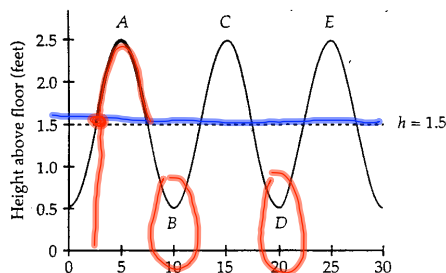


### 5.5 Applications of Sinusoidal Data

Example 1:

The following graph represents the height above the floor of a carousel horse's back hooves versus time during the carousel ride.



1. What is the amplitude of this graph? What does the amplitude represent?

$$A = \frac{\text{Max} - \text{Min}}{2} = \frac{2.5 - 0.5}{2} = 1$$

The distance above & below the VD.

2. What is the vertical translation? What does it represent?

$$1.5 \quad VD = \frac{2.5 + 0.5}{2}$$

The average height of the horses hooves.

3. What is the period? What does it represent?

10 sec. The time for the hooves to go up and down once.  
P.S.

4. What is the horizontal translation?

2.5 sec to the right

5. Use the above information to write the equation of the graph in the form

$$Y = a \sin (bx + c) + d$$

$$y = 1 \sin \frac{2\pi}{10} (x - 2.5) + 1.5$$

**Example 2:**

The following equation represents the average monthly temperature in (°F) at Pocatello, Idaho.  $Y = 27.80 \sin(0.55x - 2.61) + 54.10$

1. What is the value of "d"? What does it represent?

54.10

Average temp. in Pocatello

2. What is the value of "a"? What does it represent?

27.80

Amount above or below the ave. temp.

Max:  $54.10 + 27.80$

Min:  $54.10 - 27.80$

3. What is the value of "b"? What does it represent?

$b = 0.55$

period =  $\frac{2\pi}{b} = \frac{2\pi}{0.55} = 11.42$  months

4. What is the value of "c"? What does it represent?

$(0.55x - 2.61)$

4.75

$0.55(x - 4.75)$

right

The average temp of  $54.10^\circ\text{F}$  is reached on April 20<sup>th</sup>

**Example 3:**

Over the course of a year, the length of the day (the number of hours from sunrise to sunset) changes daily. The following table shows the length of day every 30 days for Boston, Massachusetts from 12/31/97 to 3/26/99.

Day Number	Length (hours)
0	9.1
30	9.9
60	11.2
90	12.7
120	14.0
150	15.0
180	15.3
210	14.6
240	13.3
270	11.9
300	10.6
330	9.5
360	9.1
390	9.7
420	11.0
450	12.4

Sin Reg

1. Find the equation of the sinusoidal curve of best fit.

$$y = 3.02 \sin(0.017x - 1.396) + 12.21$$

2. Use your equation to predict the length of the day on day 205.

$$y = 3.02 \sin(0.017(205) - 1.396) + 12.21$$

$$= \underline{13.49}$$

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a)  $\text{Amp} = \frac{0.9 - 0.1}{2} = 0.4$        $\text{VD} = \frac{0.9 + 0.1}{2} = 0.5$

Period: 1.2 s

$y = 3 \sin(4(x)) - 1$   
max VD + Amp  
min VD - Amp

