MATHS

BOOKS - CENGAGE PUBLICATION

TRIGONOMETRIC FUNCTIONS

Illustration

1. Find the length of the chord which subtends an angle of 120° at the centre of the circle of radius 6 cm.

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2. 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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3. 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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4. Two parallel chords of a circle of radius 2 units are $\left(\sqrt{3}+1\right)$ units apart. If these chords subtend, at the centre, angles of $\frac{90^\circ}{k}$ and $\frac{180^\circ}{k}$, where $k > 0$, then find the value of k.

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5. Find the height of the regular pyramid with each edge measuring l cm.

Also,

if α is angle between any edge and face not containing that edge, then prove that $\cos\alpha = \frac{1}{\sqrt{3}}$

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6. By geometrical interpretation, prove that

$\sin(\alpha+\beta)s \in \alpha\cos\beta+\sin\beta\cos\alpha$

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

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7. By geometrical interpretation, prove that

$\tan(\alpha+\beta)=\dfrac{\tan\alpha+\tan\beta}{1=\tan\alpha\tan\beta}$

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

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9. For acute angle θ, Prove that $\sin\theta<\theta<\tan\theta$.

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10. 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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11. Show that $3\left(\sin^4 x + \cos^4 x\right) - 2\left(\sin^6 x + \cos^6 x\right) = 1.$

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12. Prove that $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \cos ec\theta - \cot\theta.$

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13. Prove that $\frac{1+\sec A}{\sec A} = \frac{\sin^2 A}{1-\cos A}.$

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14. If $3\sin\theta + 4\cos\theta = 5$, then show that $4\sin\theta - 3\cos\theta = 0$.

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15. If

$(\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C) = (\sec A - \tan A)(\sec B -$

prove that the value of each side is +-1.

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16. If $\tan\theta + \sec\theta = 2.5$, find $\sin\theta$, $\tan\theta$ and $\sec\theta$.

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17. If $\cos ec\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$, elimnate θ.

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18. Prove that, $\cot A = \sqrt{\frac{1-\sin^2 A}{\sin^2 A}}$

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19. If $x = \sec\theta - \tan\theta$ and $y = \cos ec\theta + \cot\theta$, then prove that $xy + 1 = y - x$.

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20. For acute angle θ, prove the following:

$\sec^2\theta + \cos ec^2\theta \geq 4$

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

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22. Express 2.4 rad in degree measure.

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23. Find the length of an arc of a circle of radius 7 cm subtending a central angle measuring 30^0.

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24. Find in degrees the angle subtended at the centre of a circle of diameter 100cm by an arc of length 22 cm.

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25. If arcs of same length in two circles subtend angles of $30^0 and 45^0$ at their centers, find the ratios of their radii.

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26. 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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27. 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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28. Prove that, $(1+\tan A)^2+(1-\tan A)^2=2\sec^2 A$

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29. 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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30. Find the reference angles corresponding to each of the following angles. It may help if you sketch θ in standard position. $\theta = 640^\circ$

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

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33. Which of the following is not possible?

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

B. $\tan\theta = 1002$

C. $\cos\theta = \frac{1+p^2}{1-p^2}, (p \neq 0, \pm 1)$

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

Answer:

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

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36. Which of the following is the greatest? tan 1, tan 4, tan 7, tan 10

A. tan 1

B. tan 4

C. tan 7

D. tan 10

Answer: tan 1

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

A. sin 3

B. sin 2

C. sin 1

D. sin 7

Answer: D

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38. Which of the following is the greates? $\cos ec1$ (b) $\cos ec2$ $\cos ec4$ (d) $\cos ec(-6)$

A. cosec 1

B. cosec 2

C. cosec 4

D. cosec (-6)

Answer: D

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39. If $A = 4\sin\theta + \cos^2\theta,$ then which of the following is not true? (a) maximum value of $Ais5.$ (b)minimum value of $Ais -4$ (c) maximum value of A occurs when $\sin\theta = \frac{1}{2}\cdot$ (d) Minimum value of A occurs when $\sin\theta$=1

A. Maximum value of A is 5 .

B. Minimum value of A is -4

C. Maximum value of A occurs when $\sin\theta = 1/2$

D. Minimum value of A occurs when $\sin\theta = 1.$

Answer: ACD

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

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

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42. 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

A. 3

B. -3

C. -1

D. -2

Answer:

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43. For real values of $\theta,$ which of the following is/are always positive? $\cos(\cos\theta)$ (b) $\cos(\sin\theta)$ $\sin(\cos\theta)$ (d) $\sin(\sin\theta)$

A. $\cos(\cos\theta)$

B. $\cos(\sin\theta)$

C. $\sin(\cos\theta)$

D. $\sin(\sin\theta)$

Answer:

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

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45. Find the range of $f(x) = \cos ec^2 x + \sin^2 x$.

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46. Find the range of $f(x) = \cot^2 x + \tan^2 x$.

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47. Find the range of $f(x) = \sin^2 x - 5\sin x + 6$.

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48. Find the range of $f(x) = \sqrt{\sin^2 x - 8\sin x + 16} + 2$.

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

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50. 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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51. Which of the following is/are correct?

a. $(\tan x)^{In(\cos x)} < (\cot x)^{\ln(\cos x)} \ \forall x \in \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

b. $(\sin x)^{In(\sec x)} > (\cos x)^{\in(\cos x)} \ \forall x \in \left(0, \frac{\pi}{4}\right)$

c. $\left(sec\frac{\pi}{3}\right)^{In(\tan x)} > \left(sec\frac{\pi}{3}\right)^{In(\cos x)} \ \forall x \in \left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

d. $\left(\frac{1}{2}\right)^{In(\sin x)} > \left(\frac{3}{4}\right)^{In(\sin x)} \ \forall x \in \left(0, \frac{\pi}{2}\right)$

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

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53. Find the values of the following trigonometric ratios : $\cos 225^\circ$, $\sin 690^\circ, \tan(-390^\circ), \sec 855^\circ$

A. $\cos 225^\circ$

B. $\sin 690^\circ$

C. $\tan(-390^\circ)$

D. $\sec 855^\circ$

Answer:

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

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

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

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57. Find

$\tan 1^0 \tan 2^0 \ldots\ldots \tan 89^0$

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58. Show that $\sin^2 3^0 + \sin^2 6^0 + \sin^2 9^0 + \ + \sin^2 90^0 = 15\frac{1}{2}$.

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

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60. If $\cos\left(120^0-\alpha\right)=\cos\left(120^0-\beta\right), 0<\alpha, \beta<\pi$, then find the relation between $(\alpha$ and $\beta.)$

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61. 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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62. In triangle ABC prove that

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

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Example

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

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2. If $u_n = \sin^n \theta + \cos^n \theta$, then prove that $\frac{u_4 - u_6}{u_2 - u_4} = \frac{1}{2}$.

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3. If $a^2 + b^2 + 2ab\cos\theta = 1, c^2 + a^2 + 2cd\cos\theta = 1$ and $ac + bd + (ad + bc)\cos\theta = 0$, then prove that $a^2 + c^2 = \cos ec^2\theta$

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4. 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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5. 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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6. If $x = \frac{\sin^3 p}{\cos^2 p}, y = \frac{\cos^3 p}{\sin p}$ and $\sin p + \cos p = \frac{1}{2}$ then find the value of $x + y$.

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7. If $\frac{\sin A}{\sin B} = \frac{\sqrt{3}}{2}$ and $\frac{\cos A}{\cos B} = \frac{\sqrt{5}}{2}, 0 < A, B < \frac{\pi}{2}$, then $\tan A + \tan B$ is equal to

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

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

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Concept Application Exercises 2 1

1. Two sides of a parallelogram are 12 cm and 8 cm. If one of the interior angles is 135°, then find area of the parallelogram.

A. $A.\ 45\sqrt{2}$ sq. cm

B. B. $48\sqrt{2}$ sq. cm

C. C. $50\sqrt{2}$ sq. cm

D. D. None of These

Answer: $48\sqrt{2}$ **sq. cm**

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2. In triangle $ABC, AB = 6, AC = 3\sqrt{6}, \angle B = 60^\circ$ and $\angle C = 45^\circ$. Find length of side BC.

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3. 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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4. 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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5. A nine-side regular polygon with side length 2, is inscribed in a circle. The radius of the circle is

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6. 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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7. 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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8. If $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$, then prove that $\tan^2\alpha = \cos^2\beta - \sin^2\beta$.

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Concept Application Exercises 2 2

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

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2. If $15\sin^4\alpha + 10\cos^4\alpha = 6$, then the value of $8\,\text{cosec}^6\alpha + 27\sec^6\alpha$ is

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3. If $\sec\theta + \tan\theta = p$. Then find the value of $\tan\theta$.

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4. If (1+sinA)(1+sinB)(1+sinC) = (1-sinA)(1-sinB)(1-sinC), then prove that the value of each side = $\pm\cos A\cos B\cos C$,

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5. If $(\sec\theta + \tan\theta)(\sec\phi + \tan\phi)(\sec\Psi + \tan\Psi) = \tan\theta\tan\phi\tan\Psi$, then prove that "

$(\sec\theta - \tan\theta)(\sec\phi - \tan\phi)(\sec\Psi - \tan\Psi) = \cot\theta.\cot\phi.\cot\Psi$

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6. $If: \frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ and $\frac{x}{a}\sin\theta - \frac{y}{b}\cos\theta = 1$, Prove that : $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2$

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7. If $a + b\tan\theta = \sec\theta$ and $b - a\tan\theta = 3\sec\theta$, then findthe value of $a^2 + b^2$.

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8. If $a\sin^2 x + b\cos^2 x = c, b\sin^2 y + a\cos^2 y = d,$ and $a\tan x = b\tan y,$ then prove that $\frac{a^2}{b^2} = \frac{(d-a)(c-a)}{(b-c)(b-d)}$.

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Concept Application Exercises 2 3

1. A horse is tied to a post by a rope. If the horse moves along a circular path always keeping the rope tight, and describes 88 metres when it traces 72° at the centre, find the length of the rope.

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2. If the angular diameter of the moon be 30, how far from the eye a coin of diameter $2.\ 2cm$ be kept to hide the moon?

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3. Find the degrees and radians the angle between the hour hand and the minute hand of a clock at half past three.

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4. There is an equilateral triangle with side 4 and a circle with the centre on one of the vertex of that triangle. The arc of that circle divides the triangle into two parts of equal area. How long is the radius of the circle?

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Concept Application Exercises 2 4

1. Let (-3, -4) be a point on the terminal side of θ. Find the sine, cosine and tangent of θ.

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2. Find the reference angle $\theta'$for the following angles in standerd position : $\theta = 300^\circ$

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3. Evaluate each of the following trigonometric functions:

$\cos ec. \frac{11\pi}{4}$

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4. State if the given pairs of angles are coterminal.

(a) $-185^\circ, 535^\circ$ (b) $1000^\circ, 270^\circ$ (c) $\frac{15\pi}{4}, -\frac{17\pi}{4}$

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Concept Application Exercises 2 5

1. Find the range of $f(x) = \frac{8}{\sin x + 3}$

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2. Find the range of $f(x) = \sin(\cos x)$.

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3. Find the range of $12\sin\theta - 9\sin^2\theta$

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4. Find the minimum value of $16\tan^2\theta + 9\cot^2\theta$

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5. Which of following is correct (where $n \in N$) ?

A. $\sin\theta = \dfrac{n+1}{n}$

B. $\sin\theta = \dfrac{n^2+1}{n+1}$

C. $\sec\theta = \dfrac{n+2}{n-1}$

D. $\sec\theta = \dfrac{n}{\sqrt{n^2+1}}$

Answer: C

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6. If $\sin^2\theta_1 + \sin^2\theta_2 + \ldots + \sin^2\theta_n = 0$, then find the minimum value of $\cos\theta_1 + \cos\theta_2 + \ldots + \cos\theta_n$.

A. A. n

B. B. - n

C. C. 2n

D. D. - 2n

Answer: $-n$

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7. If $\sin^2\theta = x^2 - 3x + 3$ is meaningful, then find the values of x.

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8. If $a, b, c \in R$ then prove that $\sec^2\theta = \frac{bc + ca + ab}{a^2 + b^2 + c^2}$ only if a = b = c.

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9. Find the range of $f(x) = \sqrt{4 - \sqrt{1 + \tan^2 x}}$.

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10. Find the range of $f(x) = \frac{1}{2|\cos x| - 3}$

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11. Find the range of $f(x) = \cos^4 x + \sin^2 x - 1$.

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12. Find the minimum value of the function

$f(x) = (1 + \sin x)(1 + \cos x),\ \forall x \in R.$

A. A. 0

B. B. - 1

C. C. - 2

D. D. None of These

Answer: 0

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13. Prove that $(\sin\theta + \cos ec\theta)^2 + (\cos\theta + \sec\theta)^2 \geq 9.$

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14. Find the range of $f(x) = \cos ec^2 x + 25\sec^2 x.$

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15. If $\cos^2 x + \cos x = a + 2$, then find the value of a for which equation has solution.

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16. If $a^2 + 2a + \cos ec^2\left(\frac{\pi}{2}(a + x)\right) = 0$, then, find the values of a and x.

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Concept Application Exercises 2 6

1. Prove that: $tan720^0 - \cos 270^0 - \sin 150^0 \cos 120^0 = \frac{1}{4}$

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Concept Application Exercises 2 7

1. Find the value of the expression

$\sec 610^\circ \cos ec160^\circ - \cot 380^\circ \tan 470^\circ$

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Concept Application Exercises 2 8

1. If $\alpha = \frac{\pi}{3}$, prove that

$\cos\alpha \cos 2\alpha \cos 3\alpha \cos 4\alpha \cos 5\alpha \cos 6\alpha = -\frac{1}{16}$

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Concept Application Exercises 2 9

1. Find the value of $\tan.\frac{\pi}{20}\tan.\frac{3\pi}{20}\tan.\frac{5\pi}{20}\tan.\frac{7\pi}{20}\tan.\frac{9\pi}{20}$.

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Concept Application Exercises 2 10

1. Find the value of $\frac{\cot 54^\circ}{\tan 36^\circ} + \frac{\tan 20^\circ}{\cot 70^\circ}$

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Concept Application Exercises 2 11

1. Prove that: $\sin^2\left(\frac{\pi}{18}\right) + \sin^2\left(\frac{\pi}{9}\right) + \sin^2\left(\frac{7\pi}{18}\right) + \sin^2\left(\frac{4\pi}{9}\right) = 2$

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Concept Application Exercises 2 12

1. Prove that: $\sec\left(\frac{3\pi}{2} - \theta\right)\sec\left(\theta - \frac{5\pi}{2}\right) + tan\left(\frac{5\pi}{2} + \theta\right)\tan\left(\theta - \frac{3\pi}{2}\right) = -1.$

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Concept Application Exercises 2 13

1. If $\theta = \frac{\pi}{4n}$ then the value of $\tan\theta\tan(2\theta)\tan(3\theta)....\tan((2n-1)\theta)$ is

A. -1

B. 1

C. 0

D. 2

Answer: 1

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Concept Application Exercises 2 14

1. If any quadrilateral ABCD, prove that $\sin(A+B)+\sin(C+D)=0$

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

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Exercises

1. If $\tan\theta = 3, \quad \text{then} \quad \frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$ is equal to

A. 0

B. 1

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

D. 2

Answer: C

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2. If $\tan\theta = -\frac{4}{3}, \quad \text{then} \quad \cos\theta$ is

A. $-\frac{3}{5}$ but not $\frac{3}{5}$

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

C. $\frac{3}{5}$ but not $-\frac{3}{5}$

D. None of these

Answer: B

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3. If $\cos x + \sec x = 2$, then $\cos^n x + \sec^n x$ is equal to

A. 2

B. 2^n

C. 2^{n-1}

D. 2^{n-2}

Answer: A

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

Answer: D

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5. If $\cos ec\theta + \cot\theta = m$, then the value of $\cos ec\theta$ is

A. $m + \frac{1}{m}$

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

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

D. None of these

Answer: C

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

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

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

Answer: B

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

Answer: C

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

Answer: C

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9. If $\sec\alpha$ and $\cos ec\alpha$ are the roots of the equation $x^2 - px + q = 0$, then

A. $p^2 = q(q-2)$

B. $p^2 = q(q+2)$

C. $p^2 + q^2 = 2q$

D. None of these

Answer: B

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

A. $x^2 - 6x + 6 = 0$

B. $x^2 - 7x + 7 = 0$

C. $x^2 - 4x + 4 = 0$

D. None of these

Answer: D

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11. If $\sin x + \sin^2 x = 1$n then the value of $\cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x - 1$ is equal to

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12. $3(\sin\theta - \cos\theta)^4 + 6(\sin\theta + \cos\theta)^2 + 4\left(\sin^6\theta + \cos^6\theta\right)$ is equal to

11 (b) 12 (c) 13 (d) 14

A. 11

B. 12

C. 13

D. 10

Answer: C

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13. 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

Answer: C

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14. $(1-\tan\alpha\tan\beta)^2+(\tan\alpha+\tan\beta)^2=$

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

B. $\sec^2\alpha\sec^2\beta$

C. $\tan^2\alpha\cot^2\beta$

D. $\sec^2\alpha\cos^2\beta$

Answer: B

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15. 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

A. $3/4$

B. $3\sqrt{3}$

C. 3

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

Answer: C

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16. A circle is drawn in a sector of a larger circle of radius r, as shown in figure. The smaller circle is tangent to the two bounding radii and the arc of the sector. The radius of the smaller circle is $\frac{r}{2}$ (b) $\frac{r}{3}$ (c) $\frac{2\sqrt{3}r}{5}$ (d) $\frac{r}{\sqrt{2}}$

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

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

C. $\frac{2\sqrt{3}r}{5}$

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

Answer: A

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17. 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 $\cos\theta equal$

A. $\frac{\sqrt{6}-\sqrt{2}}{4}$

B. $\frac{4+\sqrt{2}}{6}$

C. $\frac{4-\sqrt{2}}{6}$

D. $\frac{4-\sqrt{2}}{6}$

Answer: D

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18. 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 15^0 (b) 30^0 (c) 45^0 (d) 60^0

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B

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19. Which of the following is correct?

A. $\sin 1^\circ > \sin 1$

B. $\sin 1^\circ < \sin 1$

C. $\sin 1^\circ = \sin 1$

D. $\sin 1^\circ = \frac{\pi}{180} \sin 1$

Answer: B

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

A. x = y

B. x = - y

C. 2x = y

D. None of these

Answer: A

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

A. -3

B. -2

C. 1

D. None of these

Answer: C

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

A. $x + y \neq 0$

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

C. $x = y$

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

Answer: B

Watch Video Solution

23. If $\sin x + \sin y + \sin z = 3, \quad \text{then} \quad \cos x + \cos y + \cos z$ is equal to

A. 3

B. 2

C. 1

D. 0

Answer: D

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24. 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

Answer: C

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25. Prove that, $\frac{\sin A}{1-\cos A} = \cos ecA + \cot A$

Watch Video Solution

26. If $1 + \sin x + \sin^2 x + \sin^3 x + \infty$ is equal to `4+2sqrt(3),0

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

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

C. $\frac{\pi}{3}$ or $\frac{\pi}{6}$

D. $\frac{\pi}{3}$ or $\frac{2\pi}{3}$

Answer: D

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27. 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. $2^{90} - 90$

Answer: A

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28. 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 isosceles (d) equilateral

A. right angled

B. obtuse angled

C. ospsceles

D. equilateral

Answer: B

Watch Video Solution

29. If $\sin\theta + \cos\theta = \frac{1}{5}$ and $0 \leq \theta < \pi$ then $\cot\theta$ is

A. $-4/3$

B. $-3/4$

C. $3/4$

D. $4/3$

Answer: A

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

Answer: B

Watch Video Solution

31. If $0 < \alpha < \frac{\pi}{6}$ then $\alpha(\cos ec\alpha)$ is

A. less than $\pi/6$

B. greater than $\pi/6$

C. less than $\pi/3$

D. greater than $\pi/3$

Answer: C

Watch Video Solution

32. The least value of $3\sin^2\theta + 4\cos^2\theta$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

33. The minimum value of $\sin^4\theta + \cos^4\theta$ is

A. $1/2$

B. 1

C. 2

D. 3

Answer: B

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34. If $f(x) = \sin^6 x + \cos^6 x,$ then range of $f(x)$ is $\left[\frac{1}{4}, 1\right]$ (b) $\left[\frac{1}{4}, \frac{3}{4}\right]$ (c) $\left[\frac{3}{4}, 1\right]$ (d) none of these

A. $\left[\frac{1}{4}, 1\right]$

B. $\left[\frac{1}{4}, \frac{3}{4}\right]$

C. $\left[\frac{3}{4}, 1\right]$

D. None of these

Answer: A

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35. 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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36. Range of $f(\theta) = \cos^2\theta\left(\cos^2\theta + 1\right) + 3\sin^2\theta$ is

A. $[2, 9/4]$

B. $[2, 3]$

C. $[3/4, 17/4]$

D. $[4, 17/4]$

Answer: D

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37. If `0

A. 4

B. 3

C. 5

D. 6

Answer: A

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38. If $\theta_i > 0$ for $1 \leq \theta \leq n$ and $\theta_1 + \theta_2 + \theta_3 + \ldots + \theta_n = \pi$then the greatest value of sum $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 + \ldots + \sin\theta_n$ is equal to

A. A. n

B. B. $n\sin\left(\frac{\pi}{n}\right)$

C. C. π

D. D. None of these

Answer: B

Watch Video Solution

39. 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) $[-1, \infty)$

A. $(-\infty, 1]$

B. $(-\infty, -1]$

C. ϕ

D. $[-1, \infty)$

Answer: D

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40. Let $A = \sin^6\theta + \cos^8\theta, \quad \text{then} \quad A_{\max}$ is

A. 1

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

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

D. None of these

Answer: A

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41. Minimum value of $y = 25\sin^2 x + 36\cos ec^2 x \, \forall x \in R$ is

A. 42

B. 48

C. 60

D. 76

Answer: C

Watch Video Solution

42. If $aandb$ are positive quantities such that $a > b$, the minimum value of $asec\theta - btan\theta$ is $2ab$ (b) $\sqrt{a^2 - b^2}$ (c) $a - b$ (d) $\sqrt{a^2 + b^2}$

A. 2ab

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

C. a-b

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

Answer: B

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43. If $y=(\cos x+\sec x)^2+(\tan x+\cot x)^2$ then the minimum value of $y,\ \forall x\in R$, is

A. 7

B. 3

C. 9

D. 0

Answer: C

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44. 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

A. $\left[0, \frac{\pi}{3}\right]$

B. $\left(\frac{\pi}{3}\frac{\pi}{2}\right)$

C. $\left[\frac{3\pi}{4}, \pi\right)$

D. None of these

Answer: D

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45. If the equation $\cot^4 x - 2\cos ec^2 x + a^2 = 0$ has at least one solution, then the sum of all possible integral values of a is equal to 4 (b) 3 (c) 2 (d) 0

A. 4

B. 3

C. 2

D. 0

Answer: D

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46. 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 $(2, \infty)$ (b) $(4, \infty)$ (c) $(-\infty, -2)$ (d) $(-\infty, -4)$

A. $[2, \infty)$

B. $[4, \infty)$

C. (-oo,-2]`

D. (-oo,-4]`

Answer: B

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47. 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

A. -4

B. -3

C. -2

D. -1

Answer: B

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48. If $0 < \alpha < \frac{\pi}{2}$, 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. $-1 + \cot \alpha$

Answer: B

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49. The value of $\frac{\sec \theta}{\sqrt{1 + \tan^2 \theta}} + \frac{\cos ec\theta}{\sqrt{1 + \cot^2 \theta}}$ for $\theta \in \left(0, \frac{\pi}{2}\right)$ is

A. 0

B. -2

C. 2

D. 1

Answer: B

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50. The minimum value of the function $f(x) = \frac{\sin x}{\sqrt{1-\cos^2 x}} + \frac{\cos x}{\sqrt{1-\sin^2 x}}$ whenever it is defined is

A. 4

B. -2

C. 0

D. 2

Answer: B

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51. If $\left|\cos\theta\left\{\sin\theta + \sqrt{\sin^2\theta + \sin^2\alpha}\right\}\right| \leq k$, then the value of k

A. $\sqrt{1+\cos^2\alpha}$

B. $\sqrt{1+\sin^2\alpha}$

C. $\sqrt{2+\sin^2\alpha}$

D. $\sqrt{2+\cos^2\alpha}$

Answer: B

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52. In which of the following intervals the inequality, $\sin x < \cos x < \tan x < \cot x$ can hold good ? (a) $\left(\frac{7\pi}{4}, 2\pi\right)$ (b) $\left(\frac{3\pi}{4}, \pi\right)$ (c) $\left(\frac{5\pi}{4}, \frac{3\pi}{2}\right)$ (d) $\left(0, \frac{\pi}{4}\right)$

A. $\left(\frac{7\pi}{4}, 2\pi\right)$

B. $\left(\frac{3\pi}{4}, \pi\right)$

C. $\left(\frac{5\pi}{4}, \frac{3\pi}{2}\right)$

D. $\left(0, \frac{\pi}{4}\right)$

Answer: D

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53. Th range of k for which the inequaliity $k\cos^2 x - k\cos x + 1 \geq 0 \forall x \in (-\infty, \infty) is$

A. $k < -\frac{1}{2}$

B. $k > 4$

C. $-\frac{1}{2} \leq k \leq 4$

D. $\frac{1}{2} \leq k \leq 5$

Answer: C

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54. 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

Answer: B

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55. The numerical value of $\tan\left(\frac{\pi}{3}\right) + 2\tan\left(\frac{2\pi}{3}\right) + 4\tan\left(\frac{4\pi}{3}\right)$ is equal to

A. $-3\sqrt{3}$

B. $-\sqrt{3}$

C. $3\sqrt{3}$

D. $\sqrt{3}$

Answer: A

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56. 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

A. 0

B. 1

C. 3

D. None of these

Answer: B

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57. The value of the expression $\log_{10}(\tan 6^\circ)+\log_{10}(\tan 12^\circ)+\log_{10}(\tan 18^\circ)+\ldots+\log_{10}(\tan 84^\circ)$ is

A. -1

B. 0

C. 1

D. 2

Answer: B

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Multiple Correct Answers Type

1. If $0 \leq \theta \leq \pi$ and $81^{\sin^2\theta} + 81^{\cos^2\theta} = 30$ is

A. 30°

B. 60°

C. 120°

D. 150°

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

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

A. $\sec B = \sec B$

B. $\cot A + \cot C = 0$

C. $\cos ecA = \cos ecC$

D. $\tan B + \tan D = 0$

Answer: B::C::D

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3. Which of the following is/are correct ?

A. $(\tan x)^{\ln(\sin x)} > (\cot x)^{\ln(\sin x)}, \forall x \in (0, \pi/4)$

B. $4^{\ln \cos ecx} < 5^{\ln \cos ecx}, \forall x \in (0, \pi/2)$

C. $(1/2)^{\ln(\cos x)} < (1/3)^{\ln(\cos x)}, \forall x \in (0, \pi/2)$

D. $2^{\ln(\tan x)} < 2^{\ln(\tan x)}, \forall x \in (0, \pi/2)$

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

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4. Let if then one of the possible value of is:

A. $\frac{23}{10}$ if $\frac{\pi}{2} < A < \pi$

B. $\frac{23}{10}$ if $\frac{3\pi}{2} < A < 2\pi$

C. $\frac{-53}{10}$ if $\frac{\pi}{2} < A < \pi$

D. $-\frac{53}{10}$ if $\frac{3\pi}{2} < A < 2\pi$

Answer: A::D

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5. Prove that, $\frac{1-\tan^2 A}{\cot^2 A - 1} = \tan^2 A$

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6. $(a+2)\sin\alpha + (2a-1)\cos\alpha = (2a+1)$ if $\tan\alpha$ is $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $2a(a^2+1)$ (d) $2a(a^2-1)$

A. $3/4$

B. $4/3$

C. $2a/(a^2+1)$

D. $2a/(a^2-1)$

Answer: B::D

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

A. 3

B. 4

C. 5

D. 6

Answer: A::B::C

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8. If $b > 1, \sin t > 0, \cos t > 0 and (\log)_b(\sin t) = x, then (\log)_b(\cos t)$ is equal to $\frac{1}{2}(\log)_b(a - b^{2x})$ (b) $2\log\left(1 - b^{\frac{x}{2}}\right)$ $(\log)_b\sqrt{1 - b^{2x}}$ (d) $\sqrt{1 - x^2}$

A. $\frac{1}{2}\log_b(1 - b^{2x})$

B. $2\log\left(1 - b^{x/2}\right)$

C. $\log_b \sqrt{1 - b^{2x}}$

D. $\sqrt{1 - x^2}$

Answer: A::C

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9. Which of the following is possible in ΔABC?

A. $\cos A + \cos B + \cos C = \frac{3}{2}$

B. $\cos A \cos B \cos C = 0$

C. $\sin A + \sin B + \sin C = \sqrt{2} + 1$

D. $\sin A \sin B \sin C = -\frac{3}{8}$

Answer: A::B::C

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10. If $2\sec^2\alpha - \sec^4\alpha - 2\cos ec^2\alpha + \cos ec^4\alpha = \frac{15}{4}$ then $\tan\alpha =$

A. $1/\sqrt{2}$

B. $1/2$

C. $1/22\sqrt{2}$

D. $-1/\sqrt{2}$

Answer: A::D

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

A. $x\sin\theta.\cos\theta = 1$

B. $\sin^2\theta = y\cos\theta$

C. $\left(x^2y\right)^{1/3} + \left(xy^2\right)^{1/3} = 1$

D. $\left(x^2y\right)^{2/3} - \left(xy^2\right)^{2/3} = 1$

Answer: A::B::D

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12. If $x = \sec\phi - \tan\phi$ and $y = \text{cosec}\phi + \cot\phi$, then show that $xy + x - y + 1 = 0$.

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

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

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

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

Answer: B::C::D

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13. The value of $f(\alpha) = \sqrt{\cos ec^2\alpha - 2\cot\alpha} + \sqrt{\cos ec^2\alpha + 2\cot\alpha}$ can be

A. $2\cot\alpha$

B. $-2\cot\alpha$

C. 2

D. -2

Answer: A::B::C

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14. 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) $\left(-\frac{8}{3}, \infty\right)$

A. $\left(-\infty, -\frac{8}{3}\right]$

B. $\left[-\frac{12}{5}, \infty\right)$

C. $\left[-\frac{8}{3}, -\frac{12}{5}\right]$

D. $\left[-\frac{8}{3}, \infty\right)$

Answer: A::B

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

A. $\sin(\alpha + \beta + \gamma) = \sin\gamma \forall \gamma \in R$

B. $\cos\alpha\cos\beta = 1 \forall \alpha, \beta \in R$

C. $(\cos\alpha + \cos\beta)^2 = 4 \forall \alpha, \beta \in R$

D. $\sin(\alpha + \beta + \gamma) = \sin\alpha + \sin\beta + \sin\gamma \forall a, b, \gamma \in R$

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

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

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

A. $n_1 < 0$

B. $n_2 < 0$

C. $n_3 < 0$

D. $n_4 < 0$

Answer: A::C::D

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17. 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) $xyz = yz + x$

A. $xyz = xz + y$

B. $xyz = xy + z$

C. $xyz = x + y + z$

D. $xyz = yz + x$

Answer: B::C

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Linked Comprehension Type

1. Let us consider the equation cos^4x/a xa+sin4xb=1a+b,x∈[0,π2],a,b>0

the value of sin8xb3+cos8xa3 is

A. $\frac{\sin^4 x}{b} = \frac{\cos^4 x}{a}$

B. $\frac{\sin x}{a} = \frac{\cos x}{b}$

C. $\frac{\sin^4 x}{b^2} = \frac{\cos^4 x}{a^2}$

D. $\frac{\sin^2 x}{a} = \frac{\cos^2 x}{b}$

Answer: C

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2. 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 $\sin^2 x$ in terms of a and b is

A. $\sqrt{ab}$

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

C. $\frac{b^2-a^2}{a^2+b^2}$

D. $\frac{a^2+b^2}{b^2-a^2}$

Answer: B

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3. Let us consider the equation cos^4x/a xa+sin4xb=1a+b,x∈[0,π2],a,b>0 the value of sin8xb3+cos8xa3 is

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

B. $\frac{1}{(a+b)^3}$

C. $\frac{1}{(a+b)^4}$

D. $\frac{1}{a^3+b^3}$

Answer: B

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4. α, β, γ and δ are angle in I, II, III and IV quadrants, respectively and none of them is an integral multiple of $\frac{\pi}{2}$. They form an increasing arithmetic progression. Which of the following holds? $\cos(\alpha+\delta)>0$ $\cos(\alpha+\delta)=0$ $\cos(\alpha+\delta)<0$ $\cos(\alpha+\delta)>0$ or $\cos(\alpha+\delta)<0$ Which of the following does not hold? $\sin(\beta+\gamma)=\sin(\alpha+\delta)$ $\sin(\beta-\gamma)=\sin(\alpha-\delta)$ $\sin(\alpha-\beta)=\tan(\beta-\delta)$ $\sin(\alpha+\gamma)=\cos 2\beta)$ If $\alpha+\beta+\gamma+\delta=\theta and \alpha=70^0$, then `400^0

A. $\cos(\alpha-\delta)>0$

B. $\cos(\alpha-\delta)=0$

C. $\cos(\alpha-\delta)<0$

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

Answer: A

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5. α, β, γ and δ are angle in I, II, III and IV quadrants, respectively and none of them is an integral multiple of $\frac{\pi}{2}$. They form an increasing arithmetic progression. Which of the following holds? $\cos(\alpha+\delta)>0$ $\cos(\alpha+\delta)=0$ $\cos(\alpha+\delta)<0$ $\cos(\alpha+\delta)>0$ or $\cos(\alpha+\delta)<0$ Which of the following does not hold? $\sin(\beta+\gamma)=\sin(\alpha+\delta)$ $\sin(\beta-\gamma)=\sin(\alpha-\delta)$ $\sin(\alpha-\beta)=\tan(\beta-\delta)$ $\sin(\alpha+\gamma)=\cos 2\beta)$ If $\alpha+\beta+\gamma+\delta=\theta and \alpha=70^0$, then `400^0

A. $\sin(\beta+\gamma)=\sin(\alpha+\delta)$

B. $\sin(\beta-\gamma)=\sin(\alpha-\delta)$

C. $\tan 2(\alpha+\beta)=\tan(\beta+\delta)$

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

Answer: B

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6. α, β, γ and δ are angle in I, II, III and IV quadrants, respectively and none of them is an integral multiple of $\frac{\pi}{2}$. They form an increasing arithmetic progression. Which of the following holds? $\cos(\alpha+\delta)>0$ $\cos(\alpha+\delta)=0$ $\cos(\alpha+\delta)<0$ $\cos(\alpha+\delta)>0$ or $\cos(\alpha+\delta)<0$ Which of the following does not hold? $\sin(\beta+\gamma)=\sin(\alpha+\delta)$ $\sin(\beta-\gamma)=\sin(\alpha-\delta)$ $\sin(\alpha-\beta)=\tan(\beta-\delta)$ $\sin(\alpha+\gamma)=\cos 2\beta)$ If $\alpha+\beta+\gamma+\delta=\theta and \alpha=70^0$, then `400^0

A. $400^\circ < \theta < 580^\circ$

B. $470^\circ < \theta < 650^\circ$

C. $680^\circ < \theta < 860^\circ$

D. $540^\circ < \theta < 900^\circ$

Answer: C

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7. In $\Delta ABC, BC = 1, \sin.\frac{A}{2} = x_1, \sin.\frac{B}{2} = x_2, \cos.\frac{A}{2} = x_3$ and $\cos.\frac{B}{2} =$

If $\angle A = 90^\circ$, then area of ΔABC is

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

B. 1

C. 2

D. can't be determined

Answer: B

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8. In $\Delta ABC, BC = 1, \sin.\frac{A}{2} = x_1, \sin.\frac{B}{2} = x_2, \cos.\frac{A}{2} = x_3$ and $\cos.\frac{B}{2} =$

If $\angle A = 90^\circ$, then area of ΔABC is

A. 1/2 sq. units

B. 1/3 sq. units

C. 1 sq. units

D. 2sq. Units

Answer: A

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9. Let $f(x) = \sin^6 x + \cos^6 x + k\left(\sin^4 x + \cos^4 x\right)$ for some real number k. Value of k for which $f(x)$ is constant for all values of x is $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $-\frac{3}{2}$ All real numbers k for which the equation $f(x) = 0$ has solution lie in $[-1, 0]$ (b) $\left[0, \frac{1}{2}\right]$ (c) $\left[-1, -\frac{1}{2}\right]$ (d) none of these Number of values of k for which $f(x) = 0$ is an identity is (a) 0 (b) 1 (c) infinite (d) none of these

A. $-1/2$

B. $1/2$

C. $1/4$

D. $-3/2$

Answer: D

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10. Let $f(x)=\sin^6 x+\cos^6 x+k\left(\sin^4 x+\cos^4 x\right)$ for some real number k. Value of k for which $f(x)$ is constant for all values of x is $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $-\frac{3}{2}$ All real numbers k for which the equation $f(x)=0$ has solution lie in $[-1,0]$ (b) $\left[0,\frac{1}{2}\right]$ (c) $\left[-1,-\frac{1}{2}\right]$ (d) none of these Number of values of k for which $f(x)=0$ is an identity is (a) 0 (b) 1 (c) infinite (d) none of these

A. [-1,0]

B. $\left[0,\frac{1}{2}\right]$

C. $\left[-1,-\frac{1}{2}\right]$

D. None of these

Answer: C

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11. Let $f(x) = \sin^6 x + \cos^6 x + k\left(\sin^4 x + \cos^4 x\right)$ for some real number k. Value of k for which $f(x)$ is constant for all values of x is $-\frac{1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $-\frac{3}{2}$ All real numbers k for which the equation $f(x) = 0$ has solution lie in $[-1, 0]$ (b) $\left[0, \frac{1}{2}\right]$ (c) $\left[-1, -\frac{1}{2}\right]$ (d) none of these Number of values of k for which $f(x) = 0$ is an identity is (a) 0 (b) 1 (c) infinite (d) none of these

A. 0

B. 1

C. infinite

D. None of these

Answer: A

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Matrix Match Type

1.

List I	List II
a. If $x = \sin\theta \mid \sin\theta \mid$ and $y = \cos\theta \mid \cos\theta \mid$ and $\frac{99\pi}{2} < \theta < 50\pi$, then $(y - x)$ is equal to	p. -1
b. $\frac{\sin(270^\circ + x)\cos^3(720^\circ - x) - \sin(270^\circ - x)\sin^3(540^\circ + x)}{\sin(90^\circ + x)\sin(-x) - \cos^2(180^\circ - x))} + \frac{\cot(270^\circ - x)}{\operatorname{cosec}^2(450^\circ + x)} =$	q. 0
c. $\sin(-870^\circ) + \operatorname{cosec}(-660^\circ) + \tan(-855^\circ) + 2\cot(840^\circ) + \cos(480^\circ) + \sec(900^\circ) =$	r. -2
d. $2\frac{\cos^3\left(\frac{\pi}{2} + x\right)\cot(3\pi + x)\sec(x - 3\pi)\operatorname{cosec}\left(\frac{3\pi}{2} - x\right)}{\cot x \tan^2(x - \pi)\sin(x - 2\pi)}$ is equal to	s. 1

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2. Match the following Column I to Column II

Column I	Column II
(A) If maximum and minimum values of $\frac{7 + 6\tan\theta - \tan^2\theta}{(1 + \tan^2\theta)}$ for all real values of $\theta \sim -\frac{\pi}{2}$ are λ and μ respectively, then	(p) $\lambda + \mu = 2$
(B) If maximum and minimum values of $5\cos\theta + 3\cos\left(\theta + \frac{\pi}{3}\right) + 3$ for all real values of θ are λ and μ respectively, then	(q) $\lambda - \mu = 6$
(C) If maximum and minimum values of $1 + \sin\left(\frac{\pi}{4} + \theta\right) + 2\cos\left(\frac{\pi}{4} - \theta\right)$ for all real values of θ and λ and μ respectively, then	(r) $\lambda + \mu = 6$
	(s) $\lambda - \mu = 10$
	(t) $\lambda - \mu = 14$

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3. For all real values of θ, choose the correct options.

List I	List II
a. $A = \sin^2\theta + \cos^4\theta$	p. $A \in [-1, 1]$
b. $A = 3\cos^2\theta + \sin^4\theta$	q. $A \in \left[\frac{3}{4}, 1\right]$
c. $A = \sin^2\theta - \cos^4\theta$	r. $A \in [2\sqrt{2}, \infty)$
d. $A = \tan^2\theta + 2\cot^2\theta$	s. $A \in [1, 3]$

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Numerical Value Type

1. 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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2. 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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3. If $0 < x < \frac{\pi}{4}$ and $\cos x + \sin x = \frac{3}{5}$, then the value of $25(\cos x - \sin x)^2$ is _____ .

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4. The value of $2\frac{\sin^6 t + \cos^6 t - 1}{\sin^4 t + \cos^4 t - 1}$ is equal to _____

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5. If $\sin\theta - \cos\theta = 3^{\frac{1}{2}}$, then the value of $\sin^3\theta - \cos^3\theta$ is _____ .

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

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8. The minimum value of $\sqrt{(3\sin x - 4\cos x - 10(3\sin x + 4\cos x - 1))}$ is _____

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9. If $a \in (0, 1) and f(a) = \left(a^2 - a + 1\right) + \dfrac{8\sin^2 a}{\sqrt{a^2 - a + 1}} + \dfrac{27\cos ec^2 a}{\sqrt{a^2 - a + 1}}$, then the least value of $\dfrac{f(a)}{2}$ is_____

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10. Minimum value of $\frac{\sec^4\alpha}{\tan^2\beta}+\frac{\sec^4\beta}{\tan^2\alpha}$, where `alpha!=pi/2,beta!=pi/2,0

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11. If $p\cos ec\theta+q\cot\theta=2$ and $p^2\cos ec^2\theta-q^2\theta=5$ then the value of $\sqrt{81p^{-2}}$ is_____

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Archives Jee Main

1. প্রমাণ করো :

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

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2. Let $f_k(x)=\frac{1}{k}\left(\sin^k x+\cos^k x\right)$ Then $f_4(x)-f_6(x)$ =

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

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

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

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

Answer: D

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Archives Jee Advanced Single Correct Answer Type

1. about to only mathematics

A. $p \subset Q$ and $Q - P = \phi$

B. $Q \not\subset P$

C. $P \not\subset Q$

D. P=Q

Answer: D

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Archives Jee Advanced Multiple Correct Answers Type

1. 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) $\frac{\sin^8 x}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

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. $\frac{\sin^8}{8} + \frac{\cos^8 x}{27} = \frac{2}{125}$

Answer: A::B

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Single Correct Answer Type

1. The circular wire of diameter 10 cm is cut and placed along the circumference of a circle of diameter 1 meter. The angle subtended by the wire at the centre of circle is equal to

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

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

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

D. $\frac{\pi}{10}$ radian

Answer: C

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2. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(\sqrt{5}, \frac{\pi}{2}\right)$

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3. If $\theta \in (\pi/4, \pi/2)$ and $\sum_{n=1}^{\infty} \frac{1}{\tan^n \theta} = \sin\theta + \cos\theta$, then the value of $\tan\theta$ is

A. $\sqrt{3}$

B. $\sqrt{2}+1$

C. $2+\sqrt{3}$

D. $\sqrt{2}$

Answer: A

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4. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(-\sqrt{3}, \frac{\pi}{4}\right)$

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5. Find the cartesian co-ordinates of the points whose polar co-ordinates are $(7, 0^\circ)$

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6. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(3, \frac{\pi}{2}\right)$

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7. If $\frac{\sin^2 x - 2\cos^2 x + 1}{\sin^2 x + 2\cos^2 x - 1} = 4$, then the value of $2\tan^2 x$ is

A. 3

B. 4

C. 5

D. 6

Answer: C

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8. Find the cartesian co-ordinates of the points whose polar co-ordinates are $(1, \pi)$

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9. If $\tan\theta - \cot\theta = a$ and $\sin\theta + \cos\theta = b, then, \left(b^2 - 1\right)^2\left(a^2 + 4\right)$ is equal to

A. 2

B. -4

C. ± 4

D. 4

Answer: D

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10. The least value of $18\sin^2\theta + 2\cos ec^2\theta - 3$ is (a) -15 (b) -12 (c) 0 (d) 9

A. -15

B. -12

C. 0

D. 9

Answer: D

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11. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(3, \frac{\pi}{6}\right)$

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12. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(5, \frac{\pi}{4}\right)$

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13. Find the cartesian co-ordinates of the points whose polar co-ordinates are $\left(2, \frac{\pi}{2}\right)$

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14. Simplify : $\cos\left(x - \frac{\pi}{2}\right) . \tan\left(\frac{3\pi}{2} + x\right)$

A. -2

B. -1

C. 1

D. 2

Answer: B

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15. Consider angles $\alpha = \left(2n + \frac{1}{2}\right)\pi \pm A$ and $\beta = m\pi + (-1)^m\left(\frac{\pi}{2} - A\right)$ where n, m $\in$ I. Which of the following is not true ?

A. α and β are always the same angles

B. α and β are co-terminal angles

C. $\sin\alpha = \sin\beta$ but $\cos\alpha \neq \cos\beta$

D. none of these

Answer: C

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16. Which of the following is true ?

A. $\sin 765^\circ = -\frac{1}{\sqrt{2}}$

B. $\cos\left(-\frac{15\pi}{4}\right) = -1$

C. $\tan\left(\frac{13\pi}{3}\right) = \frac{1}{\sqrt{3}}$

D. $\cos ec(-1410^\circ) = 2$

Answer: D

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17. If the angle A of a triangle ABC is given by the equation 5 cos A + 3 = 0, then sin A and tan A are the roots of the equation

A. $15x^2 - 8x - 16 = 0$

B. $15x^2 - 8\sqrt{2}x + 16 = 0$

C. $15x^2 - 8x + 16 = 0$

D. $15x^2 + 8x - 16 = 0$

Answer: D

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18. Which of the following is greatest ?

A. tan 1

B. $\tan^2 1$

C. cot 1

D. $\cot^2 1$

Answer: B

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19. The number of value/values of x for which sin $y = x^2 - 2x$ si possible is

A. 0

B. 1

C. infinite

D. none of these

Answer: C

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20. Which of the following is not correct ?

A. $\cos(\cos 1) > \cos(\sin 1)$

B. $\sin(\cos 1) < \sin(\sin 1)$

C. $\cos(\cos 2) > \sin(\cos 2)$

D. none of these

Answer: D

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21. If $\sin^4\alpha + \cos^4\beta + 2 = 4\sin\alpha\cos\beta, 0 \leq \alpha, \frac{\pi}{2}$, then $(\sin\alpha + \cos\beta)$ is equal to

A. $\sqrt{2}$

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

C. 2

D. 1

Answer: C

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22. Number of ordered pairs (a, x) satisfying the equation $\sec^2(a+2)x + a^2 - 1 = 0; \ -\pi < x < \pi$ is

A. 2

B. 1

C. 3

D. infinite

Answer: C

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

A. $[-24, 2]$

B. $[-24, 0]$

C. $[0, 24]$

D. $[-24, 24]$

Answer: B

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24. Let $f(x) = a\sin x + c$, where a and c are real numbers and a>0. Then $f(x) < 0,\ \forall x \in R$ if

A. $c < -a$

B. $c > -a$

C. $-a < c < a$

D. $c < a$

Answer: A

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25. Find sum of maximum and minimum values of the function $f(x) = \sin^2 x + 8\cos x - 7$

A. -4

B. -5

C. 4

D. 5

Answer: B

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26. $\theta_1, \theta_2, \theta_3$ are angles of 1^{st} quadrant if $\tan\theta_1 = \cos\theta_1, \tan\theta_2 = \cos ec\theta_2, \cos\theta_3 = \theta_3$. Which of the following is not true ?

A. $\theta_1 < \theta_2$

B. $\theta_1 < \theta_3$

C. $\theta_3 < \theta_1$

D. $\theta_3 < \theta_2$

Answer: C

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27. The value of $2\cos 10^\circ + \sin 100^\circ + \sin 1000^\circ + \sin 10000^\circ$ is

A. 0

B. $\sin 10^\circ$

C. $\cos 10^\circ$

D. -1

Answer: C

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28. The two legs of a right triangle are $\sin\theta + \sin\left(\frac{3\pi}{2} - \theta\right)$ and $\cos\theta - \cos\left(\frac{3\pi}{2} - \theta\right)$ The length of its hypotenuse is hypotenuse is

A. 1

B. 2

C. $\sqrt{2}$

D. none of these

Answer: C

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29. In cyclic quadrilateral ABCD (none of these being 90°), which of the following is not true ?

A. tan A cot C = -1

B. sec B cos D = -1

C. cosec B sin D = 1

D. none of these

Answer: D

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30. If $x = \sin 130^\circ \cos 80^\circ$, $y = \sin 80^\circ \cos 130^\circ$, $z = 1 + xy$, which one of the following is true ?

A. $x > 0, y > 0, z > 0$

B. $x > 0, y < 0, 0 < z < 1$

C. $x > 0, y < 0, z > 1$

D. $x < 0, y < 0, 0 < z < 1$

Answer: B

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31. 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____

A. 4

B. 6

C. 8

D. 12

Answer: C

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32. Value of expression $\sin\left(\frac{\pi}{9}\right)+\sin\left(\frac{2\pi}{9}\right)+\sin\left(\frac{3\pi}{9}\right)+\ldots+\sin\left(\frac{17\pi}{9}\right)=$

A. 0

B. -1

C. 1

D. $-3/2$

Answer: A

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33. $\cos^2 73^\circ+\cos^2 47^\circ-\sin^2 43^\circ+\sin^2 107^\circ$ is equal to

A. $1/2$

B. $3/4$

C. 1

D. none of these

Answer: C

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34. The expression

$$\frac{\tan\left(x-\frac{\pi}{2}\right).\cos\left(\frac{3\pi}{2}+x\right)-\sin^3\left(\frac{7\pi}{2}-x\right)}{\cos\left(x-\frac{\pi}{2}\right).\tan\left(\frac{3\pi}{2}+x\right)}$$ simplifies to

A. $\left(1+\cos^2 x\right)$

B. $\sin^2 x$

C. $-\left(1+\cos^2 x\right)$

D. $\cos^2 x$

Answer: B

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35. The value of $\frac{\sin 300^\circ.\tan 330^\circ.\sec 420^\circ}{\tan 135^\circ.\sin 210^\circ.\sec 315^\circ}$ is

A. -1

B. 1

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: C

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36. Find the polar coordinates of the point whose Cartesian coordinates are $\left(5, \frac{1}{\sqrt{3}}\right)$

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

B. $\left|\sin\left(\frac{B}{2}-C\right)\right|$

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

D. $\cos\left(\frac{B}{2}-C\right)$

Answer: C

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37. Find the polar coordinates of the point whose Cartesian coordinates are $\left(1, \frac{1}{\sqrt{3}}\right)$

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38. Find the polar coordinates of the point whose Cartesian coordinates are $\left(1, \sqrt{3}\right)$

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