A-Day: Due Wed., 3/10
B-Day: Due Thurs., 3/11

2009-10 Harmonic Motion 1

Harmonic Motion: Yes or No?

Pendulum: ______________

Ocean waves: ___________

A child on a swing: _______

Jumping Jacks: __________

Bouncing spring: ________

A bouncing ball: ________

A ruler pulled from one side and released: ___________

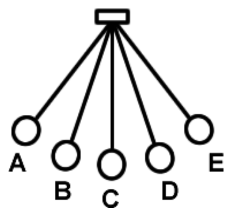
A person jumping up and down: ________________

A spinning ball: _________

1. Period	A. The number of cycles per second.
2. Equilibrium position	B. A unit of one cycle per second.
3. Amplitude	C. The size or strength of a cycle.
4. Damping	D. Time it takes to complete one cycle.
5. Frequency	E. A part of motion that repeats over and over with a set series of events.
6. Cycle	F. Halfway between the two sides and where the motion comes to rest.
7. Hertz	G. The motion dying out over time.

Period, Frequency, or Amplitude?

_____Doesn't change period.
_____More of this means more energy.
_____Increases as a pendulum swings back and forth faster.
_____Measured in cycles per second.
_____Measured in meters or centimeters.
_____This decreases with a smaller swing.
_____If the frequency increases, this decreases.
_____Measured in Hertz.
_____Measured in seconds.
_____If it swings back and forth slower, this decreases.
_____As it dampens, this decreases.



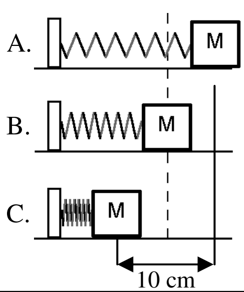
Where is the equilibrium position for this pendulum?

If the pendulum starts at C going to the right, where does 1 cycle end?

From letter A to letter ____ would be the amplitude.

If the pendulum starts at A, how many times does it pass point C in 1 cycle?

A moving spring: at A and C it turns around.



Where is its equilibrium position?

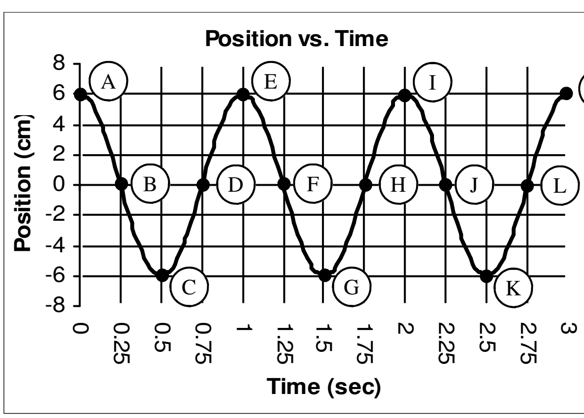
If the spring starts at position A, how much of a cycle does it complete from A to C?

If the spring moves 10 cm from C to A (side to side), how big is it's amplitude?

An spring has a period of 4 seconds. What is its frequency?

A pendulum has a frequency of 3 Hz. What is its period?

A pendulum takes 10 seconds to complete 2 cycles.
A) What is its period?
B) What is its frequency?



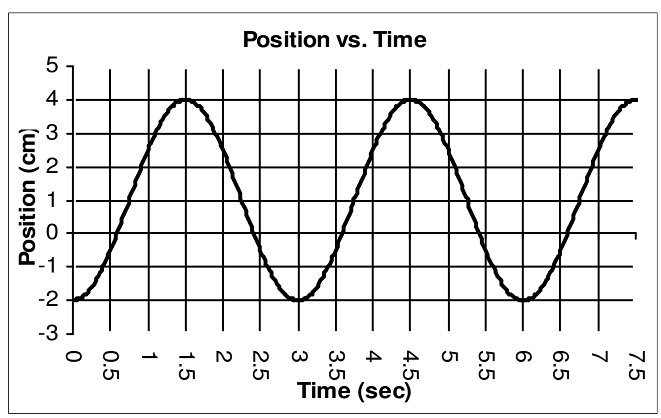
1 cycle after A is ____; 2 cycles after D is ____.

1/2 cycle after G is ____; 1/4 cycle before M is ____.

# of complete cycles shown is ____.

Period (T) = Frequency (f) =

Equilibrium position = Amplitude (A) =



Mark 1 cycle of the harmonic motion.

Starting at 1.5 secs, when does the 2nd cycle end:

Number of cycles shown is ____.

Period (T) = Frequency (f) =

Equilibrium position = Amplitude (A) =

More on Back

Use the "Harmonic Motion Basics" table to answer the following:

1. Give the variables and units for the following quantities:
   A. Period: _________; B. Amplitude: _________; C. Frequency: _________; D. Wavelength: _________

2. If the period of a pendulum is 4 seconds, find the frequency of the pendulum.

3. If the frequency of a wave is 1.35 Hz, find its period.

4. If the frequency of a wave is 0.02 Hz, find its period.

5. If the frequency gets bigger, the period gets ______________.

Example 1: Find the period of a pendulum that is 45 cm long.

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

The square root sign is the opposite of a square. $4^2 = 16$ *and* $\sqrt{16} = 4$
On your calculator push "2nd" then " x^2*" or "INV" "*x^2*".*

$$T = 2\pi\sqrt{\frac{0.45}{10}}$$

ℓ must be in meters. And 100 cm = 1 m

$$T = 2\pi\sqrt{0.045}$$

$$T = 2\pi(.212)$$

$$T = 1.33\,\text{sec}$$

6. Find the period of a pendulum that is 80 cm long.

7. What is the period of a spring-mass system if the spring has a spring constant of 25 N/m with a 1.5 kg object on it. (*Make sure to use the spring-mass system equation—not the one for a pendulum.)*

Check on the website for the TAKS HW.