

5.3 Investigate Transformations of Sine and Cosine Functions**BLM 5-7**

1. State the amplitude, period, phase shift, and vertical shift of each function.
 - a) $y = 3\sin[2(x - 30^\circ)] + 1$
 - b) $y = \frac{1}{2}\cos[3(x - 45^\circ)]$
 - c) $y = \frac{3}{5}\sin\left[\frac{1}{2}(x + 30^\circ)\right] - 2$
 - d) $y = 2\cos[4(x - 60^\circ)] + 4$
2. Write the equation of a sine function with the following properties.
 - a) amplitude 2, period 360° , phase shift 30° to the right, and vertical shift down 2
 - b) amplitude 1, period 180° , no phase shift, and vertical shift up 3
 - c) amplitude $\frac{1}{3}$, period 120° , phase shift 15° to the left, and vertical shift down 1
3. Write the equation of a cosine function with the following properties.
 - a) amplitude 3, period 180° , phase shift 30° to the right, and vertical shift up 2
 - b) amplitude 5, period 270° , phase shift 45° to the left, and no vertical shift
 - c) amplitude $\frac{3}{4}$, period 60° , no phase shift, and a vertical shift down 3
4. Without using a table of values, create a sketch of the function $y = 3\sin(x - 60^\circ) + 1$ for two cycles.
5. Without using a table of values, create a sketch of the function $y = \frac{1}{2}\cos\left[\frac{1}{2}(x - 30^\circ)\right] - 2$ for two cycles.
6. The graphs of $y = \sin x$ and $y = \cos x$ have two points of intersection from 0° to 360° .
 - a) Without graphing, determine the number of points of intersection the graphs of $y = \sin 2x$ and $y = \cos 2x$ have. Include an explanation of how you arrived at your answer.
 - b) Create a sketch to illustrate this.
 - c) Without graphing, determine the number of points of intersection the graphs of $y = \sin 3x$ and $y = \cos 3x$ have. Include an explanation of how you arrived at your answer.
 - d) Create a sketch to illustrate this.
 - e) Use the results of parts a) and c) to determine an expression for the number of points of intersection for the functions $y = \sin kx$ and $y = \cos kx$.
7. Would changing the amplitude of the graphs in question 6 affect the results of the number of points of intersection? Explain.
8. Would introducing the same phase shift to all functions in question 6 affect the results of the number of points of intersection? Explain.

