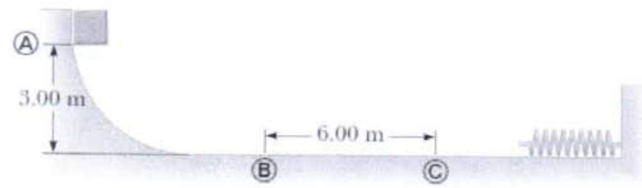
QUIZ#7- CHAPTER 8
DATE: 13/11/17

Name: Key Id#: Sect.#:

A 10.0-kg block is released from rest at point A in Figure. The track is frictionless except for the portion between points B and C, which has a length of 6.00 m. The block travels down the track, hits a spring of force constant 2250 N/m, and compresses the spring 0.300 m from its equilibrium position before coming to rest momentarily. Determine the coefficient of kinetic friction between the block and the rough surface between points B and C.



$$\Delta K^{\nearrow 0} + \Delta U_g + \Delta U_s = W_f$$

$$\Delta U_g = -mgh = -10 \times 9.8 \times 3 = -294\ \text{J}$$

$$\Delta U_s = \frac{1}{2}kx^2 - 0 = \frac{1}{2} \times 2250 \times 0.3^2 = 101.25\ \text{J}$$

$$W_f = -f_k d = -\mu_k m g d = -\mu_k 588$$

$$-294 + 101.25 = -588\mu_k$$

$$\boxed{\mu_k = 0.33}$$

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DATE: 13/11/17

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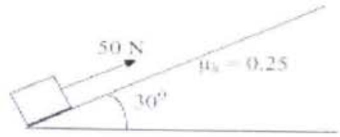
A 5.0 kg block is pulled by a force F = 50 N along a rough incline as shown in the figure. The block starts from rest at the bottom of the incline.
Calculate the speed of the block when it has moved a distance of 3.0 m up the incline.



$$\Delta K + \Delta U_g = W_{f_k} + W_F$$

$$\Delta K = K_f - K_i = \frac{1}{2} m v_f^2 - 0$$

$$\Delta U_g = mgh = mg\, d\sin\theta$$

$$W_F = F d$$

$$W_{f_k} = -\mu_k F_N d = -\mu_k mg \cos\theta\, d$$

$$\frac{1}{2} m v_f^2 + mg\, d\sin\theta = -\mu_k mg\cos\theta\, d + F d$$

$$2.5 v_f^2 + 73.5 = -31.8 + 150$$

$$v_f^2 = 17.88 \qquad \boxed{v_f = 4.23 \text{ m/s}}$$

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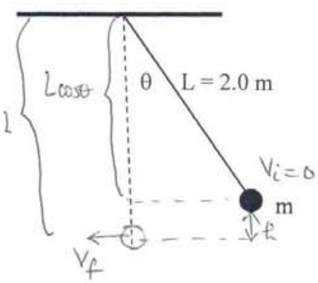
The ball of mass 2.0 kg is release from rest when the string makes an angle $\theta = 30^0$ with the vertical as shown in the figure.

(a) Use conservation of energy to calculate the speed of the ball as it passes its lowest point.

(b) Does the speed increase, decrease, or remain the same when the mass of the ball is doubled? Explain.

(c) Does the speed increase, decrease, or remain the same when the angle θ is doubled?



a) $\Delta K + \Delta U_g = 0$ $\qquad h = L - L\cos\theta$

$\Delta K = \frac{1}{2} m v_f^2 - 0$

$\Delta U_g = -mgh = -mgL(1-\cos\theta)$

$\frac{1}{2} m v_f^2 - mgL(1-\cos\theta) = 0$

$v_f^2 = 2gL(1-\cos\theta)$

$v_f = \sqrt{2gL(1-\cos\theta)} = \sqrt{5.25} = \boxed{2.29 \text{ m/s}}$

b) The speed remains the same because it is independent of the mass

c) If θ is doubled $\cos\theta$ is smaller and h becomes larger $\Rightarrow$ speed increases.