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

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

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

$period = p$

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

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

A) Amp: 4, period 4π, point (0, 0)

$A = 4$ $B(Per) = \left(\frac{2\pi}{B}\right)B$

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

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

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

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

$A = 2.5$

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

$= \frac{2\pi}{\frac{\pi}{5}}$ $\frac{2\pi}{1} \cdot \frac{5}{\pi} = 10$

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

$A \cos B(x-c)+D$

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

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

$period = p$

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

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)

12.4 hrs

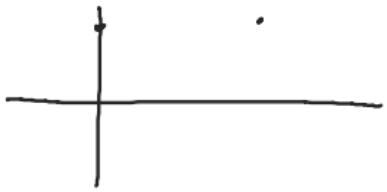
a) Model the depth, D, as a sinusoidal function of time, t, algebraically then graph the function.

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

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

Vertical Shift $= \frac{2.7+2.1}{2} = 2.4$

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



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

3.4 hr

3 hr 24 min 3:24 am

x=6

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

X=15

6:00 am → 2.3

3:00 pm → 2.1

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

.3 12:18 am

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