Due Fri., Oct 25

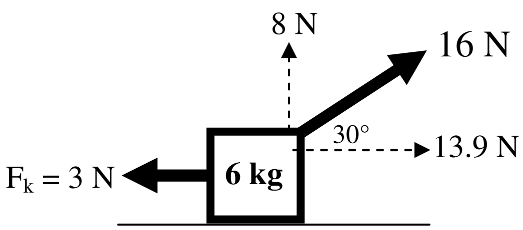
2012 PreAP Forces 4

Σ is the Greek letter "sigma" for "summation"

$\Sigma F_y = ma_y$ $\Sigma F_x = ma_x$

ΣF_y says: *"Add up all of the vertical forces."* ΣF_x says: *"Add up all of the horizontal forces."*

1. A 16 N force sitting on a table is pulling up at an angle of 30° on a 6 kg object. Friction opposes the force with 3 N to the left.



A. Since Fw = mg and g = 10 m/s^2, what is the weight of the object?

B. Since Fw pulls toward the center of the earth, draw an arrow showing the amount of weight acting on the object.

C. * In order for the object to leave the table there must be at least how much force pulling up on it?

D. So, obviously there is not enough force to lift the object and it stays on the table. Therefore it is just sitting on the table and a_y =

E. Also, since it is sitting on the table there must be a force pushing up from the table to support it. This force is called the:

F. Draw the normal force pushing up on the object from below.

G. Starting in the y-direction, put all of the vertical forces (or components) under the left side of the equation, INCLUDING F_N, which is your unknown.

H. Put 0 m/s^2 in for a_y (see E above) and put in 6kg for mass.

I. * Solve for F_N in the vertical direction.

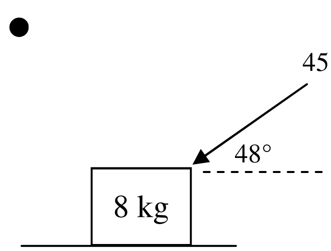
J. Put in all your horizontal forces (or components).

K. * Solve for a_x.

L. Since $F_{kinetic\ friction} = \mu_k F_N$, solve for μ_k .

$\Sigma F_y = ma_y$ | $\Sigma F_x = ma_x$

2. A 45 N force pushes on a 8 kg object an angle of 48°. The coefficient of friction is given.



$\mu_k = 0.15$

A. Draw a force diagram on the dot. Do not draw components.

B. * Since the 45N force is pushing roughly left, which way does friction point?

C. * Since the 45N force is not vertical or horizontal, resolve it into its x and y components. Draw and label it on the picture, but not your force diagram.

D. Calculate and draw the force of weight on the object.

E. In the vertical direction put in all of your vertical forces (including components).

F. Since it is being pushed down into the surface, there is no way it could be moving up, so a_y must = ____. (Put in to the equation.)

G. * In the y-direction calculate the normal force on the object.

H. In the horizontal direction put in all of your horizontal forces (including components).

I. Put in F_f (force of friction) = μF_N.

J. * Put in what you know for μ and F_N into the x-direction and solve for a_x.

$\Sigma F_y = ma_y$ | $\Sigma F_x = ma_x$

1C) 60 N
1I) 52 N
1K) 1.82 m/s^2
2B) to the right
2C) Fx = 45cos48° = 30.1N, but down and to the left, so it will be neg in the x-dir equation.
Fy = 45sin48° = 33.4N
2G) 113.4N
2J) −1.6 m/s^2 (neg means the 45N force to the left is greater than friction to the right and the object accelerates to the left.)