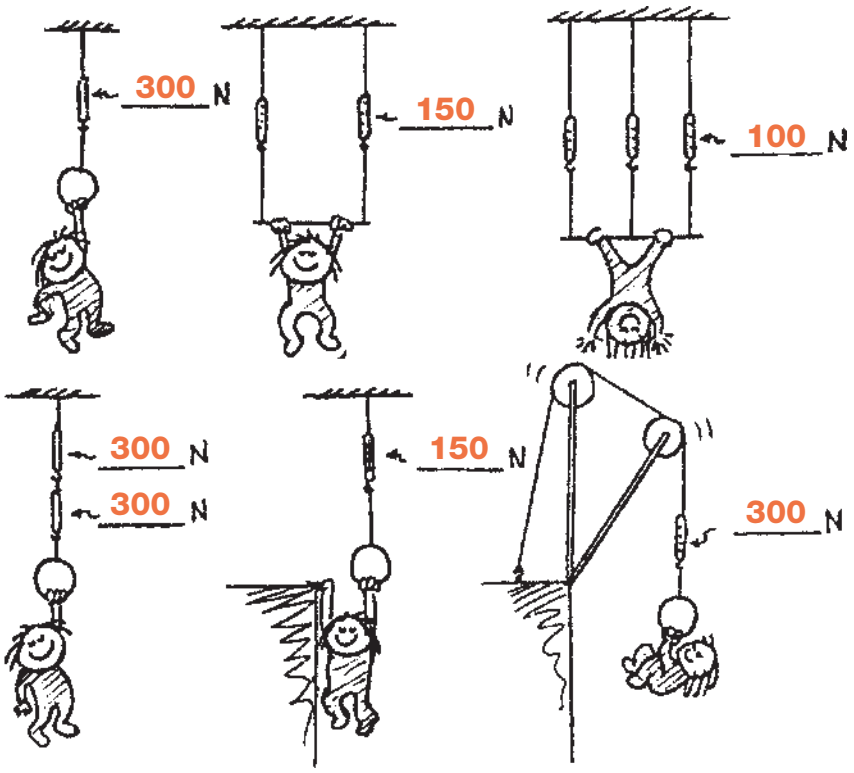
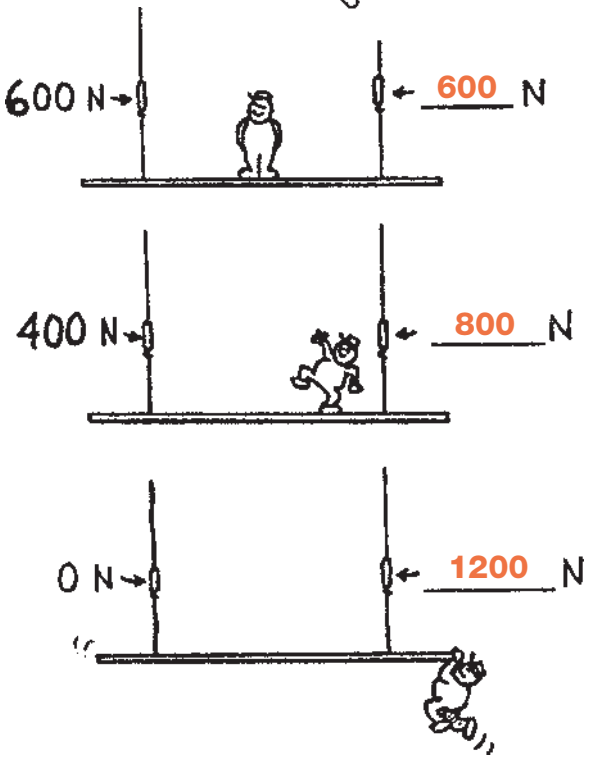
Name _____ Class _____ Date _____

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 1200 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

Name _____ Class _____ Date _____

Concept-Development Practice Page **4-2**

Hang Time

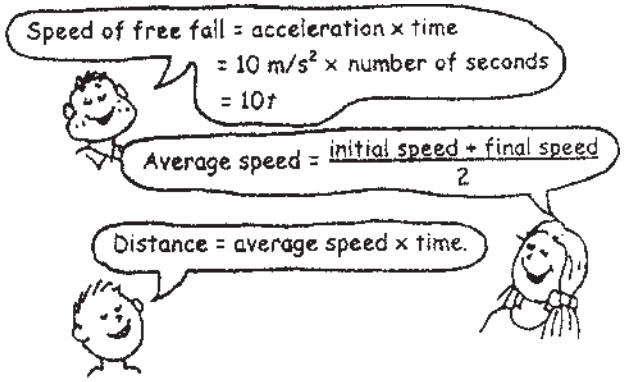
Some athletes and dancers have great jumping ability. When leaping, they seem to momentarily "hang in the air" and defy gravity. The time that a jumper is airborne with feet off the ground is called hang time. Ask your friends to estimate the hang time of the great jumpers. They may say two or three seconds. But surprisingly, the hang time of the greatest jumpers is most always less than 1 second! A longer time is one of many illusions we have about nature.

To better understand this, find the answers to the following questions:

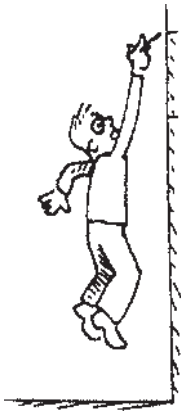
1. If you step off a table and it takes one-half second to reach the floor, what will be the speed when you meet the floor?
   $v = gt = 10\ \text{m/s}^2 \times \frac{1}{2}\ \text{s} = 5\ \text{m/s}$

2. What will be your average speed of fall?
   $v = \frac{0 + 5\ \text{m/s}}{2} = 2.5\ \text{m/s}$

3. What will be the distance of fall?
   $d = vt = 2.5\ \text{m/s} \times \frac{1}{2}\ \text{s} = 1.25\ \text{m}$



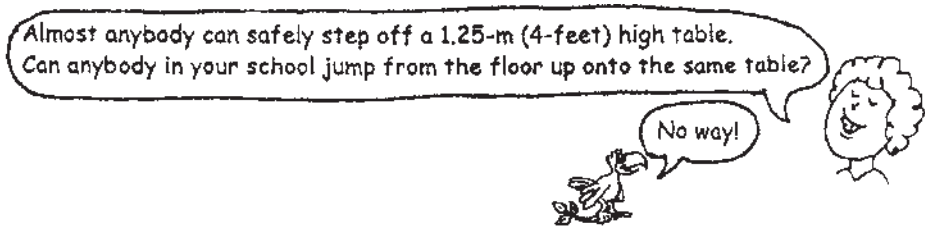
4. So how high is the surface of the table above the floor? 1.25 m

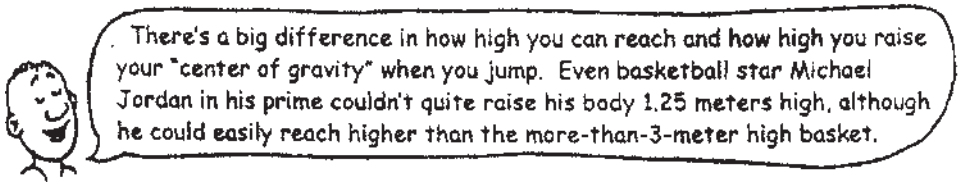


Jumping ability is best measured by a standing vertical jump. Stand facing a wall with feet flat on the floor and arms extended upward. Make a mark on the wall at the top of your reach. Then make your jump, and at the peak make another mark. The distance between these two marks measures your vertical leap. If it's more than 0.6 meters (2 feet), you're exceptional.

5. What is your vertical jumping distance? (varies)

6. Calculate your personal hang time using the formula $d = 1/2\ gt^2$. (Remember that hang time is the time that you move upward + the time you return downward.)





Here we're talking about vertical motion. How about running jumps? We'll see in Chapter 5 that the height of a jump depends only on the jumper's vertical speed at launch. While airborne, the jumper's horizontal speed remains constant while the vertical speed undergoes acceleration due to gravity. While airborne, no amount of leg or arm pumping or other bodily motions can change your hang time.

CONCEPTUAL PHYSICS