Name Ked Date ____________

Trig Identities Puzzle

Directions: Simplify each trig expression. Show all work.
Find your answer at the bottom of the page. Write the letter associated with your answer in the box that contains the question number. You may use answers more than once.

1. $\csc\theta\tan\theta$

E

$\frac{1}{\sin\theta}\cdot\frac{\sin\theta}{\cos\theta} = \sec\theta$

2. $\sin\theta + \cot\theta\cos\theta$

N

$\frac{\sin\theta}{\sin\theta}\cdot\frac{\sin\theta}{1} + \frac{\cos^2\theta}{\sin\theta}$

$\frac{\sin^2\theta + \cos^2\theta}{\sin\theta}$ $\csc\theta$

3. $\csc^2\theta - \cot^2\theta$

S

$= 1$ $1 + \cot^2\theta = \csc^2\theta$

4. $\sec^2\theta - \cos^2\theta\sec^2\theta$

H

$\sec^2\theta(1 - \cos^2\theta)$

$\sec^2\theta \cdot \sin^2\theta = \tan^2\theta$

$\frac{1}{\cos^2\theta}\cdot\sin^2\theta$

5. $\sin^2\theta + \cos^2\theta + \tan^2\theta$

I

$1 + \tan^2\theta = \sec^2\theta$

$\sec^2\theta$

6. $\cos\theta\,(1 + \tan^2\theta) = \cos\theta(\sec^2\theta)$

E

$\cancel{\cos\theta\cdot\sec\theta}\,\sec\theta$

$\sec\theta$

7. $\sin\theta\csc\theta - \cos^2\theta = \sin\theta\cdot\frac{1}{\sin\theta} - \cos^2\theta$

O

$\sin^2\theta = 1 - \cos^2\theta =$

8. $\sec\theta - \sin\theta\tan\theta$

R

$\frac{1}{\cos\theta} - \frac{\sin^2\theta}{\cos\theta} = \frac{1 - \sin^2\theta}{\cos\theta} = \frac{\cos^2\theta}{\cos\theta} =$

$\cos\theta$

9. $(\csc\theta + 1)(\csc\theta - 1)$

T

$\csc^2\theta - 1$

$\cot^2\theta$

10. $\dfrac{\sin\theta}{\cos\theta\tan\theta} = \frac{\sin\theta}{\sin\theta} = 1$

S

$\cancel{\cos\theta}\,\frac{\sin\theta}{\cancel{\cos\theta}}$

11. $(\csc\theta + \cot\theta)(1 - \cos\theta)$

U

$\csc\theta - \cancel{\cot\theta} + \cancel{\cot\theta} - \cot\theta\cos\theta$

$\frac{1}{\sin\theta} - \frac{\cos\theta\cos\theta}{\sin\theta} = \frac{1 - \cos^2\theta}{\sin\theta} =$

$\frac{\sin^2\theta}{\sin\theta} = \sin\theta$

12. $(\tan^2\theta - \sec^2\theta)(\sin^2\theta + \cos^2\theta)$

X

$(-1)(1) = -1$

E. $\sec\theta$	N. $\csc\theta$	S. 1	X. -1	R. $\cos\theta$
H. $\tan^2\theta$	O. $\sin^2\theta$	T. $\cot^2\theta$	U. $\sin\theta$	I. $\sec^2\theta$

On October 4, 2006 Akira Haraguchi broke his own record by reciting the number pi to 100,000 decimal places.
It took him over

S	I	X	T	E	E	N		H	O	U	R	S
3	5	12	9	1	6	2		4	7	11	8	10

to complete the task.

Note: this is NOT a practice test. It's just more practice questions.

Precalculus

Chapter 5 Extra Practice

Name KEY

Find all solutions for each of the equations in #1 and #2.

1. $\sin x + \sqrt{2} = -\sin x$

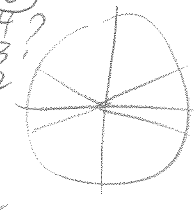
$2\sin x = -\sqrt{2}$

$\sin x = -\frac{\sqrt{2}}{2}$

$\boxed{x = \frac{5\pi}{4} + 2\pi n \qquad x = \frac{7\pi}{4} + 2\pi n}$

2. $3\tan^2 u - 1 = 0$

6 4? 3? 2



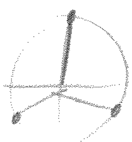
$\tan^2 u = \frac{1}{3}$

$\tan u = \pm\frac{1}{\sqrt{3}} = \pm\frac{1/2}{\sqrt{3}/2}$

$\boxed{u = \frac{\pi}{6} + \pi n \qquad u = \frac{5\pi}{6} + \pi n}$

Find all solutions from $[0, 2\pi)$ for #3 and #4.

3. $2\sin^2 x - \sin x - 1 = 0$



$(2\sin x + 1)(\sin x - 1)$

$\sin x = -\frac{1}{2} \qquad \sin x = 1$

$\boxed{x = \frac{7\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}}$

4. $\sec x \csc x = 2\csc x$

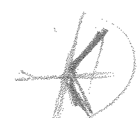
$\sec x \csc x - 2\csc x = 0$

$\csc x(\sec x - 2) = 0$

$\csc x = 0 \qquad \sec x = 2$

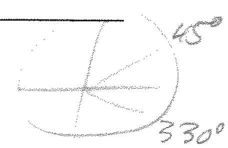
$\frac{1}{\sin x} = 0 \qquad \frac{1}{\cos x} = 2$

$\sin x = \text{undef.}$ → No solns. $\qquad \cos x = \frac{1}{2}$



$\boxed{x = \frac{\pi}{3}, \frac{5\pi}{3}}$

5. Find the exact value of $\cos 285^\circ$ using the fact that $285^\circ = 330^\circ - 45^\circ$.



$\cos 285 = \cos(330 - 45) = \cos 330 \cos 45 + \sin 330 \sin 45$

$= \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(-\frac{1}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$

$= \frac{\sqrt{6} - \sqrt{2}}{4}$

6. Simplify $\sin 8u \cos 3u + \cos 8u \sin 3u$

$\sin(8u + 3u) = \boxed{\sin 11u}$

7. Verify the following identity: $\cos\left(\frac{\pi}{2} - x\right) = \sin x$

$\cos\frac{\pi}{2}\cos x + \sin\frac{\pi}{2}\sin x$

$= (0)\cancel{(\cos x)} + (1)\sin x$

$= \sin x$

8. Find all solutions of $2\cos x + \sin 2x = 0$

$2\cos x + 2\sin x\cos x = 0$

$2\cos x(1 + \sin x) = 0$

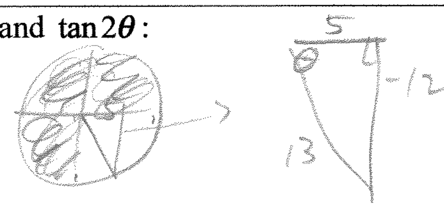
$2\cos x = 0 \qquad \sin x = -1$

$\cos x = 0$

$\boxed{x = \frac{\pi}{2} + \pi n}$ included

9. Use the following to find $\sin 2\theta$, $\cos 2\theta$, and $\tan 2\theta$:

$\cos\theta = \frac{5}{13}$ and $\frac{3\pi}{2} < \theta < 2\pi$



$\sin\theta = \frac{-12}{13}$

$\sin 2\theta = 2\sin\theta\cos\theta = 2\left(-\frac{12}{13}\right)\left(\frac{5}{13}\right) = -\frac{120}{169}$

$\cos 2\theta = 2\left(\frac{5}{13}\right)^2 - 1 = 2 \cdot \frac{25}{169} - 1 = \frac{50 - 169}{169} = \boxed{\frac{-119}{169}}$

$\tan 2\theta = \frac{\sin 2\theta}{\cos 2\theta} = \frac{\frac{-120}{169}}{\frac{-119}{169}} = \frac{120}{119}$

10. Finish the following formula three different ways:

$\cos 2u = \cos^2 u - \sin^2 u$

$\cos 2u = 2\cos^2 u - 1$

$\cos 2u = 1 - 2\sin^2 u$