

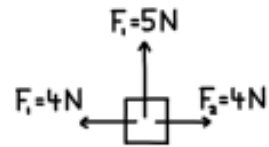
Net Force

1. Determine the net force. Be sure to indicate both the magnitude and direction.

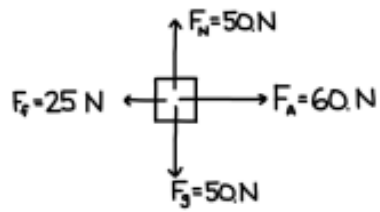
a) $F_{\text{net}} = 2 \text{ N}$



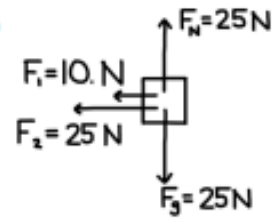
b)



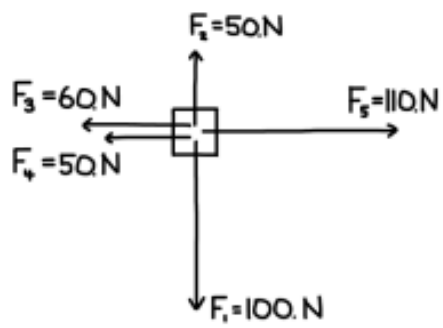
c)



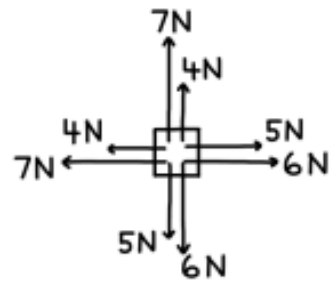
d)



e)



f)

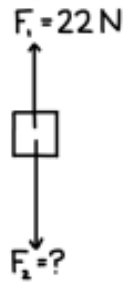


2. Determine the unknown force.

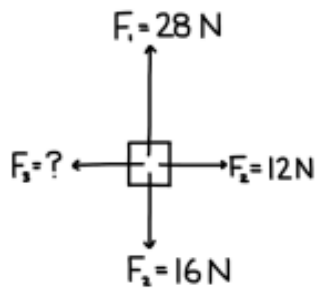
a) $F_{\text{net}} = 3 \text{ N Right}$



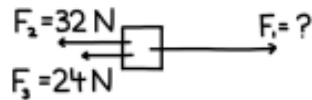
b) $F_{\text{net}} = 10. \text{ N Down}$



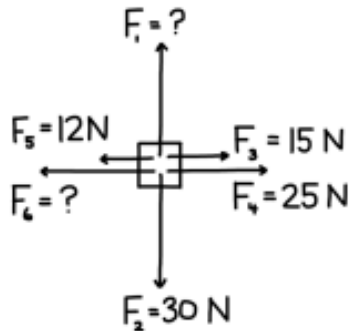
c) $F_{\text{net}} = 12 \text{ N Up}$



d) $F_{\text{net}} = 10. \text{ N Right}$



e) $F_{\text{net}} = 0$



f) $F_{\text{net}} = 2 \text{ N Right}$
(add vectors as needed)



Newton's Second Law

1. Ryan pushes a 10.0 kg box on a frictionless horizontal floor, accelerating it horizontally at 8.5 m/s^2 .

What force is he applying?

2. Ryan pushes a 10.0 kg box across a horizontal cement floor with a force of 85 N . There is a frictional force of $20. \text{ N}$ opposing the motion.

What is the acceleration of the box?

3. Ryan pushes a 10.0 kg box across a smoother horizontal floor with a force of 85 N. The box accelerates at 7.5 m/s^2 .

What is the force of friction between the floor and the box?

4. A 3.0 kg ball is falling towards Earth while experiencing air resistance of 6.0 N.

What is the ball's acceleration?

5. A 40.0 kg box is being pushed along the ground with a force of 550 N.

a) Assuming there is no friction, determine the acceleration of the box.

b) Now assume there is a force of friction that equals 80.0 N. What is the acceleration of the box now?

6. A $2.4 \times 10^5 \text{ kg}$ rocket is accelerated upwards with a thrust of $5.0 \times 10^6 \text{ N}$.

Determine the acceleration of the rocket. (Neglect air resistance)

7. As they are skating, Jason gives Ajay a push with a force of 120 N. As he is being pushed, Ajay accelerates at 1.5 m/s^2 . (Assume there is no friction)

a) What is Ajay's mass?

b) What is Ajay's weight?

c) Describe Ajay's motion once Jason stops pushing him.

8. A pair of pants with a mass of 0.80 kg falls off a clothesline. If there is a constant air resistance of 4.0 N,

determine the acceleration of the pants.

9. The "Hellevator" ride at Playland exerts an upwards force on a 50.0 kg rider, causing her to accelerate upwards at 15 m/s^2 .

What force is the ride exerting on the rider?

10. Two friends are pulling a 75 kg sled across a frozen pond on a windy day. Amy pulls with 175 N and Naomi pulls with 125 N in the same direction.

There is a frictional force of 140 N, and the wind pushes back on the sled with a force of 120 N.

What is the sled's acceleration?

11. As Angus pushes a 450 kg crate across a floor with a force of 1500 N, Scott hinders his progress by pushing in the opposite direction with a force of 300 N.

If the box accelerates at 0.30 m/s^2 , determine the force of friction on the crate.

Friction

1. A 80.0 kg table is pushed across the floor with a force of 500 N. If the coefficient of kinetic friction is 0.40, what is the acceleration of the table?

2. A 0.50 kg book is pushed across a table from rest. If the book does not move until more than 3.25 N of force is applied, what is the coefficient of static friction?

3. A 150 kg refrigerator is pushed at a constant velocity across a floor. If the coefficient of kinetic friction is 0.55, determine the applied force.
4. The coefficient of static friction between a 5.0 kg cardboard box and a tiled floor is 0.30. The coefficient of kinetic friction between the same two surfaces is 0.23.
- How much force is required to move the box from rest?
 - How much force is required to move the box at a constant velocity?
5. Sophia is sliding a cone on the ice with a force of 15 N. If the coefficient of friction is 0.18 and the acceleration of the cone is 1.2 m/s^2 , what is the mass of the cone?
6. Matthew wants to push a 12.0 kg chair to his desk. The coefficient of kinetic friction is 0.45.
- If Matthew pushes the chair with a force of 120 N, determine the acceleration of the chair.
 - As Matthew continues to push the chair with a 120 N force, his classmate Luke applies a 45 N force in the opposite direction. What is the acceleration of the chair now?
 - Instead, Luke decides to apply a 45 N force downwards. Determine the acceleration of the chair. (Hint: be sure to determine F_N first)
7. A car is moving at a speed of 80 km/h. If the coefficient of kinetic friction between the tires and the road is 0.80, determine how long the car takes to stop when it slams on the brakes.
8. An NHL hockey puck weighs about 0.16 kg. It is shot from one side of the rink to the other side 60 m away. It begins travelling at a speed of 15 m/s across the ice and hits the other side 4.5 seconds later. Determine the coefficient of kinetic friction between the ice and the puck.