28.0 kg

m_1

m_2

m_1

N

T

F_s

mg

$\sum F_y = 0$

$N - m_1 g = 0$

$N = m_1 g$

$\sum F_x = 0$

$T - F_s = 0$

$T - \mu_s N = 0$

$T - \mu_s m_1 g = 0$

$m_2 g - \mu_s m_1 g = 0$

$m_2 = \mu_s m_1$

$m_2 = (.45)(28 kg)$

$m_2 = 12.6 kg$

$12.6 kg - 1.35 kg = 11.25 kg$
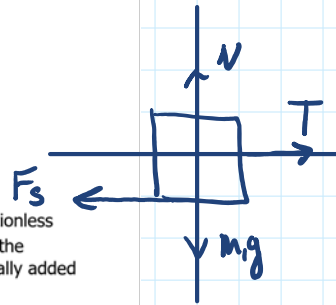of Sand

m_2

T

$T - m_2 g = 0$

$T = m_2 g$

4) A 28.0 kg block is connected to an empty 1.35 kg bucket by a cord running over a frictionless pulley? The coefficient of static friction between the table and the block is 0.450 and the coefficient of kinetic friction between the table and the block is 0.350. Sand is gradually added to the bucket until the system just begins to move.

a) Calculate the mass of sand added to the bucket. (6 points)

$a = 0$
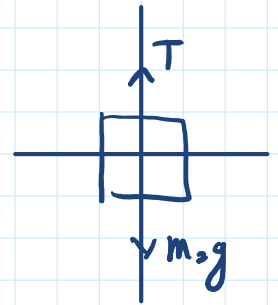
b) Calculate the acceleration of the system. (6 points)

m_1

W

T $a \rightarrow$

F_k $m_1 g$

$\sum F_y = 0$

$N - m_1 g = 0$

$\boxed{N = m_1 g}$

$\sum F_x = ma_x$
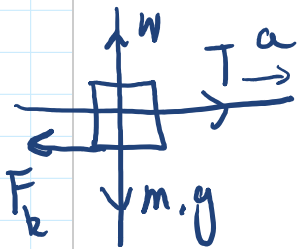
$T - F_k = m_1 a$

$T - \mu_k N = m_1 a$

$m_2 g - m_2 a - \mu_k N = m_1 a$

m_2

T $a(-)$

$m_2 g$

$\sum F_g = ma_y$

$T - m_2 g = -m_2 a$

$T = m_2 g - m_2 a$

6
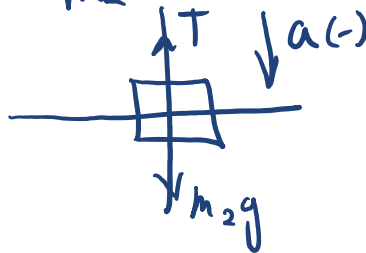
$$M_2 g - \mu_k N = m_1 a + m_2 a$$

$$m_2 g - \mu_k N = a(M_1 + M_2)$$

$$a = \frac{M_2 g - \mu_k N}{m_1 + m_2} = \frac{m_2 g - \mu_k m_1 g}{m_1 + m_2} = \frac{g(m_2 - \mu_k m_1)}{m_1 + m_2}$$

$$a = \frac{(9.8 \text{ m/s}^2)\left[12.6\,kg - (.35)(28\,kg)\right]}{40.6\,kg}$$

$$\boxed{a = .68 \text{ m/s}^2}$$