1. The ocean waves crest at 6 feet above the sea floor (high tide) every twelve hours. Low tide also occurs every twelve hours. At low tide the ocean waves are two feet above the sea floor. Assume that high tide occurs at 12 midnight, low tide at 6 a.m., etc.

a. What is the difference between the height of the waves at high tide and at low tide? 4 feet
What is the amplitude of the ocean waves? 2
Is the amplitude A, B, C, or D in a sinusoidal function: $y = A \sin (B (\theta - C)) + D$ ? A

b. Where is the midline of the ocean waves? $y = 4$
What is the vertical translation (shift) of the ocean wave function? 4
Is the vertical translation A, B, C, or D in a sinusoidal function: $y = A \sin (B (\theta - C)) + D$ ? D

c. What is the time period from high tide to high tide (or low tide to low tide)? 12 hrs
What is the period of the ocean wave function? $\frac{12}{\pi}$ hrs
What is the B factor of the ocean wave function? $\frac{2\pi}{12} = \frac{\pi}{6}$

d. If the cosine function starts at (0,1) and falls to (π,−1), before rising back to its peak value of 1 at $2\pi$, what horizontal translation (shift) to the cosine function is needed to represent the ocean wave cresting at midnight? None
What is the C factor in a sinusoidal function? 0

Graph the height of the ocean wave versus time over a 24 hour day, using t = 0 as 12 midnight.

![Graph of Height v. Time of Ocean Waves](image)

Construct a cosine function ($y = A \cos (B (\theta - C)) + D$) to represent (model) this ocean wave.

$H(t) = y = 2 \cos \left( \frac{\pi}{6} \theta \right) + 4$

Construct a sine function ($y = A \sin (B (\theta - C)) + D$) to represent (model) this ocean wave.

$H(t) = 2 \sin \left( \frac{\pi}{6} (\theta - 9) \right) + 4$ or $2 \sin \left( \frac{\pi}{6} \theta - \frac{3\pi}{2} \right) + 4$

Construct a negative cosine function ($y = -A \cos (B (\theta - C)) + D$) to represent (model) this ocean wave.

$H(t) = -2 \cos \left( \frac{\pi}{6} (\theta - 6) \right) + 4$ or $-2 \cos \left( \frac{\pi}{6} \theta - \pi \right) + 4$
2. High and low tide usually vary by approximately 6 hours 12 minutes, instead of just 6 hours. Assume the ocean waves crest at 8 feet above the sea floor (high tide) and bottom out at 1 foot above the sea floor (low tide). The first low tide occurred at 3 a.m. and the first high tide peaked at 9:12 a.m. The next low tide (trough) occurred at 3:24 p.m., and next high tide at 9:36 p.m.

Graph the height of the ocean wave versus time over a 24 hour day, using \( t = 0 \) as 12 midnight.

![Graph of Height v. Time of Ocean Waves](image)

Since the description starts with low tide, which trig function is easier to utilize: \(+/- \sin / \cos \theta\) ?

\[
- \cos \theta
\]

Construct a cosine function \( y = A \cos B (\theta - C) + D \) to represent (model) this ocean wave.

\[
H(t) = 3.5 \cos \left( \frac{5\pi}{31} (\theta - 9.2) + 4.5 \right)
\]

Construct a negative cosine function \( y = -A \cos B (\theta - C) + D \) to represent (model) this ocean wave.

\[
H(t) = -3.5 \cos \left( \frac{5\pi}{31} (\theta - 3) + 4.5 \right)
\]

Construct a sine function \( y = A \sin B (\theta - C) + D \) to represent (model) this ocean wave.

\[
H(t) = 3.5 \sin \left( \frac{5\pi}{31} (\theta - 6.1) + 4.5 \right)
\]

Construct a negative sine function \( y = -A \sin B (\theta - C) + D \) to represent (model) this ocean wave.

\[
H(t) = -3.5 \sin \left( \frac{5\pi}{31} (\theta - 12.3) + 4.5 \right)
\]

Convert the above negative sine function into the form: \( y = A \sin B \theta +/ - C + D \)

\[
H(t) = -3.5 \sin \left( \frac{5\pi}{31} \theta + \frac{\pi}{6.2} \right) + 4.5
\]

\[
02 = -3.5 \sin \left( \frac{5\pi}{31} \theta + \frac{\pi}{6.2} \right) + 4.5
\]