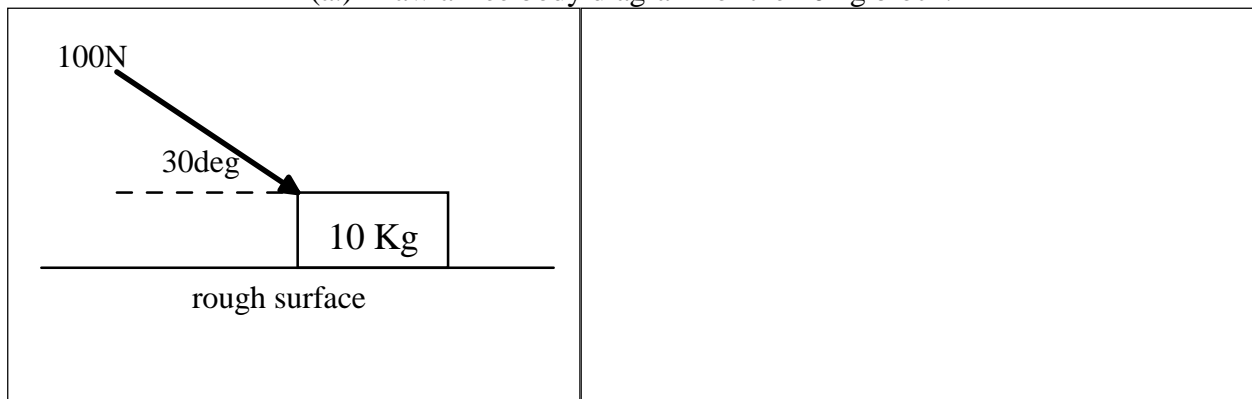


PHY 1350
EXAM #2

1. A force of 5.00N at -20.0° and a force of 8.00N at $+60.0^\circ$ pull on an object whose mass is 0.300Kg. What is the magnitude and direction of the resulting acceleration of the object?

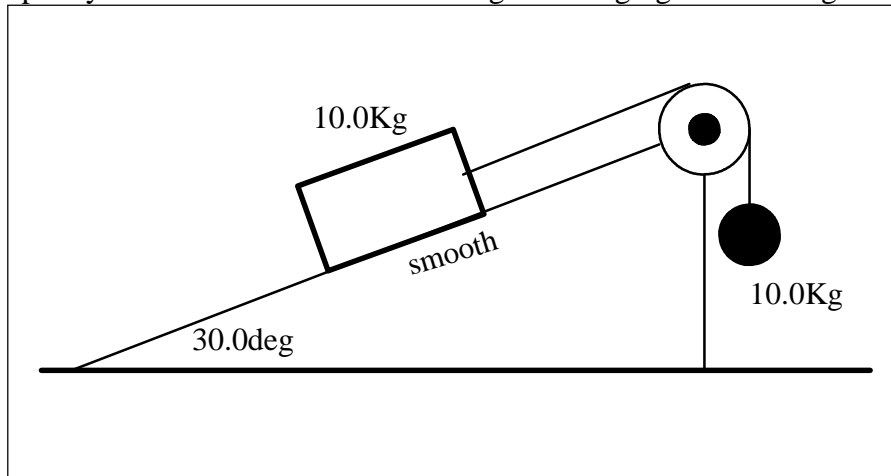
2. As shown below, a 100.N force pushes on a 10.0Kg object at an of 30.0 degrees below the horizontal. The object lies on a horizontal plane at the Earth's surface. The coefficient of kinetic friction between the surface and the block is 0.200.

(a.) Draw a free body diagram for the 10Kg block.

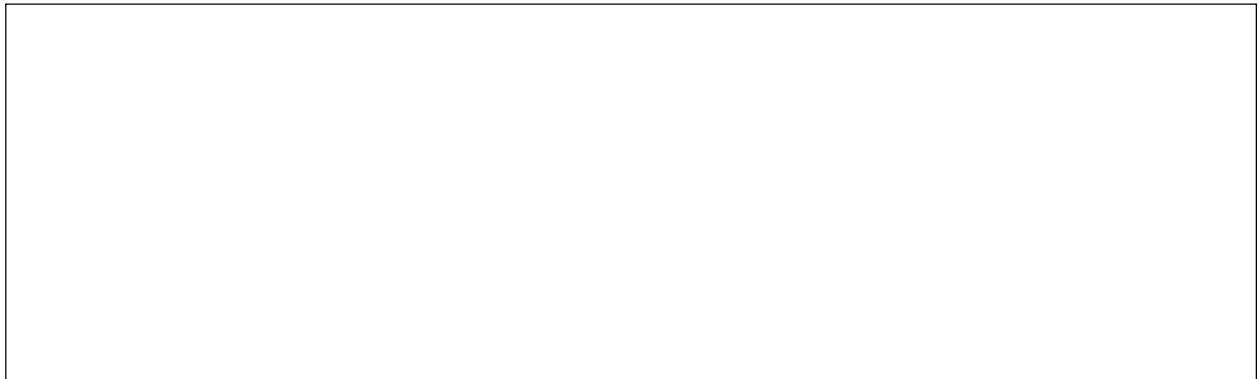


(b.) Determine the acceleration of the 10Kg block.

(3.) A 10.0Kg block rests on a smooth incline plane whose surface makes a 30.0° angle with respect to the horizontal. A light, flexible, non-extensible string, wrapped over a massless, frictionless pulley connects the block to a 10.0Kg ball hanging over the edge of the incline.



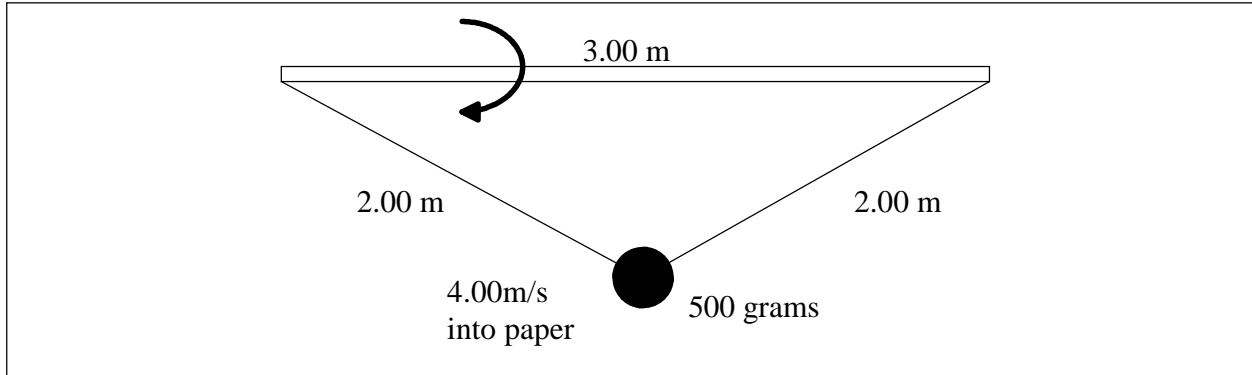
(a.) Draw a free body diagram for each mass.



(b.) Determine the tension in the cord connecting the block and ball.

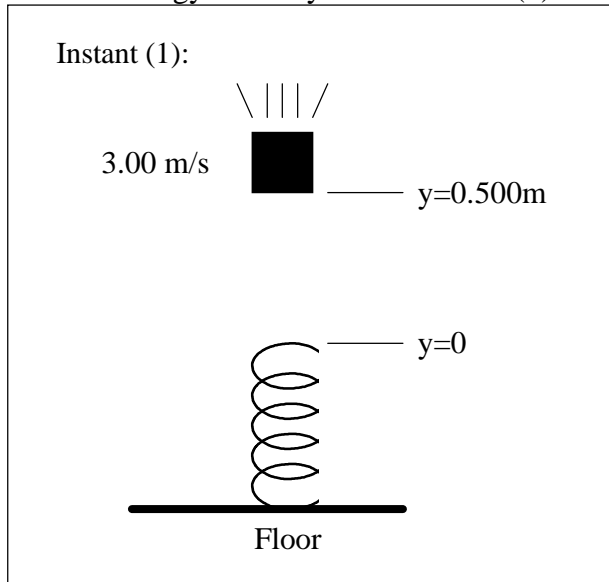
(4.) A 3.00 meter long, horizontal rod is spun about its long axis. Attached to the ends of the rod are 2.00m long strings which connect to a 500 gram mass. As the rod spins, the mass describes a circular orbit about the rod. At the instant shown below, the mass is directly below the rod and has a speed of 4.00 m/s into the paper. What is the tension in the two strings at this instant?

Assume that in addition to the string forces, a downward gravitational force also acts on the mass.



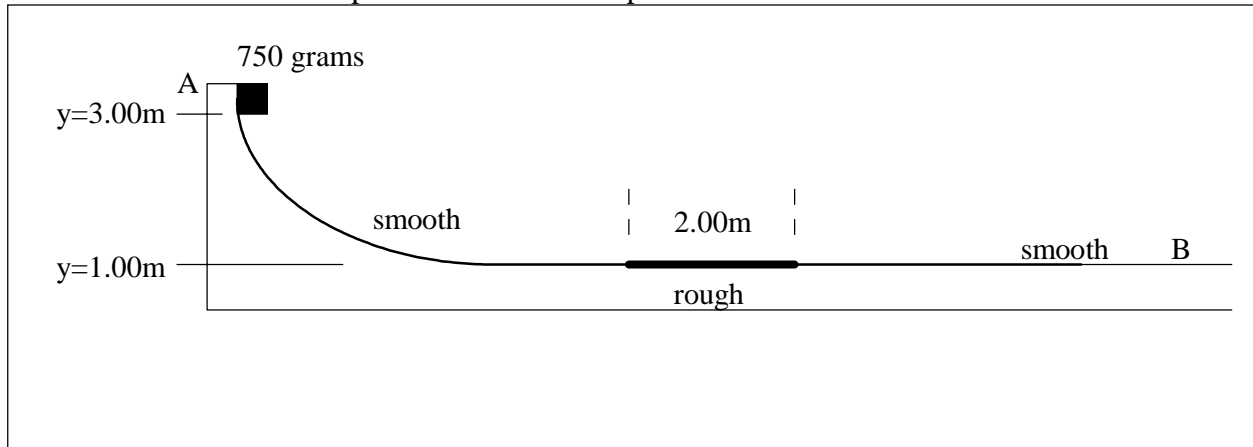
(5.) At instant (1) shown below, a 2.00Kg mass is 0.500m above the end of an unstretched spring and is moving downward at the rate of 3.00 m/s. The spring has a spring constant of 100.N/m.

(a.) Considering the block-spring-earth system, and using the coordinate system shown, what is the total energy of the system at instant (1)?



(b.) What is the maximum compression of the spring caused by the falling block?

(6.) A 750 gram mass is released from rest at point A on the smooth, curved surface shown below. The mass falls (under the influence of gravity) from an elevation of 3.00m to an elevation of 1.00m before encountering a 2.00m long patch that exerts a frictional force of 5.00N on the mass. What is the mass's speed when it reaches point B?



$$dW = \vec{F} \cdot d\vec{r}$$

$$\Sigma \vec{F} = m\vec{a}$$

$$W = mgh$$

$$E = mgh$$

$$W = \left| \vec{F} \right| \left| d \right| \cos(\theta)$$

$$P = \frac{dW}{dt}$$

$$a = \frac{v^2}{R}$$

$$E = \frac{1}{2}kx^2$$

$$E = \frac{1}{2}mv^2$$

$$v_2^2 = v_1^2 + 2a(x_2 - x_1)$$

$$\vec{v}_2 = \vec{v}_1 + \vec{a} \times (t_2 - t_1)$$

$$\vec{r} = \vec{r}_0 + \vec{v}_0 (t - t_0) + \frac{1}{2} \vec{a} \times (t - t_0)^2$$

$$F = \frac{1}{2}\rho C v^2$$

$$\vec{F} = -c \vec{v}$$

$$F = \mu_K N$$

$$F \leq \mu_S N$$

$$W = \Delta E_{\text{sys}}$$