AP Physics C
Power and Friction Problems

Name _____

1. An object of mass m is lifted at constant velocity a vertical distance H in time t. The power supplied by the lifting force is

(a) mgHt (b) mgH/t (c) mg/Ht (d) mgt/H
(e) zero

2. A moving man is pushing a 60kg sofa across a carpet at a constant speed of 6 m/s. The coefficient of kinetic (sliding) friction between the carpet and the sofa is $\mu_k = 0.70$.

a. How much work is done by the man in one second ?

W_{man} = 2470 J

a. What is the power exerted by the moving man?

P = 2470 W

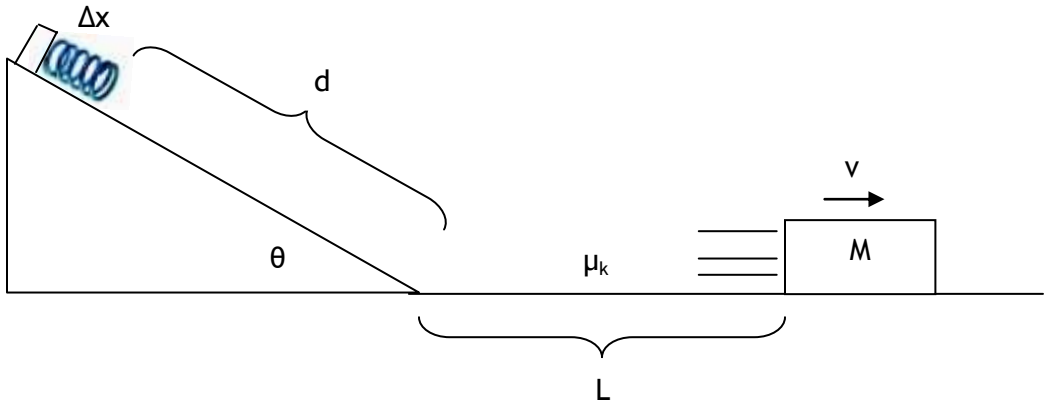
b. What is the NET work done on the sofa?

W_{net} = 0 J

AP Physics C
Power and Friction Problems

Name _____

3.



A block of mass M is at the top of a frictionless inclined plane that has an angle θ. It also compresses a spring of spring constant k a distance Δx. The spring is released and the block travels down the incline over a rough patch of length L where there exists a coefficient of kinetic friction μ_k. After this, the block has a velocity of v.

a. Find the initial distance d up the ramp from which the block was released in terms of m, v, μ_k, g, L, k, Δx, and θ. Assume d >> Δx.

$$d = \frac{\frac{1}{2}mv^2 + \mu mgL - \frac{1}{2}k\Delta x^2}{mgsin\theta}$$

Suppose the block is now pushed up the ramp at a velocity of v_2.

b. What is the magnitude of the force pushing it up the ramp?

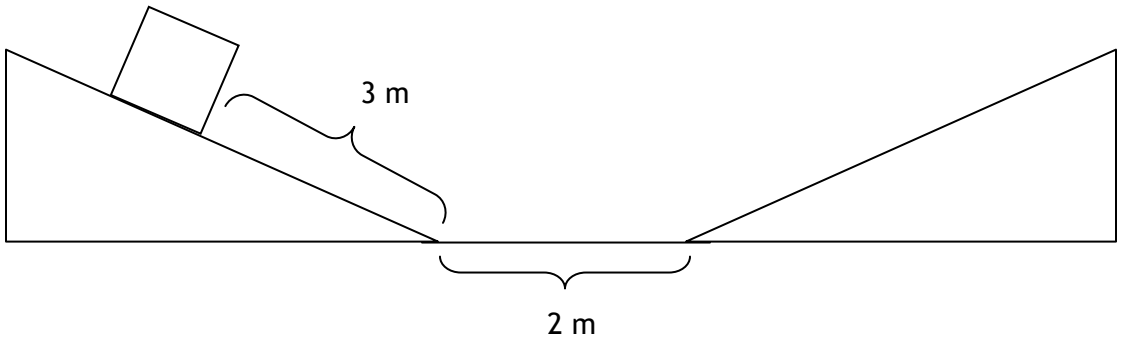
$F_{up} = mgsin\theta$

c. What is the power being generated by this force?

$P = mgv_2sin\theta$

AP Physics C
Power and Friction Problems

Name _____



4. Two identical, frictionless inclined planes, with angles of 30^0, lie across from each other as shown. The block on the left hand incline is 3 kg. There exists a coefficient of friction, μ_k, equal to .4,on the flat surface separating the inclines. The left hand block is 3 m up the incline as diagrammed above.

a. The block is released from rest at time t=0. What will be the speed of the block as it arrives at the base of the other incline?

$v_2 = 3.704$ m/s

b. How far up the incline will the block reach?

d = 2.2 m diagonally

c. From t=0, how much time does it take to reach this maximum height?

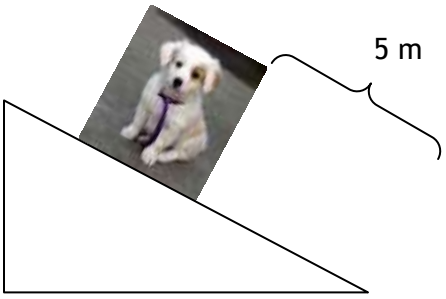
$t_{total} = 2.87$ s

Name _____

d. Assume now that the left hand incline has the same coefficient of friction between the block and the incline as the flat surface. What is the new maximum height reached by the block?

h = 0.413 m vertically

5. A 5kg puppy rests on an inclined plane elevated at an angle of 25^0. The coefficient of friction between the puppy and the incline is .5.



a. Find the gravitational potential energy of the puppy with respect to the ground.

U_g = 10.35 J

b. Someone douses the puppy in water, reducing the friction coefficient between the puppy and the slide to 0.3. The puppy then slides down the incline. Find the velocity of the puppy as it reaches the ground.

v_1 = 3.84 m/s

c. Find the percentage of initial potential energy converted into kinetic energy during his slide.

16.6% U -> K