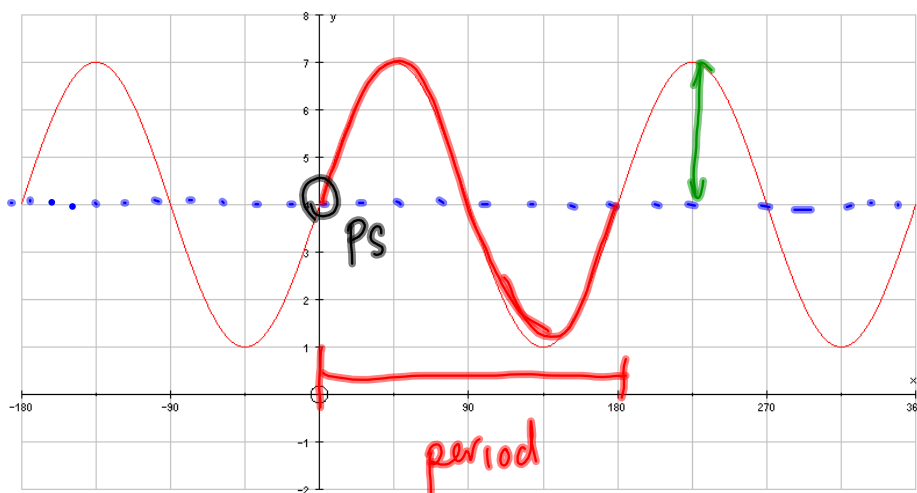


Finding the Equation from the Graph



SA: $y = 4$
 Amp: 3
 Period: 180°
 PS: 0°

Transformational Form \rightarrow

$$\frac{1}{\text{Amp}} (y - \text{SA}) = \sin\left(\frac{360^\circ}{\text{period}} (x - \text{PS})\right)$$

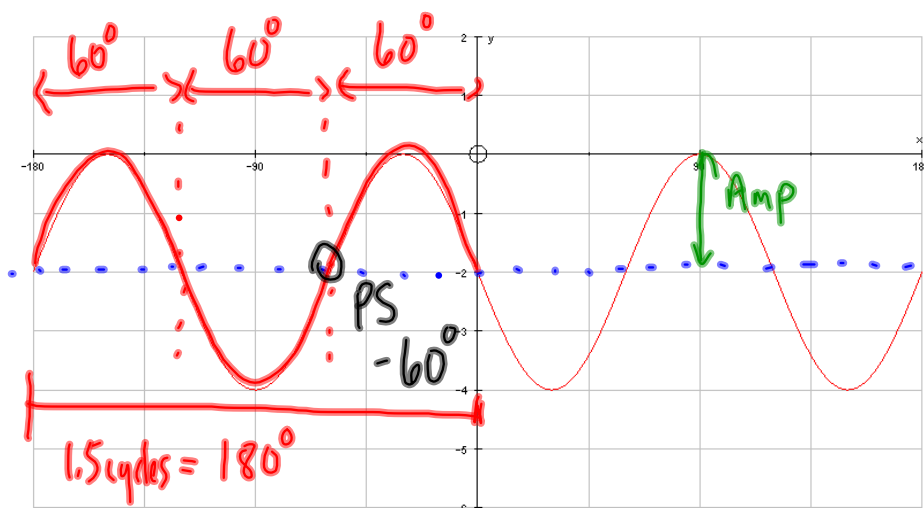
$$\frac{1}{3} (y - 4) = \sin\left(\frac{360^\circ}{180^\circ} (x - 0)\right)$$

$$\rightarrow \frac{1}{3} (y - 4) = \sin(2x)$$

$$y - 4 = 3\sin(2x)$$

functional form \rightarrow

$$\boxed{y = 3\sin(2x) + 4}$$



SA: $y = -2$

Amp: 2

Period: 120°

PS: -60°

$1.5 \text{ cycles} = 180^\circ$

$1 \text{ cycle} = 120^\circ$

or 3 cycles in 360°

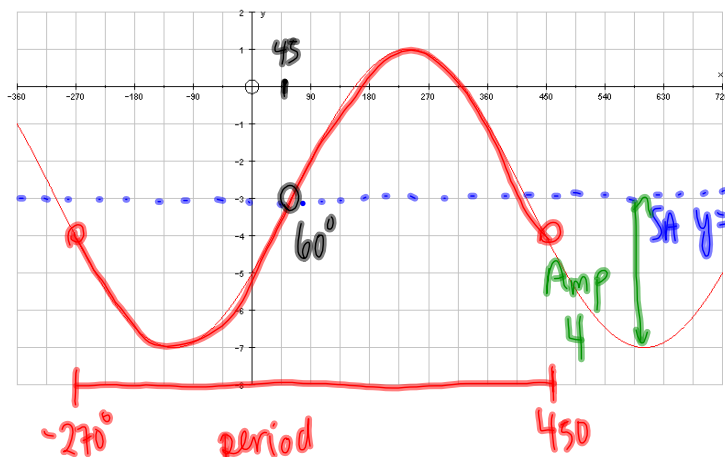
$$\frac{1}{\text{Amp}} (y - \text{SA}) = \sin\left(\frac{360^\circ}{\text{period}} (x - \text{PS})\right)$$

$$\frac{1}{2} (y - (-2)) = \sin\left(\frac{360^\circ}{120^\circ} (x - (-60^\circ))\right)$$

Transformational form $\rightarrow \frac{1}{2} (y + 2) = \sin(3(x + 60^\circ))$

$$(y + 2) = 2 \sin(3(x + 60^\circ))$$

functional form $\rightarrow y = 2 \sin(3(x + 60^\circ)) - 2$



SA: $y = -3$

Amp: 4

Period = 720°

PS: 60°

-270° period 720° 450

$$\frac{1}{\text{Amp}} (y - \text{SA}) = \sin\left(\frac{360^\circ}{\text{period}} (x - \text{PS})\right)$$

$$\frac{1}{4} (y - (-3)) = \sin\left(\frac{360^\circ}{720^\circ} (x - 60^\circ)\right)$$

transformational form $\rightarrow \frac{1}{4} (y + 3) = \sin\left(\frac{1}{2} (x - 60^\circ)\right)$

$$y + 3 = 4 \sin\left(\frac{1}{2} (x - 60^\circ)\right)$$

functional form $\rightarrow y = 4 \sin\left(\frac{1}{2} (x - 60^\circ)\right) - 3$

Remember the transformations:

SA: \rightarrow VT (vertical translation)

Amp \rightarrow VS (vertical stretch)

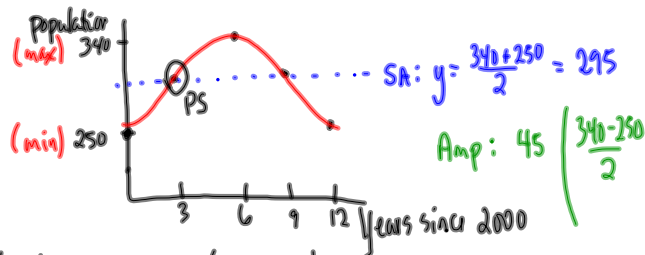
Period $\rightarrow \frac{\text{period}}{360^\circ}$ HS (horizontal stretch)

PS \rightarrow HT (horizontal translation)

Understanding Sinusoidal Situations

A deer population varies sinusoidally from a low of 250 deer to a high of 340 deer. This deer population completes a cycle every 12 years. The population reached 250 deer in the year 2000.

a) Sketch a graph:



b) the parameters (see right) Period: 12

c) equation: PS: 3

$$\frac{1}{\text{Amp}}(y - \text{SA}) = \sin\left(\frac{360^\circ}{\text{period}}(x - \text{PS})\right)$$

$$\frac{1}{45}(y - 295) = \sin\left(\frac{360^\circ}{12}(x - 3)\right)$$

$$\frac{1}{45}(y - 295) = \sin(30(x - 3))$$

$$y - 295 = 45 \sin(30(x - 3))$$

$$y = 45 \sin(30(x - 3)) + 295$$

where x is the # of years since 2000
 y is the deer population

d) What will the population be in 2014? ($x = 14$)

$$y = 45 \sin(30(x - 3)) + 295$$

$$y = 45 \sin(30(14 - 3)) + 295$$

$$y = 45 \sin(30(11)) + 295$$

$$y = 45 \sin(330) + 295$$

$$y = 272.5 \text{ deer}$$

There will be 273 deer in 2014