MATHS

BOOKS - PREMIERS PUBLISHERS

TRIGONOMETRY

Worked Examples

1. Prove that : $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta.$

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2. Prove that

$$\frac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1} = \frac{1+\cos\theta}{\sin\theta}$$

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3. Prove that

If $a\cos\theta + b\sin\theta = c$ and $a\sin\theta - b\cos\theta = d$ eliminate θ (a,b,c,d are constants)

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4. Convert

$\frac{\pi}{3}$ to degrees

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5. Convert

3 radians to degrees

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6. Convert

36^o to radians

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7. Convert

$-330^o$to radians

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8. Two circles have their radii in the ratio 8:3. Find the ratio of angles subtended by equal arcs of the circles at their centres

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9. Find the lenght of the arc of radius 10cm subtendung a central angle of 30^o.Find also the arc of the sector.

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10. A ray for x-axis makes its terminal side to pass through (5,12).Find the six trignometric functions of θ.

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11. Find the value of $\sin(-60^o)$

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12. Find the value of $\cos(-60^o)$

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13. Find the value of $\tan(-60^o)$

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14. Evaluate other five trigonometric functions given that $\cos\theta = \frac{3}{5}, \theta$ in third quadrant.

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15. Find the value of $\tan 30^o$

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16. Find the value of $\sin 225^o$

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17. Find the value of $\cos 210^o$

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18. Find the value of $\cos(-765^o)\cos ec(-1110^o)\sin(1410^o)$

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19. Show that $\sin 480^o.\cot 660^o + \tan 1050^o.\sin\left(-11\frac{\pi}{3}\right) = -1$

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20. Are the following functions r even or odd? (i)$\cos^2 x + 2\cos x + 3$

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21. Are the following functions r even or odd?(ii)$\sin 3x + \sin^3 x$

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22. Are the following functions r even or odd?(iii)$2\sin x + 3\cos x$

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23. Find the value of $\sin 15^o$ and $\cot(-165^o)$

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24. If $\sin x = \frac{5}{13}$ and x is II quadrant.$\cos y = -\left(\frac{3}{5}\right)$ and y is III quadrant .evaluate

(i)cosec(x-y)

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25. If $\sin x = \frac{5}{13}$ and x is II quadrant.$\cos y = -\left(\frac{3}{5}\right)$ and y is III quadrant evaluate

sec(x+y)

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26. If $\cos\left[\frac{3\pi}{4}-\theta\right]-\sin\left[\frac{3\pi}{4}+\theta\right]=1$,find θ

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27. If a point A(6,8) rotates through an angle 90^o about the origin in the anticlockwise direction ,find the new position of A.

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28. Find the quadratic euation whose roots are $\sin 75^o$ and $\cos 75^o$

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29. A player throws shotput from the ground level with initial velocity $16f\frac{t}{\sec}$.Find the maximum distance can be thrown and at what angle .

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30. Find the value of $\tan\left[22\left(\frac{1}{2}\right)\right]^{O}$

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31. Find the value of $\cos\left[22\left(\frac{1}{2}\right)\right]^{o}$

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32. Find the value of $\tan\left[22\left(\frac{1}{2}\right)\right]^{O}$

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33. Given $\cos\theta = -\left(\frac{5}{13}\right)$, θ in II quadrant ,find $\tan 2\theta$

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34. Show that sin(x+y)sin(x-y)=$\sin^2 x - \sin^2 y$.Hence prove that sin(x+y)sin(x-y)+sin(y+z)sin(y-z) +sin(z+x)sin(z-x)=0

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35. Show that $\cos 20^o \cos 40^o \cos 60^o \cos 80^o = \frac{1}{16}$

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36. Prove that $\frac{\sin\theta + \sin 2\theta}{1 + \cos\theta + \cos 2\theta} = \tan\theta$

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37. prove that $1 - \frac{1}{2}(\sin 2x) = \frac{\sin^3 x + \cos^3 x}{\sin x + \cos x}$

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38. Solve cos2x +sinx =1,given that $-\pi \leq x \leq \pi$

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39. Prove that $\frac{1-\cos\theta+\cos 2\theta}{\sin 2\theta-\sin\theta}=\cot\theta$

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40. prove that $\left[2\frac{\sin^3 x-\cos^3 x}{\sin x-\cos x}\right]-\sin 2x=2$

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41. prove that $\sqrt{3}\cos ec40+\sec 40=4$

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42. Show that $\sin\theta = 32\sin\left(\frac{\theta}{32}\right)\cos\left(\frac{\theta}{2}\right)\cos\left(\frac{\theta}{4}\right)\cos\left(\frac{\theta}{8}\right)\cos\left(\frac{\theta}{16}\right)\cos\left(\frac{\theta}{32}\right)$

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43. Find the value of $\sin 38^o + \cos 68^o - \cos 8^o$

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44. Express as a sum or difference,

(i)$\sin 50^o \cos 20^o$

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45. Express as a sum or difference,

(ii)$\cos 25^o \cos 75^o$

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46. Express as a sum or difference,

(iii)$\sin 2\theta \cos 7\theta$

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47. Express as a sum or difference,

(iv)$\sin 60^o \sin 20^o$

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48. Express as a productas a sum or difference,

(i)$\sin 90^o \sin 20^o$

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49. Express as a productas a sum or difference,

(ii)sin5x -sinx

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50. Express as a productas a sum or difference,

(iii)cos6x +cos3x

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51. Express as a productas a sum or difference,

(iv)cos3x -cosx

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52. Show that $\sin 20^o \sin 40^o \sin 60^o \sin 80^o = \frac{3}{16}$

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53. Show that $\cos 10^o \cos 30^o \cos 50^o \cos 70^o = \frac{3}{16}$

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54. Show that $\frac{\cos 15^o - \cos 105^o}{\cos 15^o + \cos 105^o} = \sqrt{3}$

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55. Prove that $\cos A - \cos B - \cos C = 1 - 4\sin\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)\cos\left(\frac{C}{2}\right)$,if A+B+C= π

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56. If A+B+C =π show that

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

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

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

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58. If A+B+C=π,prove that

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

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59. Find the principal solution of the following :

(i)$\cos\theta = \frac{\sqrt{3}}{2}$

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60. Find the principal solution of the following :

(ii)$\sec\theta = 2$

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61. Find the principal solution of the following :

(iii)$\cot\theta = -1$

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62. Find the principal solution of the following :

(iv)$\operatorname{cosec}\theta = -2$

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63. Find the general solution of the following:

(i)$\cos\theta = -\left(\frac{\sqrt{3}}{2}\right)$

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64. Find the general solution of the following:

(ii)$\sec\theta = -2$

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65. Find the general solution of the following:

(iii)$\cot\theta = \frac{1}{\sqrt{3}}$

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66. Find the general solution of the following:

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

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67. Solve sinx +cosx =1

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68. Solve sin7x = sinx

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69. Find the value of X if sinx +sin7x =sin4x

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70. Solve sinx-5sin3x +sin5x =cosx -5cos3x +cos5x

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

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72. Solve $3\sin^2\theta - \cos^2\theta = 0$

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73. Solve sinx +sin2x +sin3x +sin4x =0

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74. `tan3x =-cot[x+pi/6]

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

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76. Solve $\sin^2 2x - 2\cos^2 x = 0$

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77. Solve $\sin\theta + \sqrt{3}\cos\theta = 1$

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78. Solve $\tan^2\theta - \left(\sqrt{3}+1\right)\tan\theta + \sqrt{3} = 0$

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79. $\cos\theta - \sin\theta - \cot\theta + 1 = 0$

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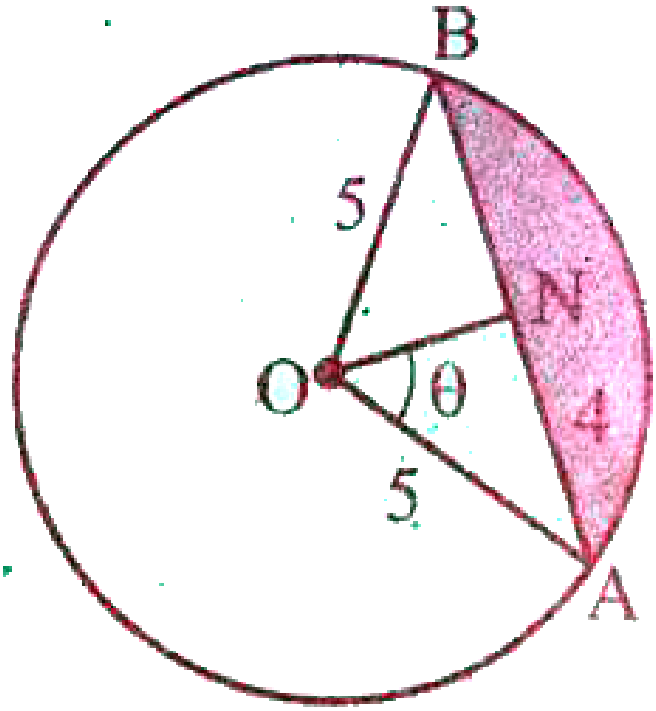
80. In the diagram given that AB=8cm,radius of the circle is 5cm .Find

(i)angle at which AB subtends at the centre O



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81. Show that `cosA/a +cosB/b +cosC/c =(a^2 +b^2 +c^2)/2abc

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82. Show that $a(b\cos C - osB) = b^2 - c^2$

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83. In any triangle prove that $a^2 = (b+c)^2 \sin^2\left(\frac{A}{2}\right) + (b-c)^2 \cos^2\left(\frac{A}{2}\right)$

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84. Show that $\sum a^3 \cos(B-C) = 3abc$

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85. Show that $\frac{\sum a^2 \sin(B-C)}{\sin A} = 0$

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86. Show that $\cos\left[\frac{B-C}{2}\right] = \frac{b+c}{a}\sin\left(\frac{A}{2}\right)$

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87. Prove that $a\sin A - b\sin B = c\sin(A - B)$

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88. Show that $\sum a\sin(B - C) = 0$

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89. Show that $\sum a^3\sin(B - C) = 0$

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90. If acosA=bcosBthen show that the triangle is either an isosceles triangle or right angled triangle.

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91. In $\triangle ABC$,if 2cosAsinC=sinBthen it is isosceles

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92. Find the area of an isosceles triangle whose perimeter is 36 cm and base is 16 cm.

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93. Find the area of the traingles whose sides are 11cm,12cm,13cm.

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94. In a $\triangle ABC$ a=5,b=5,c=7,find cosA,cosB,cosC

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95. If $\angle A = 60^o, \angle B = 30^o$ and C=15cm.solve the $\triangle ABC$

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96. If the three angles in a triangle are in the ratio 1:2:3 and one of the smallest side is 5cm .find other sides

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97. A triangular plot has two adjacent sides 130m and 80m .the included angle between the sides is 30^o .find the cost of levelling the ground at the rate of Rs 10per sq.m.

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98. The pilot in the helicopter sees two buildings A and B which are at distances 100m and 50m from the pilot.From the pilot point of view the

angle between the buildings is 60^o .How far apart the buildings?

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99. The angles of elevation of an object from two points A and B from the ground which are at a distance of 200m are 30^o and 45^o .Find how far is the objectfrom A and B.

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100. Solve the $\triangle ABC$,given that C=40,$A = 60^o$,$B = 45^o$

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101. A man starts from a point Aand walks 5km straight ,then turns left at an angle of 60^ofurther walks 4km in this direction and reaches B.Find how far B is from A.

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102. Find the principal angle of ,

(i)$\cos^{-1}\left(\frac{1}{2}\right)$

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103. Find the principal value of

$\sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$

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104. Find the principal angle of ,

(iii)$\cot^{-1}\left(-\sqrt{3}\right)$

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105. Find the principal angle of ,

(iv)$\sec^{-1}\left(\sqrt{2}\right)$

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Identity

1. Prove that$\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$

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2. Using vector method, prove $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta.$

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3. Prove by vector method that

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

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4. By vector method, Prove that $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

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5. Prove that $\tan(\alpha - \beta) = \dfrac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$

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6. Prove that $\tan(\alpha + \beta) = \dfrac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$

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7. $\sin 2A$:

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8. Prove that $\cos 2A = \cos^2 A - \sin^2 A$

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9. Prove that $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

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10. Prove that $\sin 2A = \dfrac{2\tan A}{1 + \tan^2 A}$

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11. Prove that $\cos 2A = \dfrac{1 - \tan^2 A}{1 + \tan^2 A}$

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12. Prove that$\sin 3A = 3\sin A - 4\sin^3 A$

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13. Prove that$\cos 3A = 4\cos^3 A - 3\cos A$

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14. Prove that$\tan 3A = \dfrac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$

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Solution To Exercise 3 1

1. Identify the quadrant in which an angle of each given measure lies:

25°

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2. Identify the quadrant in which an angle of each given measure lies:

825°

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3. Identify the quadrant in which an angle of each given measure lies:

25°

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4. Identify the quadrant in which an angle of each given measure lies:

328°

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5. Identify the quadrant in which an angle of each given measure lies:

-230°

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6. For each given angle, find a co-terminal angle with measure of θ such that $0^\circ \leq \theta \leq 360^\circ$

395°

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7. For each given angle, find a co-terminal angle with measure of θ such that $0^\circ \leq \theta \leq 360^\circ$

525°

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8. For each given angle, find a co-terminal angle with measure of θ such that $0^\circ \leq \theta \leq 360^\circ$

1150°

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9. For each given angle, find a co-terminal angle with measure of θ such that $0^\circ \leq \theta \leq 360^\circ$

-270°

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10. For each given angle, find a co-terminal angle with measure of θ such that $0^\circ \leq \theta \leq 360^\circ$

-450°

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11. If a cos θ - b sinθ = c, show that a sin θ + b cos $\theta = \pm\sqrt{a^2+b^2-c^2}$

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12. If sin θ + cos θ = m, show that

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

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13. If $\frac{\cos^4\alpha}{\cos^2\beta}+\frac{\sin^4\alpha}{\sin^2\beta}$ = 1, prove that

$\sin^4\alpha+\sin^4\beta=2\sin^2\alpha\sin^2\beta$

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14. If $\frac{\cos^4\alpha}{\cos^2\beta}+\frac{\sin^4\alpha}{\sin^2\beta}=1$, prove that

$$\frac{\cos^4\beta}{\cos^2\alpha}+\frac{\sin^4\beta}{\sin^2\alpha}=1$$

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15. If $y=\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha}$ then, prove that $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}=y.$

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16. If $x=\sum_{n=0}^{\infty}\cos^{2n}\theta,\quad y=\sum_{n=0}^{\infty}\sin^{2n}\theta$ and

$z=\sum_{n=0}^{\infty}\cos^{2n}\theta\sin^{2n}\theta, 0<\theta<\frac{\pi}{2}$, then show that

xyz = x + y + z

[Hint : use the formula $1+x+x^2+x^3$ +...

$=\frac{1}{1-x}$, where |x| < 1]

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17. If $\tan^2\theta = 1 - k^2$, show that sec θ + $\tan^3\theta$ cosec $\theta = \left(2 - k^2\right)^{3/2}$.

Also, find the values of k for which this result holds.

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18. If sec $\theta + \tan\theta =$ p, obtain the values of sec θ, tan θ and sin θ in terms of p.

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19. If sec $\theta + \tan\theta =$ p, obtain the values of sec θ, tan θ and sin θ in terms of p.

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20. If sec $\theta + \tan\theta =$ p, obtain the values of sec θ, tan θ and sin θ in terms of p.

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21. If cot θ(1 + sinθ) = 4m and cot θ (1 - sin θ) = 4n, prove that $\left(m^2 - n^2\right)^2$ = mn.

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22. If $\text{cosec}\theta - \sin\theta = a^3$ and $\sec\theta - \cos\theta = b^3$, then prove that $a^2b^2\left(a^2 + b^2\right) = 1$.

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23. Eliminate θ from the equations a sec θ - c tan θ = b and b sec θ + d tan θ = c.`

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Solution To Exercise 3 2

1. Express each the angles in radian measure.

30°

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2. Express each the angles in radian measure.

135°

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3. Express each the angles in radian measure.

-205°

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4. Express each the angles in radian measure.

150°

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5. Express each the angles in radian measure.

330°

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6. Find the degree measure corresponding to the radian measures.

$\frac{\pi}{3}$

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7. Find the degree measure corresponding to the radian measures.

$\frac{\pi}{9}$

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8. Find the degree measure corresponding to the radian measures.

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

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9. Find the degree measure corresponding to the radian measures.

$$\frac{7\pi}{3}$$

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10. Find the degree measure corresponding to the radian measures.

$$\frac{10\pi}{9}$$

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11. What must be the radius of a circular running path, around which an athlete must run 5 times in order to describe 1 km?

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12. In a circle of diameter 40 cm, a chord is of length 20 cm. find the length of the minor are of the chord.

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13. Find the degree measure of the angle subtended at the centre of circle of radius 100 cm by an are of length 22 cm.

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14. What is the length of the are intercepted by a central angle of measure 41° in a circle of radius 10 ft?

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15. If in two circles, arcs of same length subtend angles 60° and 75° at the centre, find the ratio of their radii?

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16. The perimeter of certain sector of a circle is equal to the length of the a semi-circle having the same radius. Express the angle of the sector in degress, minutes and seconds.

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17. An airplane propeller rotates 1000 times per minute. Find the number of degrees that a point on the edge of the propeller will rotate in 1 second.

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18. A train is moving on a circular track of 1500 m radius at the rate of 66 km/hr. what angle will it turn in 20 seconds?

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19. A circular metallic plate of radius 8 cm and thickness 6 mm is melted and molded into a pie (a sector of the circle with thickness) of radius 16 cm and thickness 4 mm. Find the angle of the sector. $= \frac{3}{4}\pi$ radians.

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Solution To Exercise 3 3

1. Find the values of

$\sin(480^\circ)$

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2. Find the values of

$\sin(-1110^\circ)$

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3. Find the values of

$\cos(300^\circ)$

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4. Find the values of

$\tan(1050^\circ)$

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5. Find the values of

$\cot(660^\circ)$

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6. Find the values of

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

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7. Find the values of

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

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8. $\left(\frac{5}{7}\ \frac{2\sqrt{6}}{7}\right)$ is a point on the terminal side of an angle θ in standard position. Determine the trigonometric function values of angle θ.

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9. Find the values of other five trigonometric functions.

$\cos\theta = -\frac{1}{2}$, θ lies in the III quadrant.

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10. Find the values of other five trigonometric functions.

$\cos\theta = \frac{2}{3}$, θ lies in the I quadrant.

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11. Find the values of other five trigonometric functions.

$\sin\theta = -\frac{2}{3}$, θ lies in the IV quadrant.

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12. Find the values of other five trigonometric functions.

$\tan\theta = -2$, θ lies in the II quadrant

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13. Find the values of other five trigonometric functions.

$\sec\theta = \frac{13}{5}$, θ lies in the IV quadrant.

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14. Prove that

$$-\frac{\cot(180^\circ+\theta)\sin(90^\circ-\theta)\cos(-\theta)}{\sin(270^\circ+\theta)\tan(-\theta)\cos es(360^\circ+\theta)} = \cos^2\theta\cot\theta.$$

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15. Find all the angles between 0° and 360° which satisfy the equation $\sin^2\theta = \frac{3}{4}$

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16. Show that $\sin^2\frac{\pi}{18} + \sin^2\frac{\pi}{9} + \sin^2\frac{7\pi}{18} + \sin^2\frac{4\pi}{9} = 2.$

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Solution To Exercise 3 4

1. If sin x = $\frac{15}{17}$ and cos y = $\frac{12}{13}, 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2},$

find the values of

sin (x + y)

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2. If sin x = $\frac{15}{17}$ and cos y = $\frac{12}{13}, 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2},$

find the values of

cos(x - y)

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3. If sin x = $\frac{15}{17}$ and cos y = $\frac{12}{13}, 0 < x < \frac{\pi}{2}, 0 < y < \frac{\pi}{2},$

find the values of

tan(x + y)

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4. If sin A = $\frac{3}{5}$ and cos B = $\frac{9}{41}, 0 < A < \frac{\pi}{2}, 0 < B < \frac{\pi}{2}$

Find the value of

sin (A + B)

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5. If sin A = $\frac{3}{5}$ and cos B = $\frac{9}{41}, 0 < A < \frac{\pi}{2}, 0 < B < \frac{\pi}{2}$

Find the value of

cos (A - B)

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6. Find cos (x - y), given that cos x = -$\frac{4}{5}$ with $\pi < x < \frac{3\pi}{2}$ and sin y = -$\frac{24}{25}$ with $\pi < y < \frac{3\pi}{2}$.

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7. Find sin (x - y) given that sin x = $\frac{8}{17}$ with $0 < x < \frac{\pi}{2}$ and cos y = -$\frac{24}{25}$ with $\pi < y < \frac{3\pi}{2}$.

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8. Find the value of

$\cos 105^\circ$

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9. Find the value of

$\sin 105^\circ$

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10. Find the value of

(iii) $\frac{\tan(7\pi)}{6}$

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11. Prove that

$\cos(30^\circ + x) = \frac{\sqrt{3}\cos x - \sin x}{2}$

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12. Prove that

$\cos(\pi + \theta) = -\cos\theta$

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13. Prove that

$\sin(\pi + \theta) = -\sin\theta$

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14. Find the quadratic euation whose roots are $\sin 75^o$ and $\cos 75^o$

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15. Expand cos (A + B + C). Hence prove that cos A cos B cos C = sin A sin B cos C + sin B sin C cos A + sin C sin A cos B, if A + B + C = $\frac{\pi}{2}$.

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16. Prove that

$\sin(45^\circ + \theta) - \sin(45^\circ - \theta) = \sqrt{2}\sin\theta$

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17. Prove that

$\sin(30^\circ + \theta) + \cos(60^\circ + \theta) = \cos\theta$

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18. If a cos (x + y) = b cos (x - y), show that (a + b)tan x = (a - b) cot y.

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19. Prove that $\sin 105^\circ + \cos 105^\circ = \cos 45^\circ$

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20. Prove that $\sin 75^o - \sin 15^o = \cos 105^o + \cos 15^o$

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21. Show that $\tan 75^\circ + \cot 75^\circ = 4$

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22. Prove that cos (A + B) cos C - cos (B + C)

cos A = sin B sin (C - A)

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23. Prove that sin (n + 1)θ sin (n - 1) θ + cos (n + 1)θ cos (n - 1) θ = cos 2θ, n $\in \mathbb{Z}$.

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

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25. Prove that

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

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26. Prove that

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

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27. Prove that

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

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28. Prove that

cos 8θ cos 2θ = $\cos^2 5\theta - \sin^2 3\theta$

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29. Show that

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

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30. If $\cos(\alpha-\beta)+\cos(\beta-\gamma)+\cos(\gamma-\alpha)=\frac{-3}{2}$ then prove that $\cos\alpha+\cos\beta+\cos\gamma=\sin\alpha+\sin\beta+\sin\gamma=0$.

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31. Show that

$$\tan(45^\circ+A)=\frac{1+\tan A}{1-\tan A}$$

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32. Show that

$$\tan(45^\circ-A)=\frac{1-\tan A}{1+\tan A}$$

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33. Prove that cot (A + B) = $\frac{\cot A \cot B - 1}{\cot A + \cot B}$

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34. If tan x = $\frac{n}{n+1}$ and tan y = $\frac{1}{2n+1}$, find tan (x + y).

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35. Prove that $\tan\left(\frac{\pi}{4} + \theta\right)\tan\left(\frac{3\pi}{4} + \theta\right) = -1$

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36. Find the values of tan $(\alpha + \beta)$, given that cot $\alpha = \frac{1}{2}$ $\alpha \in \left(\pi, \frac{3\pi}{2}\right)$ and $\sec\beta = -\frac{5}{3}, \beta \in \left(\frac{\pi}{2}, \pi\right)$.

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37. If $\theta + \phi = \alpha$ and tan θ = k tan ϕ, then prove that sin $(\theta - \phi) = \frac{k-1}{k+1}\sin\alpha.$

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Solution To Exercise 3 5

1. Find the values of cos 2A, A lies in the first quadrant, when

cos A = $\frac{15}{17}$

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2. Find the values of cos 2A, A lies in the first quadrant, when

$\sin A = \frac{4}{5}$

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3. Find the values of cos 2A, A lies in the first quadrant, when $\tan A = \frac{16}{63}$.

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4. If $\theta$is an acute angle, then find $\sin\left(\frac{\pi}{4} - \frac{\theta}{2}\right)$ when $\sin\theta = \frac{1}{25}$

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5. If $\theta$is an acute angle, then find $\cos\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$, when $\sin\theta = \frac{8}{9}$

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6. If $\cos\theta = \frac{1}{2}\left(a + \frac{1}{a}\right)$, show that cos 30 = $\frac{1}{2}\left(a^3 + \frac{1}{a^3}\right)$.

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7. Prove that cos 50 = 16 $\cos^5\theta - 20\cos^3\theta + 5\cos\theta$

Watch Video Solution

8. Prove that sin $4\alpha = 4\tan\alpha\dfrac{1-\tan^2\alpha}{\left(1+\tan^2\alpha\right)^2}$

Watch Video Solution

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

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10. Prove that $(1+\tan 1^\circ)(1+\tan 2^\circ)(1+\tan 3^\circ)$....

$(1+\tan 44^\circ)$ is multiple of 4.

Watch Video Solution

Watch Video Solution

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

Watch Video Solution

12. Show that $\cot\left(7\frac{1}{2}\right)=\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}.$

Watch Video Solution

13. Prove that

$(1+\sec 2\theta)(1+\sec 4\theta)\ldots\ldots.(1+\sec 2^n\theta)=\tan 2^n\theta\cot\theta$

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14. Prove that $32\left(\sqrt{3}\right)\sin\frac{\pi}{48}\cos\frac{\pi}{48}\cos\frac{\pi}{24}\cos\frac{\pi}{12}\cos\frac{\pi}{6}=3$

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Solution To Exercise 3 6

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

$\sin 35^\circ \cos 28^\circ$

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2. Express each of the following as a sum or difference.

sin 4x cos 2x

Watch Video Solution

3. Express each of the following as a sum or difference.

$2 \sin 10\theta \cos 2\theta$

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4. Express each of the following as a sum or difference.

$\cos 5\theta \cos 2\theta$

Watch Video Solution

5. Express each of the following as a sum or difference.

$\sin 5\theta \sin 4\theta$

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6. Express each as a product

$\sin 75^\circ - \sin 35^\circ$

Watch Video Solution

7. Express each as a product

$\cos 65^\circ + \cos 15^\circ$

Watch Video Solution

8. Express each as a product

$\sin 50^\circ + \sin 40^\circ$

Watch Video Solution

9. Express each as a product

$\cos 35^\circ - \cos 75^\circ$

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10. Show that $\sin 12^o \sin 48^o \sin 54^o = \frac{1}{8}$.

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11. Show that $\cos\frac{\pi}{15}\cos\frac{2\pi}{15}\cos\frac{3\pi}{15}\cos\frac{4\pi}{15}\cos\frac{5\pi}{15}\cos\frac{6\pi}{15}\cos\frac{7\pi}{15}=\frac{1}{128}$.

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12. Show that

$$\frac{\sin 8x\cos x-\sin 6x\cos 3x}{\cos 2x\cos x-\sin 3x\sin 4x}=\tan 2x$$

Watch Video Solution

13. Show that $\frac{(\cos\theta-\cos 3\theta)(\sin 8\theta+\sin 2\theta)}{(\sin 5\theta-\sin\theta)(\cos 4\theta-\cos 6\theta)}=1$.

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14. Prove that $\sin x+\sin 2x+\sin 3x=\sin 2x(1+2\cos x)$.

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15. Prove that $\frac{\sin 4x + \sin 2x}{\cos 4x + \cos 2x} = \tan 3x$

Watch Video Solution

16. Prove that $1 + \cos 2x + \cos 4x + \cos 6x = 4 \cos x \cos 2x \cos 3x.$

Watch Video Solution

17. Prove that $\sin \frac{\theta}{2} \sin \frac{7\theta}{2} + \sin \frac{3\theta}{2} \sin \frac{11\theta}{2} = \sin 2\theta \sin 5\theta.$

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18. Prove that $\cos(30^\circ - A)\cos(30^\circ + A) + \cos(45^\circ - A)\cos(45^\circ + A) = \cos 2A + \frac{1}{4}$.

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19. Prove that $\frac{\sin x + \sin 3x + \sin 5x + \sin 7x}{\cos x + \cos 3x + \cos 5x + \cos 7x} = \tan 4x$

Watch Video Solution

20. Prove that $\frac{\sin(4A - 2B) + \sin(4B - 2A)}{\cos(4A - 2B) + \cos(4B - 2A)} = \tan(A + B)$

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21. Show that $\cot(A + 15^\circ) - \tan(A - 15^\circ) = \frac{4\cos 2A}{1 + 2\sin 2A}$.

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Solution To Exercise 3 7

1. If A + B + C = 180°, prove that

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

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2. If A + B + C = 180°, prove that

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

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3. If A + B + C = 180°, prove that

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

Watch Video Solution

4. If A + B + C = 180°, prove that

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

Watch Video Solution

5. If A + B + C = 180°, prove that

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

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6. If A + B + C = 180°, prove that

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

Watch Video Solution

7. If A + B + C = 180°, 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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8. If A + B + C = 2s, then prove that sin (s - A) sin (s - B) + sin s. sin (s - C) = sin A sin B .

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9. If x + y + z = xyz, then prove that $\frac{2x}{1-x^2}+\frac{2y}{1-y^2}+\frac{2z}{1-z^2}=\frac{2x}{1-x^2}\cdot\frac{2y}{1-y^2}\cdot\frac{2z}{1-z^2}.$

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

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

Watch Video Solution

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

cos 2A + cos 2B + cos 2C = 1 + 4 sin A sin B cos C

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12. If ΔABC is right triangle and if $\angle A = \frac{\pi}{2}$, then prove that

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

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13. If ΔABC is right triangle and if $\angle A = \frac{\pi}{2}$, then prove that

$\sin^2 B + \sin^2 C = 1$

Watch Video Solution

14. If ΔABC is right triangle and if $\angle A = \frac{\pi}{2}$, then prove that

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

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Solution To Exercise 3 8

1. Find the general solution of the following:

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

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2. Find the principal solution and general solutions :

$\cot\theta = \sqrt{3}$

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3. Find the principal solution and general solutions :

$\tan\theta = \frac{-1}{\sqrt{3}}$

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4. Solve the equations for which solution lies in the interval $0^\circ < \theta < 360^\circ$.

$\sin^4 x = \sin^2 x$

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5. Solve the equations for which solution lies in the interval $0^\circ < \theta < 360^\circ$.

$2\cos^2 x + 1 = -3\cos x$

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6. Solve the equations for which solution lies in the interval $0^\circ < \theta < 360^\circ$.

$2\sin^2 x + 1 = 3\sin x$

Watch Video Solution

7. Solve the equations for which solution lies in the interval $0^\circ < \theta < 360^\circ$.

cos 2x = 1 - 3 sin x

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8. Solve the equations:

sin 5x - sin x = cos 3x

Watch Video Solution

9. Solve the equations:

$2\cos^2\theta + 3\sin\theta - 3 = 0$

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10. Solve the equations:

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

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11. Solve the equations:

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

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12. Solve the equations:

$\sin 2\theta - \cos 2\theta - \sin\theta + \cos\theta = 0$

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13. Solve the following equations :

(vi)$\sin\theta + \cos\theta = \sqrt{2}$

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14. Solve $\sin\theta + \sqrt{3}\cos\theta = 1$

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15. Solve the equations:

$\cot\theta + \cos ec\theta = \sqrt{3}$

Watch Video Solution

16. Solve the equations:

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

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17. Solve the equations:

$$\cos 2\theta = \frac{\sqrt{5}+1}{4}$$

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18. Are the following functions r even or odd? (i)$\cos^2 x + 2\cos x + 3$

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Solution To Exercise 3 9

1. In a $\triangle ABC$, if $\frac{\sin A}{\sin C} = \frac{\sin(A-B)}{\sin(B-C)}$, prove that a^2, b^2, c^2 are in Artithmetic Progression.

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2. The angles of a triangle ABC, are in Arithmetic progression and if b : c = $\sqrt{3}:\sqrt{2}$, find $\angle A$

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3. In a ΔABC, if cos C = $\frac{\sin A}{2\sin B}$, show that the triangle is isosceles.

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4. In a $\triangle ABC$, prove that $\frac{\sin B}{\sin C} = \frac{c - a\cos B}{b - a\cos C}$

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5. In a ΔABC, $\angle A = 60^\circ$, prove that b + c = 2a cos $\left(\frac{B-C}{2}\right)$.

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6. In a ΔABC, prove that

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

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7. In a ΔABC, prove that

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

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8. In a ΔABC, prove that

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

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9. In a ΔABC, prove that

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

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10. In a ΔABC, prove that

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

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11. In ΔABC, prove that $\left(a^2 - b^2 + c^2\right)$ tan B = $\left(a^2 + b^2 - c^2\right)$ tan C.

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12. An Engineer has to develop a triangular shaped park with a perimeter 120 m in a village. The park to be developed must be of maximum area. Find out the dimensions of the park.

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13. A rope of length 12 m is given. Find the largest area of the triangle formed by this rope and find the dimensions of the triangle so formed.

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14. Derive projection formula from

Law of sines

Watch Video Solution

15. Derive projection formula from

Law of cosines

Watch Video Solution

Solution To Exercise 3 10

1. Determine whether the following measurements produce one triangle, two triangles or no triangle $\angle B = 88^\circ$, a = 23 , b = 2. Solve if solution exists.

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2. If the sides of ΔABC are a = 4, b = 6 , c = 8 , then show that 4 cos B + 3 cos C = 2.

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3. In ΔABC, if a = $\sqrt{3}-1, b=\sqrt{3}+1$ and $\angle C = 60^\circ$, find the other side and the other two angles.

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4. In any ΔABC, prove that the area $\Delta = \dfrac{b^2+c^2-a^2}{4\cot A}$

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5. In a ΔABC, if a = 12 cm, b = 8 cm $\angle C = 30^\circ$, then show that its area is 24 sq.cm.

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6. In a ΔABC, if a = 18 cm, b = 24 cm and c = 30 cm. then show that its area is 216 sq.cm

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7. Two soldiers A and B in two different underground bunkers on a straight road, spot an intruder at the top of a hill. The angle of elevation of the intruder from A and B to the ground level in the eastern direction are 30° and 45° respectively. If A and B stand 5 km apart, find the distance of the intruder from B.

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8. A researcher wants to determine the width of a pond from east to west, which cannot by done by actual measurement . From a point p, he finds the distance to the eastern-most point of the pond to be 8 km, while the distance to the western most point from P to be 6 km. if the angle between the two lines of sight is 60°, find the width of the pond.

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9. Two Navy helicopters A and B are flying over the bay of Bengal at same altitude from the sea level to search a missing boat. Pilots of both the helicopters sight the boat the same time while they are part 10 km from each other. If the distance of the boat from A is 6 km and if the line segment AB subtends 60° at the boat, find the distance of the boat from B.

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10. A straight tunnel is to be made through a mountain. A surveyor observer the two extremities A and B of the tunnel to be built from a point P in front of the mountain. If AP = 3 km, BP = 5 km and $\angle APB = 120^\circ$, then find the length of the tunnel to be built .

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11. A farmer wants to purchase a triangular shaped land with sides 120 feet and 60 feet and the angle included between these two sides is 60° . If the land costs ₹ 500 per sq. ft. find the amount he needed to purchase the land. Also, find the perimeter of the land.

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12. A fighter jet has to hit a small target by flying a horizontal distance. When the target is sighted, the pilot measures the angle of depression

to be 30°. If after 100 km, the target has an angle of depression of 45°, how far is the target from the fighter jet at that instant?

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13. A plane is 1 km from one landmark and 2 km from another. From the planes point of view the land between them subtends an angle of 45^o. How far apart are the landmarks?

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14. A man starts his morning walk at a point A reaches two points B and C and finally back to A such that $\angle A = 60^\circ \text{ and } \angle B = 45^\circ$, AC = 4 km in ΔABC. Find the total distance he covered during his morning walk.

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15. Two vehicles leave the same place P at the same time moving along two different roads. One vehicle moves at an average speed of 60km/hr and the other vehicle moves at an average speed of 80km/hr. After half an hour the vehicle reach the destinations A and B. If AB subtends 60° at the initial point. P, then find AB.

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16. Suppose that a satellite in space, an earth station and the centre of earth all lie in the same plane. Let r be the radius of earth and R be the distance from the centre of earth to the satellite. Let d be the distance from the earth station from the satellite. Let 30° be the angle of elevation from the earth station to the satellite. if the line segment connecting earth station and satellite subtends angle α at the centre of earth, then prove that

$$d = R\sqrt{1 + \left(\frac{r}{R}\right)^2 - 2\frac{r}{R}\cos\alpha}.$$

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Solution To Exercise 3 11

1. Find the principal value of

$$\sin^{-1}\frac{1}{\sqrt{2}}$$

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2. Find the principal value of

$$\cos^{-1}\frac{\sqrt{3}}{2}$$

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3. Find the principal value of

$$\operatorname{cosec}^{-1}(-1)$$

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4. Find the principal value of

$\sec^{-1}(-\sqrt{2})$

Watch Video Solution

5. Find the principal value of

$\tan^{-1}(\sqrt{3})$

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6. A man standing directly opposite to one side of a road of width x meter views a circular shaped traffic green signal of diameter a meter on the other side of the road. The bottom of the green signal is b meter height from the horizontal level of viewer's eye. If a denotes the angle subtended by the diameter of the green signal at the viewer's eye, then prove that

$\alpha = \tan^{-1}\left(\frac{a+b}{x}\right) - \tan^{-1}\left(\frac{b}{x}\right).$

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Problems For Practice

1. If (-2,-3)is a point on the terminal side of θ.Find all the trigonometric ratios.

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2. If $a\sin^2\theta + b\cos^2\theta = c$.Show that

$$\tan^2\theta = \frac{c-b}{a-c}$$

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

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4. If $\tan\theta + \sec\theta = x$,find $\sin\theta$

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

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6. Find $(1 + \tan A + \sec A)(1 + \cot A - \cos ecA)$.

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7. Find the value of $\tan\left[22\left(\frac{1}{2}\right)\right]^{O}$

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8. Show that $\cos^2 15^\circ + \cos^2 45^\circ + \cos^2 75^o = \frac{3}{2}$.

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9. Find $\sin 15^\circ$, $\cos 15^\circ$, $\tan 15^\circ$,hence evaluate $\cot 75^\circ + \tan 75^\circ$.

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10. If in a triangleABC show that :

(i) tanA+tanB+tanC =tanAtanBtanC.

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11. If A + B + C = 180°, prove that

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

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12. If $\tan\left(\frac{\theta}{2}\right) = 2 - \sqrt{3}$, find the value of $\sin\theta$.

Watch Video Solution

13. If $\tan\alpha = \frac{1}{3}, \tan\beta = \frac{1}{7}$, show that $2\alpha + \beta = \frac{\pi}{4}$

Watch Video Solution

14. Show that $\sin 20^o \sin 40^o \sin 60^o \sin 80^o = \frac{3}{16}$

Watch Video Solution

15. Solve: $2\tan\theta - \cot\theta = -1$

Watch Video Solution

16. Solve:$\sin 2x + \sin 6x - \sin 4x = 0.$

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17. Solve $\sin x - \cos x + \sqrt{2} = 0.$

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18. Show that $\dfrac{\sum a^2 \sin(B - C)}{\sin A} = 0$

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19. Show that $\sum a^3 \sin(B - C) = 0$

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20. If acosA=bcosBthen show that the triangle is either an isosceles triangle or right angled triangle.

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21. Show that $\sin^{-1} x + \cos^{-1} x = \frac{\pi}{2}$.

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22. Evaluate $\sin\left(\cos^{-1}\left(\frac{3}{5}\right)\right)$

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23. Evaluate

(ii)$\cos^{-1}\left[-\left(\frac{1}{\sqrt{2}}\right)\right]$.

View Text Solution

24. If $\tan^2\left(45+\frac{\theta}{2}\right)=\frac{a}{b}$.Show that $\sin\theta=\frac{a-b}{a+b}$

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25. $\cot B-\cot A=b, \tan A-\tan B=a$,find$\cot(A-B)$.

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26. Show that

$(b+c)\cos A+(c+a)\cos B+(a+b)\cos C=a+b+c$

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27. Prove $\sin(180-\theta)=\sin\theta$

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Choose The Correct Answer

1. $\frac{1}{\cos 80^o} - \frac{\sqrt{3}}{\sin 80^o} =$

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 2

D. 4

Answer: D

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2. If $\cos 28^o + \sin 28^o = k^3$,then $\cos 17^o$is equal

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

B. $-\left(\frac{k^3}{\sqrt{2}}\right)$

C. $\pm\left(\frac{k^3}{\sqrt{2}}\right)$

D. $-\left(\frac{k^3}{\sqrt{3}}\right)$

Answer: A

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3. The maximum value of $4\sin^2 x + 3\cos^2 x + \sin\frac{x}{2} + \cos\frac{x}{2}$ is

A. $4+\sqrt{2}$

B. $3+\sqrt{2}$

C. 9

D. 4

Answer: A

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

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

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

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

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

Answer: A

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5. If $\pi < 2\theta < \frac{3\pi}{2}$, then $\sqrt{2+\sqrt{2+2\cos 4\theta}}$ equals to

A. $-2\cos\theta$

B. $-2\sin\theta$

C. $2\cos\theta$

D. $2\sin\theta$

Answer: C

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6. If $\tan 40^o = \lambda$, then $\frac{\tan 140^o - \tan 130^o}{1 + \tan 140^o \tan 130^o} =$

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

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

C. $10\frac{\lambda^2}{2\lambda}$

D. $\frac{1 - \lambda^2}{2\lambda}$

Answer: D

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7. $\cos 1^\circ + \cos 2^\circ \cos 3^\circ \ldots + \cos 179^\circ$ is

A. 0

B. 1

C. -1

D. 89

Answer: A

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8. Let $f_4(x) = \frac{1}{k}\left[\sin^k + \cos^k x\right]$ where x $\in \mathbb{R}$ and $k \geq 1$.

then $f_4(x) - f_6(x)$ =

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

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

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

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

Answer: B

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9. Which of the following is not true?

A. $\sin\theta = -\left(\frac{3}{4}\right)$

B. $\cos\theta = -1$

C. $\tan\theta = 25$

D. $\sec\theta = \frac{1}{4}$

Answer: D

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10. $\cos 2\theta \cos 2\phi + \sin^2(\theta - \phi) - \sin^2(\theta + \phi)$ is equal to

A. $\sin 2(\theta + \phi)$

B. $\cos 2(\theta + \phi)$

C. $\sin 2(\theta - \phi)$

D. $\cos 2(\theta - \phi)$

Answer: A

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11. $\frac{\sin(A-B)}{\cos A \cos B} + \frac{\sin(B-C)}{\cos B \cos C} + \frac{\sin(C-A)}{\cos C \cos A}$ is

A. $\sin A + \sin B + \sin C$

B. 1

C. 0

D. $\cos A + \cos B + \cos C$

Answer: C

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12. If cos $p\theta$ + cos $q\theta$ = 0 and if p $\neq$ q, then θ is equal to (n is any integer)

A. $\frac{\pi(3n+1)}{p-q}$

B. $\frac{\pi(2n+1)}{p \pm q}$

C. $\frac{\pi(2n \pm 1)}{p \pm q}$

D. $\frac{\pi(n+2)}{p+q}$

Answer: D

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13. If tan α and tan β are the roots of $x^2 + ax + b = 0$, then $\frac{\sin(\alpha+\beta)}{\sin\alpha \sin\beta}$ is equal to

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

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

C. $-\left(\frac{a}{b}\right)$

D. $-\left(\frac{b}{a}\right)$

Answer: C

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14. In a triangle ABC, $\sin^2 A + \sin^2 B + \sin^2 C = 2$, then the triangle is

A. equilateral triangle

B. isosceles triangle

C. right triangle

D. scalene triangle

Answer: C

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15. If $f(\theta) = |\sin\theta| + |\cos\theta|, \theta \in \mathbb{R},$ then $f(\theta)$ is in the interval

A. [0,2]

B. $[1, \sqrt{2}]$

C. $[1, 2]$

D. [0,1]

Answer: B

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16. $\dfrac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x}$ is equal to

A. cos2x

B. cosx

C. cos3x

D. 2cosx

Answer: D

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17. The triangle of maximum area with constant perimeter 12m

A. is an equilateral traingle with side 4m

B. is an isosceles triangle with side 2m,5m,5m

C. is a traingle with sides 3m,4m,5m,

D. does not exist

Answer: A

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18. A wheel is spinning at 2 radians/second. How many seconds will it take to make 10 complete rotations?

A. 10π seconds

B. 20π seconds

C. 5π seconds

D. 15π seconds

Answer: A

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19. If $\sin\alpha + \cos\alpha$= b, then $\sin 2\alpha$ is equal to

A. $b^2 - 1, \quad \text{if} \quad b \leq \sqrt{2}$

B. $b^2 - 1, \quad \text{if} \quad b > \sqrt{2}$

C. $b^2 - 1, \quad \text{if} \quad b \geq 1$

D. $b^2 - 1, \quad \text{if} \quad b \geq \sqrt{2}$

Answer: A

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20. In a ΔABC, if

(i)$\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2} > 0$ (ii)$\sin A \sin B \sin C > 0$

A. both (i) and (ii0 are true

B. only (i) is true

C. only (ii) is true

D. neither (i) nor(ii)is true

Answer: A

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21. Prove that $\sin^2\alpha - \sin^4\alpha = \cos^2\alpha - \cos^4\alpha$

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22. $\frac{\pi}{5}$ radians is equal to x degrees .Then x is :

A. 36^o

B. 18^o

C. 72^o

D. none of these

Answer: A

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23. If $\cos\theta = \frac{4}{5}$ and the angle θ is the second quadrant then $\tan\theta$ is :

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

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

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

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

Answer: A

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24. $\cot(-1410^o)$ is:

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

B. $\sqrt{3}$

C. $-\frac{1}{\sqrt{3}}$

D. $-\sqrt{3}$

Answer: B

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25. Find all the angles between 0 and 360^o which satisfy the eqyation $\cos\theta = \frac{\sqrt{3}}{2}$.

A. $60^o, 300^o$

B. $30^o, 330^o$

C. $30^o, 300^o$

D. $60^o, 330^o$

Answer: B

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26. $\sin 15^o + \cos 15^o$ is:

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

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

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

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

Answer: C

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27. The value of $\sin 35^o + \cos 65^o - \cos 5^o$is:

A. 1

B. -1

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

D. 0

Answer: D

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28. The general solution of the $\cos\theta = 0$is:

A. $\theta = n\pi, \neq \psi lonZ$

B. $\theta = (2n+1)\left(\frac{\pi}{2}\right), n\varepsilon Z$

C. $\theta = n\pi, n\varepsilon Z$

D. none of these

Answer: B

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29. $\cos 1^o + \cos 3^o + \cos^5 o + \ldots. + \cos 177^o + \cos 179^o$ is,

A. 1

B. -1

C. 0

D. 189

Answer: C

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30. $\left(\frac{1}{\cos 80^\circ}\right) - \frac{\sqrt{3}}{\sin 80^\circ} =$

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 2

D. 4

Answer: D

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31. Choose the correct statement :

The triangle of maximum area with constant perimeter 24m.

A. is an equilateral traingle with side 8m

B. is an isosceles triangle with side 4m,10m,10m

C. is a traingle with sides 6m,8m,10m

D. does not exist

Answer: A

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32. Choose the correct statement :

A. the principal value of $\sin^{-1}\left(\frac{1}{2}\right) is \frac{\pi}{3}$

B. $\cos(A - B) = \cos A - \cos B$

C. $\sin 2\theta = 2\sin\theta\cos\theta$

D. $1 - \tan^2\theta = \sec^2\theta$

Answer: C

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33. Choose the incorrect statement :

A. $s = \frac{a+b+c}{2}$ is called semiperimeter ,in a triangle with sides a,b,c.

B. $(b+c)\cos A + (c+a)\cos B + (a+b)\cos C = a+b+c$

C. in any triangle the sum of two sides is always less than the third side

D. the principal value of $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) is \frac{\pi}{6}$

Answer: C

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34. Find the incorrect statement :

A. $\theta = \frac{\pi}{4}$ is one of the solution for the equation $\sin 9\theta - \sin\theta = 0$

B. If $\cos^2 A + \cos^2 B = 1$then

$\sin^2 A + \sin^2 B = 1$

C. $\cos(A-B) = \cos A \cos B + \sin A \sin B$

D. If $\sin\theta = \frac{12}{13}, \theta$ beingh in first quadrant then value of $\sin 2\theta is \frac{60}{169}$

Answer: D

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35. Find the correct statement :

A. tanx is a periodic function with period π

B. $-1 < \cos\theta < 1$

C. $f(x) = \cos x$ is an odd function

D. $\cos ecx(-\theta) = \cos ec\theta$

Answer: A

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36. Find the incorrect statement :

A. $\frac{\pi}{9} radians = 20^o$

B. In a circle ,length of arc l =$r\theta$ where r is the radius of the circle and θ is radian measure .

C. $\sin\left[\frac{3\pi}{2} + \theta\right] = \cos\theta$

D. $\tan 120^o = -\sqrt{3}$

Answer: C

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37. $\sin(30^o + \theta) + \cos(60^o + \theta)$:

A. $1 - 2\sin^2\left(\frac{A}{2}\right)$

B. $\sin A$

C. $2\sin A\cos A$

D. $\cos\theta$

Answer: D

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38. $\sin 2A$:

A. $1 - 2\sin^2\left(\frac{A}{2}\right)$

B. $\sin A$

C. $2\sin A\cos A$

D. $\cos\theta$

Answer: C

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39. $\cos A$:

A. $1 - 2\sin^2\left(\frac{A}{2}\right)$

B. $\sin A$

C. $2\sin A\cos A$

D. $\cos\theta$

Answer: A

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40. $\sin(720 + A)$:

A. $1 - 2\sin^2\left(\frac{A}{2}\right)$

B. $\sin A$

C. $2\sin A\cos A$

D. $\cos\theta$

Answer: B

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41. In a $\triangle ABC, b\cos c + c\cos B$ is:

A. cosB

B. cosx

C. $\tan\left(\frac{c}{2}\right)$

D. a

Answer: D

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42. In a $\triangle ABC, \frac{c^2 + a^2 - b^2}{2ca}$ is:

A. cosB

B. cosx

C. $\tan\left(\frac{c}{2}\right)$

D. a

Answer: A

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43. In a $tra \in g \leq ABC, 2R\sin C$ is:

A. cosB

B. cosx

C. $\tan\left(\frac{c}{2}\right)$

D. a

Answer: B

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44. In a $\triangle ABC, \sqrt{\frac{(s-a)(s-b)}{s(s-c)}}$ is:

A. cosB

B. cosx

C. $\tan\left(\frac{c}{2}\right)$

D. a

Answer: C

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45. Find the odd one out.

A. $\sin 45^o$

B. $\sin 135^o$

C. $\sin 405^o$

D. $\sin 225^o$

Answer: D

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46. Find the odd one out.

A. 105^o

B. 195^o

C. 75^o

D. 175^o

Answer: C

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47. Find the odd one out.

A. sin(-x)

B. cos(-x)

C. tan(-x)

D. cosec(-x)

Answer: B

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48. Assertion:A man who is 100m away from the foot of the tree observes the top of the tree at an elevation of 45^o.Thus the height of the tree is 100m.

Reason:$\tan\theta = \frac{hypotenuse}{adjacentside}$.

A. Reason is the correct formula to prove assertion

B. Reason is not the only formula to prove assertion

C. Both reason and assertion are incorrect

D. reason is incorrect

Answer: D

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49. Assertion:$\sin 2\theta = \frac{2\tan\theta}{1+\tan^2\theta}$,

Reason:$\sin^2\theta + \cos^2\theta = 1, \sin 2\theta = 2\sin\theta\cos\theta$

A. Assertion is correct Reason is incorrect

B. Assertion is incorrect Reason is correct

C. Both reason and assertion are incorrect

D. Assertion can be proved using reason

Answer: D

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50. If $\sin\theta + \cos\theta = 1$ then $\sin^6\theta + \cos^6\theta$ is:

A. 1

B. 0

C. -1

D. 2

Answer: A

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51. If in the two circles, arcs of the same length subtend angles $30^0$and 40^o at centre, find the ratio of their radii:

A. $3:4$

B. $4:3$

C. $7:12$

D. none of these

Answer: B

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52. If $\sin(45^o + 10^o) - \sin(45^o - 10^o) = \sqrt{2}\sin x$,then x is,

A. 0^o

B. 5^o

C. 10^o

D. 15^o

Answer: C

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53. The quadratic equations whose roots are $\tan 75^o$, $\cot 75^o$is,

A. $x^2 + 4x + 1 = 0$

B. $4x^2 - x + 1 = 0$

C. $4x^2 + 4x - 1 = 0$

D. $x^2 - 4x + 1 = 0$

Answer: D

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54. If $\tan x = \frac{1}{7}, \tan y = \frac{1}{3}$,then x+y is:

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

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

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

D. π

Answer: A

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55. $\sin\left[22\left(\frac{1}{2}\right)\right]^{o}$ is:

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

B. $\frac{2\sqrt{2}-1}{4\sqrt{2}}$

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

D. none of these

Answer: A

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56. If $A+B=45^{o}$,then $\tan A+\tan B+\tan A\tan B$is:

A. 2

B. 0

C. 1

D. -1

Answer: C

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57. The value of $\sin\left(\frac{\pi}{48}\right)\cos\left(\frac{\pi}{48}\right)\cos\left(\frac{\pi}{24}\right)\cos\left(\frac{\pi}{12}\right)\cos\left(\frac{\pi}{6}\right)\cos\left(\frac{\pi}{3}\right)$ is:

A. $\frac{\sqrt{3}}{32}$

B. $\frac{\sqrt{3}}{64}$

C. $\frac{3}{32}$

D. $\frac{3}{64}$

Answer: D

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58. In a triangle ABC ,$\angle C = 90^o$,then the value of $\sin A + \sin B - 2\sqrt{2}\cos\left(\frac{A}{2}\right)\cos\left(\frac{B}{2}\right)$ is:

A. -1

B. 1

C. 0

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

Answer: A

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59. The general solution of $\cos ec\theta = -2$ is :

A. $2n\pi + (-1)^n\left(-\frac{\pi}{6}\right)$

B. $n\pi + (-1)^n\left(-\frac{\pi}{6}\right)$

C. $2n\pi \pm \frac{\pi}{6}$

D. $-\left(\frac{\pi}{6}\right)+n\pi$

Answer: B

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60. In a triangle ABC,$\angle A=60^o, \angle C=30^o, b=2\sqrt{3}, c=2$then a is:

A. 0

B. 1

C. 4

D. 2

Answer: C

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61. In triangleABC ,$\angle C=90^o$,then $\cos^2 A+\cos^2 B$is :

A. 2RsinB

B. 2sinB

C. 0

D. 2asinB

Answer: D

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62. Given:

(i)$1 - \cot^2\theta = \cos ec^2\theta$

(ii)Is $\cos 2A + \cos 2B = 0$then sin^2 A +sin^2 B =2(iii)tan2theta= (2tantheta)/(1-tan^2theta)$(iv)\sin x$ is periodic function with period $\frac{\pi}{2}$

Find which pair is true:

A. (i) and (ii) are true

B. (i) and (iv)are true

C. (ii) and (iii) are true

D. (iii) and (iv) are true

Answer: C

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