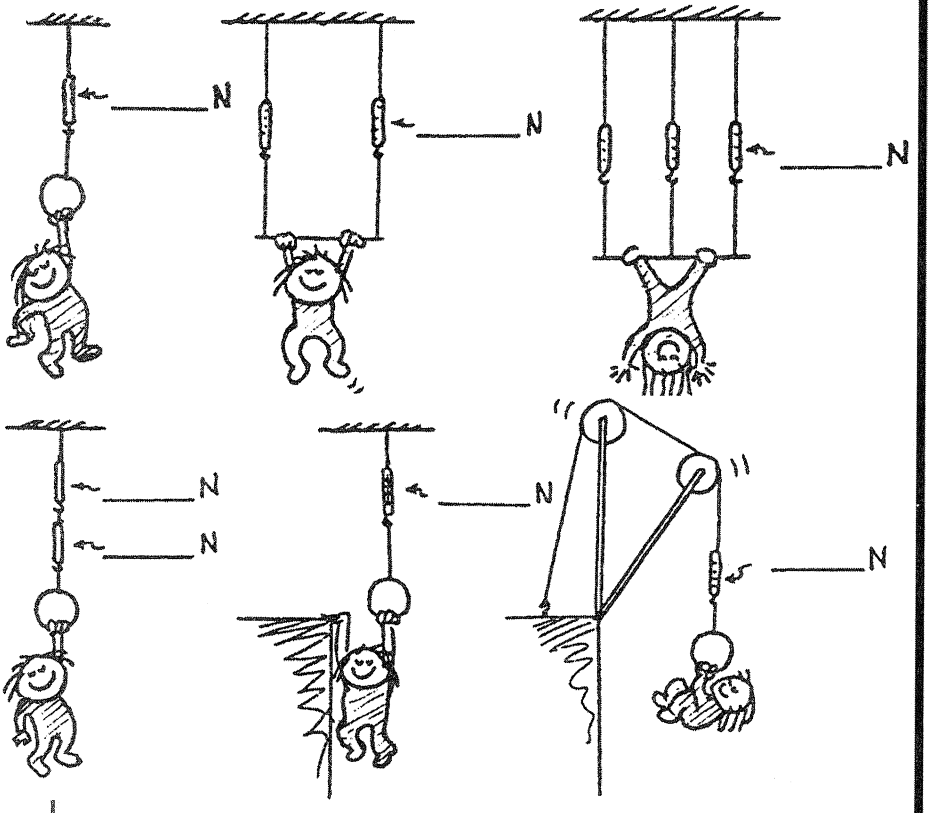
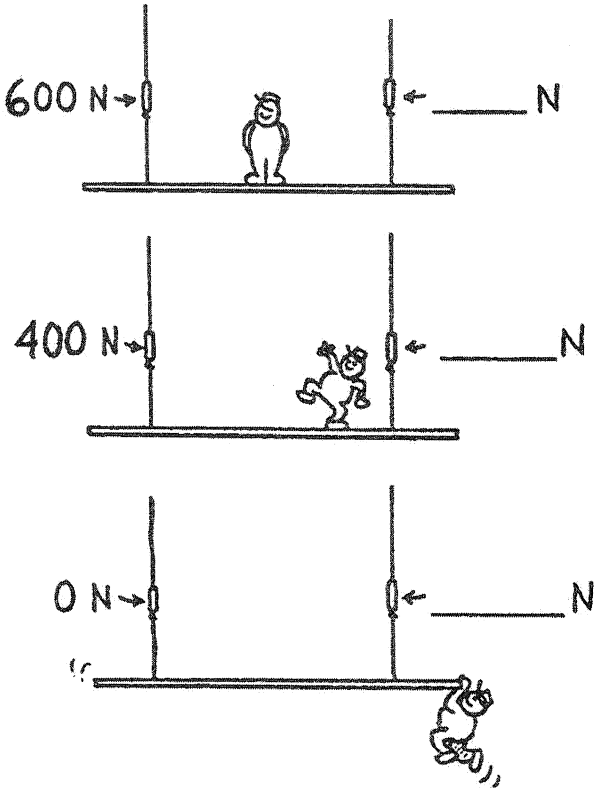
Name_____ Class_____ Date_____

Chapter 2 Newton's First Law of Motion

Static Equilibrium

1. Little Nellie Newton wishes to be a gymnast and hangs from a variety of positions as shown. Since she is not accelerating, the net force on her is zero. That is, $\Sigma F = 0$. This means the upward pull of the rope(s) equals the downward pull of gravity. She weighs 300 N. Show the scale reading(s) for each case.





2. When Burl the painter stands in the exact middle of his staging, the left scale reads 600 N. Fill in the reading on the right scale. The total weight of Burl and staging must be

   _____ N.

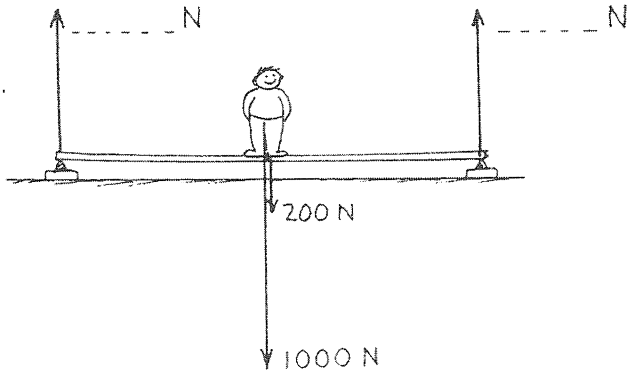
3. Burl stands farther from the left. Fill in the reading on the right scale.

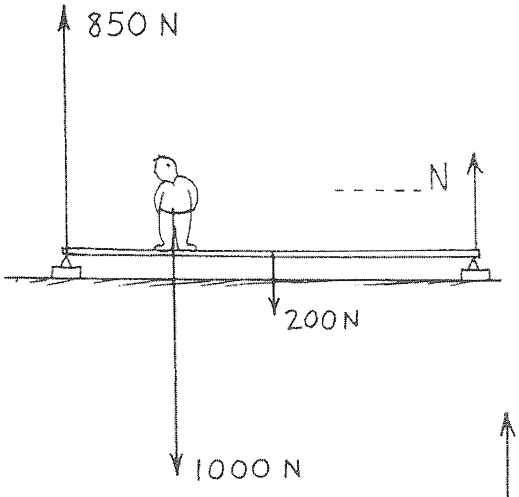
4. In a silly mood, Burl dangles from the right end. Fill in the reading on the right scale.

Chapter 2 Newton's First Law of Motion

The Equilibrium Rule: $\Sigma F = 0$

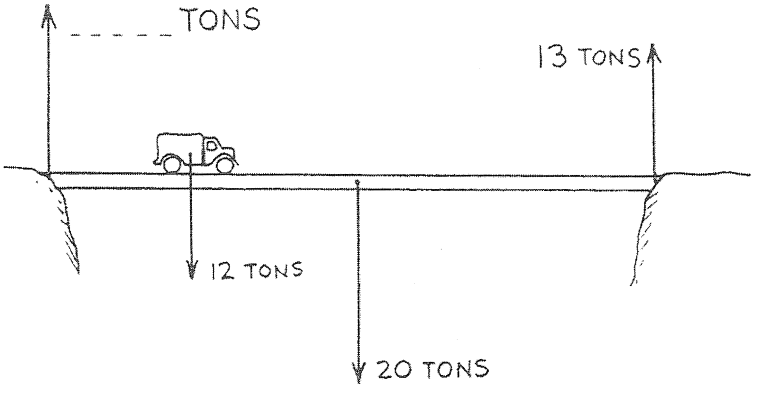
1. Manuel weighs 1000 N and stands in the middle of a board that weighs 200 N. The ends of the board rest on bathroom scales. (We can assume the weight of the board acts at its center.) Fill in the correct weight reading on each scale.



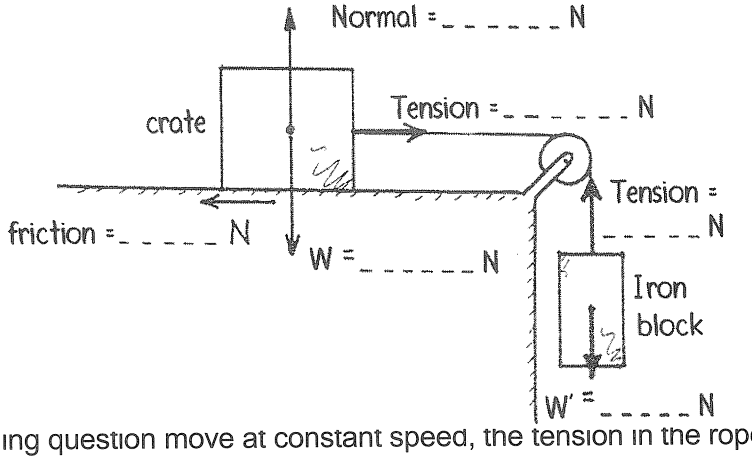


2. When Manuel moves to the left as shown, the scale closest to him reads 850 N. Fill in the weight for the right-hand scale.

3. A 12-ton truck is one-quarter the way across a bridge that weighs 20 tons. A 13-ton force supports the right side of the bridge as shown. How much support force is on the left side?



4. A 1000-N crate resting on a surface is connected to a 500-N block through a frictionless pulley as shown. Friction between the crate and surface is enough to keep the system at rest. The arrows show the forces that act on the crate and the block. Fill in the magnitude of each force.



5. If the crate and block in the preceding question move at constant speed, the tension in the rope

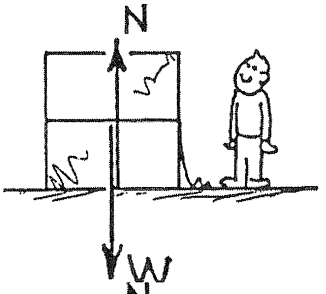
   [is the same] [increases] [decreases].

   The sliding system is then in [static equilibrium] [dynamic equilibrium].

Name_____ Class_____ Date_____

Chapter 3 Newton's Second Law of Motion—Force and Acceleration

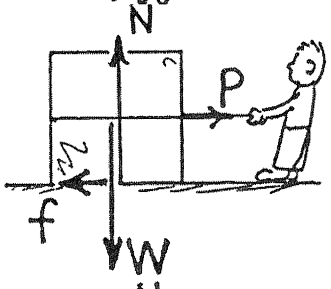
Friction



1. A crate filled with delicious junk food rests on a horizontal floor. Only gravity and the support force of the floor act on it, as shown by the vectors for weight **W** and normal force **N**.

   a. The net force on the crate is [zero] [greater than zero].

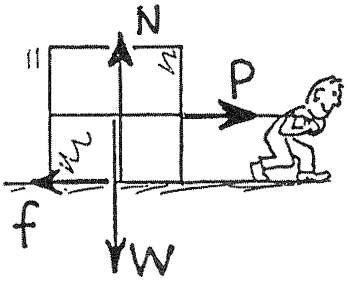
   b. Evidence for this is _____.



2. A slight pull **P** is exerted on the crate, not enough to move it. A force of friction **f** now acts,

   a. which is [less than] [equal to] [greater than] **P**.

   b. Net force on the crate is [zero] [greater than zero].

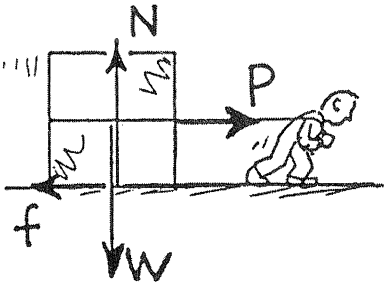


3. Pull **P** is increased until the crate begins to move. It is pulled so that it moves with constant velocity across the floor.

   a. Friction **f** is [less than] [equal to] [greater than] **P**.

   b. Constant velocity means acceleration is [zero] [more than zero]

   c. Net force on the crate is [less than] [equal to] [more than] zero



4. Pull **P** is further increased and is now greater than friction **f**.

   a. Net force on the crate is [less than] [equal to] [greater than] zero.

   b. The net force acts toward the right, so acceleration acts toward the [left] [right].

5. If the pulling force **P** is 150 N and the crate doesn't move, what is the magnitude of **f** ? _____

6. If the pulling force **P** is 200 N and the crate doesn't move, what is the magnitude of **f** ? _____

7. If the force of sliding friction is 250 N, what force is necessary to keep the crate sliding at constant velocity? _____

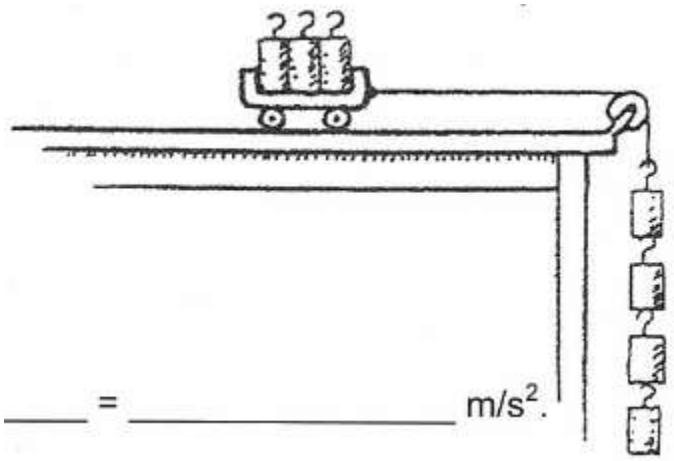
8. If the mass of the crate is 50 kg and sliding friction is 250 N, what is the acceleration of the crate when the pulling force is

   250 N? _____ 300 N? _____ 500 N? _____

Classwork (1st Law)

1. A physics book weighing 22 N is at rest on an inclined plane of 30°. It is in static equilibrium. Find the normal force and the friction acting on the book.
2. You pull a sled with a force of 70.0N at an angle 30° above the horizontal. Resolve your force into its horizontal and vertical components.
3. An object falls from a tree. Its weight is 4 N. The wind blows it to the right with 3 N. Find the net force on the object in
   a) < , > notation and
   b) magnitude and direction notation

Second Law



Classwork (2nd and 3rd Laws)

1. The forces acting on a sailboat are 120 N north and 50 N east. If the boat has a mass of 200 kg, what are the magnitude and direction of the boat's acceleration? Also write the acceleration as < , >
2. Compare the force of the bus on the bug and the force of the bug on the bug. Compare their accelerations.
3. What is the weight of the Earth with respect to you? Why is it that when you jump, you come down but the Earth does not go up?