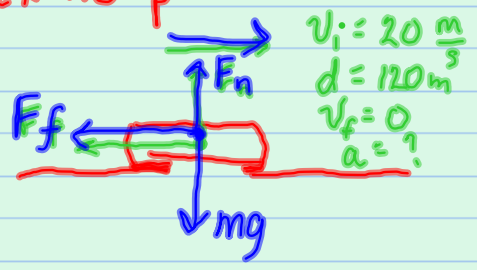


Ex 4.6 p 102



$$\Sigma F_x = -F_f = ma$$

$$-\mu F_n = ma$$

$$-\mu mg = ma$$

$$\mu g = a$$

$$\Sigma F_y = F_n - mg = ma$$

$$F_n = mg$$

$$\mu = \frac{-a}{g} = \frac{-(-1.67)}{9.8} = 0.17$$

$$v_f^2 = v_i^2 + 2ad$$

$$\frac{v_f^2 - v_i^2}{2d} = a = \frac{-(20)^2}{2(120)} = \frac{-400}{240} = -1.67 \frac{m}{s^2}$$

$F_f$  - force of friction (opposes motion/displacement)  
 $F_n$  - normal force ( $\perp$  to surface)

$$F_f = \mu F_n$$

coefficient of friction

Solve for  $\mu = \frac{F_f}{F_n}$  units  $\frac{N}{N}$   
 $\mu$  has no unit

$a_y = 0$  not moving  $\updownarrow$

**TABLE 4.2****Coefficients of Friction<sup>a</sup>**

	$\mu_s$	$\mu_k$
Steel on steel	0.74	0.57
Aluminum on steel	0.61	0.47
Copper on steel	0.53	0.36
Rubber on concrete	1.0	0.8
Wood on wood	0.25–0.5	0.2
Glass on glass	0.94	0.4
Waxed wood on wet snow	0.14	0.1
Waxed wood on dry snow	—	0.04
Metal on metal (lubricated)	0.15	0.06
Ice on ice	0.1	0.03
Teflon on Teflon	0.04	0.04
Synovial joints in humans	0.01	0.003

<sup>a</sup> All values are approximate.

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