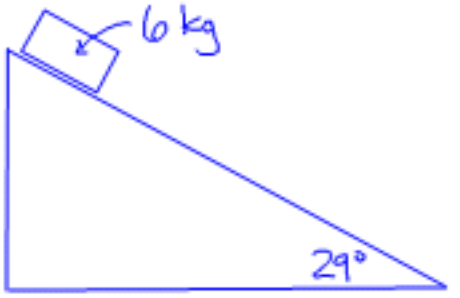
Free body diagram practice



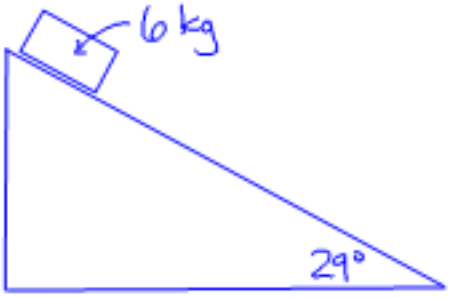
$\mu = 0$

$$\Sigma F_x = ma_x$$

$$mg\sin 29 = ma$$

$$9.8 \sin 29 = a$$

$$4.75 \frac{m}{s^2} = a$$

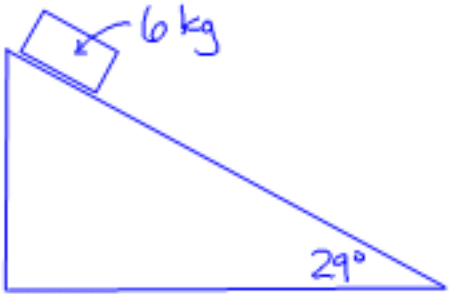


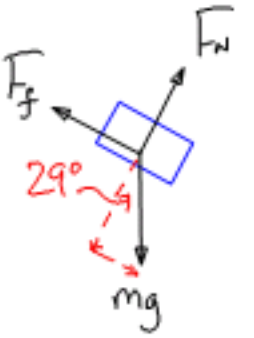
$\mu_s = .52$

$\mu_K = .4$

remember
check to see if
it moves first

(Hint: compare F_g down ramp with F_{f_s} up ramp)





$\mu_s = .52$

$\mu_k = .4$

will it slide? is F_g down ramp greater than F_{fs}?

F_g vs F_{fs}

$mg\sin 29$ vs. $\mu_s F_N$

$.52(mg\cos 29)$

$60\sin 29$ vs. $.52(60\cos 29)$

29.8 vs. 27.3

it slides

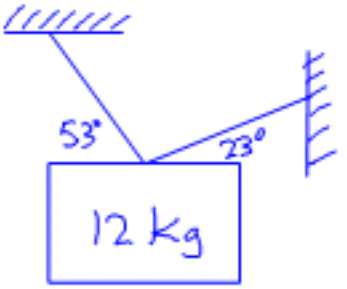
$\Sigma F_x = ma_x$

$mg\sin 29 - f_{fk} = ma$

$-\mu_k F_N$

$mg\sin 29 - .4(mg\cos 29) = ma$

$1.32 \frac{m}{s^2} = a$



FBD FIRST

Components 2nd

$\Sigma F = ma$ 3rd

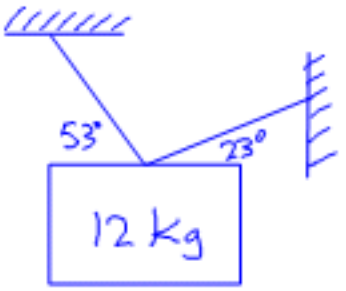
will have to do

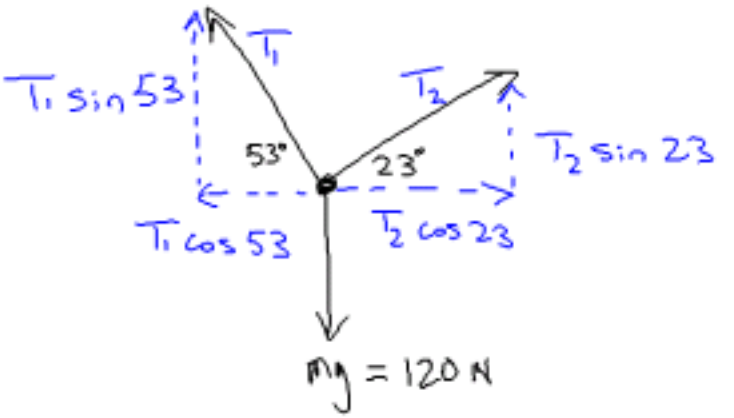
$\Sigma F = ma$ again

in the other direction

Combine equations

(Substitution)





$\sum F_y = ma_y$

$-mg + T_1 \sin 53 + T_2 \sin 23 = 0$

$-120 + \frac{T_2 \cos 23}{\cos 53}(\sin 53) + T_2 \sin 23 = 0$

$\sum F_x = ma_x$

$T_1 \cos 53 - T_2 \cos 23 = 0$

$T_1 \cos 53 = T_2 \cos 23$

$T_1 = \frac{T_2 \cos 23}{\cos 53}$

Sub for T_1 in equation on the left

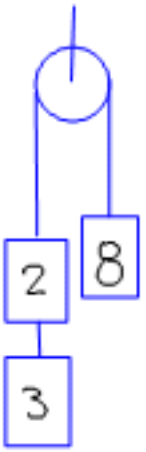
$T_2\left(\frac{(\cos 23)(\sin 53)}{\cos 53} + \sin 23\right) = 120$

$T_2 (1.612) = 120$

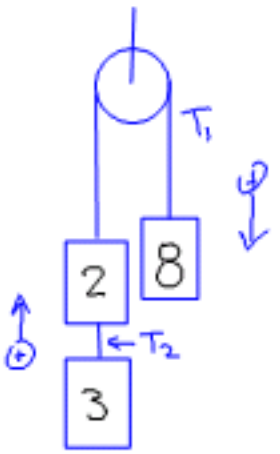
$T_2 = \frac{120}{1.612} = 74.4\ N$

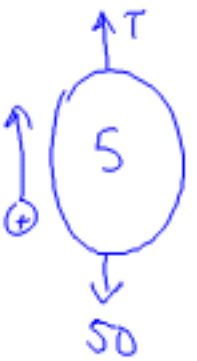
$T_1 = \frac{(74.4)\cos 23}{\cos 53}$

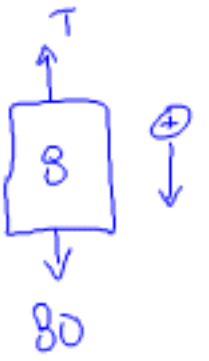
$T_1 = 113.8\ N$


2
8
3

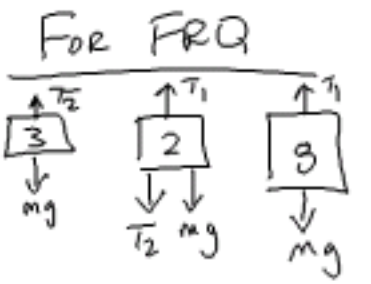
black bag







For FBD



$\Sigma F = ma$

$T - 50 = 5a$ $\quad$ $80 - T = 8a$

Add equations

$$T - 50 = 5a$$
$$+ \quad 80 - T = 8a$$

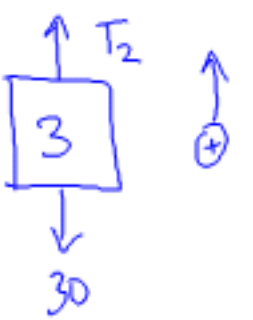
$$30 = 13a$$

$$\frac{30}{13} = a$$

$$2.31 \frac{m}{s^2} = a$$

$T = 5a + 50$

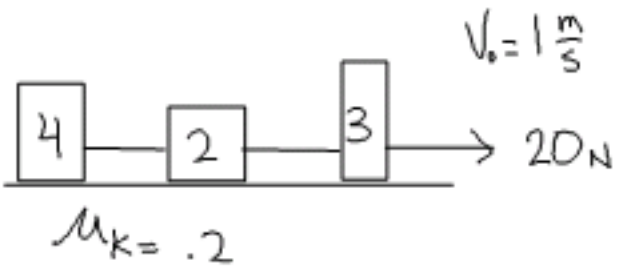
$T_1 = 61.55\,N$

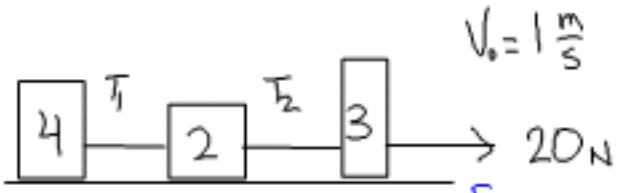


$T_2 - 30 = 3a$

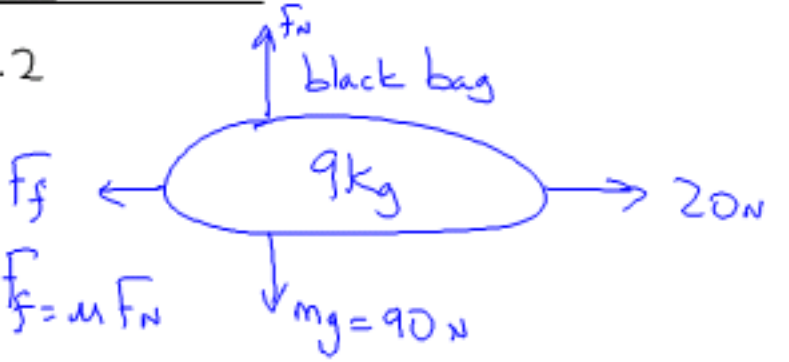
$T_2 = 3a + 30$

$T_2 = 36.9\,N$


$V_0 = 1 \frac{m}{s}$
4
2
3
20 N
$\mu_k = .2$



$\mu_k = .2$



$F_f = \mu F_N$

$= .2(90)$

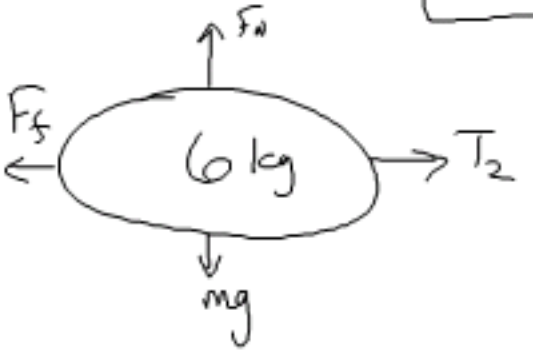
$= 18N$

$\Sigma F_x = ma_x$

$20 - 18 = 9a$

$2 = 9a$

$.22 \frac{m}{s^2} = \frac{2}{9} = a$



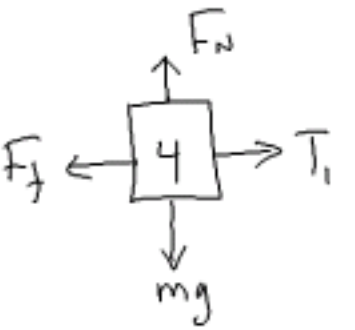
$\Sigma F_x = ma_x$

$T_2 - F_f = 6(.22)$

$T_2 = 1.32 + \mu F_N$

$T_2 = 1.32 + (0.2)(60)$

$T_2 = 13.32 N$



$\Sigma F_x = ma_x$

$T_1 - F_f = 4(.22)$

$T_1 - (.2)(40) = .88$

$T_1 = 8.88 N$