ConcepTest 13.1a Harmonic Motion I

A mass on a spring in SHM has amplitude *A* and period *T*. What is the total distance traveled by the mass after a time interval *T*?

| 1) | 0 |
|----|-------------------|
| 2) | A/2 |
| 3) | A |
| 4) | 2 A |
| 5) | 4 <i>A</i> |



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A mass on a spring in SHM has amplitude *A* and period *T*. What is the total distance traveled by the mass after a time interval *T*?





In the time interval T (the period), the mass goes through one complete oscillation back to the starting point. The distance it covers is: A + A + A + A (4A).

ConcepTest 13.3a Spring Combination I

A spring can be stretched a distance of 60 cm with an applied force of 1 *N*. If an identical spring is connected in parallel with the first spring, and both are pulled together, how much force will be required to stretch this parallel combination a distance of 60 cm?

1/4 N
1/2 N
1/2 N
1 N
2 N
4 N

ConcepTest 13.3a Spring Combination I

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Each spring is still stretched 60 cm, so each spring requires 1 *N* of force. But since there are two springs, there must be a total of 2 *N* of force! Thus, the combination of two parallel springs behaves like a stronger spring!!

A mass oscillates in simple harmonic motion with amplitude A. If the mass is doubled, but the amplitude is not changed, what will happen to the total energy of the system?

- 1) total energy will increase
- 2) total energy will not change
- 3) total energy will decrease

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The total energy is equal to the initial value of the elastic potential energy, which is $PE_s = 1/2 kA^2$. This does not depend on mass, so a change in mass will not affect the energy of the system.

Follow-up: What happens if you double the amplitude?

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Follow-up: What happens if you double the amplitude?

ConcepTest 13.9 Grandfather Clock

A grandfather clock has a weight at the bottom of the pendulum that can be moved up or down. If the clock is running slow, what should you do to adjust the time properly?

- 1) move the weight up
- 2) move the weight down
- 3) moving the weight will not matter
- 4) call the repair man

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The period of the grandfather clock is too long, so we need to decrease the period (increase the frequency). To do this, the length must be decreased, so the adjustable weight should be moved up in order to shorten the pendulum length. $T = 2\pi \sqrt{(L/r)}$

ConcepTest 13.11 Damped Pendulum

After a pendulum starts swinging, its amplitude gradually decreases with time because of friction.

What happens to the period of the pendulum during this time ?

- 1) period increases
- 2) period does not change
- 3) period decreases

ConcepTest 13.11 Damped Pendulum

After a pendulum starts swinging, its amplitude gradually decreases with time because of friction.

What happens to the period of the pendulum during this time ?



- 2) period does not change
 - 3) period decreases

The period of a pendulum does not depend on its amplitude, but only on its length and the acceleration due to gravity.

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

Follow-up: What is happening to the energy of the pendulum?