"Ganon's 7th Phantom"

Homework Wk #4 Due Thursday 9/19/19

Exam #1 Tuesday 9/24/19

Today's Topics

1. Forces
2. Examples

Laws of Motion Big Picture

1. **Changes in motion are caused by forces. No force, no change in velocity.**
2. **Net acceleration is directly caused by net force.**
3. **Forces arise from interactions. "It takes two to tango."**

Force Diagrams

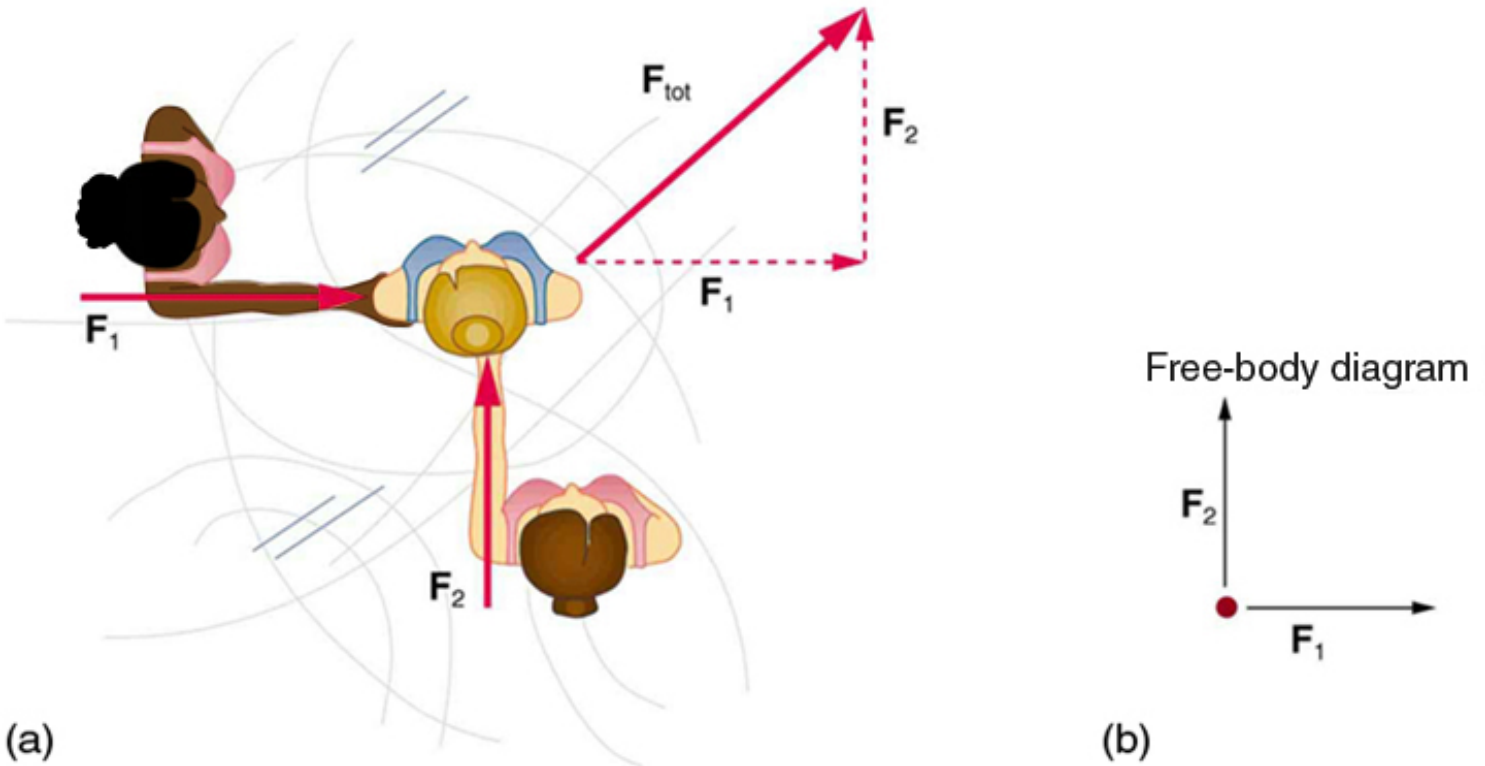

Figure: 7.1 Force Diagrams

Force Diagrams

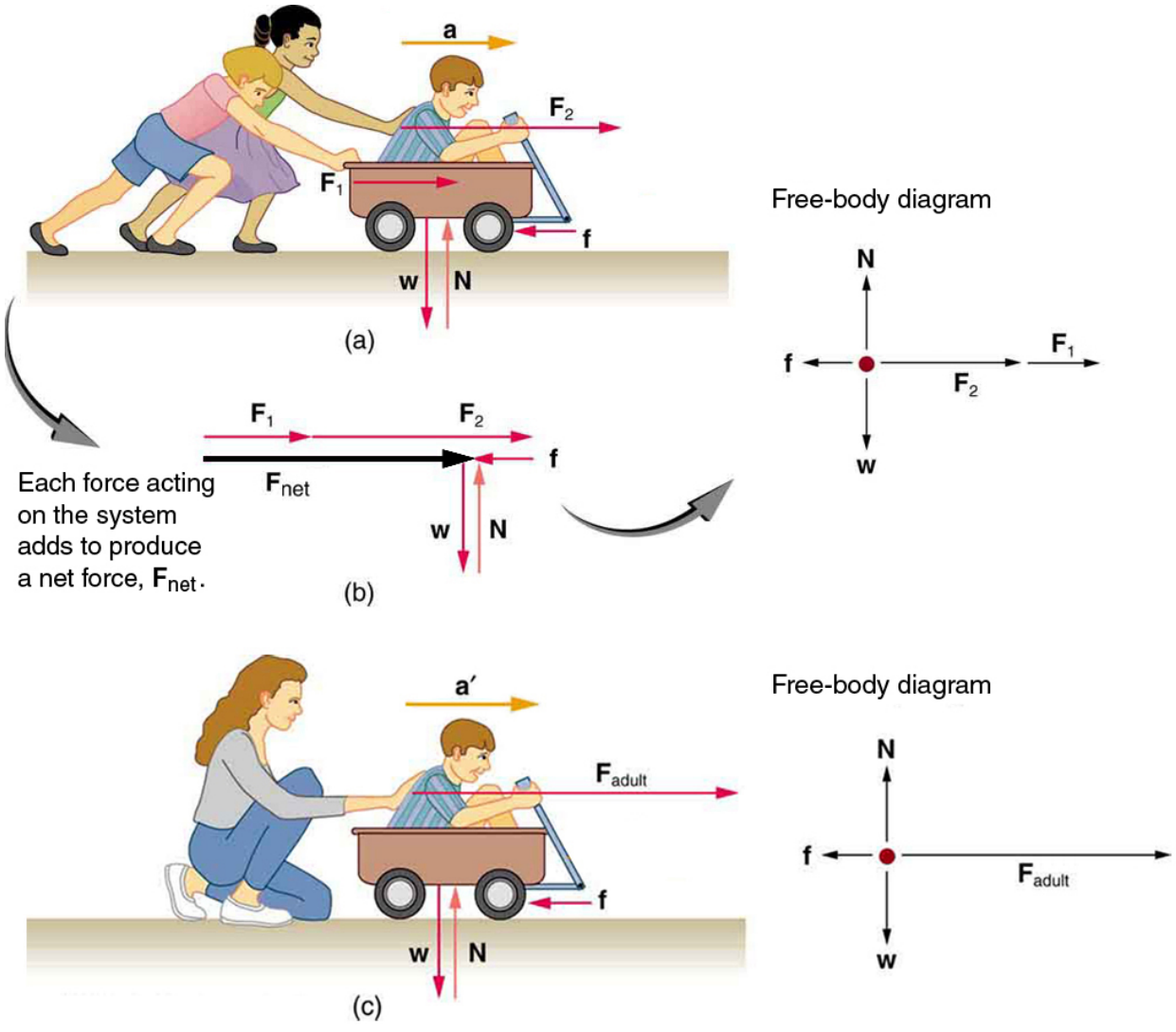

Figure: 7.2 Generating FBD's

Exercise #1

C&J 4.7.20 A $5.0\ kg$ rock and a $3.0 \times 10^4\ kg$ pebble are held near the surface of the earth.

a. Determine the magnitude of the gravitational force exerted on each by the earth.

b. Calculate the magnitude of the acceleration of each object when released.

Exercise #2

C&J 4.8.38 A $35.0\ kg$ crate rests on a horizontal floor, and a $65.0\ kg$ person is standing on the crate. Determine the magnitude of the normal force that

a. the floor exerts on the crate and

b. the crate exerts on the person.

Exercise #3

C&J 4.8.39 A $60.0\ kg$ crate rests on a level floor at a shipping dock. The coefficients of static and kinetic friction are 0.760 and 0.410, respectively. What horizontal pushing force is required to

a. just start the crate moving and

b. slide the crate across the dock at a constant speed?

Exercise #4

C&J 4.8.42 A woman stands on a scale in a moving elevator. Her mass is $60.0\ kg$, and the combined mass of the elevator and scale is an additional $815\ kg$. Starting from rest, the elevator accelerates upward. During the acceleration, the hoisting cable applies a force of $9410\ N$. What does the scale read during the acceleration?

Exercise #5

C&J 4.8.43 A car that has a mass $m = 1700\ kg$ is parked on a road that rises 15° above the horizontal. What are the magnitudes of

a. the normal force and

b. the static frictional force that the ground exerts on the tires?

Exercise #6

C&J 4.8.47 An $81.0\ kg$ baseball player slides into second base. The coefficient of kinetic friction between the player and the ground is 0.49.

a. What is the magnitude of the frictional force?

b. If the player comes to rest after $1.6\ s$, what was his initial velocity?

Exercise #7

C&J 4.8.57 A worker stands still on a roof sloped at an angle of 36° above the horizontal. He is prevented from slipping by a static frictional force of $390\ N$. Find the mass of the worker.

Exercise #8

C&J 4.AP.108 A skater with an initial speed of $7.60\ m/s$ stops propelling himself and begins to coast across the ice, eventually coming to rest. Air resistance is negligible.

a. The coefficient of kinetic friction between the ice and the skate blades is 0.100. Find the deceleration caused by kinetic friction.

b. How far will the skater travel before coming to rest?

Exercise #9

C&J 4.AP.116 As part a of the drawing shows, two blocks are connected by a rope that passes over a set of pulleys. One block has a weight of $412\ N$, and the other has a weight of $908\ N$. The rope and the pulleys are mass-less and there is no friction.

a. What is the acceleration of the lighter block?

b. Suppose that the heavier block is removed, and a downward force of $908\ N$ is provided by someone pulling on the rope, as part b of the drawing shows. Find the acceleration of the remaining block.

c. Explain why the answers in (a) and (b) are different.

Exercise #9

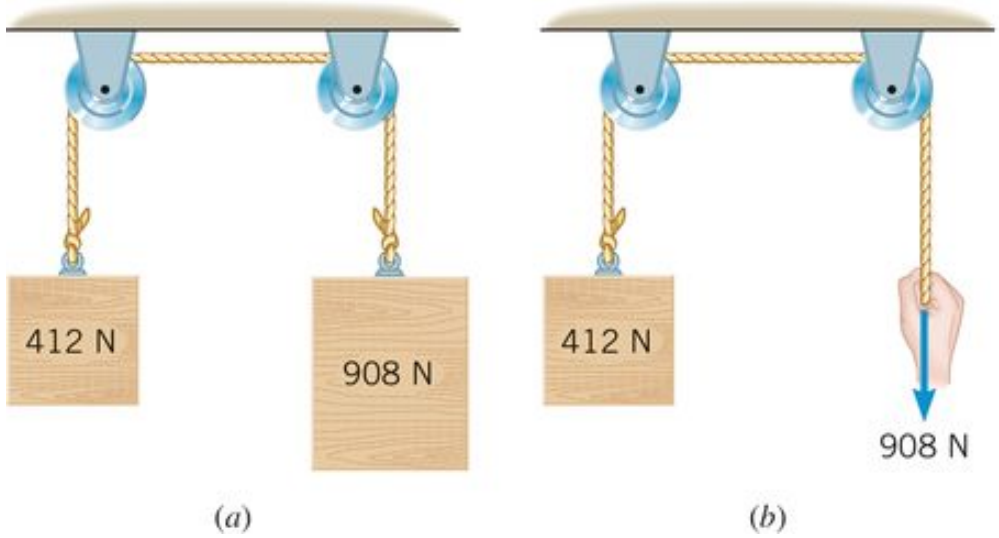

Figure: 7.3 Force, Inertia, &Acceleration

a. What is the acceleration of the lighter block?
b. Suppose that the heavier block is removed, and a downward force of $908\ N$ is provided by someone pulling on the rope, as part b of the drawing shows. Find the acceleration of the remaining block.
c. Explain why the answers in (a) and (b) are different.

Exercise #10

C&J 4.AP.117 The three objects in the drawing are connected by strings that pass over massless and friction-free pulleys. The objects move, and the coefficient of kinetic friction between the middle object and the surface of the table is 0.100.

a. What is the acceleration of the three objects?

b. Find the tension in each of the two strings.

Exercise #10

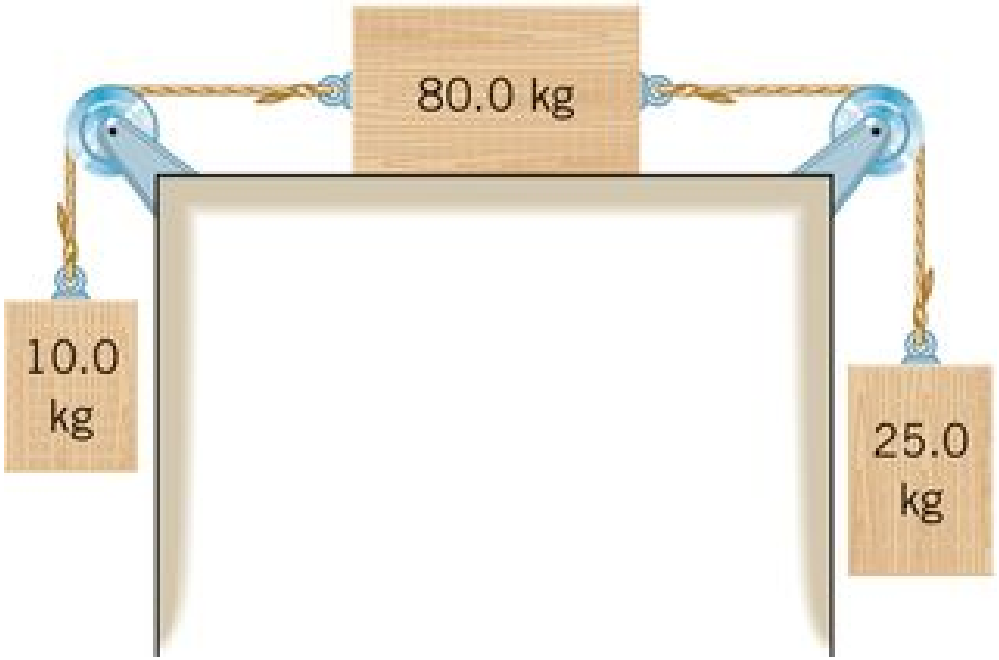

Figure: 7.4 Tension & Friction

a. What is the acceleration of the three objects?

b. Find the tension in each of the two strings.