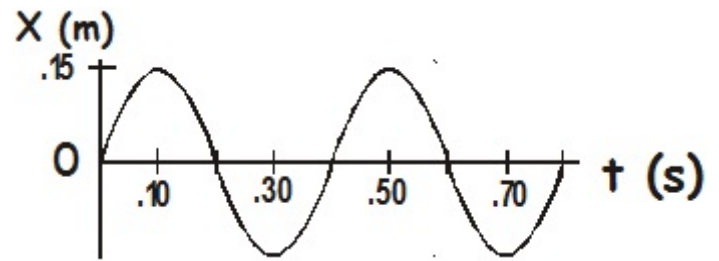


Name: \_\_\_\_\_

1. Cindy Lou has run up a staircase very quickly indeed. Cindy's mass is 35.2 kg. It took her 6.75 s to get to the top. If she developed 0.875 hp on the vertical trip, how high was the staircase?
2. A 255 g mass is hooked up to a spring ( $k = 175 \text{ N/m}$ ) and moves back and forth on your basic frictionless surface. If the mass is released from rest at  $x = 0.200 \text{ m}$ , then
  - a. find the force acting on the mass.
  - b. the max acceleration.
  - c. its acceleration at  $x = 0 \text{ m}$ .
  - d. its energy.
  - e. its period.
3. The drawing shows the harmonic motion of a mass on a spring at the extremes of its motion. The middle drawing shows the midpoint of travel. Indicate on the drawing (a) the points of greatest and least velocity, (b) the points of greatest and least acceleration, (c) the points of greatest and least potential E and kinetic E.



4. Using this graph of position vs time for the simple harmonic motion of a weight on a string, find
- the amplitude of the motion,

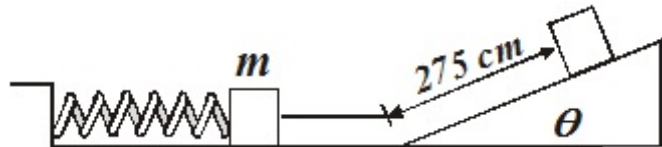


- the period of the motion,
  - the frequency of the motion
  - place(s) on the graph where the velocity is zero,
  - place(s) on the graph where the acceleration is max and min,
  - place(s) on the graph where the kinetic energy is max,
  - place(s) on the graph where the potential energy is max.
5. A 355 g mass is attached to a spring ( $k = 435 \text{ N/m}$ ). If the system is allowed to oscillate on a frictionless surface, what is the period and frequency of the motion?

6. You are designing a pendulum clock escapement. You have determined that the pendulum must have a period of 0.500 s. What should be the length of the thing?

7. A 45.0 kg projectile is fired from a gun. The elevation angle of the gun is  $30.0^\circ$ . The projectile is in the air for 48.0 s before it hits the deck at the same height as it was fired. Ignoring friction find: (a) the projectile's initial velocity, (b) the horizontal distance the projectile traveled, (c) the potential energy of the projectile at it highest point in its trajectory.

8. A 545 g block is pushed into a spring ( $k = 485 \text{ N/m}$ ) a distance of 18.0 cm. (a) When the ball is released, what is its velocity? The block slides across a smooth surface once it leaves the spring and then up a ramp. It travels up the ramp a distance of 275 cm. (b) What is the elevation angle of the ramp?



9. A 345 g ball is placed on a ramp as shown in the drawing. The ball rolls downward a distance of 50.0 cm and then goes into a vertical loop deal (like on a roly coaster) and then ends up at the bottom going from point **C** to point **D**. Determine the following: (a) the speed of the ball at the bottom of the ramp, point **C**. (b) the speed of the ball at point **A**. (c) Draw a FBD for the ball at point **A**. (d) The speed of the ball at point **B**. (e) Draw a FBD for the ball at point **B**. (f) The speed of the ball at point **D**. (g) Draw a FBD for the ball at point **D**.

