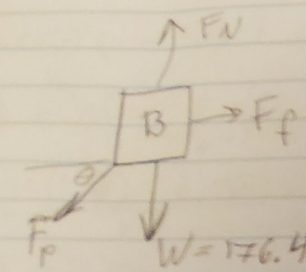
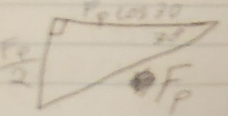
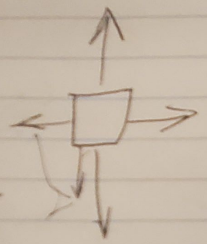
PHYS 407

1.



$\mu_s = 0.4$
$\mu_K = 0.2$ x
~~m~~ $m = 18$ ~~Kg~~ Kg
$\theta = 30°$





$F_N = 176.4 + \frac{F_p}{2}$

$F_f = F_N \mu_s = F_p \cos 30°$

$\left(176.4 + \frac{F_p}{2}\right) 0.4 = F_p \cos 30°$

$0.2\left(176.4 + \frac{F_p}{2}\right) - F_p \cos 30 =$

$F_p = 105.94\,N$

2.

the box will accelerate

$0.2\left(176.4 + \frac{105.94}{2}\right) - 105.94 \cos 30$

$= -45.87\,N$

$F = ma \qquad a = \frac{F}{m}$

$a = 2.55\,m/s^2 = \frac{45.87\,N}{18\,Kg}$

2.55 m/s² to the left

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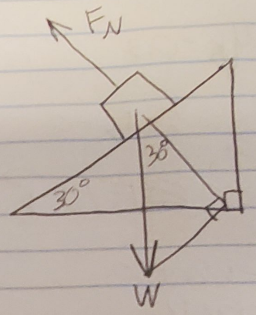
3.

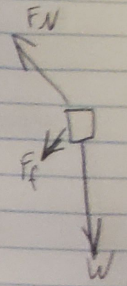


$\mu_s = 0.3$

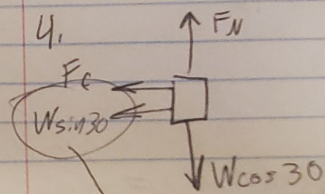
$\mu_K = 0.1$

$V_i = 3\,m/s$

$m = m$



4.



$\sum F_y = 0$

$\sum F_x \neq 0$

$F_f = F_N \mu_K$

$W = mg$

$F_N = W \cos 30$

$F_x = (mg \cos 30)\,0.1 + mg/2$

$a = \frac{0.1\,mg \cos 30 + 0.5\,mg}{m}$ ★

$a = \frac{(0.1)(9.8 \cos 30) + (0.5)(9.8)}{1}$

$a = 5.75\,m/s^2 \qquad t = \frac{?}{9.81}$

$t = 0.52$ seconds

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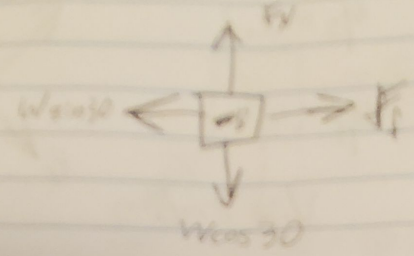
5.



$\mu_s = 0.3$

$\leftrightarrows F_y = 0$

$\leftrightarrows F_x = 0$?

$F_N = W\cos 30$

$F_f = F_N \mu_s$

$F_f = (mg\cos 30)\,0.3$

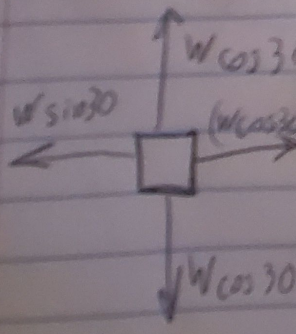
Find m

$(mg\cos(30))(0.3) = mg\sin^{(0.5)}30$

$5.75 = \dfrac{(0.3)m(9.8\cos 30) + (0.5)m(9.8)}{m}$

$5.75 = \dfrac{(0.98m'\cos 30) + (4.9m')}{m'}$

$0.3\,mg\sqrt{3} = mg$



$W\sin 30 = 0.3\,W\cos 30$

$W\sin 30 - 0.3W\cos 30 = 0$

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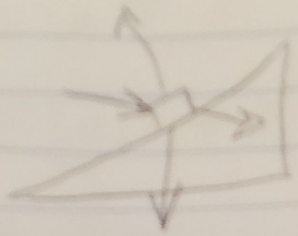
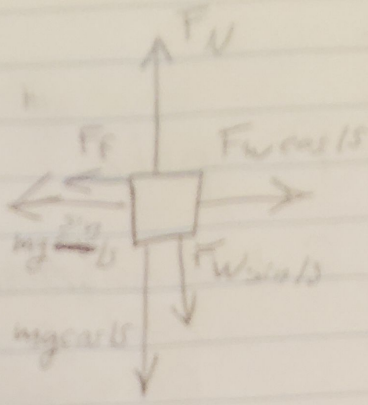
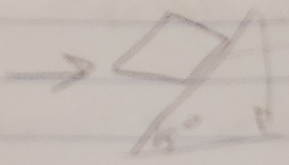
6.



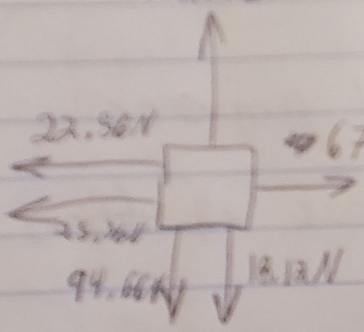




$F_w = 20N$

$F_N = mg\cos 15 + F_w \sin 15$

$F_f = 0.2(10.9 \cos 15 + 20 \sin 15) = 22.56\,N$



$\sum F_y = 0$

$\sum F_x$

$a = \frac{F}{m}$

$1.97 = \frac{19.69}{10}$

$v_f - v_i = at$

$v_f = at$

$t = \frac{8}{1.97}$

$\frac{8}{1.97} = \boxed{4.06 \text{ seconds}}$

7. no F_N only equals W on a flat surface, not an inclined surface.