

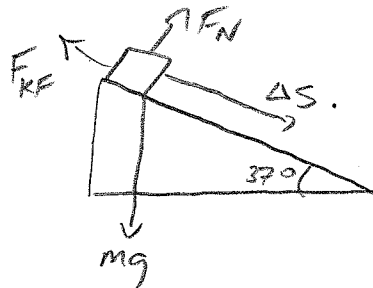
Physics 10154 - Exam #5A

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. A 12-kg block begins sliding from rest down a 5.0-meter long ramp inclined 37° with respect to the horizontal. The coefficient of kinetic friction between block and ramp is 0.27.

a) Find the work done by each of the forces acting on the block.

b) Find the final velocity of the block at the bottom of the ramp.



$$W_N = 0 \quad (\cos 90^\circ = 0)$$

$$W_{\text{grav}} = mg \Delta s \sin 37^\circ$$
$$= (12)(9.8)(5) \sin 37^\circ \Rightarrow$$

$$W_{\text{grav}} = 350 \text{ J}$$

$$W_{\text{KF}} = -\mu_k (mg \cos 37^\circ) \Delta s$$

$$= - (0.27)(12)(9.8)(\cos 37^\circ)(5.0)$$

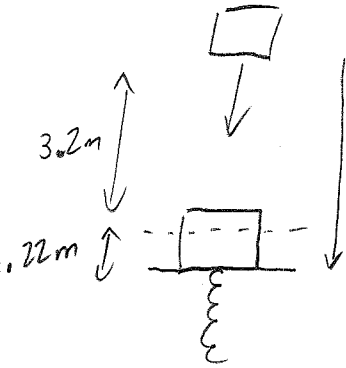
$$W_{\text{KF}} = -130 \text{ J}$$

$$b) \quad 0 + 350 - 130 = \frac{1}{2}mv^2 - 0$$

$$220 = 6v^2$$

$$v = 6.1 \text{ m/s}$$

2. A 6.5-kg block is dropped from rest at a height of 3.2 meters above the equilibrium point of a vertically oriented spring. When the block lands on the spring, the spring reaches a maximum compression of 22 cm. What is the spring constant?



$$\Delta s = 3.44 \text{ m}$$

$$K_f \quad K_i$$

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$$W_{\text{grav}} + W_{\text{spr}} = 0 - 0$$

$$mg\Delta y - \frac{1}{2}kx^2 = 0$$

$$(6.5)(9.8)(3.44) = \frac{1}{2}k(.22)^2$$

$$k = 9100 \frac{\text{N}}{\text{m}}$$