

[Download Doubtnut Now](#)**EXERCISE 3.1 - Question No. 1**

Find the radian measures corresponding to the following degree

measures: (i) 25° (ii) $-47^\circ 30'$ (iii) 240° (iv) 520°

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Find the degree measures corresponding to the following radian

measures (use $\pi = \frac{22}{7}$). (i) $\frac{11}{16}$ (ii) 4 (iii) $\frac{5\pi}{3}$ (iv) $\frac{7\pi}{6}$

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EXERCISE 3.1 - Question No. 3

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

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EXERCISE 3.1 - Question No. 4

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

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EXERCISE 3.1 - Question No. 5

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

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EXERCISE 3.1 - Question No. 6

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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EXERCISE 3.1 - Question No. 7

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)

21 cm

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EXERCISE 3.2 - Question No. 1

Find the value of other five trigonometric function $\cos x = -\frac{1}{2}$, x lies in third quadrant.

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EXERCISE 3.2 - Question No. 2

Find the value of other five trigonometric function $\sin x = \frac{3}{5}$, x lies in second quadrant.

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EXERCISE 3.2 - Question No. 3

Find the value of other five trigonometric function $\cot x = \frac{3}{4}$, x lies in third quadrant.

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EXERCISE 3.2 - Question No. 4

Find the value of other five trigonometric function $\sec x = \frac{13}{5}$, x lies in fourth quadrant.

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EXERCISE 3.2 - Question No. 5

Find the value of other five trigonometric function $\tan x = -\frac{5}{12}$, x lies in second quadrant.

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EXERCISE 3.2 - Question No. 6

Find the values of the trigonometric function $\sin 765^\circ$

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EXERCISE 3.2 - Question No. 7

Find the values of the trigonometric function $\operatorname{cosec}\left(-1410^\circ\right)$.

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EXERCISE 3.2 - Question No. 8

Find the values of the trigonometric function $\tan \frac{19\pi}{3}$

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EXERCISE 3.2 - Question No. 9

Find the values of the trigonometric function $\sin \left(-\frac{11\pi}{3} \right)$

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EXERCISE 3.2 - Question No. 10

Find the values of the trigonometric function $\cot \left(-\frac{15\pi}{4} \right)$

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EXERCISE 3.3 - Question No. 1

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

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EXERCISE 3.3 - Question No. 2

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

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EXERCISE 3.3 - Question No. 3

$$\cot^2 \frac{\pi}{6} + \operatorname{cosec} \frac{5\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6$$

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EXERCISE 3.3 - Question No. 4

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

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EXERCISE 3.3 - Question No. 5

Find the value of : (i) $\sin 75^\circ$ (ii) $\tan 15^\circ$

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EXERCISE 3.3 - Question No. 6

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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EXERCISE 3.3 - Question No. 7

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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EXERCISE 3.3 - Question No. 8

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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EXERCISE 3.3 - Question No. 9

Prove that:

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

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EXERCISE 3.3 - Question No. 10

Prove that:

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

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EXERCISE 3.3 - Question No. 11

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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EXERCISE 3.3 - Question No. 12

Prove that: $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

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EXERCISE 3.3 - Question No. 13

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

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EXERCISE 3.3 - Question No. 14

Prove that: $\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$

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EXERCISE 3.3 - Question No. 15

Prove that: $\cot 4x(\sin 5x + \sin 3x) = \cot x(\sin 5x \sin 3x)$

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EXERCISE 3.3 - Question No. 16

Prove that:
$$\frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = - \frac{\sin 2x}{\cos 10x}$$

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EXERCISE 3.3 - Question No. 17

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

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EXERCISE 3.3 - Question No. 18

Prove that:
$$\frac{\sin x - \sin y}{\cos x + \cos y} = \tan \frac{x - y}{2}$$

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EXERCISE 3.3 - Question No. 19

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

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EXERCISE 3.3 - Question No. 20

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

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EXERCISE 3.3 - Question No. 21

Prove that:
$$\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$$

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EXERCISE 3.3 - Question No. 22

Prove that: $\cot x \cot 2x \cot 2x \cot 3x \cot 3x \cot x = 1$

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EXERCISE 3.3 - Question No. 23

Prove that: $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

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EXERCISE 3.3 - Question No. 24

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

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EXERCISE 3.3 - Question No. 25

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

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EXERCISE 3.4 - Question No. 1

Find the principal and general solution of $\tan x = \sqrt{3}$

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EXERCISE 3.4 - Question No. 2

Find the principal and general solution of $\sec x = 2$

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EXERCISE 3.4 - Question No. 3

Find the principal and general solution of $\cot x = -\sqrt{3}$

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EXERCISE 3.4 - Question No. 4

Find the principal and general solution of $\cos ecx = 2$

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EXERCISE 3.4 - Question No. 5

Find the general solution : $\cos 4x = \cos 2x$

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EXERCISE 3.4 - Question No. 6

Find the general solution : $\cos 3x + \cos x \cos 2x = 0$

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EXERCISE 3.4 - Question No. 7

Find the general solution : $s \in 2x + \cos x = 0$

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EXERCISE 3.4 - Question No. 8

Find the general solution : $\sec^2 2x = 1 - \tan 2x$

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EXERCISE 3.4 - Question No. 9

Find the general solution : $s \in x + s \in 3x + s \in 5x = 0$

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EXERCISE 3.5 - Question No. 1

In any triangle ABC, if $a = 18, b = 24, c = 30$, find $\cos A, \cos B,$
 $\cos C$

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EXERCISE 3.5 - Question No. 2

In any triangle ABC, if $a = 18$, $b = 24$, $c = 30$, find $\sin A$, $\sin B$, $\sin C$

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EXERCISE 3.5 - Question No. 3

For any triangle ABC, prove that
$$\frac{a + b}{c} = \frac{\cos\left(\frac{A - B}{2}\right)}{\frac{\sin C}{2}}$$

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EXERCISE 3.5 - Question No. 4

For any triangle ABC, prove that
$$\frac{a - b}{c} = \frac{\sin\left(\frac{A - B}{2}\right)}{\frac{\cos C}{2}}$$

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EXERCISE 3.5 - Question No. 5

For any triangle ABC, prove that $\frac{\sin(B - C)}{2} = \frac{b - c}{a} \left(\frac{\cos A}{2} \right)$

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EXERCISE 3.5 - Question No. 6

For any triangle ABC, prove that $a(b \cos C - c \cos B) = b^2 - c^2$

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EXERCISE 3.5 - Question No. 7

For any triangle ABC, prove that

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

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EXERCISE 3.5 - Question No. 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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EXERCISE 3.5 - Question No. 9

For any triangle ABC, prove that

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

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EXERCISE 3.5 - Question No. 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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EXERCISE 3.5 - Question No. 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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EXERCISE 3.5 - Question No. 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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EXERCISE 3.5 - Question No. 13

For any triangle ABC, prove that

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

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EXERCISE 3.5 - Question No. 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

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EXERCISE 3.5 - Question No. 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 32 km per hour in the direction $S75^\circ E$. Find the distance between the ships at the end of 3 hours.

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EXERCISE 3.5 - Question No. 16

Two trees, A and B are on the same side of a river. From a 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 - Question No. 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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MISCELLANEOUS EXERCISE - Question No. 2

Prove that: $(\sin 3x + \sin x) \sin x + (\cos 3x \cos x) \cos x = 0$

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MISCELLANEOUS EXERCISE - Question No. 3

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

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MISCELLANEOUS EXERCISE - Question No. 4

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

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MISCELLANEOUS EXERCISE - Question No. 5

prove that $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$

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MISCELLANEOUS EXERCISE - Question No. 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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MISCELLANEOUS EXERCISE - Question No. 7

Prove that: $\sin 3x + \sin 2x + \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$

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MISCELLANEOUS EXERCISE - Question No. 8

Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ of the following : $\tan x = -\frac{4}{3}$, x in quadrant II

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MISCELLANEOUS EXERCISE - Question No. 9

Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ of the following : $\cot x = -\frac{1}{3}$, x in quadrant III

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MISCELLANEOUS EXERCISE - Question No. 10

Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ of the following : $\sin x = \frac{1}{4}$, x in quadrant II.

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SOLVED EXAMPLES - Question No. 1

Convert $40^{\circ}20'$ into radian measure.

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SOLVED EXAMPLES - Question No. 2

Convert 6 radians into degree measure.

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SOLVED EXAMPLES - Question No. 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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SOLVED EXAMPLES - Question No. 4

The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes? (Use $\pi = 3.14$).

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SOLVED EXAMPLES - Question No. 5

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

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SOLVED EXAMPLES - Question No. 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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SOLVED EXAMPLES - Question No. 7

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

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SOLVED EXAMPLES - Question No. 8

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

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SOLVED EXAMPLES - Question No. 9

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

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SOLVED EXAMPLES - Question No. 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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SOLVED EXAMPLES - Question No. 11

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

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SOLVED EXAMPLES - Question No. 12

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

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SOLVED EXAMPLES - Question No. 13

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

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SOLVED EXAMPLES - Question No. 14

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

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SOLVED EXAMPLES - Question No. 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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SOLVED EXAMPLES - Question No. 16

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

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SOLVED EXAMPLES - Question No. 17

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

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SOLVED EXAMPLES - Question No. 18

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

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SOLVED EXAMPLES - Question No. 19

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

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SOLVED EXAMPLES - Question No. 20

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

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SOLVED EXAMPLES - Question No. 21

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

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SOLVED EXAMPLES - Question No. 22

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

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SOLVED EXAMPLES - Question No. 23

$$\text{Solve } \sin 2x - \sin 4x + \sin 6x = 0 .$$

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SOLVED EXAMPLES - Question No. 24

$$\text{Solve } 2 \cos^2 x + 3 \sin x = 0 .$$

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SOLVED EXAMPLES - Question No. 25

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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SOLVED EXAMPLES - Question No. 26

Prove that $\cos 2x \frac{\cos x}{2} - \cos 3x \cos\left(9\frac{x}{2}\right) = \sin 5x \frac{\sin(5x)}{2}$.

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SOLVED EXAMPLES - Question No. 27

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

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SOLVED EXAMPLES - Question No. 28

If $\tan x = 3/4$, $\pi < x < \frac{3\pi}{2}$, find the value of $\sin(x/2)$, $\cos(x/2)$,
 $\tan(x/2)$

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SOLVED EXAMPLES - Question No. 29

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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SOLVED EXAMPLES - Question No. 30

In triangle ABC, prove that $\frac{\tan(B - C)}{2} = \frac{b - c}{b + c} \frac{\cot A}{2}$

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

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SOLVED EXAMPLES - Question No. 31

In any triangle ABC, prove that

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

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SOLVED EXAMPLES - Question No. 32

The angle of elevation of the top point P of the vertical 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 $d = h(\sqrt{3} - 1)$.

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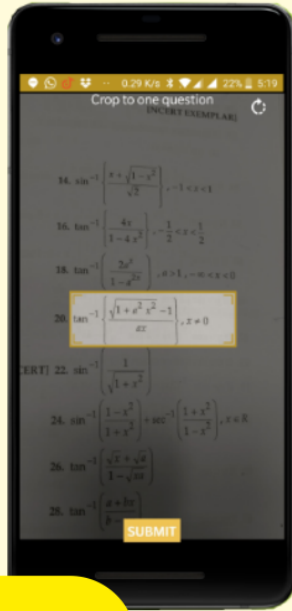
SOLVED EXAMPLES - Question No. 33

In triangle ABC, prove that $\frac{\tan(B - C)}{2} = \left[\frac{b - c}{b + c} \right] \frac{\cot A}{2}$,

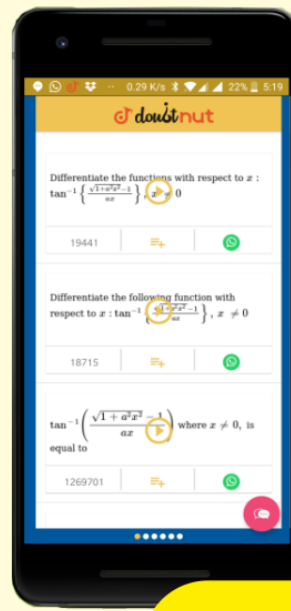
$$\frac{\tan(C - A)}{2} = \left[\frac{c - a}{c + a} \right] \frac{\cot B}{2}, \quad \frac{\tan(A - B)}{2} = \left[\frac{a - b}{a + b} \right] \frac{\cot C}{2}$$

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