

CHAPTER-3
TRIGONOMETRIC FUNCTIONS
02 MARK TYPE QUESTIONS

Q. NO	QUESTION	MARK
1.	<p>If $\tan \tan x = \frac{b}{a}$, then find the value of</p> $\sqrt{\frac{a+b}{a-b}} + \sqrt{\frac{a-b}{a+b}}$	2
2.	A circular wire of radius 3cm is cut and bent so as to lie along the circumference of a loop whose radius is 48cm. Find the angle in degrees which is subtended at the centre of the loop.	2
3.	Find the radian measure corresponding $37^{\circ}30'$.	2
4.	The minute hand of a clock is 10 cm long. How far does the tip of the hand move in 20 minutes?	2
5.	Find the values of	2
	$\sin \sin \left(-\frac{11\pi}{3} \right)$	
6.	Prove that $\sin 5x - 2\sin 3x + \sin x / \cos 5x - \cos x = \tan x$	2
7.	The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes?	2
8.	Show that $\tan 3x \cdot \tan 2x \cdot \tan x = \tan 3x - \tan 2x - \tan x$	2
9.	Prove that $\cos 6x = 32\cos^2 x - 48\cos^4 x + 18\cos^6 x - 1$	2
10.	A wheel makes 360 revolutions in 1 minute. How many radians does it turn in 1 second?	2
11.	Find the degree measure of the angle subtended at the center of a circle of radius 100cm by an arc of length 22cm.	2
12.	Prove that $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$.	2
13.	Prove that $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$.	2
14.	Find the value of $2 \sin \frac{5\pi}{4} + 2 \cos^2 \frac{\pi}{4} + 2 \sec^2 \frac{\pi}{3}$.	2
15.	Find the value of $\tan 15^{\circ}$	2

ANSWERS:

Q. NO	ANSWER	MARKS
1.	<p>Given, $\tan \theta = \frac{b}{a}$</p> $\therefore \frac{\sqrt{a+b}}{\sqrt{a-b}} + \frac{\sqrt{a-b}}{\sqrt{a+b}} = \frac{\sqrt{(a+b)^2} + \sqrt{(a-b)^2}}{\sqrt{(a-b)(a+b)}} = \frac{(a+b) + (a-b)}{\sqrt{a^2 - b^2}} = \frac{2a}{a\sqrt{1 - (\frac{b}{a})^2}} = \frac{2}{\sqrt{1 - \tan^2 \theta}}$ $\frac{2 \cos \theta \cos \theta}{\sqrt{\cos^2 \theta - \sin^2 \theta}} = \frac{2 \cos \theta \cos \theta}{\sqrt{\cos \theta \cos 2\theta}}$	2
2.	<p>Solution: Length of the wire $= 2\pi r = 2\pi \times 3 = 6\pi$ We know, $\theta = \frac{l}{r} = \frac{6\pi}{48} = \frac{\pi}{8}$ radians $= \frac{\pi}{8} \times \frac{180^\circ}{\pi} = 22.5^\circ$</p>	2
3.	<p>Solution: $60' = 1^\circ$ $\therefore 30' = \left(\frac{1}{2}\right)^\circ$ $\therefore -37^\circ 30' = 37\frac{1}{2}^\circ = -\frac{75}{2} \times \frac{2\pi}{360}$ radian $= -\frac{5\pi}{24}$ radians</p>	2
4.	<p>Solution: The minute hand moves through 120° So $\theta = \frac{2\pi}{3}$ radians We know, $l = r\theta = 10 \times \frac{2\pi}{3} = \frac{20\pi}{3}$</p>	2
5.	<p>Solution: $\sin \sin \left(-\frac{11\pi}{3}\right) = -\sin \sin \left(4\pi - \frac{\pi}{3}\right) = \sin \sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$</p>	2
6.	<p>Starting with the left-hand side and using the trigonometric difference identities for the sine function, we obtain</p> <p>L.H.S. $= \sin 5x + \sin x - 2\sin 3x / \cos 5x - \cos x$</p> $= 2\sin 3x \cdot \cos 2x - 2\sin 3x / -2\sin 3x \cdot \sin 2x$ $= 2\sin 3x(\cos 2x - 1) / -2\sin 3x \cdot \sin 2x$ $= -(1 - \cos 2x) / -\sin 2x$ $= 2\sin 2x / 2\sin x \cdot \cos x$ $= \sin x / \cos x$ $= \tan x$	2
7.	Using the above given information, we have,	2

	<p>$r=1.5\text{cm}$</p> <p>Angle made in 60min=360°</p> <p>Angle made in 1min=6°</p> <p>Angle made in 40min=$6^\circ \times 40^\circ = 240^\circ$</p> <p>Calculating the arc distance</p> <p>$\theta = l/r$</p> <p>$240 \times \pi / 180 = l / 1.5$</p> <p>$2 \times 3.14 = l$</p> <p>$6.28 = l$</p> <p>$l = 6.28\text{cm}$</p>	
8.	<p>Let us take $\tan 3x$ and we know that $3x = 2x + x$</p> <p>$\tan 3x = \tan(2x + x)$</p> <p>$\tan 3x / 1 = \tan 2x + \tan x / 1 - \tan 2x \cdot \tan x$</p> <p>$\tan 3x(1 - \tan 2x \cdot \tan x) = \tan 2x + \tan x$</p> <p>$\tan 3x - \tan 3x \cdot \tan 2x \cdot \tan x = \tan 2x + \tan x$</p> <p>$\tan 3x \cdot \tan 2x \cdot \tan x = \tan 3x - \tan 2x - \tan x$</p>	2
9.	<p>Starting with the left-hand side and using the trigonometric identities for the cosine function, we obtain</p> <p>L.H.S.</p> <p>$= \cos 6x$</p> <p>$= \cos 2(3x) = 2\cos^2 3x - 1$</p> <p>$= \cos^2(3x)$</p> <p>$= 2(4\cos^3 x - 3\cos x)^2 - 1$</p> <p>$= 2[16\cos^6 x + 9\cos^2 x - 24\cos^4 x] - 1$</p> <p>$= 32\cos^6 x + 18\cos^2 x - 48\cos^4 x - 1$</p>	2

	$=32\cos 6x - 48\cos 4x + 18\cos 2x$ $=R.H.S.$	
10.	<p>Given,</p> <p>Number of revolutions made in 60s=360</p> <p>Number of revolutions made in 1s=360/60</p> <p>Angle moved in 6 revolutions = $2\pi \times 6 = 12\pi$</p>	2
11.	$\theta = \frac{l}{r} = \frac{22}{100} \text{ rad} = \frac{11}{50} \text{ rad}$ $= \frac{11}{50} \times \frac{180}{\pi} = 12^\circ 36'$	2
12.	$\text{LHS} = \frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = \frac{2\cos 2x \sin(-x)}{-\cos 2x} = 2\sin x$	2
13.	$\text{LHS} = \cos(2 \times 2x) = 1 - 2\sin^2 2x = 1 - 2(2\sin x \cos x)^2 = 1 - 8\sin^2 x \cos^2 x.$	2
14.	$2\sin \frac{5\pi}{4} + 2\cos^2 \frac{\pi}{4} + 2\sec^2 \frac{\pi}{3} = -\sqrt{2} + 1 + 8 = 9 - \sqrt{2}$	2
15.	$\tan 15^\circ = \tan(60^\circ - 45^\circ) = \frac{\tan 60^\circ - \tan 45^\circ}{1 + \tan 60^\circ \tan 45^\circ} = \frac{\sqrt{3} - 1}{\sqrt{3} + 1} = 2 - \sqrt{3}$	2