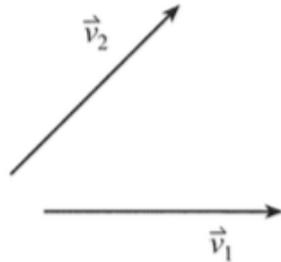


1. Draw the following vectors. Show necessary angles.
 - a) 10 m north
 - b) 15 m/s² west
 - c) 5.3 m 20° west of south
 - d) 24 m/s 20° east of south
 - e) 11 m 40° south of west
 - f) 150 m/s 10° north of east
2. Split the vectors up into horizontal and vertical components.
 - a) 14 N 45° north of east
 - b) 1.6 m/s² 33° west of north
 - c) 55 m 15° west of south
 - d) 910 m/s 5.0° south of east
 - e) 15 m 25° east of south
 - f) 25 m/s 22° north of west
3. Add the following displacement vectors. Be sure to determine both the magnitude and direction of the resultant vector.
 - a) 1.0 m north; 0.5 m south
 - b) 12 m east; 25 m west
 - c) 150 km north; 240 km west
 - d) 8.0 m west; 10.0 m south
 - e) 9.0 m south; 6.0 m 30.0° north of west
 - f) 182 km east; 40.0 km 20.0° south of east
 - g) 3.5 m 40.0° east of north; 4.3 m 35° north of west
 - h) 1.5 km 20.0° south of east; 2.5 km 30.0° north of east
4. A Physics 12 student rides up an escalator that is angled 25° above the horizontal. While he moves 2.8 m in the horizontal direction, how far does he move in the vertical direction?
5. Two velocity vectors, v_1 and v_2 , are shown. Draw the resultant of the addition of the two velocity vectors.
6. Justin skis down a 40.0° slope (measured above the horizontal). If the distance he skis along the slope is 360 m, how far does he move in the...
 - a) horizontal direction?
 - b) vertical direction?

7. Determine the displacement between the initial position, x_i , and the final position, x_f .
 - a) $x_i = 3.0$ m west; $x_f = 10.0$ m west
 - b) $x_i = 320$ km east; $x_f = 110$ km north
 - c) $x_i = 11$ m 32° south of east; $x_f = 10.0$ m south
 - d) $x_i = 550$ km 15° west of north; $x_f = 620$ km 40.0° north of west
8. A car travelling south at 15 m/s is later travelling west at 25 m/s. What is the change in velocity?
9. An airplane heads due north with an airspeed of 75 m/s. The wind is blowing due west at 18 m/s. What is the airplane's speed relative to the ground?
10. A girl can swim at 6.2 km/h. She decides to swim across a river heading straight across (east). If the current is 3.0 km/h south...
 - a) what is her velocity relative to someone sitting on the shore?
 - b) what is her speed relative to a bird sitting on a free-flowing log next to her?
11. A plane is heading directly south towards a runway at a speed of 210 km/h. Suddenly, the plane experiences a gust of wind 75 km/h due west. What direction should the pilot aim the plane in order to continue to head directly to the runway?
12. An aircraft heads due south with a speed relative to the air of 56 m/s. Its resultant speed over the ground is 62 m/s. The wind blows from the east.
 - a) What is the speed of the wind?
 - b) What is the direction of the aircraft's path over the ground?