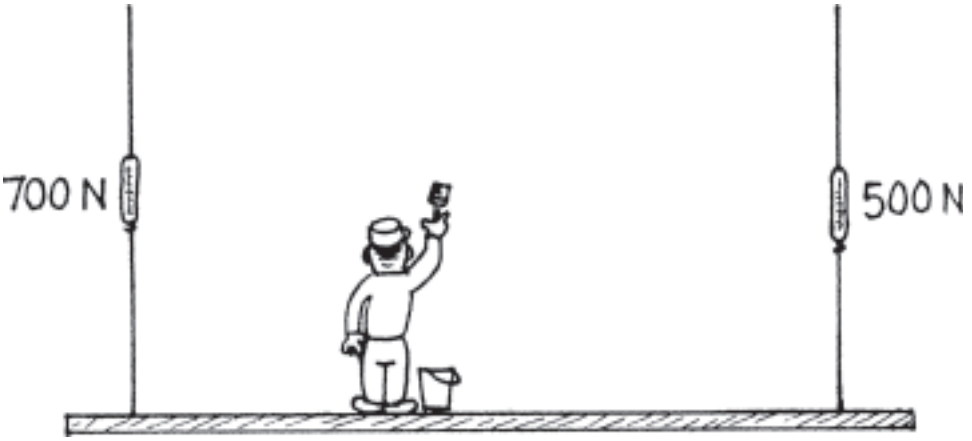
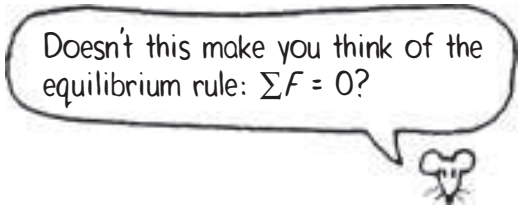
2-1 CONCEPTUAL PHYSICS
Next-Time Question

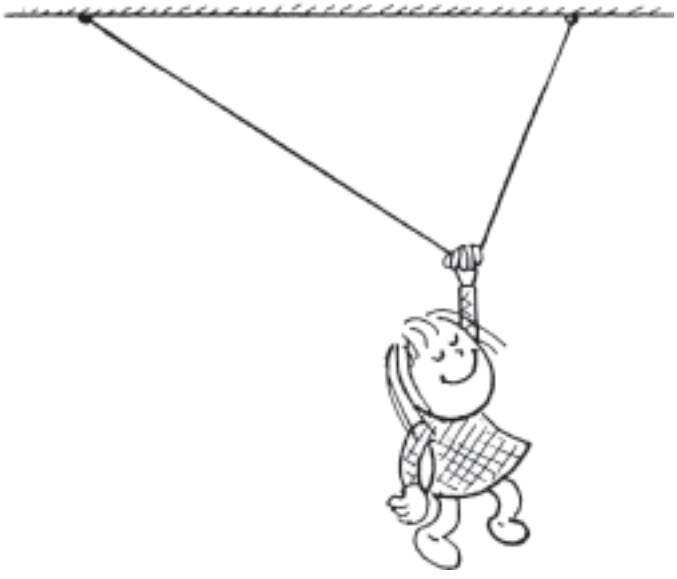


Note the readings on the scales. Burl the painter has a weight of 600 N, and carries a 100-N bucket of paint. What is the weight of the scaffold?



2-2 CONCEPTUAL PHYSICS
Next-Time Question

Nellie Newton hangs by one hand motionless from a clothesline as shown – which is on the verge of breaking. Which side of the line is most likely to break?



a) Left side

b) Right side

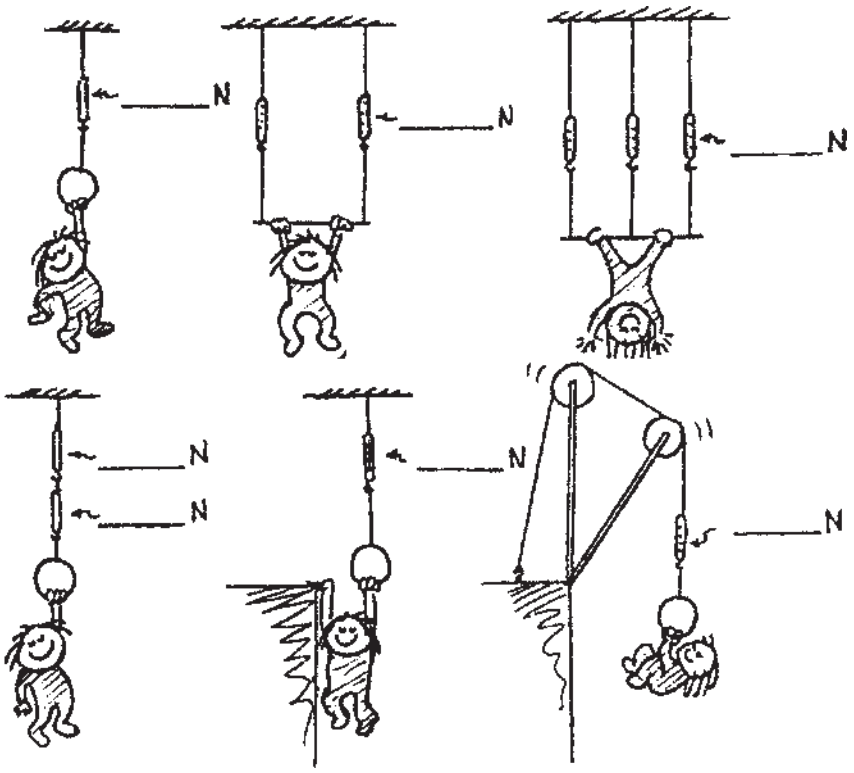
c) 50/50 chance of either side breaking

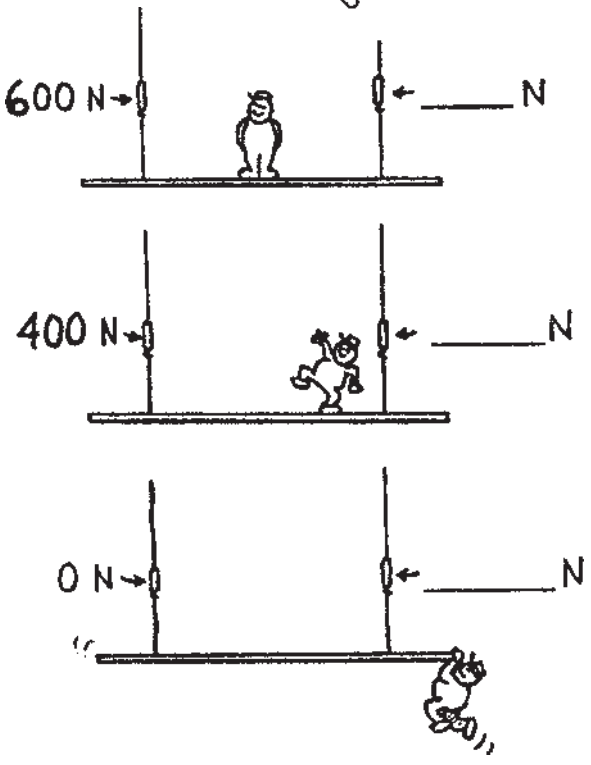
Name _____ Class _____ Date _____

Concept-Development Practice Page **2-1**

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, $\sum F = 0$. 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.

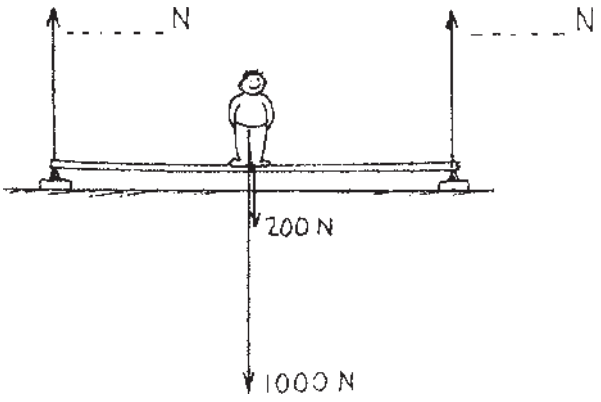
3. Burl stands farther from the left. Fill in the reading on the right scale.

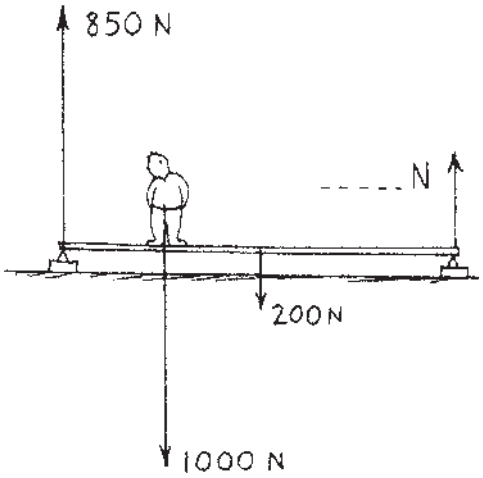
4. In a silly mood, Burl dangles from the right end. Fill in the reading on the right scale.

CONCEPTUAL PHYSICS

The Equilibrium Rule: $\Sigma F = 0$

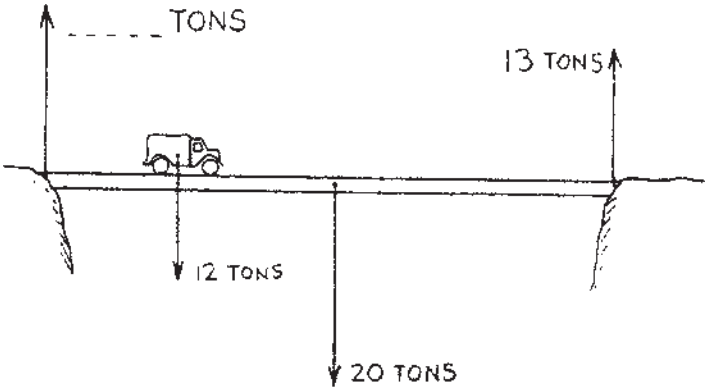
1. Manuel weighs 1000 N and stands in the middle of a board that weighs 200 N. The ends of the board rest on bathroom scales. (We can assume the weight of the board acts at its center.) Fill in the correct weight reading on each scale.



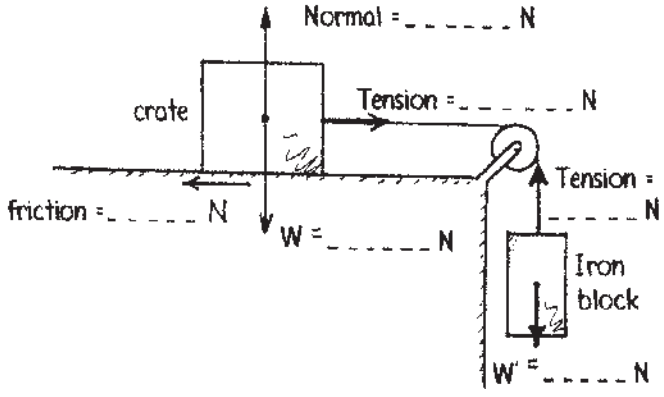


2. When Manuel moves to the left as shown, the scale closest to him reads 850 N. Fill in the weight for the far scale.

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).

The Equilibrium Rule

A painter stands on the middle of a board that is suspended at the ends by two vertical ropes. The painter and the board are in mechanical equilibrium. The tension in each rope is 350 N, and the painter's weight is 550 N. What is the weight of the board?

1. Read and Understand

What information are you given?

Tension in rope 1 = T_1 = 350 N

Tension in rope 2 = T_2 = 350 N

Weight of painter = W_1 = 550 N

2. Plan and Solve

What unknown are you trying to calculate?

Weight of the board = W_2 = ?

What mathematical equation can you use to calculate the unknown?

$\sum F = 0$

Determine the directions of all forces.

The tension in the ropes is upward. The weights of the painter and the board are downward.

Calculate the sum of the forces, being careful to use the correct signs.

$\sum F = 350\text{ N} + 350\text{ N} - 550\text{ N} - W_2 = 0$

$W_2 = 150\text{ N}$

3. Look Back and Check

Is your answer reasonable?

The sum of the upward forces is 700 N. The sum of the downward forces is 700 N. The answer is reasonable.

Math Practice

On a separate sheet of paper, solve the following problems.

1. Three vertical ropes hold up a board that weighs 180 N. What is the tension in each rope?

2. Suppose a painter weighing 700 N stands on the middle of a board suspended by two vertical ropes. If the weight of the board is 180 N, what is the tension in each rope?