# C Team Mechanics Review

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1. A 5-kilogram block is suspended by a cord from the ceiling. What is the force exerted on the block by the cord?

   (A) 0 N   (B) 25 N   (C) 50 N   (D) 100 N   (E) 200 N

2. An object with mass m and speed v_0 directed to the right strikes a wall and rebounds with speed v_0 directed to the left. What is the change in the object's kinetic energy?

   (A) $-mv_0^2$ (B) $-\frac{1}{2}mv_0^2$ (C) 0   (D) $\frac{1}{2}mv_0^2$ (E) mv_0^2

3. An object with mass m and speed v_0 directed to the right strikes a wall and rebounds with speed v_0 directed to the left. What is the change in the object's momentum?

   (A) $2mv_0$ to the left   (B) mv_0 to the left   (C) 0   (D) mv_0 to the right   (E) $2mv_0$ to the right

4. A ball, initially at rest at t = 0 seconds, rolls with constant acceleration down an inclined plane 10 meters long. If the ball rolls 1 meter in the first 2 seconds, how far will it have rolled at t = 4 seconds?

   (A) 2m   (B) 3m   (C) 4m   (D) 5m   (E) 8m
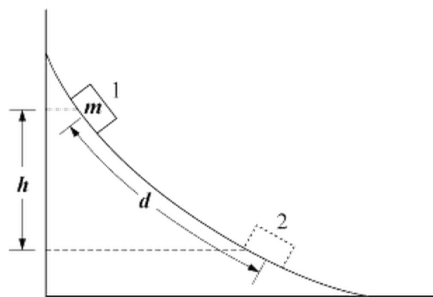
5. A box of mass m is released from rest at position 1 on the frictionless curved track shown above. It slides a distance d along the track in time t to reach position 2, dropping a vertical distance h. Let v and a be the instantaneous speed and instantaneous acceleration, respectively, of the box at position 2. Which of the following equations is valid for this situation?

   (A) $h = vt$ (B) $h = \frac{1}{2}gt^2$ (C) $d = \frac{1}{2}at^2$ (D) $v^2 = 2ad$ (E) $mgh = \frac{1}{2}mv^2$

6. The Earth has a radius of 6,400 kilometers. A satellite orbits the Earth at a distance of 12,800 kilometers from the center of the Earth. If the weight of the satellite on Earth is 100 kilonewtons, what is the gravitational force on the satellite in orbit?

(A) 11 kN   (B) 25 kN   (C) 50 kN   (D) 100 kN   (E) 200 kN

7. A pendulum of length l with a bob of mass m is oscillating with small amplitude. Which of the following changes in the pendulum would double its period?

(A) Doubling the mass m of the bob
(B) Doubling the initial force used to set the pendulum in motion
(C) Doubling the amplitude of the pendulum's swing
(D) Quadrupling the mass m of the bob
(E) Quadrupling the length l of the pendulum

8. A piece of chalk is thrown vertically upward and caught during its descent at the same height from which it was thrown. Position is measured from the location of the chalk when it left the hand. The positive direction for position, velocity, and acceleration is upward.

What are the signs of the position, velocity, and acceleration during the ascending part of the trajectory respectively?

(A) +, +, +   (B) +, +, -   (C) +, -, -   (D) -, +, -   (E) -, -, -