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GRADE 11-MATHEMATICS WORKSHEET - TRIGONOMETRIC FUNCTIONS

1. i) Find the value of $\sin\left(\frac{31\pi}{3}\right)$.
ii) Find the principal and general solutions of the equation $\cos x = \frac{-\sqrt{3}}{2}$.
2. Show that $(\cos x + \cos y)^2 + (\sin x + \sin y)^2 = 4\cos^2\left(\frac{x-y}{2}\right)$. [HSE- Mar 2011]
3. i) Find the degree measure corresponding to $\frac{11}{14}$ radians. (Use $\pi = \frac{22}{7}$).
ii) if $\cos x = \frac{1}{2}$, x lies in the 3rd quadrant, find $\sin x$ and $\tan x$.
4. Prove that $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$. [HSE-Mar 2010,]
5. a) Expand $\cos(x+y)$ and hence prove $\cos 2x = 1 - 2\sin^2 x$.
b) Solve the equation $\tan^2 \theta + \cot^2 \theta = 2$.
6. Show that $\frac{\cos 8A \cdot \cos 5A - \cos 12A \cdot \cos 9A}{\sin 8A \cdot \sin 5A + \cos 12A \cdot \sin 9A} = \tan 4A$. [HSE-Sep2010]
7. a) Convert $22^\circ 40'$ in to radian measure.
b) if $\sin x = \frac{12}{13}$ and x is an acute angle, find the value of $\cos 2x$.
c) Show that $\sin(40^\circ + x)\cos(10^\circ + x) - \cos(40^\circ + x)\sin(10^\circ + x) = \frac{1}{2}$.
8. If $x + y = \frac{\pi}{4}$, then prove that $(1 + \tan x)(1 + \tan y) = 2$ and hence deduce $\tan \frac{\pi}{8}$ [HSE-Mar 2009]
9. a) the radian measure of 240° is (1 radian, $\frac{4\pi}{3}$ radian, $\frac{\pi}{2}$ radian, $\frac{3\pi}{2}$ radian). [HSE 2008]
b) if $\sin \theta = \frac{3}{5}$, $\cos \phi = \frac{-12}{13}$, where θ and ϕ both lie in the second quadrant, find the value of $\sin(\theta + \phi)$
10. a) $\sin 765^\circ = \dots\dots\dots \left(0, \frac{1}{2}, \frac{1}{\sqrt{2}}, \frac{\sqrt{3}}{2}\right)$.
b) Prove that $\tan 3x = \frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x}$ [HSE 2008]



11. a) Show that $\sin 105^\circ + \cos 105^\circ = \frac{1}{\sqrt{2}}$.
 b) Simplify: $\sin 5x - \sin 3x$.
 c) Find the value of $\tan 22^\circ 30'$. [HSE 2008]
12. Prove that $\frac{\sin x}{1 + \cos x} = \tan \frac{x}{2}$.
13. Prove that $\sec 2A + \tan 2A = \tan\left(\frac{\pi}{4} + A\right)$
14. Prove that $\frac{\cos 2A}{1 + \sin 2A} = \tan\left(\frac{\pi}{4} - A\right)$.
15. Prove that $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$.
16. Prove that $\frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$. Hence find the value of $\frac{1 + \tan 15^\circ}{1 - \tan 15^\circ}$. Also find the value of $\tan 75^\circ$.
17. Solve: $\sin 2x - \sin 4x + \sin 6x = 0$.
18. If $\cos \theta = \frac{7}{25}$ and θ is an angle in the 4th quadrant, find the value of $\frac{25 \cos \theta - 7 \tan \theta}{\cos \theta - \sin \theta}$.
19. Given $\sec A + \tan A = m$
- a) Prove that $\cos A = \frac{2m}{m^2 + 1}$.
- b) Prove that $\tan A = \frac{m^2 - 1}{2m}$.
- c) Using (a) and (b) find $\sin A$.
20. A circle has a radius of 4cm. Find the length of the arc intercepted by a central angle of 240° . (use $\pi = 3.14$)
21. Prove that $\frac{\sin 9x + \sin 7x + \sin 5x + \sin 3x}{\cos 9x + \cos 7x + \cos 5x + \cos 3x} = \tan 6x$.
22. a) Find the angle in degree through which a pendulum swings if its length is 75cm and the tip describes an arc of length 10cm.
 b) Find the value of $\operatorname{cosec}(-1410^\circ)$.
 c) Solve $\sin 2x - \sin 4x + \sin 6x = 0$
23. Find the principal and general solutions of the trigonometric equation $\sin x = \frac{\sqrt{3}}{2}$.
24. Prove that $\frac{\sin 5x - 2 \sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$.
25. Prove that $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$.

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