Unit II
Indicator 4 and 8

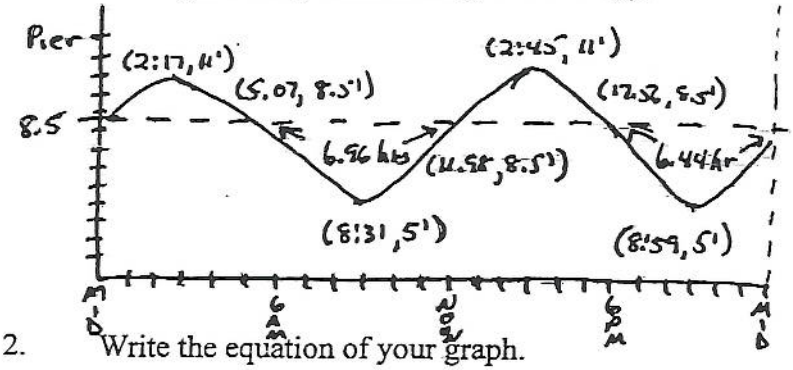
NAME Key

DATE _____ PERIOD ____

The Distance from the Dock to the Bay

You've just built a dock for your new boat over an inland waterway. The top of the pylons which support the end of the dock are 13' above the bottom of the waterway. At low tide, the water at the pylons has a depth of 5'. The distance from the dock to the water is 2 feet at high tide.

1. You've found a tide table and know that the next high tide is Saturday at 2:17 A.M. and the next low tide is at 8:31 A.M. If the tides ebb and flow over time in a periodic manner, use the cosine function and sketch a graph of the tides over the next 24 hours (from midnight Friday until midnight Saturday).



6 hrs 14 min between high and Low tide
∴ Period = 12 hrs 28 min
or 12.47 hrs.

Next high tide
2:17 + 12:28 = 14:45 (2:45 p.m)

Next Low tide
8:31 + 12:28 = 20:59 (8:59 p.m)

2. Write the equation of your graph.

$12.47 = \frac{2\pi}{B}$ $\quad 2:17 = 2\frac{17}{60}$

$\therefore B = .503 \quad = 2.28$

$D(t) = 3\cos .503(t - 2.28) + 8$

3. For safety's sake, you must use a ladder if the upper edge (gunwale) of your motor boat falls more than one foot below the dock. Your boat has an exposed height of 3 ½ feet.

   a. Are there times when you must use a ladder? yes, Low tide → 5ft + $3\frac{1}{2}$ ft < 13ft - 1 foot

   b. Write an explanation in terms of the tides, the time, and whether or not you need the ladder. One foot below the dock is 12' from the water bed
   $12 - 3\frac{1}{2} = 8\frac{1}{2}$ feet. If The water goes below $8\frac{1}{2}$ feet, a Ladder must be used.

   c. Indicate on your sketch in #1, the maximim depth that you would need a ladder.

   d. What is the probability that if you walk out on the deck any time Saturday that you will have to use a ladder to get into your boat?

During the 24 hour period, the water was below 8.5 feet a total of 13.35 hours

$\frac{13.35}{24} \approx$ 55.625% of the time