46. A flatbed truck is carrying a 2800-kg crate of bananas. If the coefficient of static friction between the crate and the bed of the truck is 0.55, what is the maximum rate the driver can decelerate when coming to a stop in order to avoid burying himself in squished bananas if the crate were to hit the cab?

$\Sigma F_x = ma_x$

$-F_{Fr} = ma_x$

$\Sigma F_y = ma_y$

$F_N + -mg = ma_y = 0$

$F_N = mg = 2800(9.8)$

$= 27,440\ N$

$F_{Fr} = \mu_s F_N$

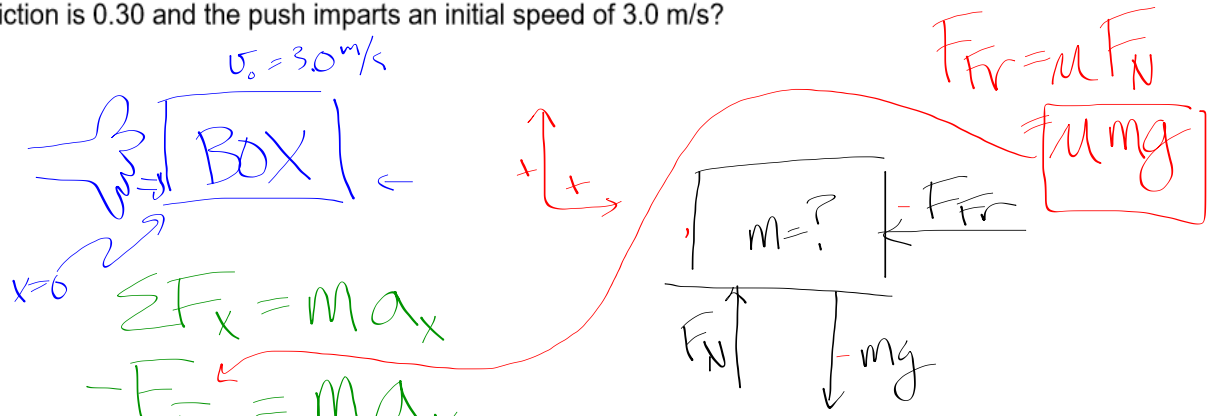
$F_{Fr} = (0.55)27,440$

$F_{Fr} = 15,092\ N$

$-15,092 = 2800\, a_x$

$a_x = -5.4\ m/s^2$

31. A box is given a push so that it slides across the floor. How far will it go, given that the coefficient of kinetic friction is 0.30 and the push imparts an initial speed of 3.0 m/s?



$\Sigma F_x = ma_x$

$-F_{Fr} = ma_x$

ΣF_y: $F_N = mg$ ($a=0$, these are the only forces)

$-\mu mg = ma_x$

$-(0.3)(9.8) = a_x = -2.94\ m/s^2$

$x_0 = 0$

$x =$

$v_0 = 3\ m/s$

$v = 0$

$a = -2.94\ m/s^2$

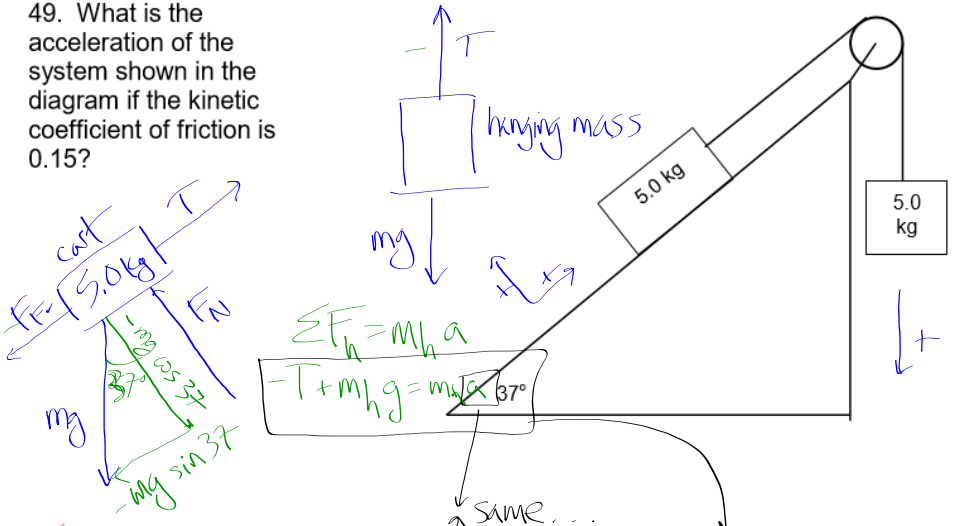
$t =$

$v^2 = v_0^2 + 2a(x - x_0)$

$0 = 9 + 5.88x$

$x = 1.53\ m$

49. What is the acceleration of the system shown in the diagram if the kinetic coefficient of friction is 0.15?



$$m_h g - m_h a = F_{Fr} + m_c g\sin 37 + m_c a$$

$$F_{Fr} = \mu F_N = [0.15(m_c g\cos 37)]$$

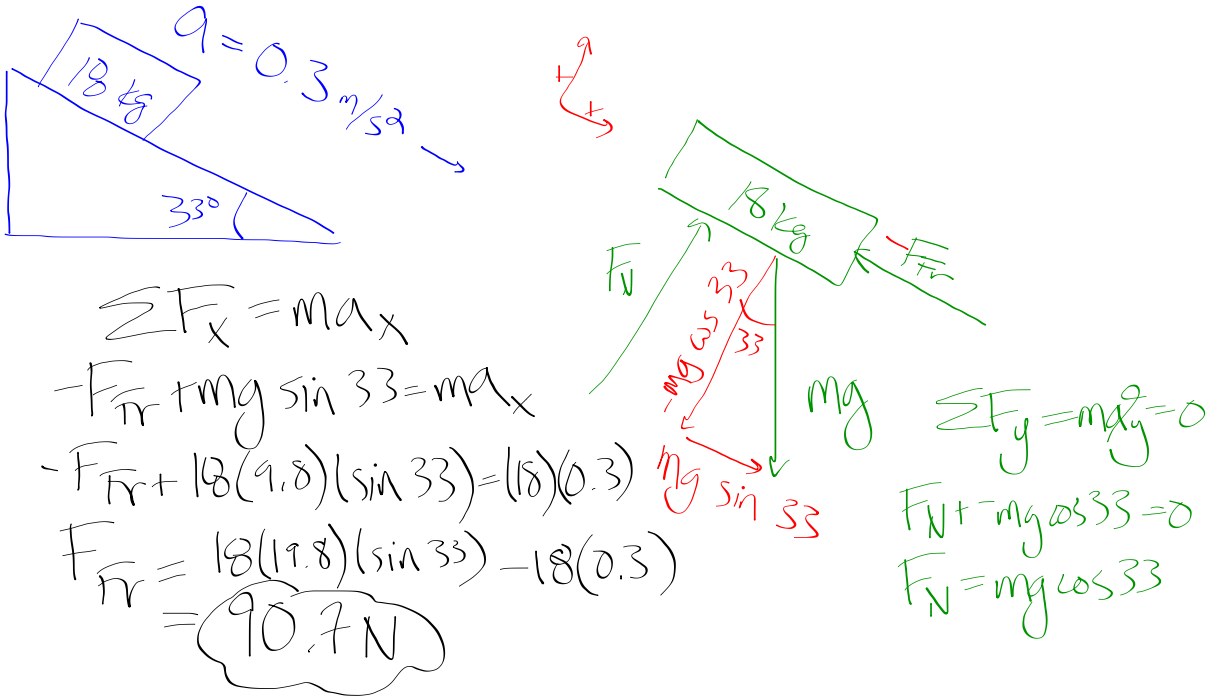
$$m_h g - m_h a = 0.15(m_c g\cos 37) + m_c g\sin 37 + m_c a$$

$$(5)(9.8) - 5a = 0.15(5)(9.8)(\cos 37) + 5(9.8)(\sin 37) + 5a$$

$$49 - 5a = 5.87 + 29.49 + 5a$$

$$10a = 13.64;\ \boxed{a = 1.36\ m/s^2}$$

37. An 18.0-kg box is released on a 33.0° incline and accelerates down the incline at 0.300 m/s^2. Find the friction force impeding its motion. How large is the coefficient of friction?



$\Sigma F_x = ma_x$

$-F_{Fr} + mg\sin 33 = ma_x$

$-F_{Fr} + 18(9.8)(\sin 33) = (18)(0.3)$

$F_{Fr} = 18(9.8)(\sin 33) - 18(0.3)$

$= 90.7\,N$

$\Sigma F_y = ma_y = 0$

$F_N + -mg\cos 33 = 0$

$F_N = mg\cos 33$