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M$6 Angle Sum and Difference Formulas

1. The cosine of the difference of two angles may be found using the formula $\cos(x-y)=\cos x\cos y+\sin x\sin y$. Use this formula to find:

   a) $\cos(90°-30°)$

   b) $\cos(-y)$

2. Fill in the blanks:

   $\sin(30°)=$ _______
   $\sin(-30°)=$ _______
   $\sin(120°)=$ _______
   $\sin(-120°)=$ _______

   In general,
   $\sin(-y)=$ ________

3. Derive a formula for $\cos(x+y)$.

4. Which of the following is equivalent to $\cos(90-x)$?

   (1) $\sin x$ (2) $\cos x$ (3) $-\sin x$ (4) $-\cos x$

5. Fill in the blanks:

   $\cos 70° = \sin$ _____
   $\cos 50° = \sin$ _____

   $\sin(90-x)=$ ______

   *Co*functions are equal when angles are ____________.

6. Derive a formula for $\sin(x+y)$ using $\sin x=\cos(90-x)$.

7. Derive a formula for $\sin(x-y)$.

Summary of Angle Sum and Difference Formulas
$\cos(x-y)=\cos x\cos y+\sin x\sin y$
$\cos(x+y)=$
$\sin(x-y)=$
$\sin(x+y)=$

Examples:

1. The expression $\cos 40^\circ \cos 10^\circ + \sin 40^\circ \sin 10^\circ$ is equivalent to:

   (1) $\sin 50^\circ$ (2) $\cos 30^\circ$ (3) $\sin 30^\circ$ (4) $\cos 50^\circ$

2. If $\sin x = \frac{4}{5}$, where $0^\circ < x < 90^\circ$, find the value of $\cos(x + 180^\circ)$.

3. If $\sin A = \frac{4}{5}$, $\tan B = \frac{5}{12}$, and angles A and B are in Quadrant I, what is the value of $\sin(A + B)$?

4. If $\sin x = \frac{12}{13}$, $\cos y = \frac{3}{5}$, and x and y are acute angles, what is the value of $\cos(x - y)$?

5. If A and B are positive acute angles, $\sin A = \frac{5}{13}$, and $\cos B = \frac{4}{5}$, what is the value of $\sin(A - B)$?