta}{z}\right)$

$(xyz)\sin 3\theta = (y + 2z)\cos 3\theta + y\sin 3\theta$

has a solution (x_0, y_0, z_0) with $y_0, z_0 \neq 0$, is

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723. A straight line through the vertex P of a triangle PQR intersects the side QR at the points S and the cicumcircle of the triangle PQR at the point $\dot{T}$ If S is not the center of the circumcircle, then $\frac{1}{PS}+\frac{1}{ST}<\frac{2}{\sqrt{QS\times SR}}$ $\frac{1}{PS}+\frac{1}{ST}>\frac{2}{\sqrt{QS\times SR}}$ $\frac{1}{PS}+\frac{1}{ST}<\frac{4}{QR}$ $\frac{1}{PS}+\frac{1}{ST}>\frac{4}{QR}$

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724. Match the statements/expressions in Column I with the statements/expression in Column II. Column I Column II Root(s) of the equation $2\sin^2\theta+\sin^2 2\theta=2$ (p) $\frac{\pi}{6}$ Points of discontinuity of the function $f(x)=\left[\frac{6x}{\pi}\right]\cos\left[\frac{3x}{\pi}\right]$, where $[y]$ denotes the largest integer less than or equal to y (q) $\frac{\pi}{3}$ Volume of the parallelepiped with its edges represented by the vectors $\vec{a}, \vec{b} and \vec{c}$ are unit vectors satisfying $\vec{a}+\vec{b}+\sqrt{3}\vec{c}=\vec{0}$ (r) $\frac{\pi}{2}$

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725. $x = \sqrt{a^2\cos^2\alpha + b^2\sin^2\alpha} + \sqrt{\alpha^2\sin^2\alpha + b^2\cos^2\alpha}$

then $x^2 = \alpha^2 + b^2 + 2\sqrt{p\left(a^2 + b^2\right) - p^2}$, where p is equal to

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726. Which of the following expresses the circumference of a circle inscribed in a sector OAB with radius $RandAB = 2a$? (a)$2\pi\frac{Ra}{R + a}$ (b) $\frac{2\pi R^2}{a}$ $(c)2\pi(r - a)^2$ (d) $2\pi\frac{R}{R - a}$

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727. Match the statement/expressions in Column I with the statements/expressions in Column II. Column I Column II The minimum value of $\frac{x^2 + 2x + 4}{x + 2}$ is (p) 0 Let $AandBbe3x3$ matrices of real numbers, where A is symmetric, B is skew symmetric, and $(A + B)(A - B) = (A - B)(A + B)$ if $(AB)^t = (-1)^k AB$, where $(AB)^t$ is the transpose of the matrix AB , then the possible values of k are (q) 1 Let $a = (\log)_3(\log)_3 2$. An integer k satisfying $1 < 2^{-k+3^{(-1)}} < 2$, must be less than (r) 2 In $\sin\theta = \cos\varphi$, then the possible values of $\frac{1}{\pi}\left(\theta \pm \varphi - \frac{\pi}{2}\right)$ are (s) 3

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728. If $(x - a)\cos\theta + y\sin\theta = (x - a)\cos\phi + y\sin\phi = a$ and $\tan\left(\frac{\theta}{2}\right) - \tan\left(\frac{\phi}{2}\right) = 2b$,then (a) $y^2 = 2ax - \left(1 - b^2\right)x^2$ (b) $\tan\left(\frac{\theta}{2}\right) = \frac{1}{x}(y + bx)$ (c)$y^2 = 2bx - \left(1 - a^2\right)x^2$ (d)$\tan\left(\frac{\phi}{2}\right) = \frac{1}{x}(y - bx)$

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729. Prove that $(b + c)\cos A + (c + a)\cos B + (a + b)\cos C = 2s$

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730. If $p = \sin(A - B)\sin(C - D), q = \sin(B - C)\sin(A - D),$ $r = \sin(C - A)\sin(B - D)$ then (a) $p + q - r = 0$ (b) $p + q + r = 0$ $p - q + r = 0$ (d) $p^3 + q^3 + r^3 = 3pqr$

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731. Let $\varphi, \phi \in [0, 2\pi]$ be such that $2\cos\theta(1 - \sin\phi) = \sin^2\theta\left(\frac{\tan\theta}{2} + \cot\theta/2\right)\cos\phi - 1, \tan(2\pi - \theta) > 0$ and $-1 < \sin\theta < -\frac{\sqrt{3}}{2}$ then φ lies between

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732. If $\cos\left(\frac{A}{2}\right) = \sqrt{\frac{b + c}{2c}}$, then prove that $a^2 + b^2 = c^2$.

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

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734. For $0 < \theta < \frac{\pi}{2}$ the solution of $\sum^{6} m = 1\text{cosec}\left(\theta + \frac{(m-1)\pi}{4}\right)\text{cosec}\left(\theta + \frac{m\pi}{4}\right) = 4\sqrt{2}$ is

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735. In ABC, if $a = 10$ and $b\cot B + c\cot C = 2(r + R)$ then the maximum area of ABC will be (a) 50 (b) $\sqrt{50}$ (c) 25 (d) 5

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736. Which of the following set of values of x satisfies the equation $2^{2\sin^2 x - 3\sin x + 1} + 2^{2 - 2\sin^2 x + 3\sin x} = 9$? (a)$x = n\pi \pm \frac{\pi}{6}, n \in I$ (b) $x = n\pi \pm \frac{\pi}{3}, n \in I$ (c)$x = n\pi, n \in I$ (d) $x = 2n\pi + \frac{\pi}{2}, n \in I$

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737. Let $f(x) = ab\sin x + b\sqrt{1 - a^2}\cos x + c,$ where $|a| 1, b 0$ then (a) maximum value of $f(x)$ is b if $c = 0$ (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=$\cos^{-1} a$

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738. A variable triangle ABC is circumscribed about a fixed circle of unit radius. Side BC always touches the circle at D and has fixed direction. If B and C vary in such a way that (BD) (CD)=2, then locus of vertex A will be a straight line. (a)parallel to side BC (b)perpendicular to side BC (c)making an angle $\left(\frac{\pi}{6}\right)$ with BC (d) making an angle $\sin^{-1}\left(\frac{2}{3}\right)$ with BC

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739. Let the sum of all x in the interval $[0, 2\pi]$ such that $3\cot^2 x + 8\cot x + 3 = 0.$

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740. 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 Prove that (a)$P(3) = \frac{1}{16}$ (b) $P(4) = \frac{2-\sqrt{2}}{16}$ (c) $P(5) = \frac{3-\sqrt{5}}{32}$ (d) $P(6)\frac{2-\sqrt{3}}{16}$

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

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742. Find the values of θ in the interval $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ satisfying the equation, $(1 - \tan\theta)(1 + \tan\theta)\sec^2\theta + 2^{\tan^2\theta} = 0$

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743. ABC is a triangle such that $\sin(2A + B) = \sin(C - A) = -\sin(B + 2C) = \frac{1}{2}$. If A,B, and C are in AP. then the value of A,B and C are..

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744. Let a, b and c be the three sides of a triangle, then prove that the equation $b^2x^2 + \left(b^2 + c^2 - a^2\right)x + c^2 = 0$ has imaginary roots.

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745. Number of roots of the equation $|\sin x \cos x| + \sqrt{2 + tan^2 x + \cot^2 x} = \sqrt{3}, x \in [0, 4\pi] are$

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746. Let $f : (-1, 1)\vec{R}$ be such that $f(\cos 4\theta) = \dfrac{2}{2 - \sec^2\theta}$ for $\theta \in \left(0, \dfrac{\pi}{4}\right) \cup \left(\dfrac{\pi}{4}, \dfrac{\pi}{2}\right)$. Then the value(s) of $f\left(\dfrac{1}{3}\right)$ is (are) (a)$1 - \sqrt{\dfrac{3}{2}}$ (b) $1 + \sqrt{\dfrac{3}{2}}$ (c) $1 - \sqrt{\dfrac{2}{3}}$ (d) $1 + \sqrt{\dfrac{2}{3}}$

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747. In a triangle ABC, if the sides a,b,c, are roots of $x^3 - 11x^2 + 38x - 40 = 0$, then find the value of $\dfrac{\cos A}{a} + \dfrac{\cos B}{b} + \dfrac{\cos C}{c}$

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

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749. If $a, b \in [0, 2\pi]$ and the equation $x^2 + 4 + 3\sin(ax + b) - 2x = 0$ has at least one solution, then the value of $(a + b)$ can be (a) $\frac{7\pi}{2}$ (b) $\frac{5\pi}{2}$ (c) $\frac{9\pi}{2}$ (d) none of these

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750. Let $a \leq b \leq c$ be the lengths of the sides of a triangle. If $a^2 + b^2 < c^2$, then prove that triangle is obtuse angled .

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

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752. The sum of all roots of $\sin\left(\pi(\log)_3\left(\frac{1}{x}\right)\right) = 0$ in $(0, 2\pi)$ is

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

B. 4

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

D. $\frac{13}{3}$

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753. Three parallel chords of a circle have lengths 2,3,4 units and subtend angles $\alpha, \beta, \alpha + \beta$ at the centre, respectively $(\alpha < \beta < \pi)$, then find the value of $\cos\alpha$

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754. Prove that $\cos 36^0 \cos 72^0 \cos 108^0 \cos 144^0 = \frac{1}{16}$.

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755. The equation $\tan^4 x - 2\sec^2 x + a = 0$ will have at least one solution if

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756. A tower PQ stands at a point P within the triangular park ABC such that the sides $a, b and c$ of the triangle subtend equal angles at P, the foot of the tower. if the tower subtends angles $\alpha, \beta and \gamma, at A, B and C$ respectively, then prove that $a^2(\cot\beta - \cot\gamma) + b^2(\cot\gamma - \cot\alpha) + a^2(\cot\alpha - \cot\beta) = 0$

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757. The number of ordered pairs (x,y) satisfying

$|x| + |y| = 2$ and $\sin\left(\frac{\pi x^2}{3}\right) = 1$ is/are

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758. If $\tan\beta = \frac{\tan\alpha + \tan\gamma}{1 + \tan\alpha\tan\gamma}\cdot$ prove that $\sin 2\beta = \frac{\sin 2\alpha + \sin 2\gamma}{1 + \sin 2\alpha \sin 2\gamma}$.

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759. Prove that $a(b\cos C - c\cos B) = b^2 - c^2$

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760. If $4\sin^4 x + \cos^4 x = 1$, then x is equal to $(n \in Z)$ (a) $n\pi$ (b) $n\pi \pm \sin^{-1}\sqrt{\frac{2}{5}}$

(c) $\frac{2n\pi}{3}$ (d) $2n\pi \pm \frac{\pi}{4}$

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761. If $x + y + z = xyz$ prove that $\frac{2x}{1 - x^2} + \frac{2y}{1 - y^2} + \frac{2z}{1 - z^2} = \frac{2x}{1 - x^2}\frac{2y}{1 - y^2}\frac{2z}{1 - z^2}$.

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762. If in a triangle $a\cos^2\left(\frac{C}{2}\right) + c\cos^2\left(\frac{A}{2}\right) = \frac{3b}{2}$, then find the relation between the sides of the triangle.

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763. Evaluate $\cos a\cos 2a\cos 3a.........\cos 999a$, where $a = \frac{2\pi}{1999}$.

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764. If $\sin^3\theta + \sin\theta\cos^2\theta = 1, then\theta$ is equal to $(n \in Z)$

A. $2n\pi$

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

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

D. $n\pi$

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765. Let ABC be a triangle of area 24sq.units and PQR be the triangle formed by the mid-points of the sides triangle ABC. Then what is the area of triangle PQR.

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766. Find the number of pairs of integer (x, y) that satisfy the following two equations: $\{\cos(xy) = x$ and $\tan(xy) = y$ (a)1 (b)2 (c) 4(d) 6

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767. 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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768. Let AD be a median of the ABC. If $AEandAF$ are medians of the triangle $ABDandADC$, respectively, and $AD = m_1, AE = m_2, AF = m_3,$ then $\frac{a^2}{8}$ is equal to (a)$m_2^2 + m_3^2 - 2m_1^2$ (b) $m_1^2 + m_2^2 - 2m_3^2$ (c)$m_1^2 + m_3^2 - 2m_2^2$ (d) none of these

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769. Find the value of $\cos 12^0 + \cos 84^0 + \cos 156^0 + \cos 132^0$

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770. If no solution of $3\sin y + 12\sin^3 x = a$ lies on the line $y = 3x$, then $a \in (-\infty, -9) \cup (9, \infty)$ a$a \in [-9, 9]$ $aa \in \{-9, 9\}$ *noneofthese*

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771. If in a triangle $PQR, \sin P, \sin Q, \sin R areinAP$, then (a)the altitudes are in A.P. (b)the altitudes are in H.P. (c)the medians are in G.P. (d)the medians are in A.P.

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

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773. If $\sin^2 x - 2\sin x - 1 = 0$ has exactly four different solutions in $x \in [0, n\pi]$, then value/values of n is/are $(n \in N)$ 5 (b) 3 (c) 4 (d) 6

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774. If in a triangle the angles are in the ratio as $1:2:3$, prove that the corresponding sides are $1:\sqrt{3}:2$.

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775. A balloon is observed simultaneously from three points A, B and C on a straight road directly under it. The angular elevation at B is twice and at C is thrice that at A . If the distance between A and B is 200 metres and the distance between B and C is 100 metres, then find the height of balloon above the road.

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776. A general solution of $\tan^2\theta + \cos 2\theta = 1$ is $(n \in Z)$ $n\pi = \frac{\pi}{4}$ (b) $2n\pi + \frac{\pi}{4}$ $n\pi + \frac{\pi}{4}$ (d) $n\pi$

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777. In an equilateral triangle, three coins of radii 1 unit each are kept so that they touch each other and also the sides of the triangle. The area of the triangle is 2sqrt(3)(b)6+4sqrt(3)12+(7sqrt(3))/4(d)3+(7sqrt(3))/4`

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

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779. If $\sin x + \cos x = \sqrt{y + \frac{1}{y}}$ for $x \in [0, \pi]$, then

A. $x = \frac{\pi}{4}$

B. $y = 0$

C. $y = 1$

D. $x = \frac{3\pi}{4}$

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780. Prove that: $tan\alpha + 2\tan 2\alpha + 4\tan 4\alpha + 8\cot 8\alpha = \cot\alpha$

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781. $\sin\theta + \sqrt{3}\cos\theta = 6x - x^2 - 11, 0 \leq \theta \leq 4\pi, x \in R,$ (a) hold for no values of x and θ (b) one value of x and two values of θ (c) two values of x and two values of θ (d) two point of values of (x, θ)

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782. If the angles of a triangle are in the ratio $4:1:1,$ then the ratio of the longest side to the perimeter is

A. $\sqrt{3}:\left(2+\sqrt{3}\right)$

B. $1:6$

C. $1:2+\sqrt{3}$

D. $2:3$

Watch Video Solution

783. Find all the solution of $4\cos^2 x\sin x - 2\sin^2 x = 3\sin x$

Watch Video Solution

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

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785. In triangle ABC, $2ac\sin\left(\frac{1}{2}(A - B + C)\right)$ is equal to

A. $a^2 + b^2 - c^2$

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

C. $b^2 - c^2 - a^2$

D. $c^2 - a^2 - b^2$

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786. $\tan 100^0 + \tan 125^0 + \tan 100^0 \tan 125^0$ is equal to

A. 0

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

C. -1

D. 1

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787. The solution set of the system of equations $x+y=\frac{2\pi}{3}, \cos x+\cos y=\frac{3}{2}$, where $x and y$ are real, is _______

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788. The positive integer value of $n>3$ satisfying the equation $\frac{1}{\sin\left(\frac{\pi}{n}\right)}=\frac{1}{\sin\left(\frac{2\pi}{n}\right)}+\frac{1}{\sin\left(\frac{3\pi}{n}\right)} is$

Watch Video Solution

789. Let $f(x)=x^2 and g(x)=\sin x f or all x \in R$ Then the set of all x satisfying $(fogogof)(x)=(gogof)(x), where (fog)(x)=f(g(x))$, is (a) $\pm\sqrt{n\pi}, n\in\{0,1,2,.\}$ (b)$\pm\sqrt{n\pi}, n\in\{1,2,.\}$ (c) $\frac{\pi}{2}+2n\pi, n\in\{,-2,-1,0,1,2\}$ (d) $2n\pi, n\in\{,-2,-1,0,1,2,\}$

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790. IF the lengths of the side of triangle are $3, 5 \text{ and } 7,$ then the largest angle of the triangle is

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

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

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

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

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791. For $x \in (0, \pi)$ the equation $\sin x + 2\sin 2x - \sin 3x = 3$ has

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792. Match list-I with list-II and select the correct answer using the codes given below the lists.

List-I (Genomic Structures)	List-II (Elucidation)
A. Nucleolar organizers	1. One condensed X chromosome in the somatic Inter-phase nucleus of mammalian female.
B. Nucleosome	2. An octamer of four groups of histones (H_2A, H_2B, H_3 & H_4) complexed with DNA.
C. Constitutive heterochromatin	3. Repetitive seque-nce DNA.
D. Facultative heterochromatin	4. Certain chromo-somal secondary constrictions cod-ing for 18S and 28S

i. A-1,B-2,C-4,D-3

ii. A-4,B-2,C-3,D-1

iii. A-3,B-4,C-2,D-1

iv. A-2,B-3,C-1,D-4

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793. In a triangle ABC, $\angle B = \frac{\pi}{3}$ and $\angle C = \frac{\pi}{4}$. Let D divide side BC internally in the ratio 1:3.

Then $\frac{\sin(\angle BAD)}{\sin(\angle CAD)}$ is

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794. If $\cos\theta_1 = 2\cos\theta_2$, then $\tan\left(\frac{\theta_1 - \theta_2}{2}\right)\tan\left(\frac{\theta_1 + \theta_2}{2}\right)$ is equal to

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

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

C. 1

D. -1

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795. If $\left(\text{cosec}^2\theta - 4\right)x^2 + \left(\cot\theta + \sqrt{3}\right)x + \frac{\cos^2(3\pi)}{2} = 0$ holds true for all real x, then the most general values of θ can be given by $n \in Z$) $2n\pi + \frac{11\pi}{6}$ (b) $2n\pi + \frac{5\pi}{6}$ $2n\pi \pm \frac{7\pi}{6}$ (d) $n\pi \pm \frac{11\pi}{6}$

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796. Which of the following is the value of $\sin 27^0 - \cos 27^0$? (a) $-\frac{\sqrt{3-\sqrt{5}}}{2}$

(b) $\frac{\sqrt{5-\sqrt{5}}}{2}$ (c) $-\frac{\sqrt{5}-1}{2\sqrt{2}}$ (d) none of these

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797. In triangle ABC, a, b, c are the lengths of its sides and A, B, C are the angles of triangle ABC. The correct relation is given by (a) $(b-c)\sin\left(\frac{B-C}{2}\right) = a\frac{\cos A}{2}$ (b) $(b-c)\cos\left(\frac{A}{2}\right) = a\sin\left(\frac{B-C}{2}\right)$ (c) $(b+c)\sin\left(\frac{B+C}{2}\right) = a\frac{\cos A}{2}$ (d)$(b-c)\cos\left(\frac{A}{2}\right) = 2a\frac{\sin(B+C)}{2}$

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

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799. Let $\tan x - \tan^2 x > 0$ and $|2\sin x| < 1$. Then the intersection of which of the following two sets satisfies both the inequalities?

(a) $x > n\pi, n \in Z$

(b) $x > n\pi - \frac{\pi}{6}, n \in Z$

(c) $x < n\pi - \frac{\pi}{4}, n \in Z$

(d) $x < n\pi + \frac{\pi}{6}, n \in Z$

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800. One angle of an isosceles triangle is 120^0 and the radius of its incircle is $\sqrt{3}$. Then the area of the triangle in sq. units is

(a) $7 + 12\sqrt{3}$ (b) $12 - 7\sqrt{3}$ (c) $12 + 7\sqrt{3}$ (d) 4π

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801. If $\cot^2 x = \cot(x - y) \cdot \cot(x - z)$, then $\cot 2x$ is equal to $\left(x \neq \pm \frac{\pi}{4}\right)$

Watch Video Solution

802. If $x + y = \frac{\pi}{4} and tan x + \tan y = 1, then (n \in Z)$

A. $\sin x = 0 always$

B. when $x = n\pi + \frac{\pi}{4} then y = - n\pi$

C. when $x = n\pi then y = n\pi + \left(\frac{\pi}{4}\right)$

D. when $x = n\pi + \frac{\pi}{4} then y = n\pi - \left(\frac{\pi}{4}\right)$

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803. In ABC, $\left(\cot\left(\frac{A}{2}\right) + \cot\left(\frac{B}{2}\right)\right)\left(a\sin^2\left(\frac{B}{2}\right) + b\sin^2\left(\frac{A}{2}\right)\right) =$ (a) $\cot C$ (b) $c\cot C$ (c) $\cot\left(\frac{C}{2}\right)$ (d) $c\cot\left(\frac{C}{2}\right)$

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804. 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 (a)$\sqrt{13}$ (b) $\sqrt{14}$ (c) $\sqrt{17}$ (d) $\sqrt{15}$

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805. If $0 \leq x \leq 2\pi$, then $2^{\operatorname{cosec}^2(x)} \sqrt{\frac{1}{2}y^2 - y + 1} \leq \sqrt{2}$ (a) is satisfied by exactly one value of y (b) is satisfied by exactly two value of x (c) is satisfied by x for which $\cos x = 0$ (d) is satisfied by x for which $\sin x = 0$

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806. In ABC, internal angle bisector of $\angle A$ meets side BC in D. $DE \perp AD$ meets AC at E and AB at F. Then (a) AE is in $H.P.$ of b and c (b) $AD = \frac{2bc}{b+c}\frac{\cos A}{2}$ (c) $EF = \frac{4bc}{b+c}\frac{\sin A}{2}$ (d) AEF is isosceles

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807. If $y = (1 + tanA)(1 - tanB)$, where $A - B = \frac{\pi}{4}$, then $(y + 1)^{y+1}$ is equal to

A. 9

B. 4

C. 27

D. 81

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808. If $\cos\left(x+\frac{\pi}{3}\right)+\cos x=a$ has real solutions, then (a) number of integral values of a are 3 (b) sum of number of integral values of $a$is 0 (c) when $a=1$, number of solutions for $x\in[0,2\pi]$ are 3 (d) when $a=1$, number of solutions for $x\in[0,2\pi]$ are 2

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809. Solve the equation $\sin^3 x.\cos 3x+\cos^3 x.\sin 3x+\frac{3}{8}=0$

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810. If $\cos 28^0+\sin 28^0=k^3, then \cos 17^0$ is equal to

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

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

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

D. none of these

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811. Solve the following system of simultaneous equation for $x and y$.

$4^{\sin x} + 3^{1/\cos y} = 11$ and $5.16^{\sin x} - 2.3^{1/\cos y} = 2$

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812. If $(1 + \tan\alpha)(1 + \tan 4\alpha) = 2, \alpha \in \left(0, \frac{\pi}{16}\right)$, then α is equal to

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

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

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

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

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813. For the equation $1 - 2x - x^2 = \tan^2(x + y) + \cot^2(x + y)$ (a)exactly one value of x exists (b)exactly two values of x exists (c) $y = -1 + n\pi + \frac{\pi}{4}, n \in Z$ (d)$y = 1 + n\pi + \frac{\pi}{4}, n \in Z$

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814. If $\tan^2\left(\frac{\pi - A}{4}\right) + \tan^2\left(\frac{\pi - B}{4}\right) + \tan^2\left(\frac{\pi - C}{4}\right) = 1$, then ABC is (A) equilateral (B) isosceles (C) scalene (D) none of these

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815. For the smallest positive values of x and y, the equation $2(\sin x + \sin y) - 2\cos(x - y) = 3$ has a solution, then which of the following is/are true? (a)$\frac{\sin(x + y)}{2} = 1$ (b) $\cos\left(\frac{x - y}{2}\right) = \frac{1}{2}$ (c)number of ordered pairs (x, y) is 2 (d)number of ordered pairs $(x, y) is 3$

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816. The minimum vertical distance between the graphs of $y = 2 + \sin x$ and $y = \cos x$ is (a)2 (b)1 (c) $\sqrt{2}$ (d) 2 - $\sqrt{2}$

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817. Find all solution of the equation. $\sin x + \sin\left(\frac{\pi}{8}\right)\sqrt{(1-\cos x)^2 + \sin^2 x} = 0$ in [5π/2, 7π/2].

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818. $\sin^3 x.\sin 3x = \sum^{n} C_m \cos mx m \rightarrow 0$ is an identity in x,where C_m s are constants then find the value of 'n'.

Watch Video Solution

819. Solve $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$ then the value of $\sin(\pi/4+\theta)$

Watch Video Solution

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

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821. Solve the equation $\sin^4x + \cos^4x - 2\sin^2x + \frac{3\sin^2 2x}{4} = 0$

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822. Prove that

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

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823. solve $\sin(2x) + \sin(x) = 0$?

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824. In any triangle ABC, prove that $\sin^3 A\cos(B - C) + \sin^3 B\cos(C - A) + \sin^3 C\cos(A - B) = 3\sin A\sin B\sin C$

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825. Find the smallest positive root of the equation $\sqrt{\sin(1 - x)} = \sqrt{\cos x}$

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

Watch Video Solution

827. Solve the equation $\tan^4 x + \tan^4 y + 2\cot^2 x\cot^2 y = 3 + \sin^2(x + y)$ for the values of x and y.

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828. The value of $\dfrac{2\sin x}{\sin 3x} + \dfrac{\tan x}{\tan 3x}$ is________.

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829. Prove that the equation $2\sin x = |x| + a$ has no solution for $a \in \left(\dfrac{3\sqrt{3} - \pi}{3}, \infty\right)$.

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830. Prove that $\tan\left(\dfrac{\pi}{16}\right) = \sqrt{4 + 2\sqrt{2}} - \left(\sqrt{2} + 1\right)$

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831. Solve the equation $2\sin x + \cos y = 2$ for the value of $x and y$.

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832. $\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right)$

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833. Prove that $\sin\theta + \sin 3\theta + \sin 5\theta + \ldots. + \sin(2n-1)\theta = \frac{\sin^2 n\theta}{\sin\theta}.$

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834. Prove that $\frac{\cos 3x}{\sin 2x \sin 4x} + \frac{\cos 5x}{\sin 4x \sin 6x} + \frac{\cos 7x}{\sin 6x \sin 8x} + \frac{\cos 9x}{\sin 8x \sin 10x} = \frac{1}{2}(\operatorname{cosec} x)[\operatorname{cosec} 2x - \operatorname{cosec} 10x]$

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835. Prove that $2\sin 2^0 + 4\sin 4^0 + 6\sin 6^0 + \ldots\ldots. + 180\sin 180^0 = 90\cot 1^0$.

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836. If $A + B + C = 180^\circ$, then prove that $\cos 2A + \cos 2B + \cos 2C = -1 - 4\cos A\cos B\cos C$.

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837. Prove that in triangle ABC, $\cos^2 A + \cos^2 B - \cos^2 C = 1 - 2\sin A\sin B\cos C$.

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838. In triangle ABC, prove that $\sin(B + C - A) + \sin(C + A - B) + \sin(A + B - C)$

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

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839. Prove that $\sum_{k=1}^{n-1}(n-k)\frac{\cos(2k\pi)}{n} = -\frac{n}{2}$, where $n \geq 3$ is an integer

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840. If $\frac{\tan(\ln 6)\tan(\ln 2)\tan(\ln 3)}{\tan(\ln 6)-\tan(\ln 2)-\tan(\ln 3)} = k,$ then the value of k is_______

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841. In any triangle $ABC, \sin^2 A - \sin^2 B + \sin^2 C$ is always equal to (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) $2\sin A\sin B\sin C$

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

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

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844. 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 minimum values of u^2 is given by : (a) $(a - b)^2$ (b) $2\sqrt{a^2 + b^2}$ (c) $(a + b)^2$ (d) $2\left(a^2 + b^2\right)$

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

____

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847. Prove that

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

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

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849. 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 $4\sin\left(\frac{\alpha}{2}\right) + 3\sin\left(\frac{\beta}{2}\right) + 2\sin\left(\frac{\gamma}{2}\right) + \sin\left(\frac{\delta}{2}\right)$ is equal to (a) $2\sqrt{1 - k}$ (b) $2\sqrt{1 + k}$ (c) $\frac{\sqrt{1 - k}}{2}$ (d) none of these

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850. $\frac{\sin^2 A - \sin^2 B}{\sin A \cos A - \sin B \cos B}$ is equal to

A. $\tan(A - B)$

B. $\tan(A + B)$

C. $\cot(A - B)$

D. $\cot(A + B)$

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

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

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

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

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

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

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853. If $tan^2\theta = 2tan^2\varphi + 1$, prove that $\cos 2\theta + \sin^2\phi$=0.`

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854. If $\tan A.\tan B = \frac{1}{2}, then (5 - 3\cos 2A)(5 - 3\cos 2B) =$ (a)2 (b) 8 (c) 12 (d) 16

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

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856. The value of $\cos^2 10^0 - \cos 10^0 \cos 50^0 + \cos^2 50^0$ is equal to

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

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

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

D. 3

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857. If $\cos\alpha + \cos\beta = \frac{3}{2}$ and $\sin\alpha + \sin\beta = \frac{1}{2}$ and θ is the arithmetic mean of α and β, then $\sin 2\theta + \cos 2\theta$ is equal to

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858. Let $a, b and c$ be real numbers such that $a + 2b + c = 4$. Find the maximum value of $(ab + bc + ca)$

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859. If $\sin x + \operatorname{cosec} x + \tan y + \cot y = 4$ where $x and y \in \left[0, \frac{\pi}{2}\right], then \tan\left(\frac{y}{2}\right)$ 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) $\alpha^2 - \alpha - 1 = 0$

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860. 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 (a) $\frac{3\pi}{4}$ (b) π (c) $\frac{3\pi}{2}$ (d) $\frac{5\pi}{4}$

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861. In ABC, if $\frac{\sin A}{c \sin B} + \frac{\sin B}{c} + \frac{\sin C}{b} = \frac{c}{ab} + \frac{b}{ac} + \frac{a}{bc}$, then the value of angle A is 120^0 (b) 90^0 (c) 60^0 (d) 30^0

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862. Column I Column II The value of $\left(\frac{4 + \sec 20^0}{\operatorname{cosec} 20^0}\right)^2$, is p. 1 The minimum value of $\frac{1 + \cos 2x + 8\sin^2 x}{2\sin 2x}, x\left(0, \frac{\pi}{2}\right)$ is q. 2 The value of $\frac{8\sin 40^0 \sin 50^0 \tan 10^0}{\cos 80^0}$ r. 3 If $\frac{\cos 5A}{\cos A} + \frac{\sin 5A}{\sin A} = a + b\cos 4A$, then $\frac{a^2}{b}$ is s. 4

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863. The value of $\cos\left(\frac{\pi}{7}\right) + \cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{3\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{5\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right) + \cos\left(\frac{7\pi}{7}\right)$ is

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864. If $x^2 + y^2 = 1$ and $P = \left(3x - 4x^3\right)^2 + \left(3y - 4y^3\right)^2$ then P is equal to

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

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866. Prove that $(\cos A - \cos B)^2 + (\sin A - \sin B)^2 = 4\sin^2\left(\frac{A - B}{2}\right)$

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867. Let $f(x) = 2\cos ec2x + \sec x + \cos ecx$, then the minimum value of $f(x)$ for $x \in \left(0, \frac{\pi}{2}\right)$ is

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868. If $\tan\alpha = \frac{1}{7}, \sin\beta = \frac{1}{\sqrt{10}}$ prove that $\alpha + 2\beta = \left(\frac{\pi}{4}\right)$ where $0 < \alpha < \frac{\pi}{2}$ and $0 < \beta < (\pi/2)$

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

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

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871. If $\alpha + \beta = 90^0$, find the maximum and minimum values of $\sin\alpha\sin\beta$.

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872. Find the maximum and minimum value of $\cos^2\theta - 6\sin\theta.\cos\theta + 3\sin^2\theta + 2$

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873. If $p(x) = \sin x\left(\sin^3 x + 3\right) + \cos x\left(\cos^3 x + 4\right) + \left(\frac{1}{2}\right)\sin^2 2x + 5$, then find the range of $p(x)$.

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874. The value of $\operatorname{cosec}\frac{\pi}{18} - 4\sin\left(\frac{7\pi}{18}\right)$ is

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875. If $A + B + C = \frac{3\pi}{2}$, then cos2A +cos2B+cos2C is

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

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877. If A,B,C, are the angles of a triangle such that $\cot\left(\frac{A}{2}\right) = 3\tan\left(\frac{C}{2}\right)$, then $\sin A, \sin B, \sin C$ are in (a)$\ddot{AP}$ (b) $\ddot{GP}$ (c) $\ddot{HP}$ (d) none of these

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878. The maximum value of $\cos^2\left(45^0 + x\right) + (\sin x - \cos x)^2$ is ______

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879. Let $\alpha, \beta and \gamma$ be some angles in the first quadrant satisfying $\tan(\alpha + \beta) = \frac{15}{8} and \operatorname{cosec}\gamma = \frac{17}{8}$, then which of the following hold(s) good? (a) $\alpha + \beta + \gamma = \pi$ (b)$\cot\alpha + \cot\beta + \cot\gamma = \cot\alpha\cot\beta\cot\gamma$ (c) $\tan\alpha + \tan\beta + \tan\gamma = \tan\alpha\tan\beta\tan\gamma$ (d)$\tan\alpha\tan\beta + \tan\beta\tan\gamma + \tan\gamma\tan\alpha = 1$

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880. If $\tan x = n\tan y, n \in R^+$, then the maximum value of $\sec^2(x - y)$ is equal to (a)$\frac{(n+1)^2}{2n}$ (b) $\frac{(n+1)^2}{n}$ (c)$\frac{(n+1)^2}{2}$ (d) $\frac{(n+1)^2}{4n}$

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881. Prove that: $\frac{1 + \sin\theta - \cos\theta}{1 + \sin\theta + \cos\theta} = \tan\left(\frac{\theta}{2}\right)$

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882. 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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883. If $a \le 3\cos x + 5\sin\left(x - \frac{\pi}{6}\right) \le b$ for all x then (a, b) is (a)$\left(-\sqrt{19}, \sqrt{19}\right)$ (b) $(-17, 17)$ $\left(-\sqrt{21}, \sqrt{21}\right)$ (b) *noneofthese*

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

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885. If $\sin\left(x + 20^0\right) = 2\sin x\cos 40^0, where \in \left(0, \frac{\pi}{2}\right)$, then which of the following hold(s) good? (a)$\cos 2x = \frac{1}{2}$ (b) $\operatorname{cosec} 4x = 2$ (c)$\sec\left(\frac{x}{2}\right) = \sqrt{6} - \sqrt{2}$ (d) $\tan\left(\frac{x}{2}\right) = \left(2 - \sqrt{3}\right)$

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886. $\frac{\cos\theta}{1 - \tan\theta} + \frac{\sin\theta}{1 - \cot\theta}$ is equals to

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887. 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 is

A. 1

B. 0

C. -1

D. none of these

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888. Prove that : $(\text{cosec}\theta - \cot\theta)^2 = \frac{1 - \cos\theta}{1 + \cos\theta}$

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889. 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) $\sin(\alpha - \beta)$ $\sin(\alpha + \beta)$ (d) none of these

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890. $\frac{1 + \sin 2\theta + \cos 2\theta}{1 + \sin 2\theta - \cos 2\theta} = ?$

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

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

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892. 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

A. -1

B. 1

C. 2

D. -2

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893. on a cartesian plane, draw a line segment XY parallel to x-axis at a distance of 5units from x-axis and a line segment PQ parallel to y-axis at a distance of 3 units from y-axis .write the co-ordinates of their point of intersection.

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

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

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896. $\frac{\sqrt{2} - \sin\alpha - \cos\alpha}{\sin\alpha - \cos\alpha}$ is equal to (a)$\sec\left(\frac{\alpha}{2} - \frac{\pi}{8}\right)$ (b)$\cos\left(\frac{\pi}{8} - \frac{\alpha}{2}\right)$ (c) $\tan\left(\frac{\alpha}{2} - \frac{\pi}{8}\right)$ (d)$\cot\left(\frac{\alpha}{2} - \frac{\pi}{2}\right)$

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

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

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899. 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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900. If $\cot(\alpha + \beta) = 0$, then $\sin(\alpha + 2\beta)$ can be

A. $-\sin\alpha$

B. $\sin\beta$

C. $\cos\alpha$

D. $\cos\beta$

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

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902. Prove that: $\frac{\sin 2\theta}{1 + \cos 2\theta} = \tan\theta$

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903. 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

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

A. $\sin 36^0, \sin 18^0$

B. $\sin 18^0, \cos 36^0$

C. $\sin 36^0, \cos 18^0$

D. $\cos 18^0, \cos 36^0$

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

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907. the least positive value of x satisfying $\frac{\sin^2 2x + 4\sin^4 x - 4\sin^2 x\cos^2 x}{4 - \sin^2 2x - 4\sin^2 x} = \frac{1}{9}$ is

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908. Prove that $\tan\left(\frac{\pi}{16}\right) + 2\tan\left(\frac{\pi}{8}\right) + 4 = \cot\left(\frac{\pi}{16}\right)$.

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909. Show that $\sqrt{2 + \sqrt{2 + 2\cos 4\theta}} = 2\cos\theta$

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

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

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912. If $\tan\left(\frac{\alpha}{2}\right) = \sqrt{\frac{a - b}{a + b}}\tan\left(\frac{\beta}{2}\right)$ prove that $\cos\alpha = \frac{a\cos\beta + b}{a + b\cos\beta}$

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913. $\left(\cos^4\left(\frac{\pi}{8}\right)\right) + \left(\cos^4\left(\frac{3\pi}{8}\right)\right) + \left(\cos^4\left(\frac{5\pi}{8}\right)\right) + \left(\cos^4\left(\frac{7\pi}{8}\right)\right)$ is

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914. If $\pi < x < 2\pi$, prove that $\frac{\sqrt{1 + \cos x} + \sqrt{1 - \cos x}}{\sqrt{1 + \cos x} - \sqrt{1 - \cos x}} = \cot\left(\frac{x}{2} + \frac{\pi}{4}\right)$.

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915. 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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916. 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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917. Prove that $\sqrt{\sin^4 x + 4\cos^2 x} - \sqrt{\cos^4 x + 4\sin^2 x} = \cos 2x$

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

A. equilateral

B. isosceles

C. right angled

D. none of these

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

____

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920. Which of the following quantities are rational? (a)$\sin\left(\frac{11\pi}{12}\right)\sin\left(\frac{5\pi}{12}\right)$ (b) $\operatorname{cosec}\left(\frac{9\pi}{10}\right)\sec\left(\frac{4\pi}{5}\right)$ (c)$\sin^4\left(\frac{\pi}{8}\right) + \cos^4\left(\frac{\pi}{8}\right)$ (d) $\left(1 + \cos\left(\frac{2\pi}{9}\right)\right)\left(1 + \cos\left(\frac{4\pi}{9}\right)\right)\left(1 + \cos\left(\frac{8\pi}{9}\right)\right)$

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921. If $\log_{10}\sin x + \log_{10}\cos x = -1$ and $\log_{10}(\sin x + \cos x) = \frac{\left(\log_{10}n\right) - 1}{2}$, then the value of $'n/3'$ is ......

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922. If $\tan(\alpha - \beta) = \frac{\sin 2\beta,}{3 - \cos 2\beta}$ then (a)$\tan\alpha = 2\tan\beta$ (b) $\tan\beta = 2\tan\alpha$ (c) $2\tan\alpha = 3\tan\beta$ (d) $3\tan\alpha = 2\tan\beta$

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923. If $\cos\beta$ is the geometric mean between $\sin\alpha and \cos\alpha$, where $0 < \alpha, \beta < \frac{\pi}{2}$, then$\cos 2\beta$ is equal to

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

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924. In a triangle ABC, if $A-B=120^0 and \sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)=\frac{1}{32}$, then the value of $8\cos C$ is______

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925. In a ΔPQR, $\angle R=\frac{\pi}{2}$. If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2+bx+c=0, a\neq 0$, then

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

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927. 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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928. If $\sin^{-1}a + \sin^{-1}b + \sin^{-1}c = \pi,$ then the value of $a\sqrt{\left(1 - a^2\right)} + b\sqrt{\left(1 - b^2\right)} + c\sqrt{\left(1 - c^2\right)}$ will be (A) $2abc$ (B) abc (C) $\frac{1}{2}abc$ (D) $\frac{1}{3}abc$

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929. Find the sum of the series $\operatorname{cosec}\theta + \operatorname{cosec}2\theta + \operatorname{cosec}4\theta + \rightarrow n\,terms$.

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

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931. If $0 < \alpha < \frac{\pi}{2}$ and $\sin\alpha + \cos\alpha + \tan\alpha + \cot\alpha + \sec\alpha + \text{cosec}\alpha = 7$, then prove that $\sin 2\alpha$ is a root of the equation $x^2 - 44x - 36 = 0$.

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932. Prove that $1 + \cot\theta \leq \cot\left(\frac{\theta}{2}\right)$ for $0 < \theta < \pi$. Find θ when equality signs holds.

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933. 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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934. Eliminate x from equations $\sin(a + x) = 2b$ and $\sin(a - x) = 2c$.

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

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936. show that $\frac{\sin x}{\cos 3x} + \frac{\sin 3x}{\cos 9x} + \frac{\sin 9x}{\cos 27x} = \frac{1}{2}(\tan 27x - \tan x)$

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937. 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

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

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

C. $a + b$

D. none of these

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938. The value of $\tan 6^0 \tan 42^0 \tan 66^0 \tan 78^0$ is (a)1 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

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939. In triangle ABC , if angle is 90^0 and the area of triangle is $30sq$ units, then the minimum possible value of the hypotenuse c

A. $30\sqrt{2}$

B. $60\sqrt{2}$

C. $120\sqrt{2}$

D. $2\sqrt{30}$

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

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941. 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 (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) $\frac{\pi}{5} and \frac{3\pi}{10}$

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942. A circular ring of radius 3 cm hangs horizontally from a point 4 cm vertically above its centre by 4 strings attached at equal intervals to its circumference . If the angle between two consecutive strings is$then$,then find the value of cos$then$

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943. If $\tan\beta = 2\sin\alpha\sin\gamma\operatorname{cos}ec(\alpha + \gamma)$, then $\cot\alpha, \cot\beta, \cot\gamma$ are in (a)A.P. (b) G.P. (c) H.P. (d) none of these

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944. $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$ is equal to

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945. 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 (a) x
(b) $\frac{1}{x}$ (c) $\frac{\sqrt{2}}{x}$ (d) $\frac{x}{\sqrt{2}}$

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946. If $\frac{\tan 3A}{\tan A} = k(k \neq 1)$ then which of the following is not true?

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

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

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

D. none of these

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947. 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 (a) 1 (b) 2 (c) -2 (d) none of these

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948. If $\cos x = \frac{2\cos y - 1}{2 - \cos y}$, where $x, y \in (0, \pi)$ then $\tan\left(\frac{x}{2}\right) \times \cot\left(\frac{y}{2}\right)$ is equal to

(a) $\sqrt{2}$

(b) $\sqrt{3}$

(c) $\frac{1}{\sqrt{2}}$

(d) $\frac{1}{\sqrt{3}}$

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949. If θ is eliminated from the equations $x = a\cos(\theta - \alpha)$ and $y = b\cos(\theta - \beta)$, then $\left(\frac{x^2}{a^2}\right) + \left(\frac{y^2}{b^2}\right) - \frac{2xy}{ab}\cos(\alpha - \beta)$ is equal to (a) $\sec^2(\alpha - \beta)$ (b) $cosec^2(\alpha - \beta)$ (c)$\cos^2(\alpha - \beta)$ (d) $\sin^2(\alpha - \beta)$

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950. If $\tan x = \frac{b}{a}$, then $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$ is equal to

(a)$2\sin x/\sqrt{\sin 2x}$

(b) $2\cos x/\sqrt{\cos 2x}$

(c)$2\cos x/\sqrt{\sin 2x}$

(d) $2\sin x/\sqrt{\cos 2x}$

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951. Given that $\left(1+\sqrt{1+x}\right)\tan y = 1+\sqrt{1-x}$. Then $\sin 4y$ is equal to

(a)$4x$

(b) $2x$

(c) x

(d) none of these

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952. If $\cos 2B = \dfrac{\cos(A+C)}{\cos(A-C)}$, then $\tan A$, $tanB$, $\tan C$ are in

(a)A.P.

(b) G.P.

(c) H.P.

(d) none of these

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

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

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955. Given $\alpha + \beta - \gamma = \pi$, prove that $\sin^2\alpha + \sin^2\beta - \sin^2\gamma = 2\sin\alpha\sin\beta\cos\gamma$.

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

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957. The value of $\operatorname{cosec}10^0 + \operatorname{cosec}50^0 - \operatorname{cosec}70^0$ is ____

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958. Column I, a) $\int \frac{e^{2x} - 1}{e^{2x} + 1} dx$ is equal to b) $\int \frac{1}{\left(e^x + e^{-x}\right)^2} dx$ is equal to c) $\int \frac{e^{-x}}{1 + e^x} dx$ is equal to d) $\int \frac{1}{\sqrt{1 - e^{2x}}} dx$ is equal to COLUMN II p) $x - \log\left[1 + \sqrt{1 - e^{2x}} + c\right.$ q) $\log\left(e^x + 1\right) - x - e^{-x} + c$ r) $\log\left(e^{2x} + 1\right) - x + c$ s) $-\frac{1}{2\left(e^{2x} + 1\right)} + c$

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

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960. 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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961. The maximum value of $4\sin^2 x + 3\cos^2 x + \sin\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right)$ is

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

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

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

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

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966. Prove that $\left(1 + \tan 1^0\right)\left(1 + \tan 2^0\right)......\left(1 + \tan 45^0\right) = 2^{23}$.

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967. Find the value of

$$\frac{\cot 25^0 + \cot 55^0}{\tan 25^0 + \tan 55^0} + \frac{\cot 55^0 + \cot 100^0}{\tan 55^0 + \tan 100^0} + \frac{\cot 100^0 + \cot 25^0}{\tan 100^0 + \tan 25^0}$$

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968. 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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969. $16\left(\cos\theta - \cos\left(\frac{\pi}{8}\right)\right)\left(\cos\theta - \cos\left(\frac{3\pi}{8}\right)\right)\left(\cos\theta - \cos\left(\frac{5\pi}{8}\right)\right)\left(\cos\theta - \cos\left(\frac{7\pi}{8}\right)\right) = \lambda\cos 4\theta,$ then the value of λ is ____.

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970. 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 $2\sin a - 6\sin b + 7\sin c - 9\sin d = 0,$ then the value of $3\frac{\cos(a + d)}{\cos(b + c)}$ is_____

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971. The maximum value of the expression $\frac{1}{\sin^2\theta + 3\sin\theta\cos\theta + 5\cos^2\theta}$ is

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972. $(\sec 2x - \tan 2x)$ equals

a) $\tan\left(x - \frac{\pi}{4}\right)$

b) $\tan\left(\frac{\pi}{4} - x\right)$

c) $\cot\left(x - \frac{\pi}{4}\right)$

d) $\tan^2\left(x + \frac{\pi}{4}\right)$

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973. Prove that $\cos 65^0 + \cos 115^0 = 0$

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974. If $\sin A = \sin B$ and $\cos A = \cos B$, then prove that $\sin\left(\frac{A - B}{2}\right) = 0$

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975. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: The minimum value of $27^{\cos 2x} 81^{\sin 2x}$ is $\frac{1}{243}$ Statement 2: The minimum value of $a\cos\theta + b\sin\theta is - \sqrt{a^2 + b^2}$

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976. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\frac{\sin\pi}{18}$ is a root of $8x^3 - 6x + 1 = 0$ Statement 2: For any $\theta \in R, \sin 3\theta = 3\sin\theta - 4\sin^3\theta$

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977. $\cos A + \cos B + \cos C = 1 + 4\frac{\sin A}{2}\frac{\sin B}{2}\frac{\sin C}{2},$ if A, B, C are the angles of a triangle.

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978. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: If in a triangle, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then one of the angles must be 90 Statement 2: In any triangle, $\sin^2 A + \sin^2 B + \sin^2 C = 2 + 2\cos A\cos B\cos C$

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979. Each question has four choices, a,b,c and d, out of which only one is correct. Each question contains STATEMENT 1 and STATEMENT 2. If both the statement are TRUE and STATEMENT 2 is the correct explanation of STATEMENT 1. If both the statements are FALSE but STATEMENT 2 is NOT the correct explanation of STATEMENT 1. If STATEMENT 1 is TRUE and STATEMENT 2 is FLASE. If STATEMENT 1 is FALSE and STATEMENT 2 is TURE.

Statement 1: Lagrange mean value theorem is not applicable to $f(x) = |x - 1|(x - 1)$ Statement 2: $|x - 1|$ is not differentiable at $x = 1$.

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980. : In $\dot{ABC}$ Show that, $\tan A + \tan B + \tan C = \tan A \tan B \tan C$

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981. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\frac{\sin\pi}{18}$ is a root of $8x^3 - 6x + 1 = 0$ Statement 2: For any $\theta \in R, \sin 3\theta = 3\sin\theta - 4\sin^3\theta$

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982. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: $\tan 5^0$ is an irrational number Statement 2: $\tan 15^0$ is an irrational number.

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983. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: a.) If both the statements are true and Statement 2 is the correct explanation of statement 1. b.)If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is

True. Statement 1: $\tan 5^0$ is an irrational number Statement 2: $\tan 15^0$ is an irrational number. In $\left(\frac{\cot A}{2}+\frac{\cot B}{2}+\frac{\cot C}{2}\right)=\frac{\ln\cot A}{2}+\frac{\ln\cot B}{2}+\frac{\ln\cot C\cdot}{2}$

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984. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. Statement 1: The maximum value of $\sin\sqrt{2}x+\sin ax$ cannot be 2 (a is positive rational number) Statement 2: $\frac{\sqrt{2}}{a}$ is irrational.

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985. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: a) If both the statements are true and Statement 2 is the correct explanation of statement 1. b) If both the statements are True but Statement 2 is not the correct explanation of Statement 1. c) If Statement 1 is True and Statement 2 is False. d) If Statement 1 is False and Statement 2 is True. Statement 1: If A, B, C are the angles of a triangle such that angle A is obtuse, then $\tan B tan C > 1$. Statement 2: In any triangle, $\tan A = \frac{\tan B + \tan C}{\tan B \tan C - 1}$

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986. . $If xy + yz + zy = 1, where x, y, z \in R^+$, then $\frac{x}{1 + x^2} + \frac{y}{1 + y^2} + \frac{z}{1 + z^2} = \frac{2}{\sqrt{\left(1 + x^2\right)\left(1 + y^2\right)\left(1 + z^2\right)}}$

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987. Each question has four choices a,b,c and d out of which only one is correct. Each question contains Statement 1 and Statement 2. Make your answer as: If both the statements are true and Statement 2 is the correct explanation of statement 1. If both the statements are True but Statement 2 is not the correct explanation of Statement 1. If Statement 1 is True and Statement 2 is False. If Statement 1 is False and Statement 2 is True. If $A+B+C=\pi,$ then Statement 1: $\cos^2 A+\cos^2 B+\cos^2 C$ has its minimum value $\frac{3}{4}\cdot$ Statement 2: Maximum value of $\cos A \cos B \cos C$ is $\frac{1}{8}$

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