

# Lesson 5: Sum, Difference and Double Angle Identities

## Question #1

Reference Q.12567

Simplify using the sum and difference identities.

- $\cos(180 - B)^\circ$
- $\sin\left(\frac{\pi}{2} - x\right)$
- $\cos(90 + t)^\circ$
- $\sin(\pi + x)$

## Question #2

Reference Q.12568

Simplify and evaluate the following.

- $\sin 70^\circ \cos 20^\circ + \cos 70^\circ \sin 20^\circ$
- $\cos 170^\circ \cos 50^\circ + \sin 170^\circ \sin 50^\circ$
- $\sin \frac{\pi}{3} \cos \frac{\pi}{6} - \cos \frac{\pi}{3} \sin \frac{\pi}{6}$
- $\frac{\tan \frac{15\pi}{8} - \tan \frac{3\pi}{8}}{1 + \tan \frac{15\pi}{8} \tan \frac{3\pi}{8}}$

## Question #3

Reference Q.12569

Use exact values to show that

- $\sin 75^\circ = \frac{\sqrt{6} + \sqrt{2}}{4}$
- $\cos \frac{\pi}{12} = \frac{\sqrt{6} + \sqrt{2}}{4}$

## Question #4

Reference Q.12597

Express  $\frac{7\pi}{12}$  as a sum of two special angles and hence show that

$$\tan \frac{7\pi}{12} = \frac{1 + \sqrt{3}}{1 - \sqrt{3}}$$

## Question #5

Reference Q.12598

Prove that the exact value of  $\csc 105^\circ$  is  $\sqrt{6} - \sqrt{2}$ .

## Question #6

Reference Q.12599

Given  $\sin x = \frac{3}{5}$  and  $\sin y = \frac{7}{25}$ , and  $x$  and  $y$  are both acute angles, show that  $\tan(x + y) = \frac{4}{3}$ .

## Question #7

Reference Q.12641

Determine exact values for  $\cos\left(\theta + \frac{\pi}{6}\right)$  and  $\sin\left(\theta + \frac{\pi}{6}\right)$  if

$$\tan \theta = \frac{4}{3}, \text{ and } \pi \leq \theta \leq \frac{3\pi}{2}.$$

## Question #8

Reference Q.12642

Prove the following identities.

- $\tan\left(x + \frac{\pi}{4}\right) = \frac{1 + \tan x}{1 - \tan x}$
- $\frac{\sin(A - B)}{\cos A \cos B} = \tan A - \tan B$
- $(\cos A + \cos B)^2 + (\sin A + \sin B)^2 = 2[1 + \cos(A - B)]$
- $\sin(x + y) \sin(x - y) = \sin^2 x - \sin^2 y$

## Question #9

Reference Q.12643

If  $\cos(A + B) = 0.8320$  and  $\cos(A - B) = 0.4358$ , then the value of  $\cos A \cos B$  is

- 1.2678
- 0.6339
- 0.3962
- 0.1981

### Question #10

Reference Q.12644

The value of  $\cos(\pi + y) - \cos(\pi - y)$  is

- A. 0
- B. 2
- C. -2
- D. dependent on the value of  $y$

### Question #11

Reference Q.12645

Given  $\csc x = -\frac{17}{15}$ , where  $\frac{3\pi}{2} \leq x \leq 2\pi$ , and  $\cot y = -\frac{3}{4}$ ,

where  $\frac{\pi}{2} \leq y \leq \pi$ , the value of  $\cos(x - y)$  is

- A.  $-\frac{84}{85}$
- B.  $-\frac{36}{35}$
- C.  $\frac{84}{85}$
- D.  $\frac{36}{35}$

### Question #12

Reference Q.12646

If  $\sin(A + B) = 0.75$  and  $\sin(A - B) = 0.43$ , then the value of  $\cos A \sin B$ , to the nearest hundredth, is \_\_\_\_\_.

### Question #13

Reference Q.12583

Use the sum identity for cosine to prove the following double angle identities.

- a.  $\cos 2x = 2 \cos^2 x - 1$
- b.  $\cos 2x = 1 - 2 \sin^2 x$

### Question #14

Reference Q.12584

Write double angles identities for

- a.  $\tan 6x$
- b.  $\cos 3\theta$
- c.  $\sin \frac{1}{2}A$

### Question #15

Reference Q.12585

Express each of the following terms of a single trigonometric function.

- a.  $2 \sin \frac{1}{2}x \cos \frac{1}{2}x$
- b.  $\cos^2 2A - \sin^2 2A$
- c.  $1 - 2 \sin^2 3x$

### Question #16

Reference Q.12586

Use a double angle identity to simplify and evaluate

- a.  $\frac{2 \tan \frac{\pi}{8}}{1 - \tan^2 \frac{\pi}{8}}$
- b.  $\cos^2 \frac{\pi}{12} - \sin^2 \frac{\pi}{12}$
- c.  $\sin \frac{5\pi}{12} \cos \frac{5\pi}{12}$

### Question #17

Reference Q.12587

Prove the identity  $\frac{\sin 2x}{1 - \cos 2x} = \cot x$  and state the restrictions on  $x$ .

### Question #18

Reference Q.12588

Prove the identities

- a.  $\frac{1 - \tan^2 x}{1 + \tan^2 x} = \cos 2x$
- b.  $\sin 4x = 4 \sin x \cos^3 x - 4 \sin^3 x \cos x$

### Question #19

Reference Q.12589

The expression  $\frac{\cos^2 \frac{3}{2}x - \sin^2 \frac{3}{2}x}{\sin \frac{3}{2}x \cos \frac{3}{2}x}$  is equivalent to

- A.  $\cos \frac{3}{2}x - \sin \frac{3}{2}x$
- B.  $\cot 3x$
- C.  $2 \cot 3x$
- D.  $2 \csc 3x$

🔍 **Question #20**

Reference Q.12590

If  $a \cos^2 \frac{\pi}{8} - a \sin^2 \frac{\pi}{8} = 4\sqrt{2}$ , the value of  $a$  to the nearest tenth is \_\_\_\_.

🔍 **Question #21**

Reference Q.12591

If  $\sin 6\theta \cos 2\theta - \cos 6\theta \sin 2\theta = 2 \sin a\theta \cos a\theta$ , then the value of  $a$  is \_\_\_\_.