

## Activity 5.4 - Answer Key

### Problem 1

Find the exact value of:  $\cos(105^\circ) \sin(75^\circ)$

$$\begin{aligned}\cos(105^\circ) \sin(75^\circ) &= \frac{1}{2}(\sin(105^\circ + 75^\circ) - \sin(105^\circ - 75^\circ)) \\ &= \frac{1}{2}(\sin(180^\circ) - \sin(30^\circ)) \\ &= \frac{1}{2}\left(0 - \frac{1}{2}\right) \\ &= \frac{-1}{4}\end{aligned}$$

### Problem 2

Find  $\sin(32^\circ) - \sin(16^\circ)$

$$\begin{aligned}\sin(32^\circ) - \sin(16^\circ) &= 2 \sin\left(\frac{32^\circ - 16^\circ}{2}\right) \cos\left(\frac{32^\circ + 16^\circ}{2}\right) \\ &= 2 \sin(8^\circ) \cos(24^\circ)\end{aligned}$$

### Problem 3

Use the sum-to-product to rewrite the expression:  $\sin(10^\circ) + \sin(6^\circ)$

$$\begin{aligned}\sin(10^\circ) + \sin(6^\circ) &= 2 \sin\left(\frac{10^\circ + 6^\circ}{2}\right) \cos\left(\frac{10^\circ - 6^\circ}{2}\right) \\ &= 2 \sin(8^\circ) \cos(2^\circ)\end{aligned}$$

### Problem 4

Evaluate:  $\sin(67.5^\circ) \cos(22.5^\circ)$

$$\begin{aligned}\sin(67.5^\circ) \cos(22.5^\circ) &= \frac{1}{2}(\sin(67.5^\circ + 22.5^\circ) + \sin(67.5^\circ - 22.5^\circ)) \\ &= \frac{1}{2}(\sin(90^\circ) + \sin(45^\circ)) \\ &= \frac{1}{2}\left(1 + \frac{\sqrt{2}}{2}\right) \\ &= \frac{1}{2} + \frac{\sqrt{2}}{4}\end{aligned}$$

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### Problem 5

Find the exact value of  $\sin(195^\circ) \cdot \cos(45^\circ)$

$$\begin{aligned}\sin(195^\circ) \cos(45^\circ) &= \frac{1}{2}(\sin(195^\circ + 45^\circ) + \sin(195^\circ - 45^\circ)) \\ &= \frac{1}{2}(\sin(240^\circ) + \sin(150^\circ)) \\ &= \frac{1}{2} \left( \frac{-\sqrt{3}}{2} + \frac{1}{2} \right) \\ &= \frac{-\sqrt{3}}{4} + \frac{1}{4} \\ &= \frac{-\sqrt{3} + 1}{4}\end{aligned}$$

### Problem 6

True or False:  $\sin(x) + \sin(y) = \sin(x + y)$

False

$$\text{For example: } \sin\left(\frac{\pi}{2}\right) + \sin\left(\frac{\pi}{2}\right) = 1 + 1 = 2 \neq \sin(\pi) = 0$$

### Problem 7

Fill in the blank:  $\cos(3x) + \cos(5x) = \underline{\hspace{2cm}}$

$$\begin{aligned}\cos(3x) + \cos(5x) &= 2 \cos\left(\frac{3x + 5x}{2}\right) \cos\left(\frac{3x - 5x}{2}\right) \\ &= 2 \cos\left(\frac{8x}{2}\right) \cos\left(\frac{-2x}{2}\right) \\ &= 2 \cos(4x) \cos(-x) \\ &= 2 \cos(4x) \cos(x)\end{aligned}$$

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### **Secret Phrase**

What was the name found?

BURDELL