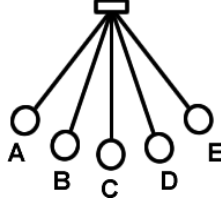


# 2011 PreAP Harmonic Motion 1

Harmonic Motion: Yes or No?		1. Period 2. Equilibrium position 3. Amplitude 4. Damping 5. Frequency 6. Cycle 7. Hertz	A. The number of cycles per second. B. A unit of one cycle per second. C. The size or strength of a cycle. D. Time it takes to complete one cycle. E. A part of motion that repeats over and over with a set series of events. F. Halfway between the two sides and where the motion comes to rest. G. The motion dying out over time.
Pendulum: _____	A bouncing ball: _____		
Ocean waves: _____	A ruler pulled from one side and released: _____		
A child on a swing: _____	A person jumping up and down: _____		
Jumping Jacks: _____	A spinning ball: _____		
Bouncing spring: _____			

*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.



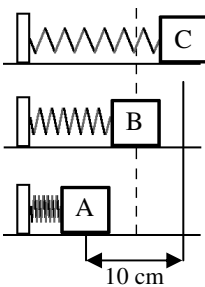
Where is the equilibrium position for this pendulum?

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 spring vibrates between points A and C.*



Where is its equilibrium position?

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

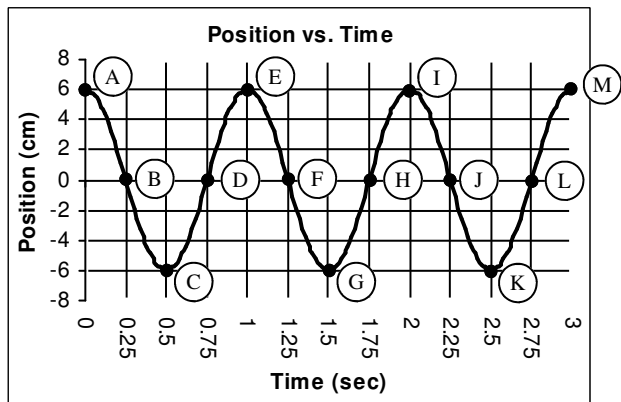
If the spring moves 10 cm from C to A (side to side), how big is its amplitude?

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?



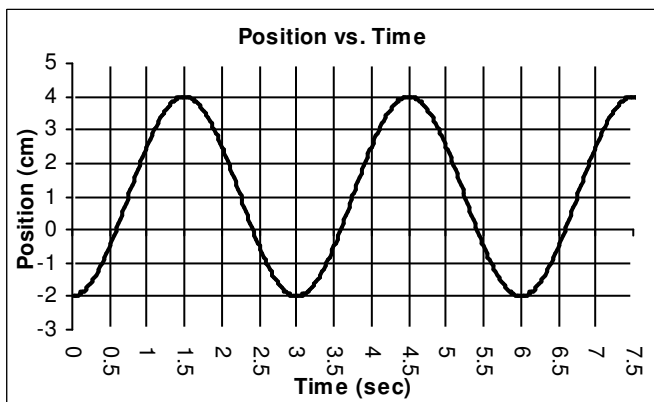
1 cycle after A is \_\_\_\_;      2 cycles after D is \_\_\_\_.

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) =

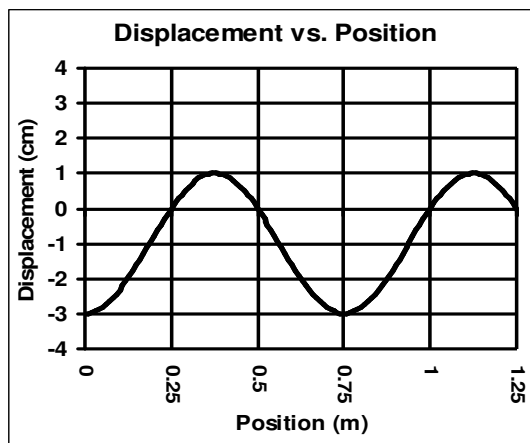
Equilibrium position =              Amplitude (A) =

- Give the variables and units for the following quantities:  
 A. Period: \_\_\_\_\_; B. Amplitude: \_\_\_\_\_; C. Frequency: \_\_\_\_\_; D. Wavelength: \_\_\_\_\_
- If the period of a pendulum is 4 seconds, find the frequency of the pendulum.

Use your “Harmonic Motion Table” notes for the following.

- What is “dampening”?
- What is the equation for the speed of a wave?
- What do we call this symbol:  $\lambda$ ?
- A wave is moving 25 m/s and has a frequency of 80 Hz. What is the wavelength of the wave?

- What is the *medium* that sound travels thru to your ears?
- On the graph at the right...  
 A. What is the wavelength of the wave?  
 B. Mark a trough and a crest.
- For sound, how many decibels is twice as loud?
- If a sound is 40 dB, how many decibels is twice as loud?
- Find the period of a pendulum that is 80 cm long, realizing to use standard units.



- How long is a pendulum that has a period of 0.84 seconds?
- 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.)
- A spring-mass system has a period of 0.15 seconds and a 150 g on it (use standard units). What is the spring constant for the spring?

Remember again that the period is how long for 1 cycle OR sec per cycle so,  $T = \text{\#seconds}/\text{\#cycles}$ . The frequency is how many cycles occur each second OR cycles/sec so,  $f = \text{\#cycles}/\text{\#seconds}$ . Add these 2 formulas on the table in the 1st column.

- A pendulum swings back and forth 14 times in 8 seconds. What is the pendulum’s period?
- A spring oscillates (moves back and forth) 35 times in 10 seconds. Calculate its frequency.