

Key

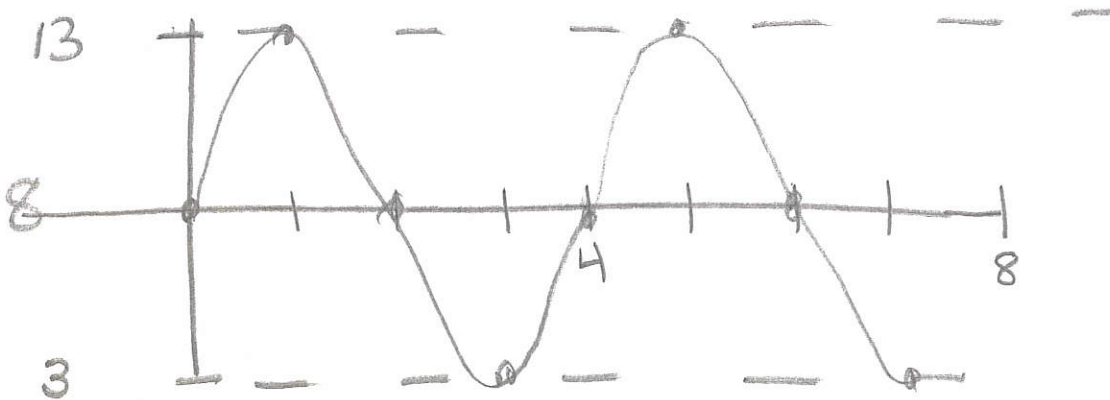
## Pre-Calc – Analyzing Sinusoidal Models A

1. Your height above the ground (in feet) while jumping on a trampoline is modeled by the equation  $h(t) = 5 \sin\left(\frac{\pi}{2}t\right) + 8$ , where  $t$  is measured in seconds.

A. How long does it take you to make one complete jump (wave, cycle)?

$$\text{Per} = 2\pi \div \frac{\pi}{2} = 2\pi \cdot \frac{2}{\pi} = 4 \text{ secs}$$

B. Sketch the graph over ~~60~~ <sup>8 sec</sup> seconds.



C. How many jump cycles will you complete in one minute?

$$60 \div 4 = 15 \text{ cycles}$$

D. At what times will your feet be at the height closest to the ground (min)?

3, 7, 11, 15, 19, 23, 27, 31,  
35, 39, 43, 47

E. What is the range of heights you reach when jumping?

3 to 13

[3, 13]

2. Let  $R$  = population of rabbits

$C$  = population of coyotes

$$R = 25,000 + 15,000 \cos\left(\frac{\pi}{12}t\right)$$

$$C = 5000 + 2000 \sin\left(\frac{\pi}{12}t\right)$$

A. How many rabbits will there be after 6 months?

$$R = 25,000 + 15,000 \cos\left(\frac{\pi}{12} \cdot 6\right)$$

25,000 Rabbits

B. How many rabbits will there be after 4 months?

$$R = 25,000 + 15,000 \cos\left(\frac{4\pi}{12}\right)$$

$$= 25,000 + 15,000 \cdot \frac{1}{2}$$

$$= 25,000 + 7,500$$

$$= 32,500$$

C. When will there be 7,000 coyotes?

$$7000 = 5000 + 2000 \sin\left(\frac{\pi}{12}t\right)$$

Calc intersect or  $1 = \sin\left(\frac{\pi}{12}t\right)$

after 6 months

D. When will there be 10,000 rabbits?

Calc intersect or  $y_2 = 10,000$

$$10,000 = 25,000 + 15,000 \cos\left(\frac{\pi}{12}t\right)$$

$$-1 = \cos\left(\frac{\pi}{12}t\right)$$

after 12 months

E. What is the range of the coyote population?

[3000, 7000]

F. What is the range of the rabbit population?

[10,000, 40,000]

G. Examine the graphs of both populations on the same coordinate plane. What conclusion can you draw about the relationship between the rabbit and coyote populations?

$t$	$R$	$C$
0	40,000	5000
4	32,500	
6	25,000	7000

max → (at t=0)  
min → (at t=6)

The max # Coyotes corresponds with min # of rabbits & vice versa. → makes sense. Coyotes eat rabbits.