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.

   SOLUTION:

   $\boldsymbol{F_{net} = 225\ N + 165\ N = 3.90 \times 10^2\ N}$ **in the direction of the two forces**

   ANSWER:

   $\boldsymbol{F_{net} = 3.90 \times 10^2\ N}$ **in the direction of the two forces.**

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.

   SOLUTION:

   $\boldsymbol{F_{net} = 225\ N - 165\ N = 6.0 \times 10^1\ N}$ **in the direction of the larger force.**

   ANSWER:

   $\boldsymbol{F_{net} = 6.0 \times 10^1\ N}$ **in the direction of the larger force.**

8. **Challenge** Three confused sled 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?

   SOLUTION:

   Identify east as positive and the sled as the system.

   $$\boldsymbol{F_{net} = F_{\text{Alutia on sled}} + F_{\text{Seward on sled}} - F_{\text{Kodiak on sled}}}$$
   $$\boldsymbol{= 35\ N + 42\ N - 53\ N}$$
   $$\boldsymbol{= 24\ N}$$

   $\boldsymbol{F_{net} = 24\ N}$ **east**

   ANSWER:

   $\boldsymbol{F_{net} = 24\ N}$ **east**

9. A spring scale is used to exert a net force of 2.7 N on a cart. If the cart's mass is 0.64 kg, what is the cart's acceleration?

SOLUTION:

$$F_{net} = ma$$

$$a = \frac{F_{net}}{m}$$

$$= \frac{2.7\ \text{N}}{0.64\ \text{kg}}$$

$$= 4.2\ \text{m/s}^2$$

ANSWER:

$\boldsymbol{a = 4.2\ \text{m/s}^2}$

10. 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.)

SOLUTION:

$\boldsymbol{F_{net} = ma = (27.2\ \text{kg})(0.80\ \text{m/s}^2) = 22\ \text{N}}$

ANSWER:

$\boldsymbol{F_{net} = 22\ \text{N}}$

11. **Challenge** Two horizontal forces are exerted on a large crate. The first force is 317 N to the right. The second force is 173 N to the left.

a. Draw a force diagram for the horizontal forces acting on the crate.
b. What is the net force acting on the crate?
c. The box is initially at rest. Five seconds later, its velocity is 6.5 m/s to the right. What is the crate's mass?

SOLUTION:

a.

b.

$$F_{net} = F_{right} - F_{left}$$

$$= 317\ \text{N} - 173\ \text{N}$$

$$= 144\ \text{N}$$

c. First, find the average acceleration.

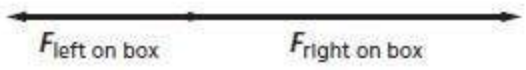
$$\bar{a} = \frac{\Delta v}{\Delta t}$$
$$= \frac{v_f - v_i}{t_f - t_i}$$
$$= \frac{6.5\ \text{m/s} - 0\ \text{m/s}}{5\ \text{s} - 0\ \text{s}}$$
$$= 1.3\ \text{m/s}^2$$

Then use the average acceleration to find the mass.

$$F_{net} = ma$$
$$m = \frac{F_{net}}{a}$$
$$= \frac{144\ \text{N}}{1.3\ \text{m/s}^2}$$
$$= 111\ \text{kg}$$

ANSWER:

a.



b. F_{net} **= 144 N**

c. $\bar{a}$ **= 111 kg**

Section 2 Weight and Drag Force: Practice Problems

16. You place a watermelon on a spring scale calibrated to measure in newtons. If the watermelon's mass is 4.0 kg, what is the scale's reading?

SOLUTION:

The scale reads the weight of the watermelon: $F_g = mg$ **= (4.0 kg)(9.8 N/kg) = 39 N**

ANSWER:

F_{net} **= 39 N**

17. You place a 22.50-kg television on a spring scale. If the scale reads 235.2 N, what is the gravitational field at that location?

SOLUTION:

$$F_g = mg$$

$$g = \frac{F_g}{m}$$

$$= \frac{235.2\ \text{N}}{22.50\ \text{kg}}$$

$$= 10.5\ \text{N/kg}$$

ANSWER:

g = 10.5 N/kg

18. A 0.50-kg guinea pig is lifted up from the ground. What is the smallest force needed to lift it? Describe the particular motion resulting from this minimum force.

SOLUTION:

$F_{lift} = F_g$
$= mg$
$= (0.50\ \text{kg})(9.8\ \text{N/kg})$
$= 4.9\ \text{N}$
It would move at a constant speed.

ANSWER:

F_{lift} = 4.9 N. It would move at a constant speed.

19. **Challenge** 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?

SOLUTION:

Use Newton's second law $F_{net} = ma$.
If F_{bag} on groceries > 230 N, then the bag rips.
$F_{net} = F_{bag}$ on groceries + F_g
F_{bag} on groceries = $F_{net} - F_g$
$= (15\ \text{kg})(7.0\ \text{m/s}^2) - (15\ \text{kg})(-9.8\ \text{N/kg})$
$= 105\ \text{N} + 147\ \text{N}$
$= 252\ \text{N}$
The bag does not hold.

ANSWER:

The bag does not hold.