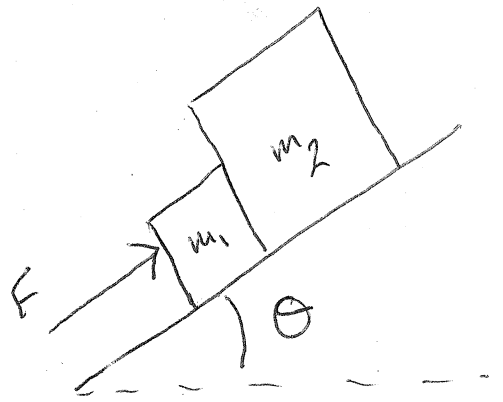
Example: Forces and Incline



* Ignore Friction

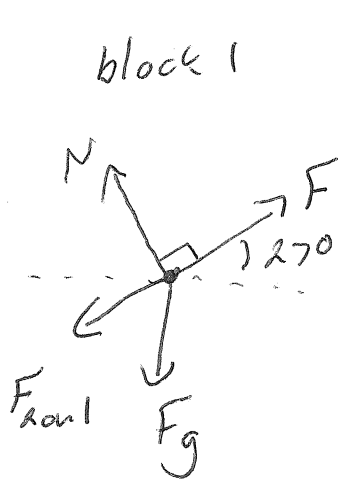
$m_1 = 2.0\,kg$

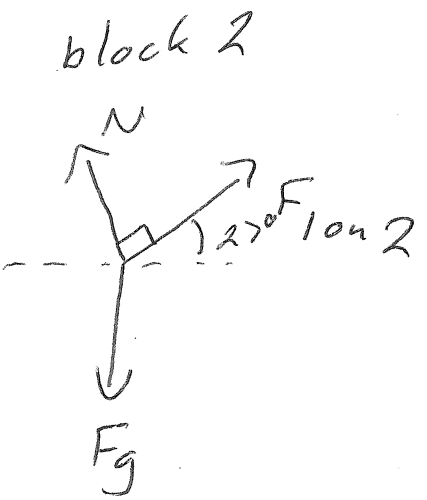
$m_2 = 7.0\,kg$

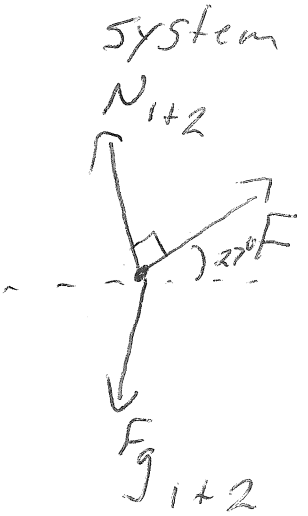
$F = 102\,N$

$\theta = 27^\circ$

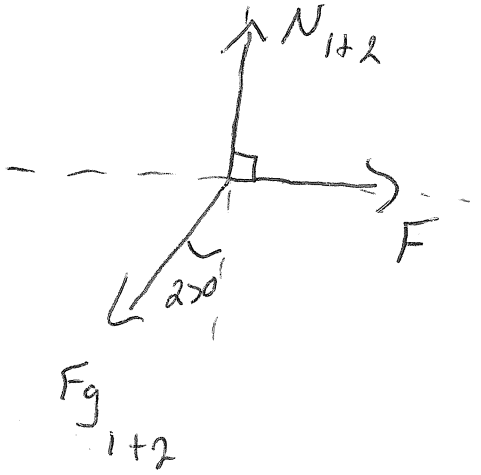
1) Determine the force of block 2 on block 1







Use the system diagram to determine system acceleration.



rotate the diagram -27° so only one force has x and y components.

We are interested in the x-acceleration because that is the acceleration along the incline

$$\Sigma F_x = m_s a_s = F + \left(F_{g_{1+2}}\right) \sin 27°$$

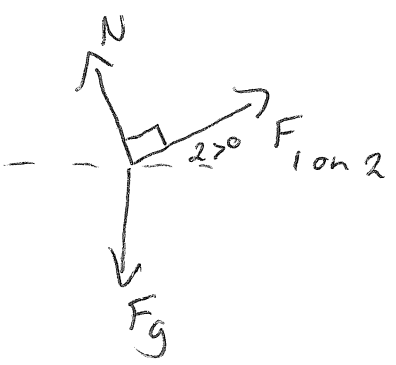
negative by system diagram

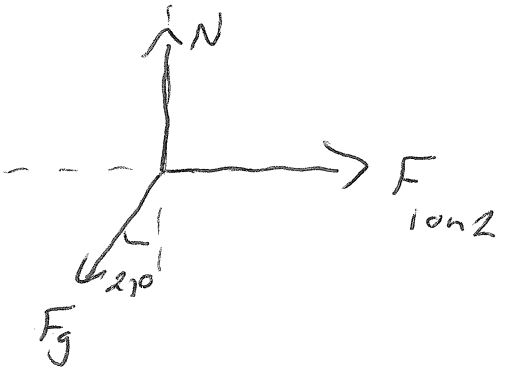
$$\left(9.0 kg\right) a_s = 102 N + \left(-9.0 kg\right)\left(9.81 \frac{N}{kg}\right) \sin 27°$$

$$a_s = 6.88 \, m/s^2$$

System acceleration is the same as individual part acceleration.

block 2





$$\Sigma F_x = ma = F_{1 on 2} + F_g \sin 27$$

$$7.0 kg \left(6.88 \frac{m}{s^2}\right) = F_{1 on 2} + -(7.0 kg)\left(9.81 \frac{N}{kg}\right)(\sin 27)$$

$$(7.0 kg)\left(9.81 \frac{N}{kg}\right)\sin 27° + (7.0 kg)\left(6.88 \frac{m}{s^2}\right) = F_{1 on 2}$$

$$79.34 N = F_{1 on 2}$$

$$|F_{1 on 2}| = |F_{2 on 1}| = \boxed{79.34 N \text{ or } 79 N}$$

Newton's 3rd law