Math 1113
Section 2.5

2.5- Modeling with Trigonometry

Practice Worksheet

1. A deer population oscillates 19 above and below average during the year, reaching the lowest value in January. The average population starts at 800 deer ~~and increases by 160 each year~~. Find a function that models the population, P, in terms of months since January, t.

$A=19$
$D=800$
$B=\frac{2\pi}{12}=\frac{\pi}{6}$

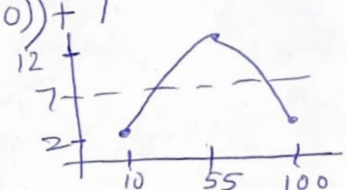
$y=-19\cos(\pi/6\, t)+800$

2. During a 90-day monsoon season, daily rainfall can be modeled by sinusoidal functions. If the rainfall fluctuates between a low of 2 inches on day 10 and 12 inches on day 55, during what period is daily rainfall more than 10 inches?

Min = 2in
Max = 12in
D = 7in
A = 5in

P = 90 days
$B=\frac{2\pi}{90}=\frac{\pi}{45}$

$y=-5\cos\left(\frac{\pi}{45}(x-10)\right)+7$



3. A Ferris wheel is 25 meters in diameter and boarded from a platform that is 1 meter above the ground. The six o'clock position on the Ferris wheel is level with the loading platform. The wheel completes 1 full revolution in 10 minutes. The function $h(t)$ gives a person's height in meters above the ground t minutes after the wheel begins to turn.

Min = 1m
Max = 26m
P = 10min
$B=\frac{\pi}{5}$
D = 13.5

a. Find the amplitude, midline, and period of $h(t)$.

$A=12.5 \quad D=13.5 \quad P=10$

b. Find a formula for the height function $h(t)$.

$h(t)=-12.5\cos(\pi/5\, t)+13.5$

c. How high off the ground is a person after 5 minutes?

$h(5)=-12.5\cos(\frac{\pi}{\cancel{5}}\cdot\cancel{5})+13.5$
$=-12.5\cos\pi+13.5$
$=\boxed{26\text{ feet}}$

4. Outside temperatures over the course of a day can be modeled as a sinusoidal function. Suppose the high temperature of 105°F occurs at 5PM and the average temperature for the day is 85°F. Find the temperature, to the nearest degree, at 9AM.

High = 105°F
Average (D) = 85°F
Low = 65°F
A = 20
P = 24 hrs
$B=\pi/12$

$y=20\cos\left(\pi/12(x-17)\right)+85$
$y=20\cos\left(\pi/12(9-17)\right)+85$
$y=20\cos\left(-\frac{8\pi}{12}\right)+85$
$y=20\left(-\frac{1}{2}\right)+85$
$y=\boxed{75°F}$