Physics 2A
Fall 2018

ave. = 8.1
σ = 2.1

Name Answer Key

Lab: early late (please circle one)

Quiz #5: Applying Newton's Laws

Problem 1 (2 points)
A fireman is sliding down a fire pole. As he speeds up, he tightens his grip on the pole, thus increasing the frictional force the pole exerts on the fireman. When the frictional force equals the weight of the fireman, what happens?

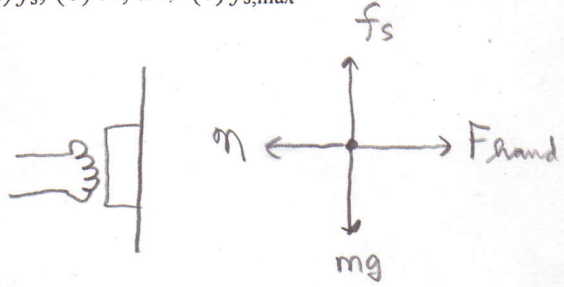
C

a) The fireman descends with slower and slower speed.
b) The fireman comes to a stop
c) The fireman continues to descend, but with constant speed.

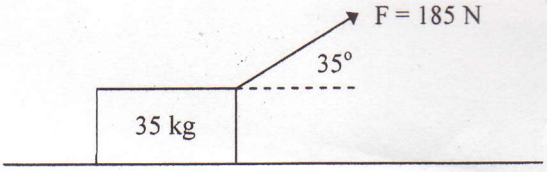
once $\sum \vec{F} = 0$, then $\vec{a} = 0$ and fireman descends at a constant velocity

Problem 2 (3 points)
Suppose that you press an apple crate against a wall so hard that the crate cannot slide down the wall. If you increase your push, what happens to (a) f_s, (b) N, and (c) $f_{s,max}$?

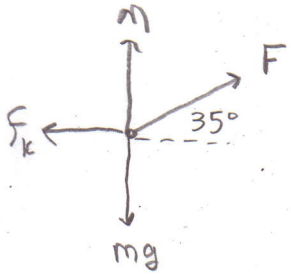
a) remain the same ($f_s = w$)
b) increase ($n = F_{hand}$)
c) increase ($f_{s,max} = \mu_s n$)

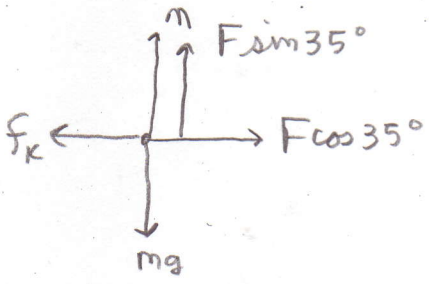


Problem 3 (5 points)
A 35 kg crate is being pulled to the right along a rough surface by a 185 N force acting at a 35° angle as shown in the figure. The coefficient of kinetic friction $\mu_k = 0.45$.



a) What is the normal force on the crate?





$\sum F_y = ma_y = 0$

$n + F\sin 35° - mg = 0$

$n = mg - F\sin 35°$

$n = (35\,kg)(9.80\,m/s^2) - (185\,N)\sin 35°$

$n = 237\,N$

b) What is the magnitude of the acceleration of the crate?

$\sum F_x = ma_x$

$F\cos 35° - f_k = ma_x$

$F\cos 35° - \mu_k n = ma_x$

$a_x = \dfrac{F\cos 35° - \mu_k n}{m}$

$a_x = \dfrac{(185\,N)\cos 35° - (0.45)(237\,N)}{(35\,kg)}$

$a_x = 1.3\,m/s^2$