

1. Some Antarctic explorers heading due south toward the pole travel 50 km during the first day. A sudden snowstorm slows their progress and they move only 30 km on the second day. With plenty of rest they travel the final 65-km the last day and reach the pole. What was the explorers' displacement?
2. Sara and Tory are out fishing on the lake on a hot summer day when they both decide to go for a swim. Sara dives off the front of the boat with a force of 45 N, while Tory dives off the back with a force of 60 N. a) Draw a vector diagram of the situation (boat). b) Find the resultant force on the boat.
3. Young thoroughbreds are sometimes reluctant to enter the starting gate for their first race. Astro Turf is one such horse, and it takes two strong men to him set for the race. Derek pulls Astro Turf's bridle from the front with a force of 200 N and Dan pushes him from behind with a force of 150 N, while the horse pushes back against the ground with a force of 300 N. a) Draw a vector diagram of the situation. b) What is the resultant force on Astro Turf?
4. Rochelle is flying to New York for her big Broadway debut. If the plane heads out of LA with a velocity of 220 m/s in a northeast direction, relative to the ground, and encounters a wind blowing head-on at 45 m/s, what is the resultant velocity of the plane, relative to the ground?
5. While Dexter is on a camping trip with his Boy Scout troop, the scout leader hands each boy a compass and map. The directions on Dexter's map read as follows: "Walk 500.0 m north, 200.0 m east, 300 m south, and 400 m west." If he follows the map, what is Dexter's displacement? Solve graphically.
6. Arny flies due east from San Francisco to Washington, a displacement of 5600 km. He then flies from Washington to Boston, a displacement of 900 km at an angle of 55.0° east of north. What is Arny's total displacement? Solve graphically.
7. Marcie shovels snow by exerting a force of 30.0 N on her shovel at an angle of 60.0° to the vertical. What are the horizontal and vertical components of the force exerted by Marcie?
8. Ivar pulls a sled loaded with logs to his cabin in the woods. If Ivar pulls with a force of 800 N in a direction 20.0° above the horizontal, what are the horizontal and vertical components of the force exerted by Ivar?

Vectors

Sample Problems:

1. If the swallows fly due north and cover 200 km on the first day, 300 km on the second day, and 250 km on the third day, draw a vector diagram of their trip and find their total displacement for the 3-day journey.
2. There are some men who claim that they have such strong teeth that they can even use them to move cars, trains, and helicopters. Joe is one such man. Suppose a car pulling forward with a force of 20,000 N was pulled back by a rope that Joe held in his teeth. Joe pulled the car with a force of 25,000 N. Draw a vector diagram of the situation and find the resultant force.
3. If Carl hit a baseball due west with a speed of 50.0 m/s, and the ball encountered a wind that blew it north at 5.00 m/s, what was the resultant velocity of the baseball?
4. The Maton family begins a vacation trip by driving 700-km west. Then the family drives 600-km south, 300-km east, and 400-km north. Where will the Matons end up in relation to their starting point? Solve graphically.
5. Ralph is mowing the back yard with a downward force of 20.0 N at an angle of 30.0° to the horizontal. What are the horizontal and vertical components of the force exerted by Ralph?