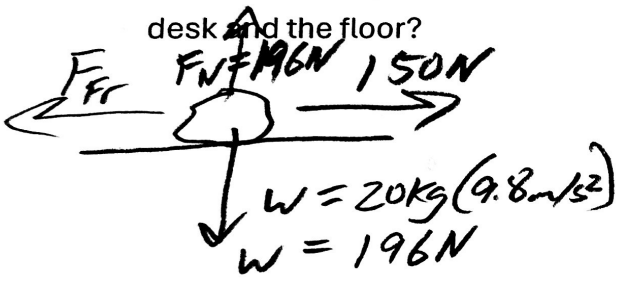
7

1. Someone slides a 20kg rock across a horizontal floor. If the person does this by applying a 150N horizontal force, and the rock accelerates at 3.5m/s^2, what is the coefficient of friction between the desk and the floor?



$\Sigma F = 20kg(3.5m/s^2) = 70N$

$\Sigma F = 150N - F_{Fr} = 70N$

$F_{Fr} = 80N$

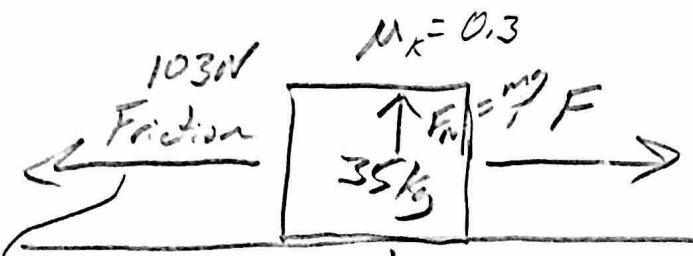
$80N = \mu F_N = \mu(196N)$

$\mu = 0.408$

... of kinetic friction between a 35-kg crate and the floor is 0.30...

2.

a)



$F_{Fr} = \mu_K F_N$

$= \mu_K mg$

$= 0.3(35kg)(9.8 m/s^2)$

$= 103N$

We know $F_N = mg$ because box is not moving in Y dimension

Steady speed means $a = 0$

$\sum F = ma$

If $a = 0$, then $\sum F = 0$,

So forces are balanced, and

$F = F_{Friction}$

$\sum F = ma$

$\sum F = F - F_{Fr}$

$ma = F - F_{Fr}$

$35kg(0 m/s^2) = F - 103N$

$F = 103N$

---

b) If $\mu = 0$, then $F_{Fr} = 0$

$\sum F = ma$

$\sum F = F - F_{Fr}$

$ma = F - F_{Fr}$

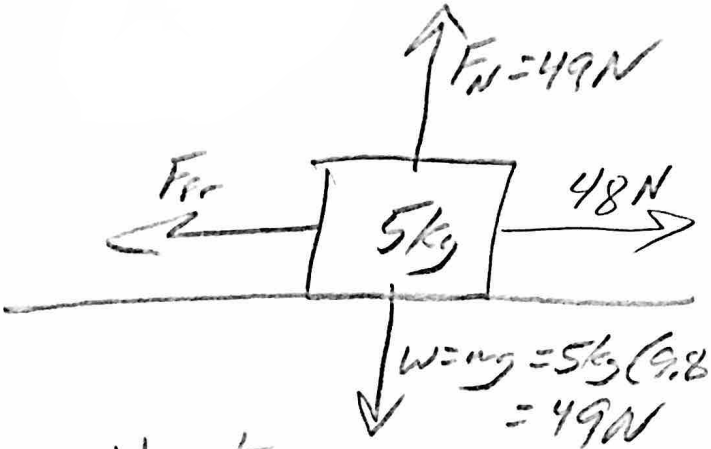
$35kg(0 m/s^2) = F - 0$

$F = 0$

3,

7

a)



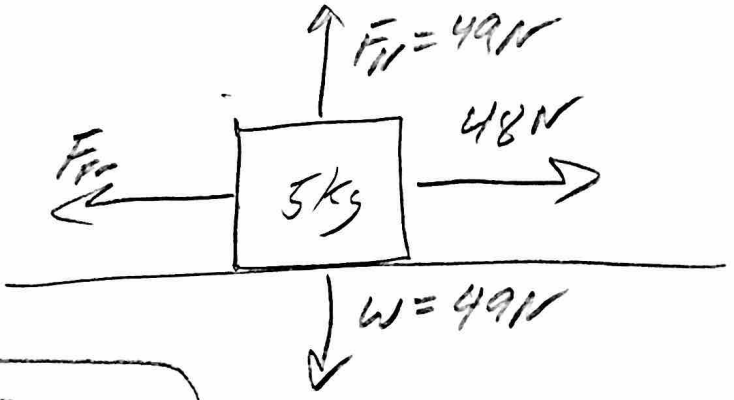
If at least 48N is needed to start moving the box, then F_{Fr} must = 48N

$$F_{Fr} = \mu_s F_N = 48N$$

$$\mu_s (49N) = 48N$$

$$\boxed{\mu_s = 0.98}$$

b)



$\mu_k (F_N)$

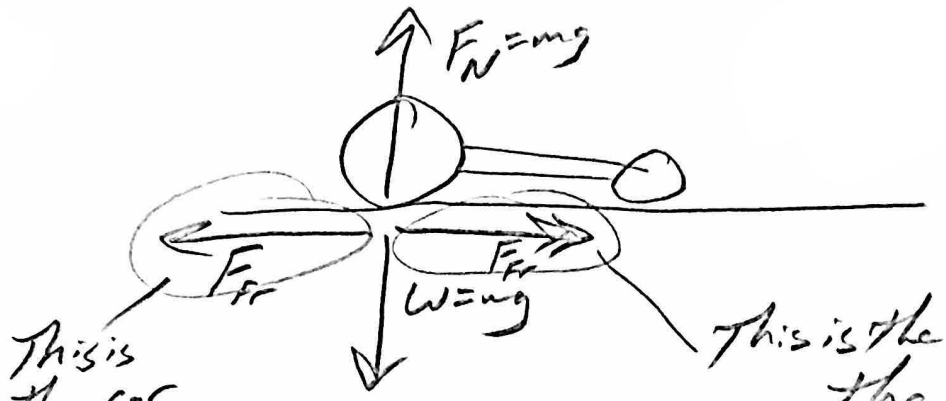
$\Sigma F = ma$

$\Sigma F = 48N - F_{Fr}$ $\Rightarrow$ $ma = 48N - F_{Fr}$

$5kg(0.7 m/s^2) = 48N - \mu_k(49N)$

$$\boxed{\mu_k = 0.91}$$

5.



This is the car pushing the road, using Friction.

This is the road pushing the car, using friction

$$\sum F_{car} = ma$$

$$\sum F_{car} = F_{Fr} = \mu_s F_N = \mu_s mg$$

$$ma = \mu_s mg$$

$$\mu_s = \frac{a}{g}$$ ← we need a...

Using Kinematics

$\Delta x = 1{,}000\ m$

$v_{0x} = 0\ m/s$

$\Delta t = 12\ s$

$$\Delta x = v_0 t + \frac{1}{2} a t^2$$

$$1{,}000\ m = 0\ m/s\,(12\ s) + \frac{1}{2} a (12\ s)^2$$

$$a = 13.9\ m/s^2$$

$$\mu_s = \frac{13.9\ m/s^2}{9.8\ m/s^2} = \boxed{1.42}$$

6.

8

kinematics - to find Δx

$\Delta x = ?$

$v_0 = 4\ m/s$

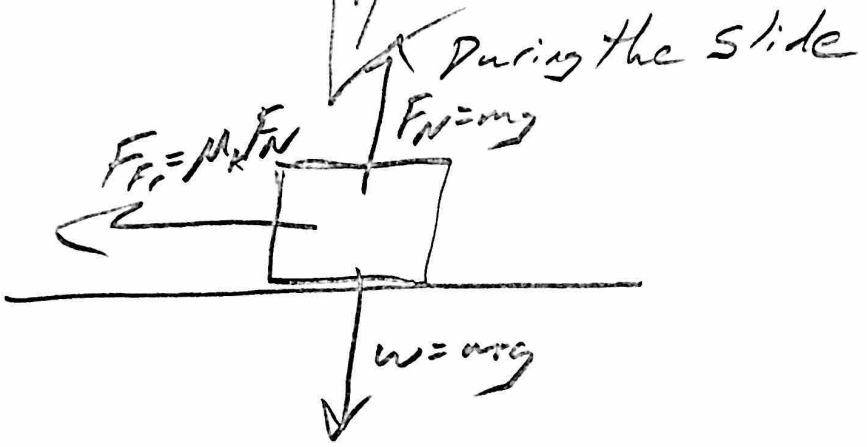
$v = 0\ m/s$

$a =$

$t =$

we need a

$v^2 = v_0^2 + 2a\Delta x$



$$\sum F = ma$$

$$\sum F = -F_f = -\mu_k F_N = -\mu_k mg$$

$$ma = -\mu_k mg$$

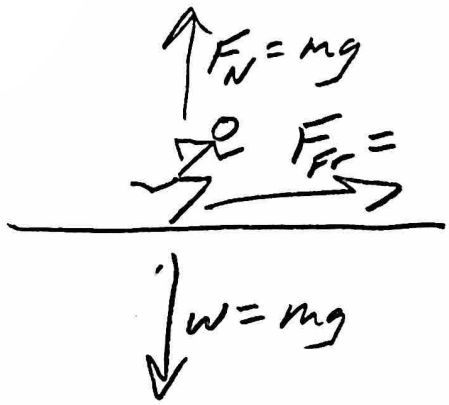
$$a = -(0.2)(9.8\ m/s^2) = -1.96\ m/s^2 = a$$

$$0^2_{m/s} = 4^2_{m/s} + 2(-1.96\ m/s^2)\Delta x$$

$$\Delta x = 4.08\ m$$

8

7.



$\Sigma F = ma$

$\Sigma F = F_{Fr}$

$F_{Fr} = ma$

$F_{Fr} = \mu_s F_N = \mu_s mg$

$ma = \mu_s mg$

$a = \mu_s g$

$a = 0.015\,(9.8\,m/s^2)$

$a = 0.147\,m/s^2$

Kinematics

$V_0 = 0\,m/s$

$a = 0.147\,m/s^2$

$\Delta x = 10\,m$

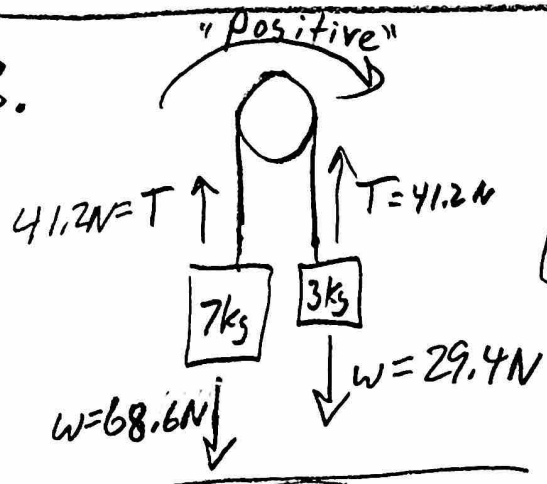
$\Delta t = ?$

$\Delta x = V_0 t + \frac{1}{2} a t^2$

$10\,m = 0t + \frac{1}{2}(0.147\,m/s^2)t^2$

$t = 11.7\,s$

8.



$\Sigma F_{10} = 10kg\,(a)$

$\Sigma F = 29.4N - 68.6N = -39.2N$

$10kg\,(a) = -39.2kg\,m/s^2$

$a = -3.92\,m/s^2$

$a = 3.92\,m/s^2$ Counter-clockwise

$\Sigma F_3 = T - 29.4N$

$\Sigma F_3 = 3kg\,(3.92\,m/s^2) = 11.76N$

$T - 29.4N = 11.76N$

$T = 41.2N$