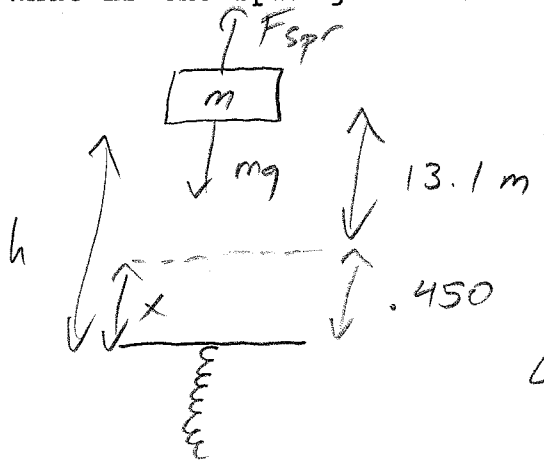
Quiz #5B

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. A 14.5-kg mass is dropped from a height of 13.1 meters onto a vertical spring, which compresses by a maximum of 0.450 meters. What is the spring constant of the spring?



$$\Sigma W_F = W_{grav} + W_{spr} = 0 - 0$$

$$mgh - \frac{1}{2}kx^2 = 0$$

$$2mgh = kx^2$$

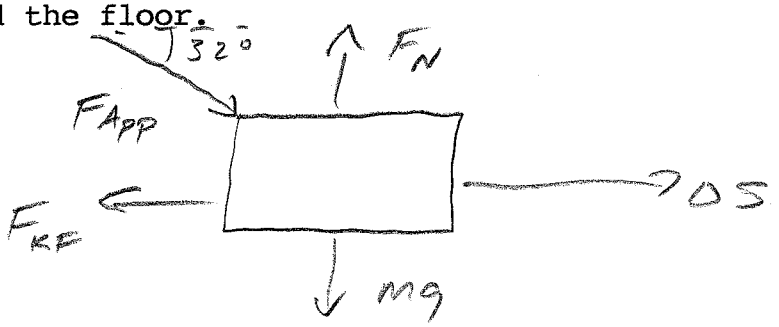
$$k = \frac{2mgh}{x^2}$$

$$k = \frac{2(14.5)(9.8)(13.55)}{(.45)^2}$$

$$= 19000 \text{ N/m}$$

$$= \boxed{1.90 \times 10^4 \text{ N/m}}$$

2. A 3.5-kg block is pushed across a rough rough with an applied force of 67 Newtons, directed 32° below the horizontal. The block starts from rest and reaches a speed of 4.1 meters/sec after travelling a distance of 2.0 meters. Find <u>and clearly indicate with a box</u> the work done by each force present in this problem. <u>Also</u>, find the coefficient of kinetic friction between the block and the <u>floor</u>.



$$\boxed{W_N = 0 \quad W_{grav} = 0} \quad (\text{both} \perp \text{to } \Delta s)$$

$$W_{App} = F_{App}\,\Delta s \cos\cancel{\theta}$$

$$= (67)(2.0)\cos 32°$$

$$W_{App} = 113.6 = \boxed{110\ \text{J}}$$

$$\Sigma W_E = W_N + W_{grav} + W_{App} + W_{KF} = \Delta K$$

$$0 + 0 + 113.6 + W_{KF} = \tfrac{1}{2}(3.5)(4.1)^2 - 0$$

$$W_{KF} = 29.4 - 113.6 = \boxed{-84\ \text{J}}$$

$$F_N = mg + F_T \sin 32$$

$$= (3.5)(9.8) + 67 \sin 32 = 69.8\ \text{N}$$

$$W_{KF} = -84 = -\mu_K F_N \Delta s$$

$$\mu_K = \frac{84}{F_N \Delta s} = \frac{84}{(69.8)(2.0)} = \boxed{0.60}$$