Phy 2A Review 5/12

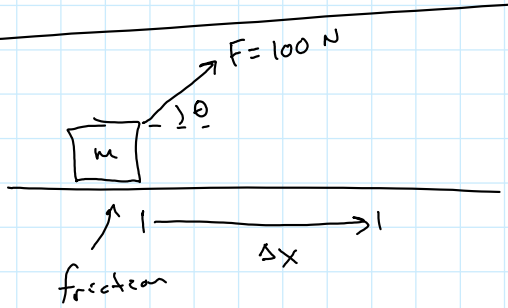
Friday, May 12, 2017 9:58 AM

Work - Kinetic Energy Theorem:

$$W_{Net} = \Delta K$$

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

1)



given: $F = 100\ N$

$\theta = 30°$

$m = 20\ kg$

$\mu_k = 0.2$

$\Delta x = 5\ m$

$v_i = 0$

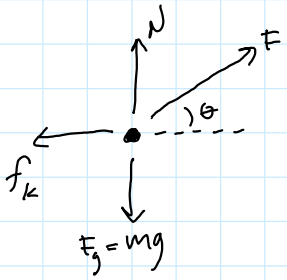
find: v_f

plan: a) Draw FBD

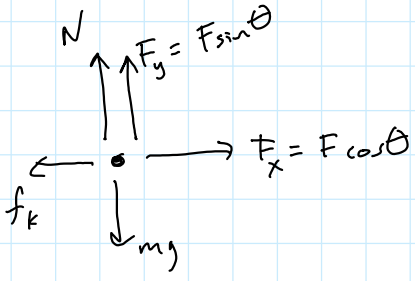
b) find work done on the box by every force acting on the box

c) Find W_{Net} done on the box

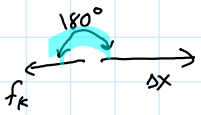
d) Use $W_{Net} = \Delta K$ to get v_f



OR



Force	work done on box
N	$W_N = N(\Delta x)\cos 90^\circ = 0$
f_k	$W_{f_k} = f_k(\Delta x)\cos 180^\circ = -f_k \Delta x$ $= -\mu_k N(\Delta x)$ $= -(0.2)(146)(5)$ $= -146$ J
$F_g = mg$	$W_{F_g} = F_g(\Delta x)\cos 90^\circ = 0$
F	$W_F = F(\Delta x)\cos 30^\circ$ $= 100(5)\cos 30^\circ$ $= 433$ J



Find N:

$\Sigma F_\perp = 0$ ← $a_\perp = 0$

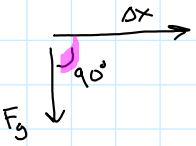
$N + F_y - mg = 0$

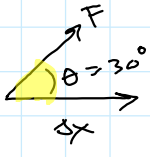
$N = mg - F_y$

$= mg - F\sin\theta$

$= 20(9.8) - 100\sin 30^\circ$

$= 146$ N





$W_{Net} = W_N + W_{f_k} + W_{F_g} + W_F$

$= 0 - 146 + 0 + 433$

$= 287$ J

$W_{Net} = \Delta K$

$= K_f - K_i$

$= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$ ← $v_i = 0$

$$= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$$

$$287 = \frac{1}{2}(20) v_f^2 - 0$$

$$v_f = 5.36 \ \frac{m}{s}$$

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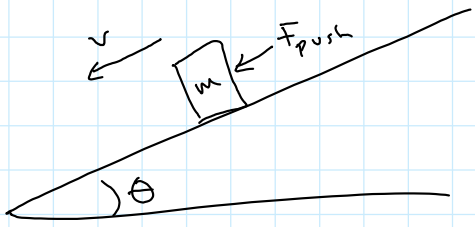
2)



given: $v_i = 0$

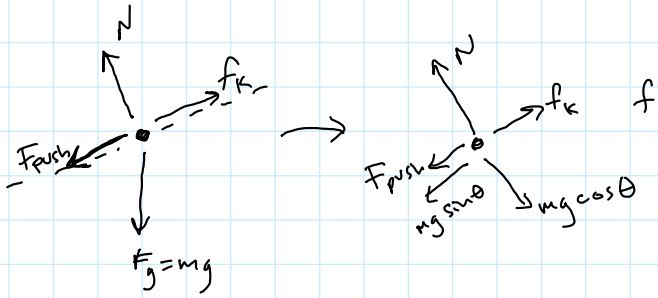
$m = 20$ kg

$\theta = 30°$

$F_{push} = 40$ N

$\mu_K = 0.2$

$\Delta x = 5$ m



find: v_f

Force	Work done on the box
N	$W_N = N(\Delta x)\cos 90° = 0$
F_{push}	$W_{F_{push}} = F_{push}(\Delta x)\cos 0°$ $= F_{push}(\Delta x)$ $= 40(5)$ $= 200$ J
F_g	$W_{F_g} = (F_g)_x \Delta x \cos 0°$ OR

$(F_g)_x = mg\sin\theta$

OR

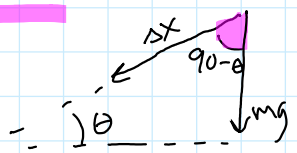
F_g

OR

$F_g (\Delta x) \cos(90-\theta)$

OR

$F_g \Delta x \sin\theta$



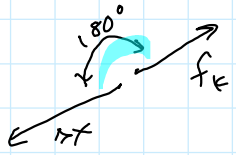
$= mg \sin\theta (\Delta x)$

$= 20(9.8)\sin 30^\circ (5)$

$= 490$ J

f_k

$W_{f_k} = f_k \Delta x \cos 180^\circ$



$= \mu_k N \Delta x \cos 180^\circ$

$= \mu_k (mg\cos\theta) \Delta x \cos 180^\circ$

$= (0.2)(20)(9.8)\cos 30^\circ (5)(-1)$

$= -170$ J

$W_{Net} = W_N + W_{F_{push}} + W_{F_g} + W_{f_k}$

$= 0 + 200 + 490 - 170$

$= 520$ J

$W_{Net} = \Delta K = K_f - K_i$

$= \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$ ($v_i = 0$: starts from rest)

$520 = \frac{1}{2}(20) v_f^2$

$$V_f = 7.21 \ \frac{m}{s}$$