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GUIDED NOTES: Amplitude, Period, Frequency, and Vertical Shift

	Definition	How to find on a graph:	How to find in an equation:
amplitude	distance from the midline to a maximum or minimum midline - imaginary line graph oscillates about (bounces up and down around)	count the number of spaces from midline to any max/min	$amp = a $
period	how long (how many radians) until the graph repeats	Start at y-intercept. Count how long it takes graph to get back to same type of point.	$period = \frac{2\pi}{b}$
frequency	how much of the wave happens in one radian	*not found on graph find period, then do the reciprocal	*not found in equation find period, then do the reciprocal
vertical shift	how far above or below the x-axis the graph was moved (where the midline is)	average the highest and lowest y-values $y = \frac{highest + lowest}{2}$	value of d +d → up -d → down

There is also a such thing as a phase shift. You will learn about it in your next math class.

April 30

Equations of Sine and Cosine

$$y = a \cdot \sin bx + d$$

$$y = a \cdot \cos bx + d$$

Determine amplitude, period, and vertical shift:

Ex1) $y = 6 \sin 5x - 8$

amp = $|6|$
amp = 6

period = $\frac{2\pi}{5}$

v.s. = down 8

freq = $\frac{5}{2\pi}$

Ex2) $y = -1 \cos \frac{1}{4}x + 1$

amp = $|-1|$
amp = 1

period = $\frac{2\pi}{\frac{1}{4}}$

v.s. = up 1

period = 8π

freq = $\frac{1}{8\pi}$

Ex3) $y = 7 \cos 6x + 0$

amp = $|7|$
amp = 7

period = $\frac{2\pi}{6}$

v.s. = none

period = $\frac{\pi}{3}$

freq = $\frac{3}{\pi}$

Ex4. Given amplitude of 6, period of $\frac{\pi}{8}$, and vertical shift up 13, write the equation of the cosine function.

$$\begin{aligned} \text{amp} &= 6 \\ |a| &= 6 \\ a &= 6, -6 \end{aligned}$$

$$\begin{aligned} \text{period} &= \frac{\pi}{8} \\ \frac{2\pi}{b} &= \frac{\pi}{8} \\ b \cdot \pi &= 2\pi \cdot 8 \\ \frac{\pi b}{\pi} &= \frac{16\pi}{\pi} \\ \hline b &= 16 \end{aligned}$$

$$\begin{aligned} \text{v.s.} &= \text{up } 13 \\ d &= +13 \end{aligned}$$

$$y = \pm 6 \cos 16x + 13$$

Ex5. Given amplitude of 11, frequency of $\frac{1}{4\pi}$, and vertical shift down 39, write the equation of the sine function.

$$\begin{aligned} \text{amp} &= 11 \\ |a| &= 11 \\ a &= 11, -11 \end{aligned}$$

$$\begin{aligned} \text{freq} &= \frac{1}{4\pi} \\ \text{period} &= 4\pi \\ \frac{2\pi}{b} &= \frac{4\pi}{1} \\ b \cdot 4\pi &= 2\pi \cdot 1 \\ \frac{4\pi b}{4\pi} &= \frac{2\pi}{4\pi} \\ \hline b &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{v.s.} &= \text{down } 39 \\ d &= -39 \end{aligned}$$

$$y = \pm 11 \sin \frac{1}{2}x - 39$$