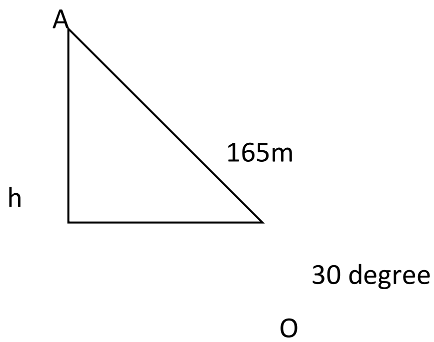
CHAPTER-3

TRIGONOMETRIC FUNCTIONS

03 MARK TYPE QUESTIONS

Q. NO	**QUESTION**	**MARK**
1.	A cow is tied to a pole by a rope. If it moves along a circular path always keeping the rope tight and describe 88m when it has traced out 72 at the centre, find the length of rope.	3
2.	If $cos\, cos\,(\alpha+\beta) = \frac{4}{5}$ and $sin\, sin\,(\alpha-\beta) = \frac{5}{13}$, where α lie between 0 and $\frac{\pi}{4}$, then find that value of $tan\, tan\, 2\alpha$	3
3.	A kite is flying , attached to a thread which is 165m long. The thread makes an angle of 30° with the ground. Find the height of the kite from the ground, assuming that there is no slack in the thread.	3
4.	**Find the radius of the circle in which a central angle of 60° intercepts an arc of length 37.4 cm (use π = 22/7).**	3
5.	**Prove that:** $$\cos^2 x + \cos^2\left(x+\frac{\pi}{3}\right) + \cos^2\left(x-\frac{\pi}{3}\right) = \frac{3}{2}$$	3
6.	**Find the value of √3 cosec 20° – sec 20°.**	3
7.	Prove that $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13}+\cos\frac{3\pi}{13}+\cos\frac{5\pi}{13}=0.$	3
8.	Prove that $\frac{\cos 4x+\cos 3x+\cos 2x}{\sin 4x+\sin 3x+\sin 2x}=\cot 3x.$	3
9.	Prove that $\sin 2x + 2\sin 4x + \sin 6x = 4\cos^2 x \sin 4x$	3

ANSWERS:

<table>
<tr><th>Q. NO</th><th>ANSWER</th><th>MARKS</th></tr>
<tr><td>1.</td><td>Solution:
Here, arc(l) =88m
$\theta = 72°$ =72× $\frac{\pi}{180} = \frac{2\pi}{5}$
We know,
r= $\frac{l}{\theta} = \frac{88}{\frac{2\pi}{5}} = \frac{88\times5\times7}{2\times22}$ =70
so the length of the rope be 70m</td><td></td></tr>
<tr><td>2.</td><td>Solution:
We know sin^2x +cox^2x =1
So $\sin \sin (\alpha+\beta) = \sqrt{1-\frac{16}{25}} = \pm\frac{3}{5} = \frac{3}{5}$ [since α lie between 0 and $\frac{\pi}{4}$]
Simillarly $\cos \cos (\alpha-\beta) = \frac{12}{13}$
Now $\tan \tan (\alpha+\beta) = \frac{3}{4}$
$\tan \tan (\alpha-\beta) = \frac{5}{12}$
$\therefore \tan \tan 2\alpha = \tan \tan (\alpha+\beta+\alpha-\beta)$
$= \frac{\tan\tan (\alpha+\beta)+\tan\tan (\alpha-\beta)}{1-\tan\tan (\alpha+\beta)\tan\tan (\alpha-\beta)}$
$= \frac{56}{33}$</td><td></td></tr>
<tr><td>3.</td><td>Solution:


Here ∠BOA=30°
OA=165m
∠ OBA=90°
From the Triangle ,
$$\sin \sin 30° = \frac{AB}{OA}$$
$$=> \frac{1}{2} = \frac{h}{165}$$
=> h= $\frac{165}{2}$ =82.5
Hence the height of the kite from the ground = 82.5m</td><td></td></tr>
<tr><td>4.</td><td></td><td></td></tr>
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	Given, Length of the arc = l = 37.4 cm Central angle = θ = 60° = 60π/180 radian = π/3 radians We know that, r = l/θ = (37.4) * (π / 3) = (37.4) / [22 / 7 * 3] = 35.7 cm Hence, the radius of the circle is 35.7 cm.	
5.	$= \cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right)$ $= \cos^2 x + [\cos(x + \frac{\pi}{3})]^2 + [\cos(x - \frac{\pi}{3})]^2$ $= \cos^2 x + (\cos x\, cos\frac{\pi}{3} - \sin x \sin\frac{\pi}{3})^2 + (\cos x\, cos\frac{\pi}{3} + \sin x \sin\frac{\pi}{3})^2$ $= \cos^2 x + [\cos x\, \left(\frac{1}{2}\right) - \sin x\, (\frac{\sqrt{3}}{2})]^2 + [\cos x\, \left(\frac{1}{2}\right) + \sin x\, (\frac{\sqrt{3}}{2})]^2$ $= \cos^2 x + \frac{1}{4}(\cos x - \sqrt{3}\sin x)^2 + \frac{1}{4}(\cos x + \sqrt{3}\sin x)^2$ $= \cos^2 x + \frac{1}{4}(\cos^2 x + 3\sin^2 x - 2\sqrt{3}\cos x \sin x) + \frac{1}{4}(\cos^2 x + 3\sin^2 x + 2\sqrt{3}\cos x \sin x)$ $= \cos^2 x + \frac{1}{4}(\cos^2 x + 3\sin^2 x - 2\sqrt{3}\cos x \sin x + \cos^2 x + 3\sin^2 x + 2\sqrt{3}\cos x \sin x)$ $= \cos^2 x + \frac{1}{4}(2\cos^2 x + 6\sin^2 x)$ $= \cos^2 x + \frac{1}{2}\cos^2 x + \frac{3}{2}\sin^2 x$ $= \frac{3}{2}\cos^2 x + \frac{3}{2}\sin^2 x$ $= \frac{3}{2}(\cos^2 x + \sin^2 x)$ $= \frac{3}{2}(1)$ $= \frac{3}{2}$ = RHS Hence proved.	

6.	3 cosec 20° – sec 20° $= \frac{\sqrt{3}}{\sin 20^\circ} - \frac{1}{\cos 20^\circ}$ $= \frac{\sqrt{3}\cos 20^\circ - \sin 20^\circ}{\sin 20^\circ \cos 20^\circ} = 4\left(\frac{\frac{\sqrt{3}}{2}\cos 20^\circ - \frac{1}{2}\sin 20^\circ}{2\sin 20^\circ \cos 20^\circ}\right)$ $= 4\left(\frac{\sin 60^\circ \cos 20^\circ - \cos 60^\circ \sin 20^\circ}{\sin 40^\circ}\right)$ $= 4\left(\frac{\sin(60^\circ - 20^\circ)}{\sin 40^\circ}\right) = 4$	
7.	$LHS = 2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + 2\cos\frac{4\pi}{13}\cos\left(-\frac{\pi}{13}\right)$ $= 2\cos\frac{\pi}{13}\left(\cos\frac{9\pi}{13} - \cos\frac{\pi}{13}\right) = 2\cos\frac{\pi}{13}\left(2\cos\frac{\pi}{2}\cos\frac{5\pi}{26}\right)$ $= 0$ Since $\cos\frac{\pi}{2} = 0$.	3
8.	$LHS = \frac{\cos 4x + \cos 2x + \cos 3x}{\sin 4x + \sin 2x + \sin 3x} = \frac{2\cos 3x \cos x + \cos 3x}{2\sin 3x \sin x + \sin 3x} = \frac{\cos 3x}{\sin 3x}$ $= \cot 3x$	3
9.	$LHS = \sin 2x + \sin 6x + 2\sin 4x = 2\sin 4x \cos -2x + 2\sin 4x$ $= 2\sin 4x\,(\cos 2x + 1) = 2\sin 4x\,(2\cos^2 x)$ $= 4\cos^2 x \sin 4x$	3