

Part A: Concepts

1. A hockey puck slides east across the ice. The net force on it is 0 N. Marisol says the puck must be slowing down and will stop soon. Is she right? Explain using the net force.
2. Two forces act on a box: 12 N and 7 N. Without knowing their directions, what is the **largest** net force they could make, and what is the **smallest**? Describe the direction of the forces in each case.

Part B: Finding the Net Force

Choose a positive direction, give each force a sign, and add. State the size and direction of the net force.

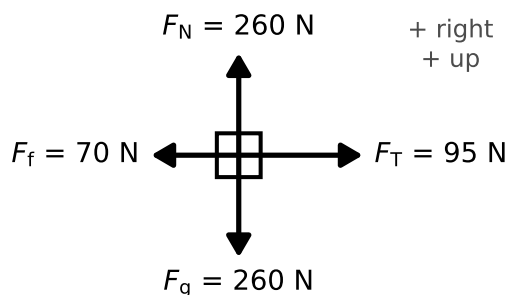
3. Three movers slide a piano across a stage. Two push it east with 180 N and 225 N. The third, who forgot which way to go, pushes it west with 60 N. Friction on the piano is 310 N west. Find the net force on the piano.
4. A hot-air balloon is tied down at a festival. When the ropes are released, the buoyant force and gravity are the only forces on it, as shown. Find the net force on the balloon. What happens to it?

$$F_B = 12,600 \text{ N}$$



$$F_g = 11,900 \text{ N}$$

5. The free-body diagram shows the forces on a sled being pulled across snow.



- Write the horizontal net force equation using symbols, then solve it.
- Write the vertical net force equation using symbols, then solve it.
- The sled starts at rest. Describe its motion.

6. Each row describes a cart that is already moving. For each cart, find the net force (size and direction) and decide whether the cart speeds up, slows down, or keeps a constant velocity.

Cart	Moving	Forces on the cart	Net force	Motion
A	east	40 N east, 40 N west		
B	east	55 N east, 70 N west		
C	west	30 N east, 18 N west		
D	west	25 N west, 10 N east		

7. Jordan's big dog pulls west on its leash with 165 N, and Jordan pulls east on the leash with only 140 N. Jordan's friend grabs the leash and also pulls east. Now the leash stays still. How hard is the friend pulling? (Treat the leash as the object.)