Example 6

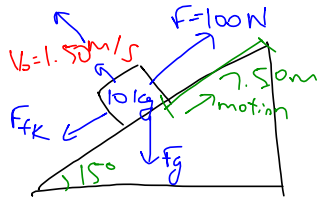
POWER

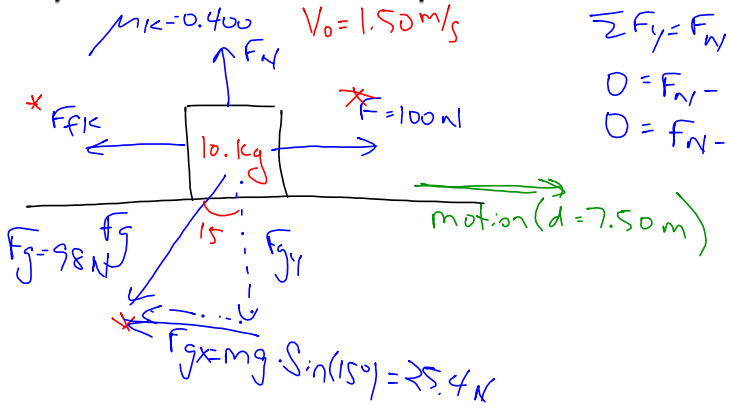
A 10.0 kg crate is being pulled up a rough incline (angled up 15.0°) with an initial velocity of 1.50 m/s. The applied force is 100.0 N and is directed parallel to the incline. The coefficient of kinetic friction between the crate and the incline is 0.400. The crate moves a distance of 7.50 m up the incline.

A. Draw a FBD of the object. Indicate the direction of motion.

B. Which force or forces are able to do work on the object?

C. What is the velocity of the crate after it is pulled 7.50 m?





$\Sigma F_y = F_N - F_{gy}$

$0 = F_N - (98)\cos 15°$

$0 = F_N - 94.7$

$F_N = 94.7\ N$

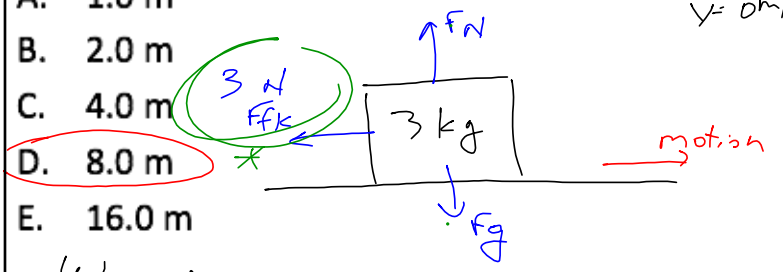
Example 7

POWER

A 3.00 kg block with an initial speed of 4.0 m/s slides across a rough horizontal floor before coming to rest. The frictional force on the block is 3.00 N. How far does the block slide before coming to rest?

A. 1.0 m
B. 2.0 m
C. 4.0 m
D. 8.0 m
E. 16.0 m

$V_0 = 4\ m/s$
$V = 0\ m/s$



$\Sigma F_x = F_{fk}$
$ma = F_{fk}$
$V_0 = 4\ m/s$
$V = 0\ m/s$
$d = ?$

$W_{net} = \Delta KE$
$W_{net} = \frac{1}{2}mV_f^2 - \frac{1}{2}mV_0^2$
$0 + 0 + W_{fk} =$
$F \cdot d \cdot \cos 0 =$
$(3)\, d \cdot (-1) =$
$-3 \cdot d = -\frac{1}{2}(3)(4)^2$
$-3 \cdot d = -24$

Example 8 and 9

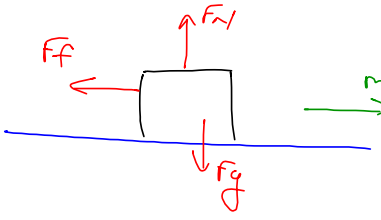
POWER

A car of mass m slides across a patch of ice at a speed v with its brakes locked. It the hits dry pavement and skids to a stop in a distance d. The coefficient of kinetic friction between the tires and the dry road is μ.

If the car has a mass of 2m, it would have skidded a distance of

A. 0.5 d
B. d
C. 1.41 d
D. 2 d

V_o $2V_o$



$W_{net} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_o^2$

$0 + 0 + W_{ff} =$

$F_{fk} \cdot d \cdot \cos\theta = -\frac{1}{2}mv_o^2$

$\mu F_N \cdot d \cdot (-1) = +\frac{1}{2}mv_o^2$

$\mu \cdot mg \cdot d = \frac{1}{2}mv_o^2$

$\mu g \cdot d = \frac{1}{2}v_o^2$

$d = \frac{v_o^2}{2 \cdot \mu \cdot g}$

$d' = \frac{(2v_o)^2}{2\mu \cdot d} = \frac{4v_o^2}{2\mu d}$

$d' = 4 \cdot d$

Example 8 and 9

A car of mass m slides across a patch of ice at a speed v with its brakes locked. It the hits dry pavement and skids to a stop in a distance d. The coefficient of kinetic friction between the tires and the dry road is μ.

If the car has a speed of 2v, it would have skidded a distance of

A. d
B. 1.41 d
C. 2 d
D. 4 d

Gravitational Potential Energy

POWER

- Potential Energy – possibility of doing work
  - Energy based on vertical height above the *ground

- *Work must be done (by you) to lift an object a height (h) into the air

Me

$W = F \cdot d \cdot \cos\theta$

$W = mg \cdot h \cdot \cos 0^\circ$

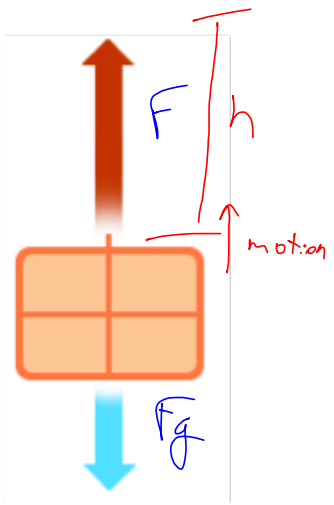
$W = m(9.8)h$

$W = mgh$

Work done by me = Energy gained by Object

$U = mgh$ (9.8)

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



Gravitational Potential Energy

- Where U = 0 J
  - Without specific guidelines, this can be where ever you want, but **be consistent**!