

Finding Net Forces

A force is a push or a pull. Forces are measured in Newtons (N) in the metric system. More than one force can act on an object at a time. The net force is the combination of all the forces acting on an object. For forces acting in the same direction, the net force is the sum of the forces. For forces acting in opposite directions the net force is the difference between of the forces. If the forces are equal and opposite, the net force is zero. Forces acting at right angles form a net or *resultant* force that is the hypotenuse of a right triangle with the two forces as the sides. The size of the force can be determined by the Pythagorean theorem ($a^2 + b^2 = c^2$).



Sample Problems:

Problem 1

What is the resultant force on an object when it is acted on by three forces; 2 N east, 5 N west, and 4 N east.

Step 1: Add the forces that are acting in the same direction.

$$2 \text{ N east} + 4 \text{ N east} = 6 \text{ N east}$$

Step 2: Subtract the forces that are in the opposite direction. (*NOTE:* The net force is in the direction of the larger force.)

$$6 \text{ N east} - 5 \text{ N west} = 1 \text{ N east}$$

Problem 2

What is the net force on an object when it is acted on by a force of 1.5 N east and 2 N south.

Step 1: Apply the Pythagorean theorem

$$c^2 = (1.5)^2 + (2)^2 = 2.25 + 4 = 6.25$$

Step 2: Find the square root

$$c = \sqrt{c^2} = \sqrt{6.25} = 2.5 \text{ N southeast}$$

Answer the questions below based on your reading and on the sample problems above. SHOW YOUR WORK.

1. A body builder bench presses a 980 N barbell with an upward force of 1050 N . What is the net force on the barbell? (*HINT:* Don't forget that the downward force of gravity is the barbell's weight.)
2. Two football players grab hold of a football. One pulls the ball north with a force of 600 N . The other pulls the ball east with a force of 800 N . What is the net force on the football?
3. Two workers push on a crate, one with a force of 550 N east, and the other with a force of 720 N east. The crate is held in place by a spring that pulls west with a force of 930 N . What is the net force on the crate?