Oscillations

Many physical systems near equilibrium are describe by the following **Differential Equation**:

$$\ddot{x} = -\varpi^2 x$$

This is the second time derivative of ***x*** (acceleration)

By using analogy with rotation, we have found in class that solution to this equation is an oscillatory motion with period $T=2\pi/\omega$:

Angular Frequency, $\omega = 2\pi/T$

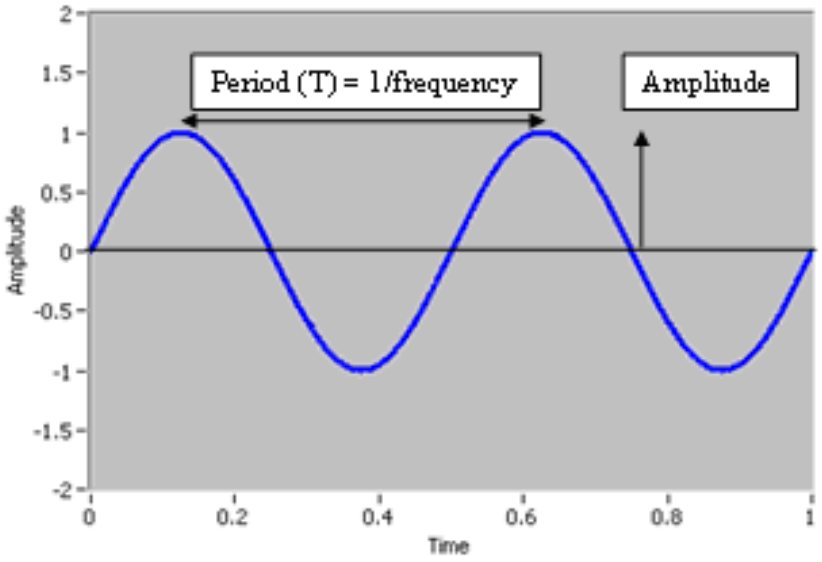
$$x(t) = A\sin(\varpi t + \varphi_0)$$

Amplitude

Phase Shift

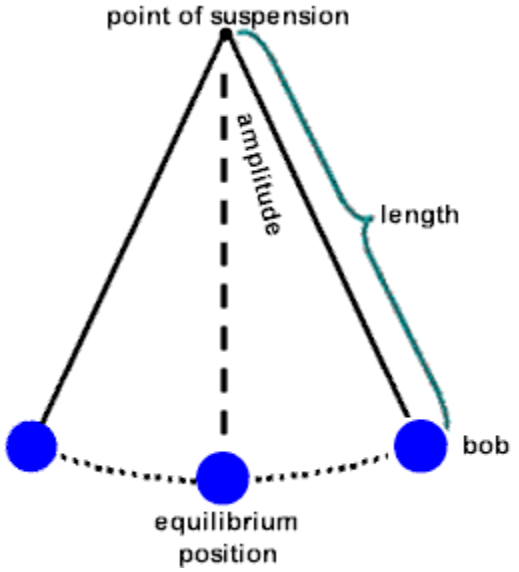
$$T = \frac{1}{f} = \frac{2\pi}{\omega}$$

Parameter	Formula	Units
Period	T	s
Frequency	f=1/T	1/s=Hz (Hertz)
Angular frequency	$\omega=2\pi f=2\pi/T$	1/s
Amplitude	A	varies



Example: Period of small oscillations of a pendulum

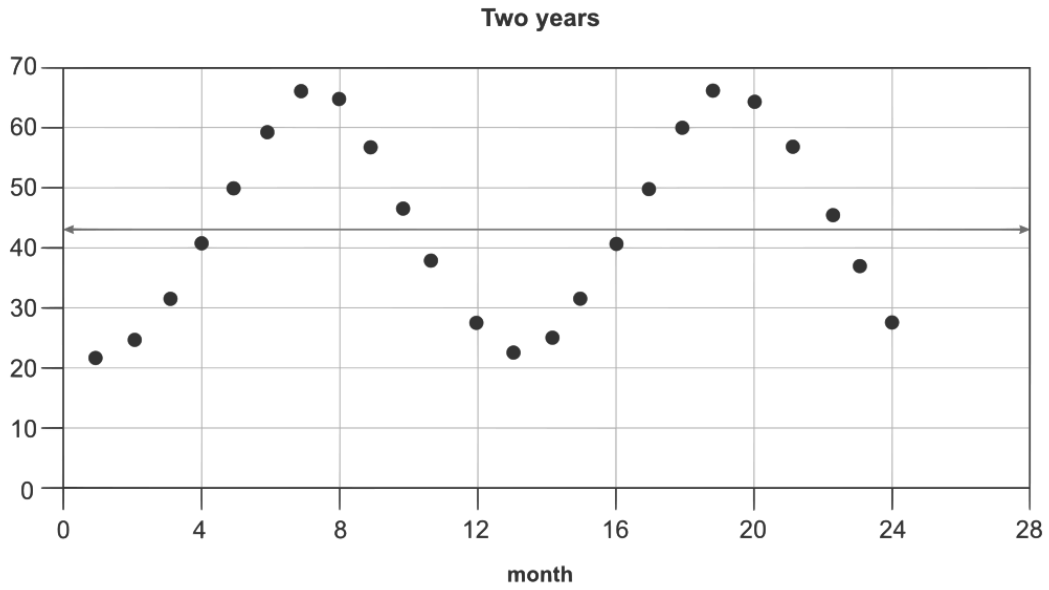
$$T = 2\pi\sqrt{\frac{L}{g}}$$ *L* is length.



Homework

Problem 1 Write a formula that would fit the plot x(t), shown below (t in months):

X



Proble

a) Design and builds a pendulum that has a period T=1s.
b) Measure this period. Make several measurements, find the average and estimate the error in your experiment.
c) Have this pendulum around during the time of our next class

THINK ABOUT ANY QUESTION YOU'D LIKE TO GET AN ASWER TO.