4.19

$F_g = mg$ $\quad g_E = 9.80 m/s^2$ $\quad g_I = 1.81 m/s^2$

$F_{gE} = 44.0 N$ $\quad F_{gI} = ?$

$$m = \frac{F}{g} = \frac{44}{9.80} = 4.4897959... = \boxed{4.49 kg} \quad (a)$$

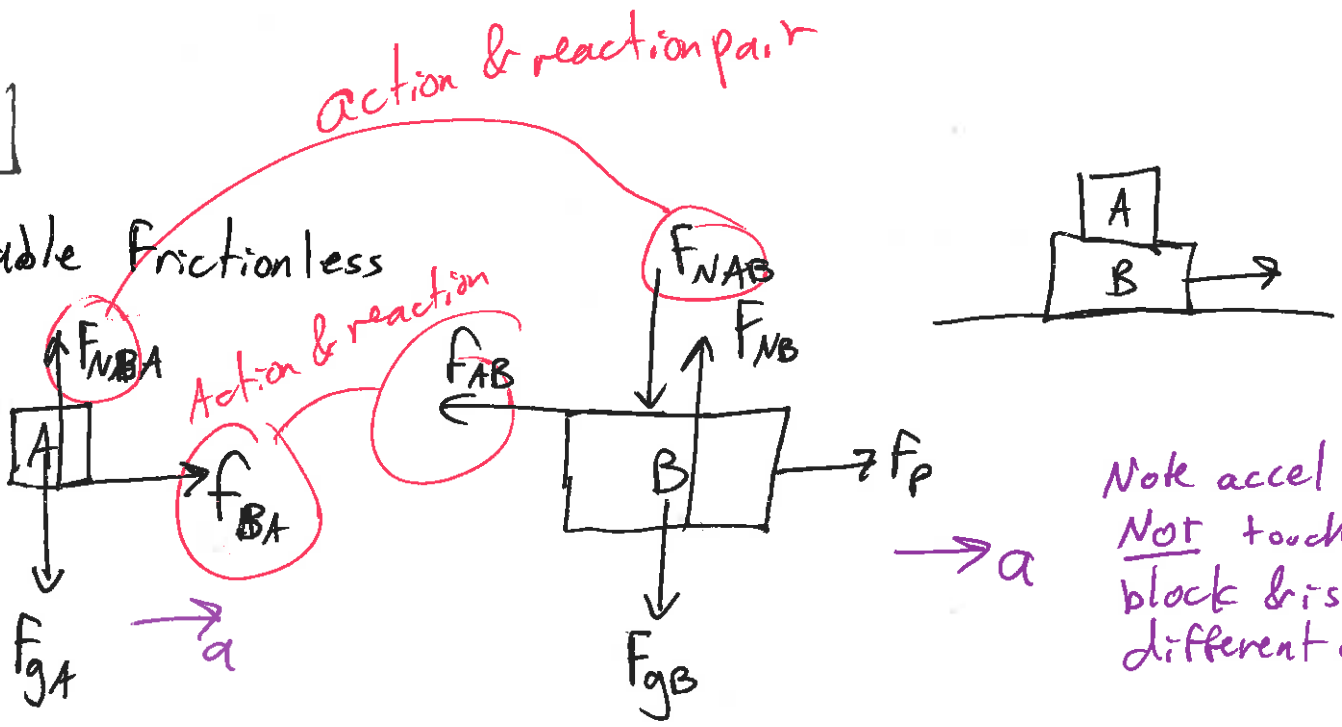
b) $$m = \frac{F_E}{g_E} = \frac{F_I}{g_I} \rightarrow F_I = F_E \frac{g_I}{g_E} = 44 \cdot \frac{1.81}{9.8}$$

$$= 8.12653... = \boxed{8.13 N} \quad (b)$$

Sanity check: Should weigh less on Io.
Does it seem like a reasonable amount less?

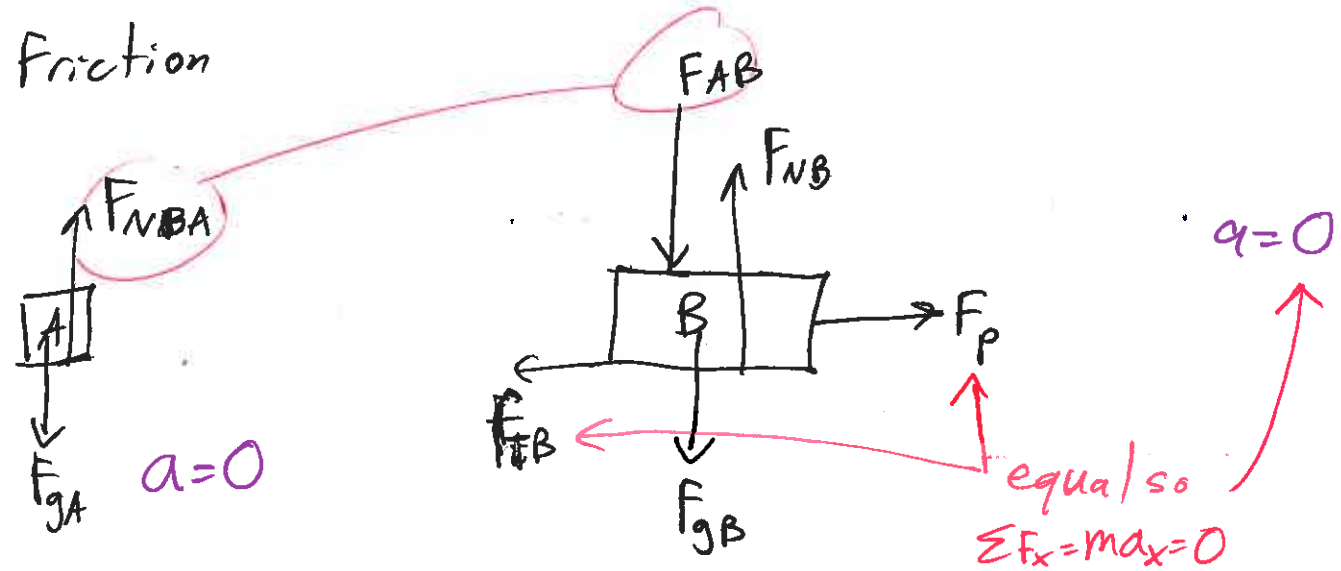
9.28

a) Table Frictionless



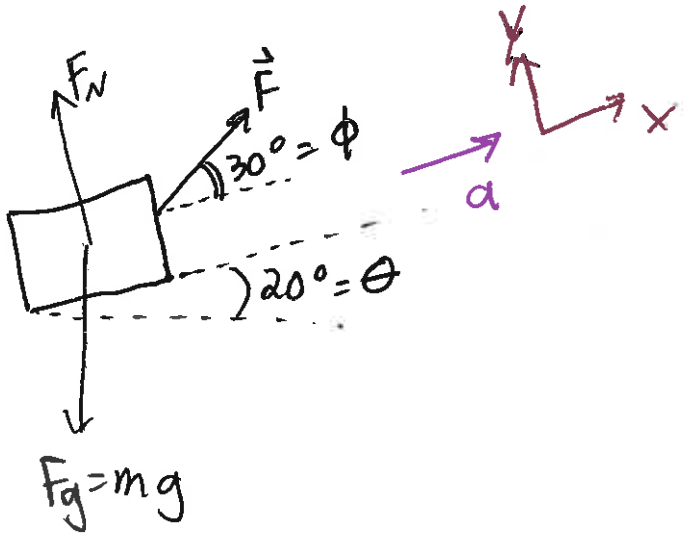
$f_{BA} = f_{AB}$ need this friction or else A would slide off of B.

b) w/ Friction



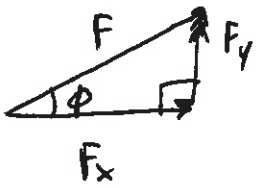
No friction between A & B because moving at a steady rate (constant velocity).

4.4



a) Find F so $F_x = 60.0N$

Redraw F as hypoteneuse of a right triangle



SOH CAH TOA or "Cos thru angle"

$F\cos\phi = F_x$

$F = \frac{F_x}{\cos\phi} = \frac{60.0}{\cos 30} = 69.28203230...$

69.2N

b) Find F_y

$F\sin\phi = F_y$

$F_y = 69.282 \sin 30 = 34.641016...$

$= \boxed{34.6N}$

c) Plan: Use FBD to list all Forces in x & y-dir^{n}s separately, including components.
This might be a case where I end up with 2 equations (x & y-dir^{n}s) & 2 unknowns (a, ?).

X-dir^n

+ $F_x = F\cos\phi$ (a)

− $F_{gx} = F_g \sin\theta$

$F\cos\phi - F_g\sin\theta = ma_x$

ΣF_x

y-dir^n

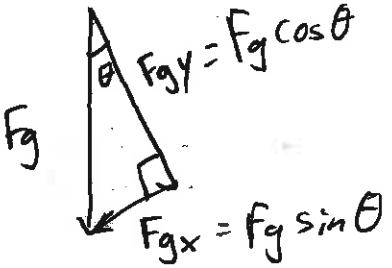
+ $F_y = F\sin\phi$ (b)

+ F_N

− $F_{gy} = F_g\cos\theta$

$F\sin\phi + F_N - F_g\cos\theta = 0$

ΣF_y $\quad ma_y$



Hint: be clear on angles >45° or <45°, that will help you find similar triangles.

solving for this, and yay, we know everything else in this eq^n!:)

$ma_x = F\cos\phi - F_g\sin\theta$

$ma_x = F_x - mg\sin\theta$

$a_x = \frac{F_x}{m} - g\sin\theta$

$a_x = \frac{60.0}{24.5} - 9.80\sin 20° = -0.9028178 = \boxed{-0.903\,m/s^2}$

Sanity Check: What does the − mean?