1. A 50-kg woman climbs a flight of stairs 6.0-m high. How much work is required?

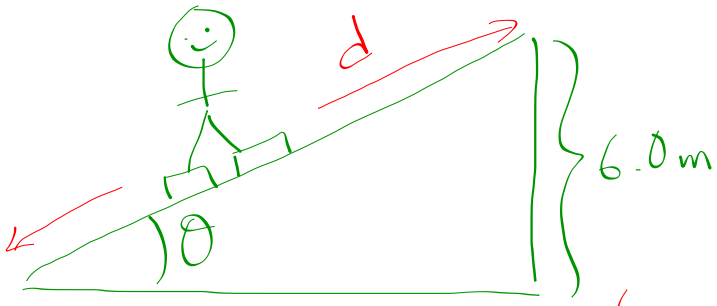
↳ minimum amount of work...

↓ no acceleration

↓

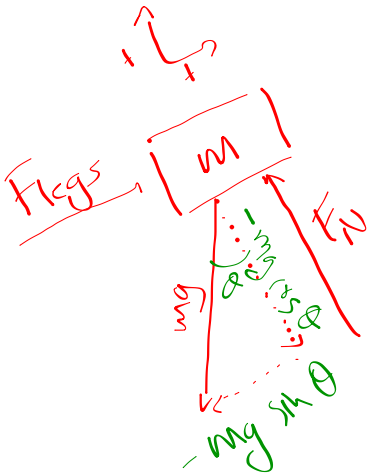
$\Sigma F = \emptyset$

$W_{net} = \emptyset = F \cdot d$



$\sin\theta = \frac{6}{d}$

$d = \frac{6}{\sin\theta}$



$\Sigma F_x = ma_x$

$F_{legs} + -mg\sin\theta = ma_x = \emptyset$

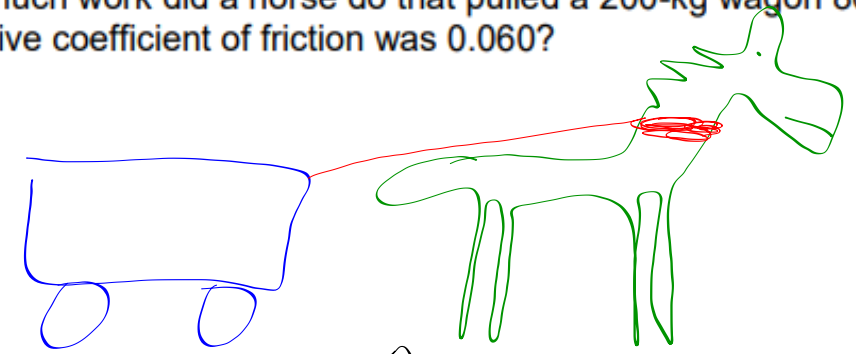
$F_{legs} = mg\sin\theta$

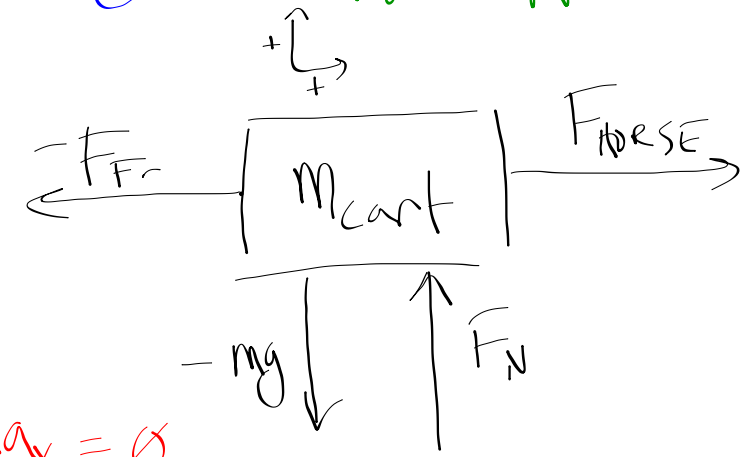
$W = F_{\parallel} \cdot d$

$W = mg\sin\theta \cdot \left(\frac{6}{\sin\theta}\right)$

$= (m)(g)(6)$

3. How much work did a horse do that pulled a 200-kg wagon 80 km without acceleration along a level road if the effective coefficient of friction was 0.060?





$W = F_{\parallel} \cdot d$

$W_{HORSE} = F_H \cdot d$

$\Sigma F_x = ma_x = 0$

$-F_{Fr} + F_{HORSE} = 0$

$F_H = F_{Fr}$

$\Sigma F_y = ma_y = 0$

$-mg + F_N = 0$

$F_N = mg$

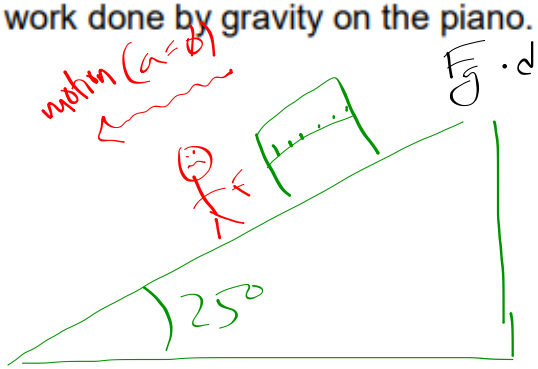
$F_{Fr} = \mu F_N$

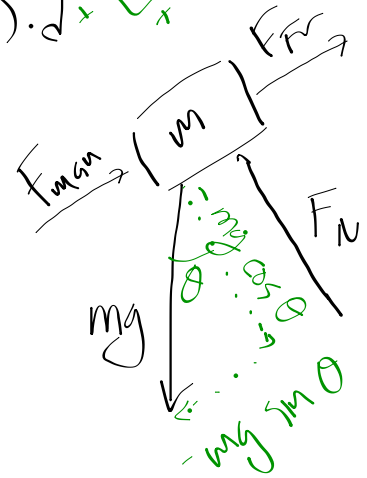
9. A 300-kg piano slides at constant speed 4.5 meters down a 25° incline. It is kept from accelerating by a man who is pushing back on it. The effective coefficient of friction is 0.39. Calculate

a) the net work done on the piano. $= W_{net} = \Sigma F \cdot d = 0$

b) the work done by the man on the piano. $= F_{man} \cdot d = (mg\sin\theta - \mu mg\cos\theta) \cdot d$

c) the work done by gravity on the piano. $= F_g \cdot d = (-mg\sin\theta) \cdot d$





$W = F_{||} \cdot d$

$\Sigma F_x = ma_x = 0$

$F_{man} + F_{Fr} + -mg\sin\theta = 0$

$F_{Fr} = \mu F_N$

$= \mu mg\cos\theta$

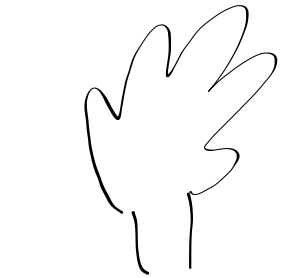
$F_{man} = mg\sin\theta - \mu mg\cos\theta$

$\Sigma F_y = ma_y = 0$

$F_N + -mg\cos\theta = 0$

$F_N = mg\cos\theta$

19. A baseball (m = 140 grams) traveling 30 m/s moves a fielder's glove backward 35 cm when the ball is caught. What was the average force exerted by the ball on the glove?



$\leftarrow O$

$\overleftarrow{d = 0.35m}$

$W = F_{||} \cdot d$

Work - KE theorem:

$W = \frac{1}{2}mv^2 - \frac{1}{2}mv_0^2$

$(-63) = F_{||} \cdot (0.35m)$

$F = 180\ N$

$W = -\frac{1}{2}mv_0^2$

$= -\frac{1}{2}(0.14)(30^2)$

$= -63J$