MATHS

BOOKS - KUMAR PRAKASHAN KENDRA MATHS (GUJRATI ENGLISH)

TRIGONOMETRIC FUNCTIONS

Exercise 3 1

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

25°

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2. Find the radian measure corresponding to the following degree measures.

$-47^\circ, 30'$

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3. Find the radian measure corresponding to the following degree measures.

240°

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4. Find the radian measure corresponding to the following degree measures.

520°

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5. Find the degree measures corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

$\frac{11}{16}$

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6. Find the degree measures corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

-4

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7. Find the degree measures corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

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

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8. Find the degree measures corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

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

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

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

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

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

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13. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length (i) 10 cm (ii) 15 cm (iii) 21cm.

$10cm$

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14. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length (i) 10 cm (ii) 15 cm (iii) 21cm.

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15. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length (i) 10 cm (ii) 15 cm (iii) 21cm.

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Exercise 3 2

1. Find the values of other five trigonometric functions

$\cos x = -\frac{1}{2}$, x lies in third quadrant.

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2. Find the values of other five trigonometric functions

$\sin x = \frac{3}{5}$, x lies in second quadrant.

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3. Find the values of other five trigonometric functions

$\cot x = \frac{3}{4}$, x lies in third quadrant.

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4. Find the values of other five trigonometric functions

$\sec x = \frac{13}{5}$, x lies in fourth quadrant.

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5. Find the values of other five trigonometric functions

$\tan x = -\frac{5}{12}$, x lies in second quadrant.

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6. Find the values of the trigonometric functions

$\sin 765^\circ$

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7. Find the values of the trigonometric functions

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

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8. Find the values of the trigonometric functions

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

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9. Find the values of the trigonometric functions

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

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10. Find the values of the trigonometric functions

$$\cot\left(-\frac{15\pi}{4}\right)$$

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Exercise 3 3

1. Prove that :

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

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2. Prove that :

$$2\sin^2\left(\frac{\pi}{6}\right)+coe\sec^2\left(\frac{7\pi}{6}\right)\cos^2\left(\frac{\pi}{3}\right)=\frac{3}{2}$$

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3. Prove that :

$$\cot^2\left(\frac{\pi}{6}\right)+\cos ec\left(\frac{5\pi}{6}\right)+3\tan^2\left(\frac{\pi}{6}\right)=6$$

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4. Prove that :

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

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5. Find the value of :

$$\sin(75^\circ)$$

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6. Find the value of :

$\tan(15^\circ)$

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7. Prove that

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

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8. Prove that

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

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9. Prove that

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

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10. Prove that

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

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11. Prove that

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

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12. Prove that

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

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13. Prove that

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

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14. Prove that

$\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$

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15. Prove that

$\sin(2x) + 2\sin(4x) + \sin(6x) = 4\cos^2 x \sin 4x$

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16. Prove that

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

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17. Prove that

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

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18. Prove that

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

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19. Prove that

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

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20. Prove that

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

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21. Prove that

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

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22. Prove that

$$\frac{\cos(4x) + \cos(3x) + \cos(2x)}{\sin(4x) + \sin(3x) + \sin(2x)} = \cot(3x)$$

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23. Prove that

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

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24. Prove that

$$\tan 4x = \frac{4\tan x\left(1 - \tan^2 x\right)}{1 - 6\tan^2 x + \tan^4 x}$$

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25. Prove that

$$\cos 4x = 1 - 8\sin^2 x \cos^2 x$$

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26. Prove that

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

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Exercise 3 4

1. Find the principal and general solution of the following equations :

$\tan x = \sqrt{3}$

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2. Find the principal and general solution of the following equations :

$\sec x = 2$

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3. Find the principal and general solution of the following equations :

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

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4. Find the principal and general solution of the following equations :

$\operatorname{cosec} x = -2$

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5. Find the general solution of the following equations :

$\cos 4x = \cos 2x$

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6. Find the general solution of the following equations :

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

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7. Find the general solution of the following equations :

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

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8. Find the general solution of the following equations :

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

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9. Find the general solution of the following equations :

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

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Exercise 3 5

1. If any triangle ABC, $a = 18, b = 24, c = 30$

$\cos A, \cos B, \cos C$

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2. If any triangle ABC, $a = 18, b = 24, c = 30$

$\sin A, \sin B, \sin C$

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3. For any triangle ABC, prove that :

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

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4. For any triangle ABC, prove that :

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

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5. For any triangle ABC, prove that :

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

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6. For any triangle ABC, prove that :

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

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7. For any triangle ABC, prove that :

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

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8. For any triangle ABC, prove that :

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

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9. For any triangle ABC, prove that :

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

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10. For any triangle ABC, prove that :

$$a\cos A + b\cos B + c\cos C = 2a\sin B\sin C$$

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11. For any triangle ABC, prove that :

$$\frac{\cos A}{a} + \frac{\cos B}{b} + \frac{\cos C}{c} = \frac{a^2+b^2+c^2}{2abc}$$

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12. For any triangle ABC, prove that :

$$(b^2 - c^2)\cot A + (c^2 - a^2)\cot B + (a^2 - b^2)\cot C = 0.$$

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13. For any triangle ABC, prove that :

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

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14. A tree stands vertically on a hill side which makes an angle of 15° with the horizontal. From a point on the ground $35m$. Down the hill from the base of the tree, the angle of elevation of the top of the tree is 60°. Find the height of the tree.

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15. Two ships leave a port at the same time. One goes 24 km per hour in the direction $N45^\circ E$ and other travels $32km$ per hour in the directions $S75^\circ E$. Find the distance between the ships at the end of 3 hours.

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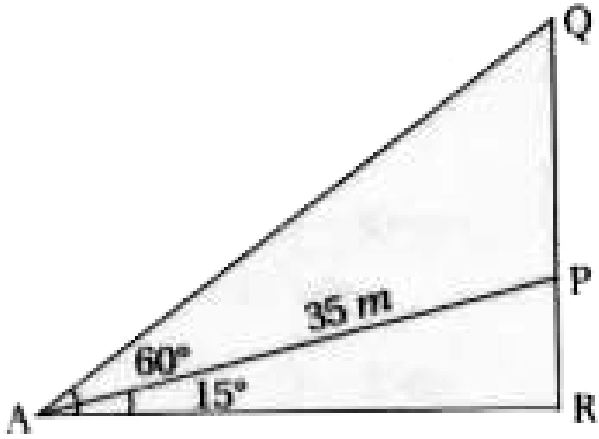
16. Two trees A and B are the same side of a river. From point c in the river the distance of the trees A and B is $250m$ and $300m$ respectively. If the angle C is 45°, find the distance between the trees. (Use $\sqrt{2} = 1.44$)



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Miscellaneous Exercise 3

1. Prove that :

$$2\cos\frac{\pi}{13}\cos\frac{9\pi}{13}+\cos\frac{3\pi}{13}+\cos\frac{5\pi}{13}=0$$

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2. Prove that :

$$[\sin(3x)+\sin x]\sin x+[\cos(3x)-\cos x]\cos x=0$$

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3. Prove that :

$$(\cos x+\cos y)^2+(\sin x-\sin y)^2=4\cos^2\frac{x+y}{2}$$

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4. Prove that :

$$(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4\sin^2 \frac{x-y}{2}$$

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5. Prove that :

$$\sin x + \sin(3x) + \sin(5x) + \sin(7x) = 4\cos x \cos(2x)\sin(4x)$$

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6. Prove that :

$$\frac{[\sin(7x) + \sin(5x)] + [\sin(9x) + \sin(3x)]}{[\cos(7x) + \cos(5x)] + [\cos(9x) + \cos(3x)]} = \tan(6x)$$

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7. Prove that :

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

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8. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ in each of the following.

$\tan x = -\frac{4}{3}, x$ in quadrant II^{nd}.

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9. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ in each of the following.

$\cos x = -\frac{1}{3}, x$ in quadrant III.

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10. Find $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$ in each of the following.

$\sin x = \frac{1}{4}, x$ in quadrant II.

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Practice Work

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

$40^\circ 20'$

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2. Find the radian measures corresponding to the following degree measures.

$48^\circ, 37'30''$

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3. Find the radian measures corresponding to the following degree measures.

135°

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4. Find the radian measures corresponding to the following degree measures.

$-22^\circ 30'$

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5. Find the radian measures corresponding to the following degree measures.

-33°

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6. Find the degree measurs corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

$\frac{1}{4}$

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7. Find the degree measurs corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

$\frac{2\pi}{15}$

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8. Find the degree measurs corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

11

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9. Find the degree measurs corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

-3

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10. Find the degree measurs corresponding to the following radian measures. (Use $\pi = \frac{22}{7}$)

$\frac{-5\pi}{6}$

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11. The minute hand of a watch is $1.5cm$ long. How far does it tip move in 40 minute?

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12. Find the degree of radian, the angle between the hour hand and the minute hand of a clock at half past three.

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13. Find the length of arc of a circle of radius 5 cm subtending a central angle measuring 15°.

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14. 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 m when it has traced out 54° at the centre. Find the length of the rope.

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15. The difference between the two acute angleof a right angled triangle is $\frac{2\pi}{5}$ radians. Express the angles in degrees.

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16. Find the value of other five trigonometric function.

$\cot\theta = \frac{12}{5,\theta}$ lies in third quadrant.

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17. Find the value of other five trigonometric function.

$\tan\theta = \frac{3}{4}, \theta$ lies in third quandrant.

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18. Find the value of other five trigonometric function.

$\sin\theta = -\frac{2\sqrt{6}}{5}, \theta$ lies in fourth quadrant.

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19. Find the value of other five trigonometric function.

$\cot x = -\frac{5}{12}, x$ lies in second quadrant.

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20. Prove that, $\cos 510^\circ \cos 330^\circ + \sin 390^\circ \cos 120^\circ = -1.$

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21. Prove that,

$$\sin\left(\frac{8\pi}{3}\right)\cos\left(\frac{23\pi}{6}\right) + \cos\left(\frac{13\pi}{3}\right)\sin\left(\frac{35\pi}{6}\right) = \frac{1}{2}$$

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22. 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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23. Find the value of x.

$\cos ec(90^\circ + \theta) + x \cos\theta \cot(90^\circ + \theta) = \sin(90^\circ + 0)$

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24. Find the value of x.

$x \cot(90^\circ + \theta) + \tan(90^\circ + \theta)\sin\theta + \cos ec(90^\circ + \theta) = 0$

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25. Find the value of following trigonometric function.

$\tan(-585^\circ)$

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26. Find the value of following trigonometric function.

$\sin(4530^\circ)$

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27. Find the value of following trigonometric function.

$\tan\left(\frac{11\pi}{6}\right)$

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28. Find the value of following trigonometric function.

$\cos(1755^\circ)$

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29. Find the value of following trigonometric function.

$\sin(-330^\circ)$

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30. Prove that

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

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31. Find the value of

$$\sin(135^\circ)\cos ec(225^\circ)\tan(150^\circ)\cot(315^\circ)$$

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32. Prove that,

$$3\sin\left(\frac{\pi}{6}\right)\sec\left(\frac{\pi}{3}\right)-4\sin\left(\frac{5\pi}{6}\right)\cot\left(\frac{\pi}{4}\right)=1.$$

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33. Prove

$$\tan\left(\frac{11\pi}{3}\right)-2\sin\left(\frac{4\pi}{6}\right)-\left(\frac{3}{4}\right)\cos ec^2\left(\frac{\pi}{4}\right)+4\cos^2\left(\frac{17\pi}{6}\right)=\frac{3-4\sqrt{3}}{2}$$

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34. Find the value of

$\cos 75^\circ$

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35. Find the value of

$\tan 75^\circ$

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36. Find the value of

$\sin 15^\circ$

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37. Find the value of

$\sec 105^\circ$

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38. Prove that,

$\sin(40^\circ + \theta)\cos(10^\circ + \theta) - \cos(40^\circ + \theta)\sin(10^\circ + \theta) = \frac{1}{2}$

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39. Prove that, $\frac{\tan A + \tan B}{\tan A - \tan B} = \frac{\sin(A + B)}{\sin(A - B)}$

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40. Prove that, $\cos^2 45^\circ - \sin^2 15^\circ = \frac{\sqrt{3}}{4}$

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41. Prove that,

$\cos 105^\circ + \cos 15^\circ = \sin 75^\circ - \sin 15^\circ$

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42. Prove that $\frac{\tan 69^\circ + \tan 66^\circ}{1 - \tan 69^\circ \tan 66^\circ} = -1$

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43. If $\sin A = \frac{4}{5}$ and $\cos B = \frac{5}{13}$, where $0 < A, B < \frac{\pi}{2}$ then find (i) $\sin(A + B)$ (ii) $\cos(A - B)$.

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44. If x and y are acute angles and $\cos x = \frac{13}{14}$ and $\cos y = \frac{1}{7}$ then prove that $x - y = -\frac{\pi}{3}$.

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45. Prove that,

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

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46. Find the value of

$$\sin^2 37\frac{1^\circ}{2}-\sin^2 7\frac{1}{2}$$

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47. Find the value of

$$\sin^2 52\frac{1^\circ}{2}-\cos^2 7\frac{1^\circ}{2}$$

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48. Find the value of

$$\cos^2 37\frac{1^\circ}{2} - \sin^2 37\frac{1^\circ}{2}$$

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49. Prove that,

$$\sin^2 A + \sin^2 B + \cos^2(A+B) + 2\sin A \sin B \cos(A+B) = 1$$

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50. Prove that

$$\sin\theta + \sin\left(\theta + \frac{2\pi}{3}\right) + \sin\left(\theta + \frac{4\pi}{3}\right) = 0$$

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51. Prove that,

$$\cos 20^\circ + \cos 60^\circ + \cos 100^\circ + \cos 140^\circ = \frac{1}{2}$$

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52. Prove that, $\sin 65^\circ + \cos 65^\circ = \sqrt{2}\cos 20^\circ$

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53. Prove that, $\cos 55^\circ + \cos 65^\circ + \cos 175^\circ = 0$

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54. Prove that, $\dfrac{\cos 7A + \cos 5A}{\sin 7A - \sin 5A} = \cot A$

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55. Prove that, $\dfrac{\sin \frac{5\pi}{12} - \cos \frac{5\pi}{12}}{\cos \frac{5\pi}{12} + \sin \frac{5\pi}{12}} = \dfrac{1}{\sqrt{3}}$

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56. Prove that, $\sin 10^\circ + \sin 50^\circ - \sin 70^\circ = 0$

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57. Prove that, $\cos 18^\circ - \sin 18^\circ = \sqrt{2}\sin 27^\circ$

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58. If $\sin\theta = n\sin(\theta + 2\alpha)$ then prove that, $\tan(\theta + \alpha) = \frac{1+n}{1-n}\tan\alpha$

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59. Prove that, $\frac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A.\tan 3A$

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

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61. Prove that,

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

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62. Prove that,

$\cos 80^\circ + \cos 40^\circ - \cos 20^\circ = 0$

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63. Prove that,

$\sin 51^\circ + \cos 81^\circ = \cos 21^\circ$

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64. Prove that,

$\sin A + \sin 2A + \sin 4A + \sin 5A =$

$4\cos\left(\frac{A}{2}\right)\cos\left(\frac{3A}{2}\right)\sin 3A.$

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65. Prove that,

$\cos 3A + \cos 5A + \cos 7A + \cos 15A = 4\cos 4A \cos 5A \cos 6A.$

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66. Prove that,

$\tan 3A.\ \tan 2A.\ \tan A = \tan 3A - \tan 2A - \tan A$

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67. Prove that, $\tan 25^\circ . \tan 15^\circ + \tan 15^\circ \tan 50^\circ + \tan 25^\circ \tan 50^\circ = 1.$

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68. Prove that, $\tan 65^\circ = \tan 25^\circ + 2\tan 40^\circ .$

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69. If $A + B + C = k\pi, k \in Z$ Then prove that,

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

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70. If $A + B + C = k\pi, k \in Z$ Then prove that,

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

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71. Prove that,

$$\sin 5A = 5\cos^4 A \sin A - 10\cos^2 A \sin^3 A + \sin^5 A$$

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72. Prove that,

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

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73. Prove that,

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

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

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75. Prove that,

$\sin 4A = 4 \sin A \cos^3 A - 4 \cos A \sin^3 A$

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76. If $2 \cos \theta = x + \frac{1}{x}$ then prove that, $2 \cos 3\theta = x^3 + \frac{1}{x^3}$.

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77. Find the general solutions of the following equations :

$2 \sin \theta + 1 = 0$

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78. Find the general solutions of the following equations :

$\cos 3\theta = -\frac{1}{2}$

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79. Find the general solutions of the following equations :

$\sec\theta = \sqrt{2}$

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80. Find the general solutions of the following equations :

$\cos\theta = \frac{-\sqrt{3}}{2}$

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81. Find the general solutions of the following equations :

$\sin\theta = \frac{1}{2}$

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82. Find the general solutions of the following equations :

$\cos\theta = -1$

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83. Find the general solutions of the following equations :

$\sin 5\theta = \frac{1}{\sqrt{2}}$

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84. Find the general solutions of the following equations :

$\sin\frac{3\theta}{2} = 0$

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85. Find the general solution for each of the following equations :

$4\sin x\cos x + 2\sin x + 2\cos x + 1 = 0$

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86. Find the general solution for each of the following equations :

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

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87. Find the general solution for each of the following equations :

$\sin 3\alpha = 4\sin\alpha\sin(x + \alpha)\sin(x - \alpha)$

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88. Find the general solution for each of the following equations :

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

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89. Find the general solution for each of the following equations :

$4 \sin x \sin 2x \sin 4x = \sin 3x$

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90. Find the general solution for each of the following equations :

$\sin 2\theta + \sin 4\theta + \sin 6\theta = 0$

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91. Find the general solution for each of the following equations :

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

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92. Find the general solution for each of the following equations :

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

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93. Find the general solution for each of the following equations :

$2\sin^2 x + \sqrt{3}\cos x + 1 = 0$

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94. Find the general solution for each of the following equations :

$\sin\theta = \tan\theta$

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95. In $\Delta ABC, a = 4, b = 6$ and $c = 8$ then move that $4\cos B + 8\cos C = \frac{3}{4}$.

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96. In $\Delta ABC, \frac{b+c}{11} = \frac{c+a}{12} = \frac{a+b}{13}$ then prove that $\frac{\cos A}{7} = \frac{\cos B}{19} = \frac{\cos C}{25}$.

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97. In ΔABC, if $\cos A = \frac{\sin B}{2 \sin C}$ then show that ΔABC is an isoscles triangle.

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98. In ΔABC, if $A = 45^\circ, B = 60^\circ$ and $C = 75^\circ$ then find the ratio of its side.

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99. The angles of ΔABC are in A.P. if $b : c = \sqrt{3} : \sqrt{2}$ then find $\angle A, \angle B$ and C.

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100. For ΔABC prove that,

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

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

Watch Video Solution

102. Prove that,

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

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103. Prove that,

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

Watch Video Solution

104. Prove that,

$$a^3\sin(B-C)+b^3\sin(C-A)+c^3\sin(A-B)=0$$

Watch Video Solution

105. Prove that,

$$\cot\frac{\pi}{24}=\sqrt{2}+\sqrt{3}+\sqrt{4}+\sqrt{6}$$

Watch Video Solution

106. Prove that,

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

Watch Video Solution

107. Prove that,

$4\sin 27^\circ = \sqrt{5+\sqrt{5}} + \sqrt{3-\sqrt{5}}$

Watch Video Solution

108. If α and β are roots of the equation $a\cos\theta + b\sin\theta = c$ then prove that,

$\cos\alpha + \cos\beta = \frac{2ac}{a^2+b^2}$ and $\cos\alpha.\cos\beta = \frac{c^2-b^2}{a^2+b^2}$

Watch Video Solution

109. If α and β are roots of the equation $a\cos\theta + b\sin\theta = c$ then prove that,

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

Watch Video Solution

110. If $\cos\theta = a$ then show that $\cos^2\left(\frac{\theta}{2}\right)$ and $\sin^2\left(\frac{\theta}{2}\right)$ are roots of the equation $4x^2 - 4x + 1 = a^2$.

Watch Video Solution

111. Prove that, $(2\cos\theta + 1)(2\cos\theta - 1)$

$(2\cos 2\theta - 1)(2\cos 4\theta - 1) = 2\cos 8\theta + 1$

Watch Video Solution

112. If ΔABC is a right angle triangle then prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 \Leftrightarrow \sin^2 A + \sin^2 B + \sin^2 C = 2$

Watch Video Solution

113. If $\cos\alpha = \frac{3}{5}, \cos\beta = \frac{5}{13}, 0 < \alpha, \beta < \frac{\pi}{2}$ then find the value of $\sin^2\left(\frac{\alpha - \beta}{2}\right)$ and $\cos^2\left(\frac{\alpha - \beta}{2}\right)$.

Watch Video Solution

114. Prove, $\sin 6^\circ . \sin(42^\circ). \sin(66^\circ). \sin(78^\circ) = \frac{1}{16}$.

Watch Video Solution

115. Prove that $2\tan\beta + \cot\beta = \tan\alpha \Rightarrow 2\tan(\alpha - \beta) = \cot\beta.$

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116. If $\theta + \beta = \alpha$ and $\sin\theta = k\sin\beta$ then prove that $\tan\theta = \frac{k\sin\alpha}{1 + k\cos\alpha}$ and $\tan\beta = \frac{\sin\alpha}{k + \cos\alpha}.$

Watch Video Solution

117. If $a\sin\theta = b\sin\left(\theta + \frac{2\pi}{3}\right) = c\sin\left(\theta + \frac{4\pi}{3}\right)$ then prove that, $ab + bc + ca = 0.$

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118. If $\cos\alpha = \frac{-5}{13}, \frac{\pi}{2} < \alpha < \pi$ and $\tan\beta = \frac{4}{3}, \pi < \beta < \frac{3\pi}{2}$ then determine the quadrant of $P(\alpha + \beta)$.

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119. Solve : $\sqrt{2}\sec\theta + \tan\theta = 1$

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

Watch Video Solution

121. If $\cos\theta = \dfrac{\cos\alpha\cos\beta}{1-\sin\alpha\sin\beta}$ then prove that $\tan\left(\dfrac{\theta}{2}\right) = \dfrac{\tan\left(\frac{\alpha}{2}\right) - \tan\left(\frac{\beta}{2}\right)}{1-\tan\left(\frac{\alpha}{2}\right)\tan\left(\frac{\beta}{2}\right)}$

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122. If $\tan A = \dfrac{1}{7}$ and $\tan B = \dfrac{1}{3}$ then show that $\cos(2A) = \sin(4B)$.

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Textbook Based Mcqs

1. In a circle with radius 3 cm an arc of length 1 cm subtends an angle of measure ..... at the centre of the circle.

A. 2 Radian

B. 3 Radian

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

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

Answer: C

Watch Video Solution

2. The radian measure of 56° is .....

A. $\frac{12\pi}{35}$

B. $\frac{14\pi}{45}$

C. $\frac{7\pi}{20}$

D. $\frac{7\pi}{36}$

Answer: B

Watch Video Solution

3. Out of the following sentence, which is true?

A. $\cos 1 < \cos 1^\circ$

B. $\cos 1 > \cos 1^\circ$

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

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

Answer: A

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4. The angle between the hour hand and the minute hand of a clock at the time $4:20$ is .....

A. $\frac{\pi}{18}$

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

C. $\frac{\pi}{10}$

D. $\frac{\pi}{36}$

Answer: A

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5. sin 2 ..... sin 5

A. $>$

B. $<$

C. =

D. $\leq$

Answer: A

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6. A circular wire of radius 7 cm is cut and arrange on the diameter of a circle with radius 12 cm. The angle subtended by it at the centre of the circle is .....

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

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

C. $\frac{5\pi}{9}$

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

Answer: B

Watch Video Solution

7. The degree measure of 3 radian is .....

A. $171^\circ 49' 5''$

B. $171^\circ 49' 50''$

C. $171^\circ 50' 5''$

D. $171^\circ 48' 15''$

Answer: A

Watch Video Solution

8. The angles of a quadrilateral are in A.P. If the greates angle is 120° then the smallest angle is .....

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

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

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

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

Answer: C

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9. $y = \sin\frac{x}{2}, x \in [0, 2\pi]$. The function y is ..... In $(0, \pi)$.

A. Decreasing

B. Increasing

C. Constant

D. Can not say anything

Answer: B

Watch Video Solution

10. $\tan 15^\circ$ = ...

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

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

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

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

Answer: A

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11. $2\cos\frac{5\pi}{24}.\cos\frac{\pi}{24}$ = ...

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

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

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

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

Answer: C

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12. The value of $\frac{\tan 3x}{\tan x}$ do not lie between .....

A. $-\frac{1}{3}$ and 0

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

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

D. -3 and 3

Answer: B

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13. $\tan 75^\circ - \cot 75^\circ = \ldots\ldots\ldots$

A. $2\sqrt{3}$

B. $2 + \sqrt{3}$

C. $2 - \sqrt{3}$

D. None of these

Answer: A

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14. $\cos ec(-1410^\circ) = \ldots\ldots\ldots$

A. -2

B. 2

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

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

Answer: B

Watch Video Solution

15. $\sin\theta = -\frac{3}{5}$ and $\pi < \theta < \frac{3\pi}{2}$ then the value of $\frac{\sec\theta - \cot\theta}{\tan\theta - \operatorname{cosec}\theta}$ is .....

A. $\frac{31}{29}$

B. $-\frac{31}{29}$

C. $\frac{30}{29}$

D. -1

Answer: B

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16. Out of the following statement which is false?

A. $\sin\theta = -\frac{1}{5}$

B. $\cos\theta = 1$

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

D. $\tan\theta = 20$

Answer: C

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17. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$ then $m^2 - n^2$ = ...

A. $4mn$

B. $\sqrt{mn}$

C. $4\sqrt{mn}$

D. $2mn$

Answer: C

Watch Video Solution

18. $\cos 105^\circ + \sin 105^\circ$ = ...

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

B. 1

C. $\sqrt{2}$

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

Answer: D

Watch Video Solution

19. If $A + B = 225^\circ$ then $\frac{\cot A}{1 + \cot A} \cdot \frac{\cot B}{1 + \cot B}$ = ...

A. 1

B. -1

C. 0

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

Answer: D

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20. If $y = (1 + \tan A)(1 - \tan B)$ and $A - B = \frac{\pi}{4}$ then $(y + 1)^{y+1}$ =

.....

A. 9

B. 4

C. 27

D. 81

Answer: C

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

A. 1

B. 2

C. -1

D. 0

Answer: B

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22. $\frac{\cos(17^\circ)+\sin(17^\circ)}{\cos(17^\circ)-\sin(17^\circ)}=$ .....

A. $\tan 62^\circ$

B. $\tan 56^\circ$

C. $\tan 54^\circ$

D. $\tan 73^\circ$

Answer: A

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23. $\frac{\sin(70^\circ) + \cos(40^\circ)}{\cos(70^\circ) + \sin(40^\circ)} = \ldots\ldots\ldots$

A. 1

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

C. $\sqrt{3}$

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

Answer: C

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24. $\sin(12^\circ)\sin(48^\circ)\sin(54^\circ) = \ldots\ldots\ldots$

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

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

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

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

Answer: C

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25. The value of $\frac{1-\tan^2(15^\circ)}{1+\tan^2(15^\circ)}$ is .....

A. 1

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

C. 2

D. $\sqrt{3}$

Answer: B

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26. The value of $\frac{1-\tan^2 15^\circ}{1+\tan^2 15^\circ}$ is

A. $\frac{m-1}{m^2+1}$

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

C. $\frac{m^2-1}{m^2+1}$

D. $\frac{m+1}{m^2+1}$

Answer: A

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27. $\cos^2\left(7\frac{1^\circ}{2}\right)-\cos^2\left(37\frac{1^\circ}{2}\right)=$ .....

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

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

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

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

Answer: D

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28. The value of $\cos(480^\circ)\sin(150^\circ) + \sin(600^\circ)\cos(390^\circ)$ is .....

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

B. 0

C. -1

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

Answer: C

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29. $\cos\left(\frac{2\pi}{7}\right) + \cos\left(\frac{4\pi}{7}\right) + \cos\left(\frac{6\pi}{7}\right) =$

A. 1

B. -1

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

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

Answer: D

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30. If $\frac{\tan x}{1} = \frac{\tan y}{2} = \frac{\tan z}{3} (\neq 0)$ and $x + y + z = \pi$ then which of the following is false?

A. $\tan x = \pm 1, \tan y = \pm 2, \tan z = \pm 3$

B. $\tan x + \tan y + \tan z = 0$

C. $\tan x + \tan y + \tan z$, Maximum value 6

D. $\tan x + \tan y + \tan z$, Minimum value -6

Answer: B

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31. $\cos\left(\frac{\pi}{7}\right)\cos\left(\frac{2\pi}{7}\right)\cos\left(\frac{4\pi}{7}\right) = \ldots\ldots\ldots$

A. 0

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

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

D. $-\frac{1}{8}$

Answer: D

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32. $\sin\left(\frac{\pi}{16}\right)\sin\left(\frac{3\pi}{16}\right)\sin\left(\frac{5\pi}{16}\right)\sin\left(\frac{7\pi}{16}\right) = \ldots\ldots\ldots$

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

B. $\frac{\sqrt{2}}{16}$

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

D. $\frac{\sqrt{2}}{8}$

Answer: B

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33. $\cos^2\left(\frac{\pi}{12}\right) + \cos^2\left(\frac{3\pi}{12}\right) + \cos^2\left(\frac{5\pi}{12}\right) =$ .....

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

B. 0

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

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

Answer: D

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34. If $A = 125$ and $x = \sin A^\circ + \cos A^\circ$ then .....

A. $x < 0$

B. $x = 0$

C. $x > 0$

D. $x \geq 0$

Answer: C

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35. The value of $\sqrt{3}\cos ec20^\circ - \sec 20^\circ$ is .....

A. -4

B. 1

C. 2

D. 4

Answer: D

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36. If $\cos\alpha = -\frac{4}{5}, \frac{\pi}{2} < \alpha < \pi$ then $\tan\left(\frac{\alpha}{2}\right) =$ .....

A. -3

B. 3

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

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

Answer: B

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37. If $\tan x = -\frac{4}{3}, \frac{\pi}{2} < x < \pi$ then $\sin\left(\frac{x}{2}\right) =$ .....

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

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

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

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

Answer: B

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38. One of the roots of $4x^3 - 3x = \frac{1}{2}$ is .....

A. $\sin 70^\circ$

B. $\sin 10^\circ$

C. $\sin 20^\circ$

D. $\cos 70^\circ$

Answer: A

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39. The value of $\cos\left(67\frac{1^\circ}{2}\right)$ is .....

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

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

C. $\sqrt{2}-1$

D. $\sqrt{2}+1$

Answer: B

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40. If one of the roots of $25\cos^2\theta + 5\cos\theta - 12 = 0$ is α then the value of $\sin 2\theta$ is ..... $\left(\frac{\pi}{2} < \theta < \pi\right)$.

A. $\frac{-24}{23}$

B. $\frac{-13}{18}$

C. $\frac{13}{18}$

D. $-\frac{24}{25}$

Answer: A

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41. If $\cos\alpha = -0.6$ and $\pi < \alpha < \frac{3\pi}{2}$ then $\tan\left(\frac{\alpha}{4}\right)$ = ...

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

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

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

D. $\frac{\sqrt{5}+1}{2}$

Answer: D

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42. If $\tan x = \frac{b}{a}$ then $a\cos(2x) + b\sin(2x)$ = ...

A. $a - b$

B. a

C. b

D. $a + b$

Answer: B

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43. If $\cos A = \frac{3}{4}$ then $32 \sin\left(\frac{A}{2}\right) \sin\left(\frac{5A}{2}\right)$ = ...

A. -11

B. $-\sqrt{11}$

C. $\sqrt{11}$

D. 11

Answer: D

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44. $\sqrt{2+\sqrt{2+2\cos 4\theta}} =$ .....

A. $\cos\theta$

B. $\sin\theta$

C. $2\cos\theta$

D. $2\sin\theta$

Answer: C

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45. If $\tan^2\theta = 2\tan^2\phi + 1$ then the value of $\cos(2\theta) + \sin^2\phi$ is .....

A. -1

B. 0

C. 1

D. 2

Answer: B

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46. If $\tan\frac{\alpha}{2}$ and $\tan\frac{\beta}{2}$ are roots of the equation $8x^2 - 26x + 15 = 0$ then $\cos(\alpha + \beta)$ = ...

A. $-\frac{627}{725}$

B. $\frac{627}{725}$

C. -1

D. None of these

Answer: A

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47. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$ then the value of $\cos\left(\theta - \frac{\pi}{4}\right)$ is .....

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

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

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

D. ± 1

Answer: B

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48. The number of solutions of the equation $3\sin^2 x - 7\sin x + 2 = 0$ in $[0, 5\pi]$ are .....

A. 0

B. 5

C. 6

D. 10

Answer: C

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49. The general solution of the equation $\sin^{50} x - \cos^{50} x = 1$ is .....

A. $2k\pi + \frac{\pi}{2}, k \in Z$

B. $2k\pi + \frac{\pi}{3}, k \in Z$

C. $k\pi + \frac{\pi}{3}, k \in Z$

D. $k\pi + \frac{\pi}{2}, k \in Z$

Answer: D

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50. The solution set of $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ is .....

A. R

B. $k\pi, k \in Z$

C. ϕ

D. $(2k+1)\frac{\pi}{2}, k \in Z$

Answer: A

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51. The number of points of intersection of the graphs $2y = 1$ and $y = \sin x, \ -2\pi < x \leq 2\pi$ is .....

A. 2

B. 4

C. 3

D. 1

Answer: B

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52. The real solutions of the equation $\cos^7 x + \sin^4 x = 1$ in $(-\pi, \pi)$ are .....

A. $0, \frac{\pi}{3}, -\frac{\pi}{3}$

B. $0, \frac{\pi}{4}, -\frac{\pi}{4}$

C. $0, \frac{\pi}{2}, -\frac{\pi}{2}$

D. $\frac{\pi}{2}, \frac{\pi}{3}, \frac{\pi}{4}$

Answer: C

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53. The solution set of $\sin\theta + \cos\theta = 2$ is .....

A. $k\pi, k \in Z$

B. $2k\pi + \frac{\pi}{2}, k \in Z$

C. ϕ

D. $(2k+1)\frac{\pi}{2}, k \in Z$

Answer: C

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54. If $3\sin\theta = 2\cos\theta$ then the value of $\sin 2\theta$ is .....

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

B. $\frac{5}{13}$

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

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

Answer: A

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55. $\tan^6 40^\circ - 33\tan^4 40^\circ + 27\tan^2 40^\circ$ = ...

A. 1

B. 2

C. 3

D. None of these

Answer: C

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56. $\theta_1, \theta_2 \in [0, 2\pi]$ and θ_1 and θ_2 satisfy the equation $\tan\theta = 1$ then $\tan\left(\frac{\theta_1}{2}\right).\tan\left(\frac{\theta_2}{2}\right) =$ .....

A. 0

B. -1

C. 2

D. 1

Answer: B

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57. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$ then $\frac{\tan x}{\tan y}$ = ...

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

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

C. ab

D. $a-b$

Answer: B

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58. Trigonometric point $P\left(\frac{101\pi}{3}\right)$ lies in.....quadrant.

A. First

B. Second

C. Third

D. Fourth

Answer: D

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59. If $\cos(\alpha+\beta)=\frac{4}{5}, \sin(\alpha-\beta)=\frac{5}{13}, 0<\alpha, \beta<\frac{\pi}{4}$ then $\tan 2\alpha$ = ...

A. $\frac{16}{63}$

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

C. $\frac{28}{33}$

D. None of these

Answer: B

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60. The number of solutions of the equation $16^{\sin^2 x} + 16^{\cos^2 x} = 10, x \in [0, 3\pi]$ is .....

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Textbook Illustrations For Practice Work

1. Convert 40°, $20'$ into radian measure.

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2. Convert 6 radians into degree measure.

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3. Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4 cm.

(Use $\pi = \frac{22}{7}$)

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4. The minute hand of a watch is $1.5cm$ long. How far does it tip move in 40 minute?

(Use $\pi = 3.14$)

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5. If the arcs of the same lengths in two circles subtends angles 65° and 110° at the centre, find the ratio of their radii.

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6. If $\cos x = \frac{-3}{5}$, x lies in the third quadrant, find the values of other five trigonometric functions.

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7. If $\cot x = \frac{-5}{12}$, x lies in second quadrant, find the values of other five trigonometric functions.

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8. Find the value of $\sin \frac{31\pi}{3}$

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9. Find the value of $\cos(-1710^\circ)$

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10. Prove that, $3\sin\frac{\pi}{6}\sec\frac{\pi}{3} - 4\sin\frac{5\pi}{6}\cot\frac{\pi}{4} = 1$

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11. Find the value of $\sin 15^\circ$.

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12. Find the value of $\tan \frac{13\pi}{12}$

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13. Prove that, $\frac{\sin(x+y)}{\sin(x-y)} = \frac{\tan x + \tan y}{\tan x - \tan y}$

Watch Video Solution

14. Show that, $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$.

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15. Prove that,

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

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16. Prove that, $\frac{\cos 7x+\cos 5x}{\sin 7x-\sin 5x}=\cot x$

Watch Video Solution

17. Prove that, $\frac{\sin 5x-2\sin 3x+\sin x}{\cos 5x-\cos x}=\tan x$

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18. Find the principal solutions of the equation $\sin x=\frac{\sqrt{3}}{2}$.

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19. Find the principal solutions of the equation $\tan x = -\frac{1}{\sqrt{3}}$.

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20. Find the solution of $\sin x = -\frac{\sqrt{3}}{2}$.

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21. Solve $\cos x = \frac{1}{2}$.

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

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

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24. Solve $2\cos^2 x + 3\sin x = 0.$

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25. In triangle ABC, prove that,

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

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26. In any triangle ABC, prove that

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

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27. The angle of elevation of the top point P of the vartical tower PQ of height h from a point A is 45° and from a point B, the angle of elevation is 60°. Where B is a point at a distance d from the point. A measured along the line AB which makes an angle 30° with AQ. Prove that $d = h\left(\sqrt{3} - 1\right)$.

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

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29. If $\sin x = \frac{3}{5}, \cos y = -\frac{12}{13}$, where x and y both lie in second quadrant, find the value of $\sin(x + y)$.

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30. Prove that,

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

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31. Find the value of $\tan \frac{\pi}{8}$.

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32. If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, find the value of $\sin \frac{x}{2}, \cos \frac{x}{2}$ and $\tan\left(\frac{x}{2}\right)$.

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33. Prove that,

$$\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3}{2}.$$

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Solution Of Ncert Exemplar Problems Short Answer Type Questions

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

Thinking Process : Here, use the formula i.e., $\sec^2 A - \tan^2 A = 1$ and $a^2 - b^2 = (a + b)(a - b)$ to solve the above problems.

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

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3. If $m \sin\theta = n \sin(\theta + 2\alpha)$, then prove that $\tan(\theta + \alpha)\cot\alpha = \frac{m+n}{m-n}$.

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4. If $\cos(\alpha + \beta) = \frac{4}{5}$ and $\sin(\alpha + \beta) = \frac{5}{13}$, where α lie between 0 and $\frac{\pi}{4}$, then find that value of $\tan(2\alpha)$.

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5. If $\tan x = \frac{b}{a}$, then find the value of $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$.

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6. Prove that,

$$\cos\theta \cos\left(\frac{\theta}{2}\right) - \cos 3\theta \cos\left(\frac{9\theta}{2}\right) = \sin 7\theta \sin 8\theta.$$

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7. If $a\cos\theta + b\sin\theta = m$ and $a\sin\theta - b\cos\theta = n$, then show that, $a^2 + b^2 = m^2 + n^2$.

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8. Find the value of $\tan(22^\circ 30')$.

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9. Prove that, $\sin 4A = 4\sin A\cos^3 A - 4\cos A\sin^3 A$.

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10. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then prove that $m^2 - n^2 = 4\sin\theta\tan\theta$.

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11. If $\tan(A+B)=p$ and $\tan(A-B)=q$, then show that $\tan 2A=\frac{p+q}{1-pq}$.

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12. If $\cos\alpha+\cos\beta=0=\sin\alpha+\sin\beta$, then prove that $\cos 2\alpha+\cos 2\beta=-2\cos(\alpha+\beta)$.

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

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14. If $\tan\theta=\frac{\sin\alpha-\cos\alpha}{\sin\alpha+\cos\alpha}$, then show that $\sin\alpha+\cos\alpha=\sqrt{2}\cos\theta$.

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15. If $\sin\theta + \cos\theta = 1$, then find the general value of θ.

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16. Find the most general value of θ satisfying the equation $\tan\theta = -1$ and $\cos\theta = \frac{1}{\sqrt{2}}$.

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17. If $\cot\theta + \tan\theta = 2\,\text{cosec}\,\theta$, then find the general value of θ.

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18. If $2\sin^2\theta = 3\cos\theta$, where $0 \leq \theta \leq 2\pi$, then find the value of θ.

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19. If $\sec x \cos 5x + 1 = 0$, where $0 < x \leq \frac{\pi}{2}$, then find the value of x.

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Solution Of Ncert Exemplar Problems Long Answer Type Questions

1. If $\sin(\theta + \alpha) = a$ and $\sin(\theta + \beta) = b$, then prove that $\cos 2(\alpha - \beta) - 4ab\cos(\alpha - \beta) = 1 - 2a^2 - 2b^2$.

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2. If $\cos(\theta + \phi) = m\cos(\theta - \phi)$, then prove that $\tan\theta = \frac{1-m}{1+m}\cot\phi$.

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3. Find the value of the expression

$$3\left[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi+\alpha)\right]-2\left[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi-\alpha)\right]$$

.

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4. If $a\cos 2\theta + b\sin 2\theta = c$ has α and β as its roots, then prove that $\tan\alpha + \tan\beta = \frac{2b}{a+c}$.

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

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6. If θ lies in the first quadrant and $\cos\theta = \frac{8}{17}$, then find the value of $\cos(30^\circ + \theta) + \cos(45^\circ - \theta) + \cos(120^\circ - \theta)$.

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7. Find the value of

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

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8. Find the general solution of the equation

$$5\cos^2\theta + 7\sin^2\theta - 6 = 0.$$

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9. Find the general solution of the equation,

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

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10. Find the general solution of the equation,

$(\sqrt{3}-1)\cos\theta+(\sqrt{3}+1)\sin\theta=2$

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Solution Of Ncert Exemplar Problems Objective Type Questions

1. If $\sin\theta+\cos ec\theta=2$, then $\sin^2\theta+\cos ec^2\theta$ is equal to

A. 1

B. 4

C. 2

D. None of these

Answer: C

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

A. $f(x) < 1$

B. $f(x) = 1$

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

D. $f(x) \geq 2$

Answer: D

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3. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$, then the value of $\theta + \phi$ is

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

B. π

C. 0

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

Answer: D

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4. Which of the following is not correct?

A. $\sin\theta = -\frac{1}{5}$

B. $\cos\theta = 1$

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

D. $\tan\theta = 20$

Answer: C

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5. The value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \ldots\ldots \tan 89^\circ$ is

A. 0

B. 1

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

D. Not defined

Answer: B

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6. The value of $\frac{1-\tan^2 15^\circ}{1+\tan^2 15^\circ}$ is

A. 1

B. $\sqrt{3}$

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

D. 2

Answer: C

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7. The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots\ldots \cos 179^\circ$ is

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

B. 0

C. 1

D. -1

Answer: B

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8. If $\tan\theta = 3$ and θ lies in third quadrant, then the value of $\sin\theta$ is

A. $\frac{1}{\sqrt{10}}$

B. $-\frac{1}{\sqrt{10}}$

C. $-\frac{3}{\sqrt{10}}$

D. $\frac{3}{\sqrt{10}}$

Answer: C

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9. The value of $\tan 75^\circ - \cot 75^\circ$ is

A. $2\sqrt{3}$

B. $2 + \sqrt{3}$

C. $2 - \sqrt{3}$

D. 1

Answer: A

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10. 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. $\sin 1^\circ = \frac{\pi}{18^\circ} \sin 1$

Answer: B

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11. If $\tan\alpha = \frac{m}{m+1}$ and $\tan\beta = \frac{1}{2m+1}$ then $(\alpha+\beta)$ is equal to

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

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

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

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

Answer: D

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12. The minimum value of $3\cos x + 4\sin x + 8$ is

A. 5

B. 9

C. 7

D. 3

Answer: D

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13. The value of $\tan 3A - \tan 2A - \tan A$ is

A. $\tan 3A \tan 2A \tan A$

B. $-\tan 3A \tan 2A \tan A$

C. $\tan A \tan 2A - \tan 2A \tan 3A - \tan 3A \tan A$

D. None of the above

Answer: A

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14. The value of $\sin(45^\circ + \theta) - \cos(45^\circ - \theta)$ is

A. $2\cos\theta$

B. $2\sin\theta$

C. 1

D. 0

Answer: D

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15. The value of $\cot\left(\frac{\pi}{4} + \theta\right)\cot\left(\frac{\pi}{4} - \theta\right)$ is

A. -1

B. 0

C. 1

D. Not defined

Answer: C

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

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

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

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

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

Answer: B

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17. The value of $\cos 12^\circ + \cos 84^\circ + \cos 156^\circ + \cos 132^\circ$ is

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

B. 1

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

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

Answer: C

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18. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then $\tan(2A + B)$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer: C

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19. The value of $\sin\frac{\pi}{10}\sin\frac{13\pi}{10}$ is

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

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

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

D. 1

Answer: C

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20. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is

A. 1

B. 0

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

D. 2

Answer: B

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21. If $\sin\theta + \cos\theta = 1$, then the value of $\sin(2\theta)$ is

A. 1

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

C. 0

D. -1

Answer: C

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22. If $\alpha + \beta = \frac{\pi}{4}$, then the value of $(1 + \tan\alpha)(1 + \tan\beta)$ is

A. 1

B. 2

C. -2

D. Not defined

Answer: B

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23. If $\sin\theta = \frac{-4}{5}$ and θ lies in third quadrant, then the value of $\cos\frac{\theta}{2}$ is

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

B. $-\frac{1}{\sqrt{10}}$

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

D. $\frac{1}{\sqrt{10}}$

Answer: C

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

A. 0

B. 1

C. 2

D. 3

Answer: C

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25. The value of $\sin\left(\frac{\pi}{18}\right)+\sin\left(\frac{\pi}{9}\right)+\sin\left(\frac{2\pi}{9}\right)+\sin\left(\frac{5\pi}{18}\right)$ is

A. $\sin\left(\frac{7\pi}{18}\right)+\sin\left(\frac{4\pi}{9}\right)$

B. 1

C. $\cos\left(\frac{\pi}{6}\right)+\cos\left(\frac{3\pi}{7}\right)$

D. $\cos\left(\frac{\pi}{9}\right)+\sin\left(\frac{\pi}{9}\right)$

Answer: A

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26. If A lies in the second quadrant and $3\tan A+4=0$, then the value of $2\cot A-5\cos A+\sin A$ is

A. $\frac{-53}{10}$

B. $\frac{23}{10}$

C. $\frac{37}{10}$

D. $\frac{7}{10}$

Answer: B

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27. The value of $\cos^2 48^\circ - \sin^2 12^\circ$ is

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

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

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

D. $\frac{\sqrt{5}+1}{2\sqrt{2}}$

Answer: A

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28. If $\tan\alpha = \frac{1}{7}$ and $\tan\beta = \frac{1}{3}$, then $\cos 2\alpha$ is equal to

A. $\sin 2\beta$

B. $\sin 4\beta$

C. $\sin 3\beta$

D. $\cos 2\beta$

Answer: B

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29. If $\tan\theta = \frac{a}{b}$, then $b\cos 2\theta + a\sin 2\theta$ is equal to

A. a

B. b

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

D. None of these

Answer: B

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30. If for real values of x, $\cos\theta = x + \frac{1}{x}$, then

A. θ is an acute angle

B. θ is right angle

C. θ is an obtuse angle

D. No values of θ is possible

Answer: D

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Solution Of Ncert Exemplar Problems Fillers

1. The value of $\frac{\sin 50^\circ}{\sin 130^\circ}$ is .....

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2. If $k = \sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)$, then the numerical value of k is .....

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

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

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

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

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5. In right angled ΔABC with $m\angle C = 90^\circ$ the equation whose roots are $\tan A$ and $\tan B$ is .....

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

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7. Given $x > 0$, the value of $f(x)$ =

$-3\cos\sqrt{3 + x + x^2}$ lie in the interval .....

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8. The maximum distance of a point on the graph of the function $y = \sqrt{3}\sin x + \cos x$ from X-axis is .....

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9. If $\tan A = \dfrac{1 - \cos B}{\sin B}$, then $\tan 2A = \tan B$.

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10. The equality $\sin A + \sin 2A + \sin 3A = 3$ holds for some real value of A.

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11. $\sin 10^\circ$ is greater than $\cos 10^\circ$.

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

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

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14. If $\cos ecx = 1 + \cot x,$ then $x = 2n\pi, 2n\pi + \frac{\pi}{2}, n \in Z.$

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15. If $\tan\theta + \tan 2\theta + \sqrt{3}\tan\theta\tan 2\theta = \sqrt{3},$ then $\theta = \frac{n\pi}{3} + \frac{\pi}{9}.$

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16. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta),$ then

$\cos\left(\theta - \frac{\pi}{4}\right) = \frac{1}{2\sqrt{2}}.$

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17. In the following match each item given under the Column-I to its correct answer given under the Column-II.

Column-I	Column-II
(i) $\sin(x+y)\sin(x-y)$	(a) $\cos^2 x - \sin^2 y$
(ii) $\cos(x+y)\cos(x-y)$	(b) $\frac{1-\tan\theta}{1+\tan\theta}$
(iii) $\cot\left(\frac{\pi}{4}+\theta\right)$	(c) $\frac{1+\tan\theta}{1-\tan\theta}$
(iv) $\tan\left(\frac{\pi}{4}+\theta\right)$	(d) $\sin^2 x - \sin^2 y$

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Question Of Module Knowledge Test

1. Convert 25° in radian measure.

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2. The length of a chord of a circle with diameter $40cm$ is $20cm$. Find the measure of its corresponding minor arc.

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3. Find the value of $\sin \frac{3\pi}{4}$.

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4. $\sec\theta = \frac{17}{2}$ and θ is in IV^{th} quadrant. Find the value of other trigonometric functions.

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5. Find the value of $\cos 15^\circ$.

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6. $\sin(n+1)x.\cos nx - \cos(n+1)x.\sin nx =$ .....

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7. Find the general solution of $\cos x = \frac{1}{2}$.

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8. Find the solution of $\cos 4x + \cos 6x = 0$.

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9. $a = 18, b = 24, c = 30$. Find the value of $\cos A$.

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10. Prove that $a(b\cos C - c\cos B) = b^2 - c^2$.

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

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12. For ΔABC, prove that,

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

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13. For ΔABC, prove that,

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

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14. For ΔABC, prove that,

$$\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}.$$

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15. If $\tan x = -\frac{3}{4}$ and $\frac{\pi}{2} < x < \pi$ then find the value of $\sin\frac{x}{2}, \cos\frac{x}{2}$ and $\tan\frac{x}{2}$.

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