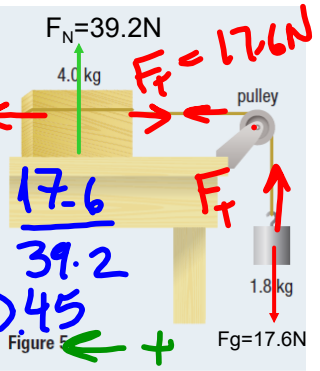
Pause and Try (see solutions video for more info)

Practice

1. Two trunks sit side by side on the floor. The larger trunk (52 kg) is to the left of the smaller trunk (34 kg). A person pushes on the larger trunk horizontally toward the right. The coefficient of static friction between the trunks and the floor is 0.35. T/I
   (a) Determine the magnitude of the maximum force the person can exert without moving either trunk. [ans: 290 N]
   (b) Calculate the force the larger trunk exerts on the smaller trunk. [ans: 120 N [right]]
   (c) Would either answer change if the person pushed in the opposite direction on the smaller trunk? Explain your reasoning.
2. A 4.0 kg block of wood sits on a table (**Figure 5**). A string is tied to the wood, running over a pulley and down to a hanging object. The greatest mass that can be hung from the string without moving the block of wood is 1.8 kg. Calculate the coefficient of static friction between the block of wood and the table. T/I [ans: 0.45]



17.6N = F_f F_f = 17.6N

$\mu = \frac{17.6}{39.2}$

$\mu = 0.45$

Figure 5

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System

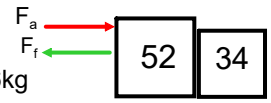
Mass = 86kg

F_g = 843N

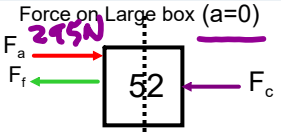
F_N = 843N

F_f = 0.35(843)

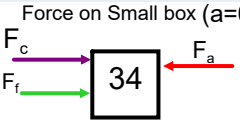
F_f = 295N



Force on Large box (a=0)



Force on Small box (a=0)



$F_{Net} = F_a - F_f - F_c$

$0 = 295 - \mu F_{gL} - F_c$

$0 = 295 - 0.35(52)(9.8) - F_c$

$F_c = 116.6\ N$

$F_{Net} = F_a - F_f - F_c$

$0 = 295 - 0.35(34)(9.8) - F_c$

$F_c = 178\ N$

Pause and Try (see solutions video for more info)

Practice

1. A 0.170 kg hockey puck is initially moving at 21.2 m/s [W] along the ice. The coefficient of kinetic friction for the puck and the ice is 0.005. T/I
   (a) What is the speed of the puck after travelling 58.5 m? [ans: 21.1 m/s]
   (b) After being played on for a while, the ice becomes rougher and the coefficient of kinetic friction increases to 0.047. How far will the puck travel if its initial and final speeds are the same as before? [ans: 6.24 m]

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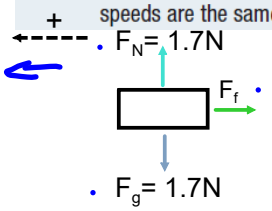


$F_f = u(F_N)$

F_f=0.005(1.7)

F_f=0.0085N

$F_{Net} = -F_f$

ma = -0.0085

0.170a = -0.0085

a = -0.05 m/s^2

V_i = 21.2 m/s

a = -0.05 m/s^2

d = 58.5m

V_f =

$V_f^2 = V_i^2 + 2ad$

$V_f^2 = 21.2^2 + 2(-0.05)(58.5)$

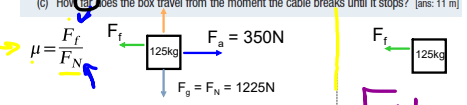
V_f = 21.06 or 21.1 m/s

sqrt

Pause and Try (see solutions video for more info)

4. An electric motor is used to pull a 125 kg box across a floor using a long cable. The tension in the cable is 350 N and the box accelerates at 1.2 m/s² [forward] for 5.0 s. The cable breaks and the box slows down and stops. T/I C
   (a) Calculate the coefficient of kinetic friction. [ans: 0.16]
   (b) How far does the box travel up to the moment the cable breaks? [ans: 15 m]
   (c) How far does the box travel from the moment the cable breaks until it stops? [ans: 11 m]

$\mu = \frac{F_f}{F_N}$



$F_{Net} = 350 - F_f$

ma

$(125)(1.2) = 350 - F_f$

$F_f = 200N$

$\mu_k = \frac{200}{1225}$ $\mu_k = 0.16$

$v_i = 0$

$a = 1.2 m/s^2$

$t = 5 sec$

$d =$

$d = v_i t + \frac{1}{2} a t^2$

$d = 0 + \frac{1}{2}(1.2)(5)^2$

$d = 15m$

$v_f = v_i + at$

$= 0 + 1.2(5)$

$= 6 m/s$

$F_{Net} = -F_f$

$ma = -\mu \cdot F_N$

$125a = -0.16(125)(9.8)$

$a = -1.6 m/s^2$

$v_f = 0$

$v_i = 6 m/s$

$d =$

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

$0 = 6^2 + 2(-1.6)d$

$-36 = -3.2d$

$11.25m = d$

$26.25m$