ave. = 5.8
σ = 2.5

Physics 11
Spring 2026

Name Answer Key

Quiz #5: Applying Newton's Laws

Problem 1 (1.5 points)
Consider a person standing in an elevator that is moving upward with constant velocity. The upward normal force N exerted by the elevator floor on the person is

B

a) larger than
(b) identical to
c) smaller than

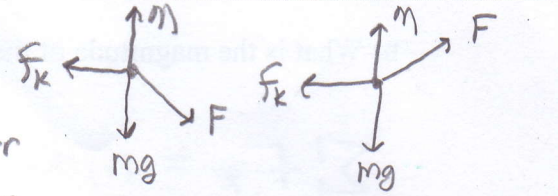
the downward weight w of the person.

$a_y = 0$ so $\Sigma F_y = 0$

$n - mg = 0$

$n = mg$

Problem 2 (1.5 points)
A person has a choice of either pushing or pulling a sled at constant velocity, as the drawing illustrates. Friction is present. If the angle θ is the same in both cases, does it require more force to push or pull? Account for your answer.



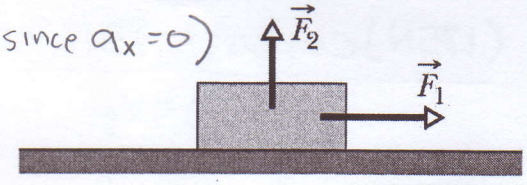
It requires more force to push. When you push, the normal force is greater so the force of friction is greater. When you pull, the normal force is less so $f_k = \mu_k n$ is less.

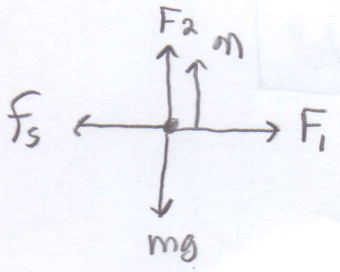
Problem 3 (3 points)
In the figure below, a horizontal force F_1 of magnitude 10 N is applied to a box on a floor, but the box does not slide. Then, as the magnitude of a vertically applied force F_2 is increased from zero but before the box begins to slide, do the following quantities increase, decrease, or remain the same: (a) the magnitude of the frictional force on the box; (b) the magnitude of the normal force on the box; (c) the maximum value $f_{s,\,max}$ of the static frictional force on the box?

a) remain the same ($f_s = F_1$ since $a_x = 0$)

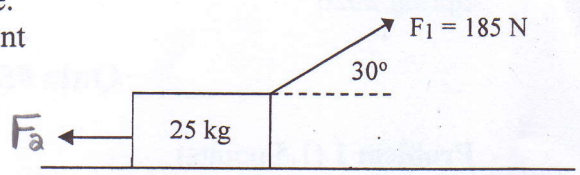
b) decreases (n decreases as F_2 increases)

c) decreases ($f_{s,max} = \mu_s n$ and n decreases)

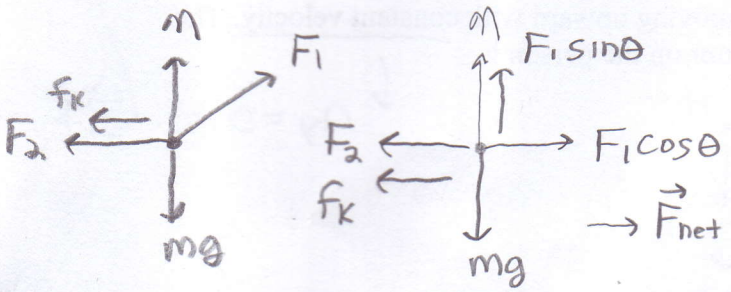




Problem 4 (4 points)
A 25 kg crate is being pulled to the right along a rough surface by a 185 N force acting at a 30° angle as shown in the figure. There is also a 95 N force acting to the left. Friction is present and the coefficient of kinetic friction is $\mu_k = 0.40$.



a) What is the normal force on the crate?



$$\sum F_y = ma_y = 0$$

$$n + F_1 \sin\theta - mg = 0$$

$$n = mg - F_1 \sin\theta$$

$$n = (25\,kg)(9.80\,m/s^2) - (185\,N)\sin 30°$$

$$n = 152.5\,N \rightarrow \boxed{n = 1.5 \times 10^2\,N}$$

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

$$\sum F_x = ma_x$$

$$F_1 \cos 30° - F_a - f_k = ma_x \qquad f_k = \mu_k n$$

$$a_x = \frac{F_1 \cos 30° - F_a - \mu_k n}{m}$$

$$a_x = \frac{(185\,N)\cos 30° - 95\,N - (0.40)(152.5\,N)}{25\,kg}$$

$$\boxed{a_x = 0.17\,m/s^2}$$