Chapter 4 problems - Draw the force diagram for each of the problems in addition to finding the correct solutions.

p93 6, 7, 8 | p97 15, 16, 17 | p100 20 | p106 32, 33

End of Chapter pages 113+:   61, 63, 64, 68, 70, 74, 76, 77, 79, 84, 85, 86, 87, 88, 92

6. Two horizontal forces, 225 N and 165 N, are exerted on a canoe. If these forces are applied in the same direction, **find the net horizontal force on the canoe.**

7.   If the same two forces as in the previous problem are exerted on the canoe in opposite directions, **what is the net horizontal force on the canoe?** *Be sure to indicate the direction of the net force.*

8. Three confused sleigh dogs are trying to pull a sled across the Alaskan snow. Alutia pulls east with a force of 35 N, Seward also pulls east but with a force of 42 N, and big Kodiak pulls west with a force of 53 N. **What is the net force on the sled?**

15. You place a watermelon on a spring scale at the supermarket. If the mass of the watermelon is 4.0 kg, **what is the reading on the scale?**

16. Kamaria is learning how to ice-skate. She wants her mother to pull her along so that she has an acceleration of 0.80 m/s^2.   If Kamaria's mass is 27.2 kg, with **what force does her mother need to pull her?** *(Neglect any resistance between the ice and Kamaria's skates.)*

17. Taru and Reiko simultaneously grab a 0.75-kg piece of rope and begin tugging on it in opposite directions. If Taru pulls with a force of 16.0 N and the rope accelerates away from her at 1.25 m/s^2, **with what force is Reiko pulling?**

Real and Apparent Weight Your mass is 75.0 kg, and you are standing on a bathroom scale in an elevator. Starting from rest, the elevator accelerates upward at 2.00 m/s^2 for 2.00 s and then continues at a constant speed. Is the scale reading during acceleration greater than, equal to, or less than the scale reading when the elevator is at rest?
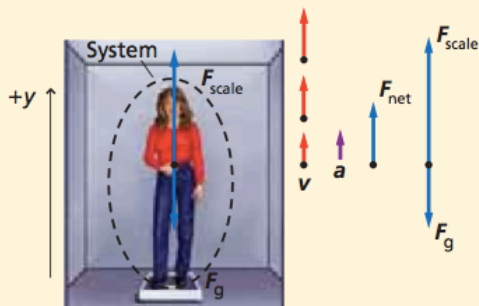
1 Analyze and Sketch the Problem

- Sketch the situation.
- Choose a coordinate system with the positive direction as upward.
- Draw the motion diagram. Label **v** and **a**.
- Draw the free-body diagram. The net force is in the same direction as the acceleration, so the upward force is greater than the downward force.

Known:	Unknown:
$m = 75.0$ kg	$F_{scale} = ?$
$a = 2.00$ m/s^2	
$t = 2.00$ s	
$g = 9.80$ N	

20. Use the results from Example Problem 2 to answer questions about a scale in an elevator on Earth. **What force would be exerted by the scale on a person in the following situations?**

a. The elevator moves at constant speed.

b. It slows at 2.00 m/s^2 while moving upward.

c. It speeds up at 2.00 m/s^2 while moving downward.
d. It moves downward at constant speed.
e. It slows to a stop at a constant magnitude of acceleration.

32. You are helping to repair a roof by loading equipment into a bucket that workers hoist to the rooftop. If the rope is guaranteed not to break as long as the tension does not exceed 450 N and you fill the bucket until it has a mass of 42 kg, **what is the greatest acceleration that the workers can give the bucket** as they pull it to the roof?

33. Diego and Mika are trying to fix a tire on Diego's car, but they are having trouble getting the tire loose. When they pull together, Mika with a force of 23 N and Diego with a force of 31 N, they just barely get the tire to budge. **What is the magnitude of the strength of the force between the tire and the wheel?**

61. A car of mass 2300 kg slows down at a rate of 3.0 m/s^2 when approaching a stop sign. What is the **magnitude of the net force causing it to slow down?**

63. What is your weight in Newtons?

64. Your new motorcycle weighs 2450 N. What is its mass in kilograms?

68. A 873-kg dragster, starting from rest, attains a speed of 26.3 m/s in 0.59 s.

   a.   **Find the acceleration** of the dragster during this time interval.

   b.   What is the **magnitude of the net force** on the dragster during this time?

   c.   Assume that the driver has a mass of 68 kg. What horizontal **force does the seat exert on the driver**?

70. A grocery sack can withstand a maximum of 230 N before it rips. Will a bag holding 15 kg of groceries that is lifted from the checkout counter at an acceleration of 7.0 m/s^2 hold (**what is the maximum acceleration that the bag can hold**)?

74. A race car has a mass of 710 kg. It starts from rest and travels 40.0 m in 3.0 s. The car is uniformly accelerated during the entire time. What net force is exerted on it?

76. Rain A raindrop, with mass 2.45 mg, falls to the ground. As it is falling, what magnitude of force does it exert on Earth?

77. A 90.0-kg man and a 55-kg man have a tug-of-war. The 90.0-kg man pulls on the rope such that the 55-kg man accelerates at 0.025 m/s^2. What force does the rope exert on the 90.0-kg man?

79. A 4500-kg helicopter accelerates upward at 2.0 m/s^2. What lift force is exerted by the air on the propellers?

84. Suppose a 65-kg boy and a 45-kg girl use a massless rope in a tug-of-war on an icy, resistance-free surface as in Figure 4-21. If the acceleration of the girl toward the boy is 3.0 m/s^2, find the magnitude of the acceleration of the boy toward the girl.

?   3.0 m/s^2
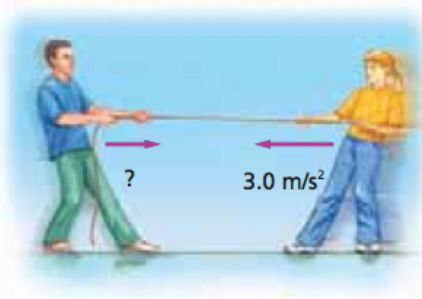
■ Figure 4-21

85. Pratish weighs 588 N and is weightless in a space station. If she pushes off the wall with a vertical acceleration of 3.00 m/s^2, determine the force exerted by the wall during her push off.

86. Baseball As a baseball is being caught, its speed goes from 30.0 m/s to 0.0 m/s in about 0.0050 s. The mass of the baseball is 0.145 kg.

    a.   What is the baseball's acceleration?

    b.   What are the magnitude and direction of the force acting on it?

    c.   What are the magnitude and direction of the force acting on the player who caught it?

87. Air Hockey An air-hockey table works by pumping air through thousands of tiny holes in a table to support light pucks. This allows the pucks to move around on cushions of air with very little resistance. One of these pucks has a mass of 0.25 kg and is pushed along by a 12.0-N force for 9.0 s.

a. What is the puck's acceleration?

 b. What is the puck's final velocity?

88. A student stands on a bathroom scale in an elevator at rest on the 64th floor of a building. The scale reads 836 N.

     a.   As the elevator moves up, the scale reading increases to 936 N. Find the acceleration of the elevator.

     b.   As the elevator approaches the 74th floor, the scale reading drops to 782 N. What is the acceleration of the elevator?

     c.   Using your results from parts a and b, explain which change in velocity, starting or stopping, takes the longer time.

92. Two blocks, one of mass 5.0 kg and the other of mass 3.0 kg, are tied together with a massless rope as in Figure 4-24. This rope is strung over a massless, resistance-free pulley. The blocks are released from rest. Find the following.

a. the tension in the rope
b. the acceleration of the blocks

3.0 kg

5.0 kg

■ Figure 4-24