

## 8.8 - Applications of Trig Functions

1. The geese population in a certain area fluctuates periodically between a maximum of 600 geese and a minimum of 350 geese. This population cycle repeats every 5 years. Write a sine function to model the geese population when time is measured in years.

$$A = \frac{1}{2}(600 - 350) = 125$$

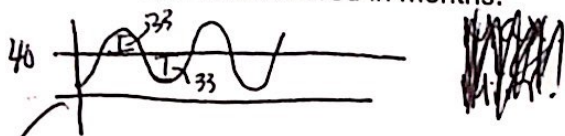
period: 5 years

period =  $\frac{2\pi}{b}$

$\frac{2\pi}{b} = \frac{2\pi}{5}$   
 ~~$\frac{2\pi}{b} = \frac{2\pi}{1}$~~   
 $b = \frac{2\pi}{5}$

$$y = 125 \sin \frac{2\pi}{5} x$$

2. The average monthly temperature in Greenville varies periodically with a maximum of 69°F and a minimum of 41°F. A complete cycle repeats every year. Write a cosine function to model the temperature in Greenville when time is measured in months.



3. The function  $f(x) = -33 \cos(\frac{\pi}{6}x) + 40$  models the height of a rider on a Ferris wheel, where  $x$  represents time in minutes. Determine the maximum and minimum height the rider reaches, and determine the amount of time it takes for the rider to complete a full revolution.

Min:  $40 - 33 = 7$

Max:  $40 + 33 = 73$

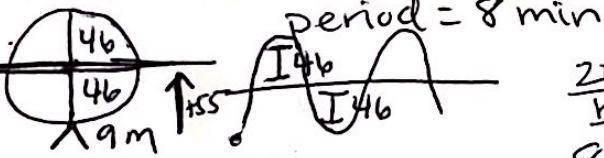
period?  $\text{period} = \frac{2\pi}{b} = \frac{2\pi}{\frac{\pi}{6}}$

12 minutes

$$\frac{2\pi}{1} \cdot \frac{6}{\pi} = \frac{12\pi}{\pi} = 12$$

4. A Ferris wheel has a diameter of 92 m and makes a complete revolution every 8 minutes. The wheel starts turning when a rider is at its lowest point, 9 m above the ground. Write a cosine function to model the rider's height above the ground when time is measured in minutes.

neg fun



$$\frac{2\pi}{b} = \frac{8}{1}$$

$$8b = 2\pi$$

$$y = -46 \cos \frac{2\pi}{8} \theta + 55$$

$$y = -46 \cos \frac{\pi}{4} \theta + 55$$

5. The function  $f(x) = 1.3 \cos(4\pi x) + 88.7$  models the altitude of the midday sun at Venus's equator, where  $x$  represents time in years. Determine the maximum and minimum altitude the sun reaches, and determine the amount of time it takes for the sun to complete a full cycle.

6. When an appliance is plugged into an outlet, voltage fluctuates between positive and negative values. In Barbados, the voltage fluctuates between 163 volts and -163 volts with a frequency of 50 cycles per second. Write a sine function to model the voltage when time is measured in seconds.

Max: 163

Min: -163

frequency:  $\frac{50}{1}$

$$A = \frac{1}{2}(163 - (-163)) = 163$$

frequency =  $\frac{2\pi}{b} = 50$   
 ~~$\frac{2\pi}{b} = \frac{2\pi}{1}$~~   
 $b = 100\pi$

$$y = 163 \sin(100\pi x)$$