

$$y = A \sin B(x - c) + D$$

$$\text{Amp} = A = \frac{\text{Max} - \text{Min}}{2}$$

$$\text{Vertical} = (C) = \frac{\text{Max} + \text{Min}}{2}$$

$$\text{period} = p$$

Horizontal Stretch/Shrink

$$B = \frac{2\pi}{p}$$

How to choose an appropriate model based on the behavior at some given time, T.

$y = A \cos B(t - T) + C$
if at time T the function attains a maximum value

$y = -A \cos B(t - T) + C$
if at time T the function attains a minimum value

$y = A \sin B(t - T) + C$
if at time T the function halfway between a minimum and a maximum value

$y = -A \sin B(t - T) + C$
if at time T the function halfway between a maximum and a minimum value

period
↑

Construct a sinusoid with the given amplitude and period that goes through the given point.

A) Amp: 4, period 4π , point (0, 0)

$$\text{Per} = \frac{2\pi}{B}$$

$$B = \frac{2\pi}{\text{Per}} = \frac{2\pi}{4\pi} = \frac{1}{2}$$

$$y = 4 \sin \frac{1}{2}x$$

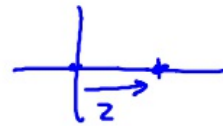
B) Amp: 2.5, period $\frac{\pi}{5}$, point (2, 0)

$$A = 2.5$$

$$B = \frac{2\pi}{\text{Per}} = \frac{2\pi}{\frac{\pi}{5}} = \frac{2\pi}{1} \div \frac{\pi}{5} = \frac{2\pi}{1} \cdot \frac{5}{\pi} = 10$$

P.S. 2 Right

$$y = 2.5 \sin 10(x - 2)$$



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Example 7: Calculating the Ebb and Flow of Tides

9.6

One particular July 4th in Galveston, TX, high tide occurred at 9:36 am. At that time the water at the end of the 61st Street Pier was 2.7 meters deep. Low tide occurred at 3:48 p.m, at which time the water was only 2.1 meters deep. Assume that the depth of the water is a sinusoidal function of time with a period of half a lunar day (about 12 hrs 24 min)

a) Model the depth, D, as a sinusoidal function of time, t, algebraically then graph the function.

$$A = \frac{2.7 - 2.1}{2} = .3$$

$$V.S. = \frac{2.7 + 2.1}{2} = 2.4$$

$$B = \frac{2\pi}{12.4} = \frac{\pi}{6.2}$$

P.S. 9.6 Right

$$.3 \cos \frac{\pi}{6.2}(x - 9.6) + 2.4$$

12.40

b) At what time on the 4th of July did the first low tide occur.

c) What was the approximate depth of the water at 6:00 am and at 3:00 pm?

$$\hookrightarrow b = 15$$

$\rightarrow b = 6$

d) What was the first time on July 4th when the water was 2.4 meters deep?

80) Temperature Data: The normal monthly Fahrenheit temperatures in Helena, MT, are shown in the table below (month 1 = January)

Model the temperature T as a sinusoidal function of time using 20 as the minimum value and 68 as the maximum value. Support your answer graphically by graphing your function with a scatter plot.

M	1	2	3	4	5	6	7	8	9	10	11	12
T	20	26	35	44	53	61	68	67	56	45	31	21