

Name: _____

Date: _____

M10/11H HW Section 4.9 P1 Sum and Difference Identities

$$\sin(a-b) = \sin a \cos b - \sin b \cos a \quad \cos(a+b) = \cos a \cos b - \sin b \sin a \quad \sin(a+b) = \sin a \cos b + \sin b \cos a$$

$$\cos(a-b) = \cos a \cos b + \sin b \sin a \quad \tan(a+b) = \frac{\tan a + \tan b}{1 - \tan a \tan b} \quad \tan(a-b) = \frac{\tan a - \tan b}{1 + \tan a \tan b}$$

- Using two of any of these angles: 30° , 45° , 60° , 90° , 180° , 270° , and 360° , add or subtract them to see how many angles that you can create: ie: $75^\circ = 30^\circ + 45^\circ$
- Find the exact ratio of sine and cosine of the following angles:
 30° , 45° , 60° , 90° , 135° , 150° , 210° , 225° , 240° , 300° , 315° , and 330°
- If we are given the ratio $\sin a = \frac{3}{7}$, what is the value of $\cos a = ??$
- If $\cos Q = \frac{-3}{11}$ and angle Q is in quadrant 3, then what is the value of $\sin Q$??
- If $\sin \theta = \frac{-\sqrt{5}}{7}$, then what is the value of $\sin(-\theta)$ equal to? Explain
- If $\cos \theta = \frac{-9}{\sqrt{101}}$, then what is the value of $\cos(-\theta)$ equal to? Explain
- How can we use the sum and difference identities to find the exact value of $\sin 75^\circ$? Explain:

8. Is the following an identity? $\cos(a - b) = \cos a - \cos b$? Explain:

9. Given that $\tan \theta = \frac{\sin \theta}{\cos \theta}$, what is $\tan(a + b) = ??$ What is $\tan(a - b) = ??$

10. Find the exact value of each trigonometric expression:

a) $\sin(45^\circ + 30^\circ) =$	b) $\cos\left(\frac{3\pi}{4} + \frac{2\pi}{3}\right)$
c) $\cos(120^\circ + 45^\circ)$	d) $\sin(-15^\circ)$
e) $\cos\left(\frac{5\pi}{12}\right)$	f) $\cos(255^\circ)$
g) $\tan(300^\circ - 45^\circ)$	h) $\tan(300^\circ + 45^\circ)$
i) $\cos 195^\circ$	j) $\tan\left(\frac{\pi}{12}\right)$
k) $\sin\left(\frac{5\pi}{12}\right)$	l) $\sin 375^\circ$

11. Simplify each expression to an exact form:

a) $\cos(\theta + 2\pi)$	b) $\sin\left(\theta - \frac{3\pi}{2}\right)$
c) $\tan\left(\theta + \frac{\pi}{2}\right)$	d) $\cos(\theta - 2\pi)$
a) $\cos 70^\circ \cos 20^\circ + \sin 70^\circ \sin 20^\circ$	b) $\sin 20^\circ \cos 10^\circ + \cos 20^\circ \sin 10^\circ$
c) $\cos 110^\circ \cos 10^\circ - \sin 110^\circ \sin 10^\circ$	d) $\cos \frac{\pi}{3} \cos \frac{\pi}{4} + \sin \frac{\pi}{3} \sin \frac{\pi}{4}$
e) $\sin 42^\circ \cos 17^\circ - \cos 42^\circ \sin 17^\circ$	f) $\frac{\tan\left(\frac{\pi}{9}\right) + \tan\left(\frac{5\pi}{36}\right)}{1 - \tan\left(\frac{\pi}{9}\right)\tan\left(\frac{5\pi}{36}\right)}$
g) $\sin\left(\frac{\pi}{3} - x\right)\cos\left(\frac{\pi}{3} + x\right) + \cos\left(\frac{\pi}{3} - x\right)\sin\left(\frac{\pi}{3} + x\right)$	H) $\sin a \cos 2a + \cos a \sin 2a$

12. If $\sin a = \frac{4}{9}$, $90^\circ < a \leq 180^\circ$, then what is the exact value of $\sin(a + 180^\circ)$ equal to?

13. Given that $\sin 30^\circ = \frac{1}{2}$, $\cos 30^\circ = \frac{\sqrt{3}}{2}$, and $\cos 45^\circ = \sin 45^\circ = \frac{1}{\sqrt{2}}$ find the exact value of $\cos 75^\circ$, $\sin 75^\circ$, $\sin 15^\circ$, and $\cos 15^\circ$.

14. Given that $\sin a = \frac{3}{5}$ and $\cos b = \frac{4}{7}$, where both angles "a" and "b" are in quadrant 1, then find the following:
 $\sin(a + b)$, $\sin(a - b)$, $\cos(a + b)$, and $\cos(a - b)$

15. Simplify the following: $\cos\left(x + \frac{\pi}{2}\right) - \cos\left(x - \frac{\pi}{2}\right)$

- a) 0 b) $-2 \sin x$ c) $2 \sin x$ d) $2 \cos x$ e) $-2 \cos x$

16. Suppose $\cos x = 0$ and $\cos(x + z) = 0.5$. What is the smallest possible positive value of "z"?

- (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{5\pi}{6}$ (E) $\frac{7\pi}{6}$

17. Suppose that $\sin a + \sin b = \sqrt{\frac{5}{3}}$ and $\cos a + \cos b = 1$. What is $\cos(a - b)$