Simple harmonic motion

$$d = a\cos(\omega t) \qquad d = a\sin(\omega t)$$

Start

Rest

Amplitude

Rest/Start

Amplitude
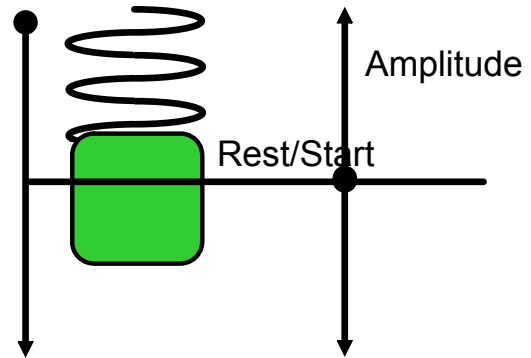
Which function?

$$d = a\sin(\omega t)$$

Time required for one period: 8 seconds

Remember: $\underline{Observed}\ Period = \dfrac{2\pi}{\omega}$ and $\omega = \dfrac{2\pi}{P}$

Paying more attention to units:

$$Period\ \frac{\sec.}{cycle} = \frac{2\pi}{\omega}\frac{\sec.}{cycle} \quad \text{and} \quad \omega\ \frac{rad}{\sec.} = \frac{2\pi}{P}\frac{rad}{\sec.}$$

$$\omega = \frac{2\pi}{8} = \frac{\pi}{4}\frac{rad}{\sec.}$$

New: Frequency -

How many oscillations does it make in a certian amount of time?

or $cycle\!\!\Big/\!\!_{time}$

Period is in $time\!\!\Big/\!\!_{cycle}$

so $\qquad Frequency = 1\!\!\Big/\!_{P} = \dfrac{1}{2\pi\!\!\Big/\!_{\omega}} = \dfrac{\omega}{2\pi}$

$$F \; cycle\!\!\Big/\!_{time} = \dfrac{1}{P \; time\!\!\Big/\!_{cycle}} = \dfrac{\omega}{2\pi} \; cycle\!\!\Big/\!_{time}$$

In a simple harmonic motion at time 0 figure is at the bottom of its cycle:

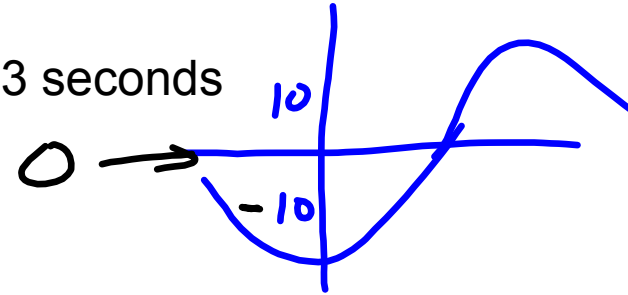$H = -10 \cos\left(\frac{2\pi}{3} t\right)$

amplitude = 10, time per cycle = 3 seconds

$W = \frac{2\pi}{P} = \frac{2\pi}{3}$

Write the equation?
What is the frequency?

In a simple harmonic motion at time 0 figure is at the middle of its cycle and rising:

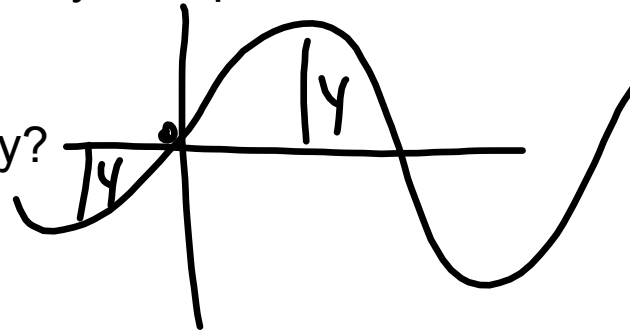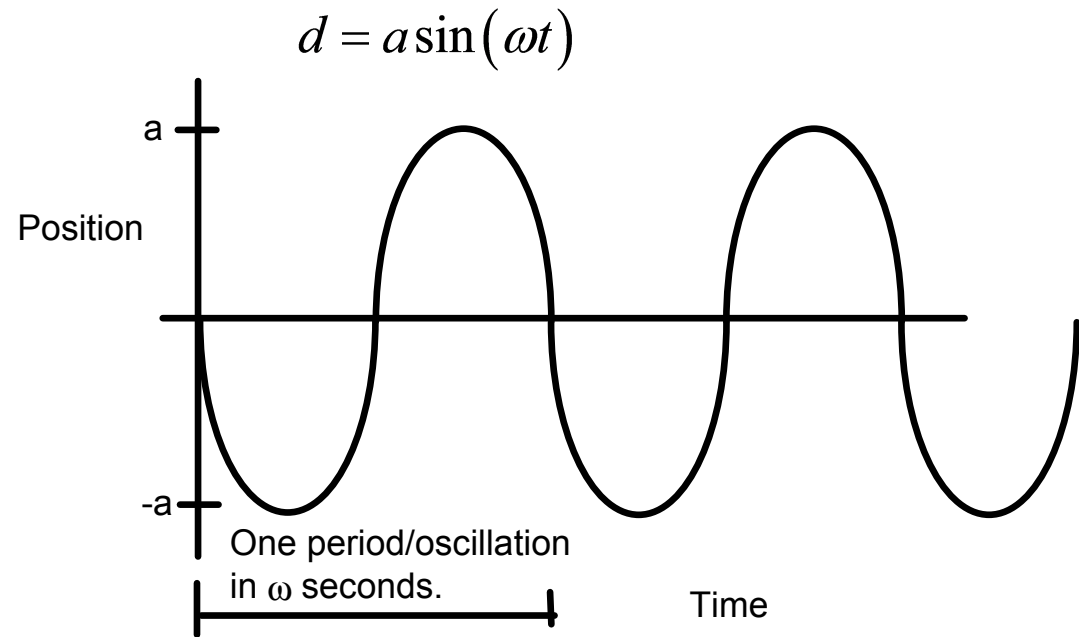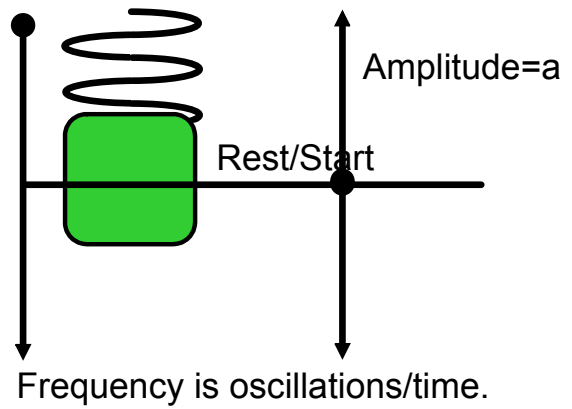$H = 4 \sin\left(4 t\right)$

amplitude = 4, time per cycle = pi/2 seconds

$W = \frac{2\pi}{\pi/2}$

$W = 4$

Write the equation?
What is the frequency?

4

$$d = a\sin(\omega t)$$

Amplitude=a

Rest/Start

Frequency is oscillations/time.

a

Position

-a

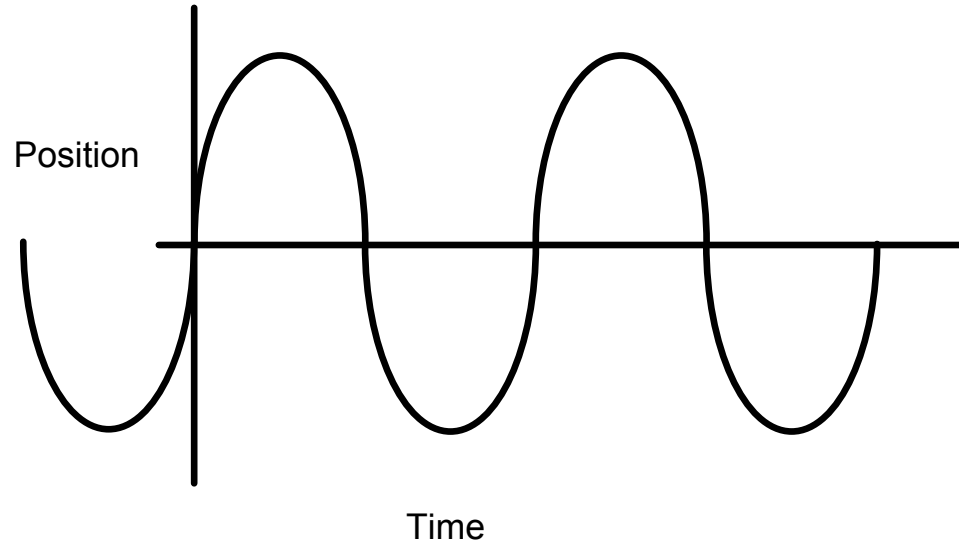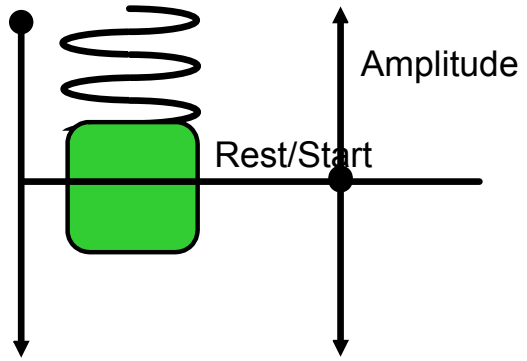One period/oscillation
in ω seconds.

Time

Period
(time for one cycle)

$$f = \frac{\omega}{2\pi} = \frac{1}{P} \qquad \omega = 2\pi * f = \frac{2\pi}{P} \qquad T \; or \; P = \frac{2\pi}{\omega}$$

Amplitude

Rest/Start

Position

Time

Attachments

material-2224.ggb