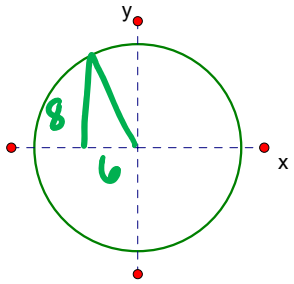
Algebra 2 H **Name:**
Pythagorean Identities

1. For the rotation angle θ with terminal point (-6, 8), **write the six trig ratios for θ.**



sinθ = 4/5 **cscθ =** 5/4

cosθ = -3/5 **secθ =** -5/3

tanθ = -4/3 **cotθ =** -3/4

Calculate this very famous Pythagorean identity: **$(\sin\theta)^2 + (\cos\theta)^2$**

$$\left(\frac{4}{5}\right)^2 + \left(\frac{-3}{5}\right)^2 = \frac{16}{25} + \frac{9}{25} = \frac{25}{25} = 1$$

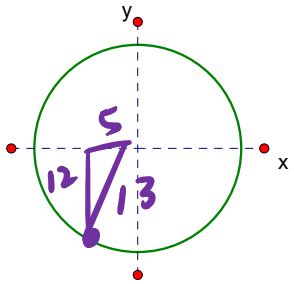
Other Pythagorean identities:

$$1 + \cot^2\theta = \csc^2\theta \qquad \tan^2\theta + 1 = \sec^2\theta$$

*Notice how we move the square operation to after the ratio instead of after the Θ? Why do you think we write it this way?

we are not squaring the θ, we are squaring the ratio!

2. For the rotation angle θ with terminal point (-5, -12), **write the six trig ratios for θ.**



sinθ = -12/13 **cscθ =** -13/12

cosθ = -5/13 **secθ =** -13/5

tanθ = 12/5 **cotθ =** 5/12

Verify the three Pythagorean identities using algebra:

★ $\left(\frac{-12}{13}\right)^2 + \left(\frac{-5}{13}\right)^2 = \frac{144}{169} + \frac{25}{169} = 1$ ✓

★ $1 + \left(\frac{5}{12}\right)^2 = \left(\frac{-13}{12}\right)^2$

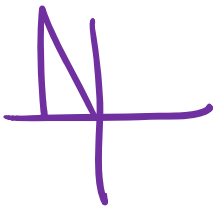
$1 + \frac{25}{144} = \frac{169}{144}$ ✓

★ $\left(\frac{12}{5}\right)^2 + 1 = \left(\frac{-13}{5}\right)^2$ $\frac{144}{25} + 1 = \frac{169}{25}$ ✓

Evaluate the following using exact values:

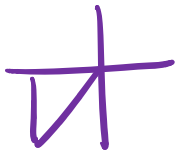
3. cos480°

$\cos 120^\circ = -\frac{1}{2}$



4. sin585°

$\sin 225^\circ = -\frac{\sqrt{2}}{2}$



5. tan(-600°)

$\tan(-240^\circ)$

$\tan 120^\circ$

$= -\sqrt{3}$

6. sin450°

$2\pi = \frac{6\pi}{3}$

7. cos(-2520°)

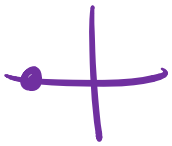
$\cos 0^\circ$

$= 1$

8. tan855°

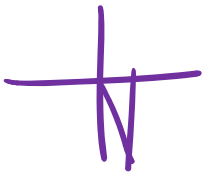
9. $\sin 7\pi$

$\sin\pi = 0$

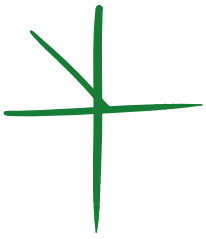


10. $\cos\frac{11\pi}{3}$

$\cos\frac{5\pi}{3} = \frac{1}{2}$



11. $\tan\left(-\frac{13\pi}{4}\right)$

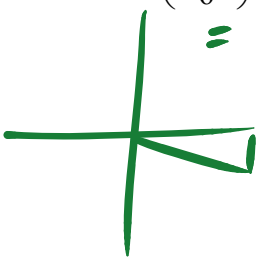


$= -1$

12. $\sin\left(\frac{15\pi}{4}\right)$

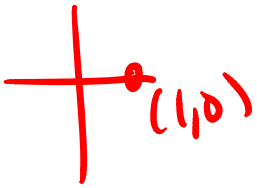
$\sin\frac{7\pi}{4} = -\frac{\sqrt{2}}{2}$

13. $\cos\left(\frac{23\pi}{6}\right)$



$= \frac{\sqrt{3}}{2}$

14. $\cot 10\pi$



Evaluate the following:

15. $\dfrac{2(\sin 30^\circ)\cdot(\cos 45^\circ)}{8}$

$\dfrac{2\cdot\frac{1}{2}\cdot\frac{\sqrt{2}}{2}}{8} = \dfrac{\frac{\sqrt{2}}{2}}{8} = \frac{\sqrt{2}}{2}\cdot\frac{1}{8}$

$= \frac{\sqrt{2}}{16}$

16. $\dfrac{3(\sin 60^\circ)\cdot(\cos 135^\circ)}{(\sin 30^\circ)}$

$\dfrac{3\cdot\frac{\sqrt{3}}{2}\cdot\frac{-\sqrt{2}}{2}}{\frac{1}{2}} = -\frac{3\sqrt{6}}{4}\cdot 2 = -\frac{3\sqrt{6}}{2}$

17. $5\sin\frac{\pi}{2} + 4\tan\frac{5\pi}{4} - 3\cos\pi$

$5\cdot 1 + 4\cdot 1 - 3\cdot -1$

$= 12$

18. $\dfrac{\left(\cos\frac{4\pi}{3}\right)}{\left(\sin\frac{5\pi}{6}\right) - \left(\sin\frac{11\pi}{6}\right)}$

$= \dfrac{-\frac{1}{2}}{\frac{1}{2} + \frac{1}{2}} = -\frac{1}{2}$