

## Vectors

- Draw the following vectors:
  - 10 m north
  - 15 m/s west
  - 5.3 m  $20^\circ$  west of south
  - 24 m/s  $20^\circ$  east of south
  - 11 m  $40^\circ$  south of west
  - 150 m/s  $10^\circ$  north of east
- Determine the horizontal and vertical components of 14 N  $45^\circ$  north of east.
- Determine the horizontal and vertical components of 910 m/s  $5.0^\circ$  south of east.
- Determine the horizontal and vertical components of 1.6 m/s<sup>2</sup>  $33^\circ$  west of north.
- Determine the horizontal and vertical components of 55 m  $15^\circ$  west of south.
- Determine the horizontal and vertical components of 15 m  $25^\circ$  east of south.
- Determine the horizontal and vertical components of 25 m/s  $22^\circ$  north of west.
- A student rides up an escalator angled  $25^\circ$  above the horizontal. While they move 2.8 m horizontally, how far do they move vertically?
- A skier moves down a  $40.0^\circ$  slope 360 m long.
  - How far horizontally?
  - How far vertically?
- Katelyn drives down a  $15^\circ$  incline. If she descends 20.0 m vertically, how far has she driven along the incline?
- Draw a vector diagram to represent travelling 1.0 m north and then 0.5 m south.
- Draw a vector diagram to represent travelling 12 m east and then 25 m west.
- Draw a vector diagram to represent travelling 150 km north and then 240 km west.
- Draw a vector diagram to represent travelling 8.0 m west and then 10.0 m south.
- Draw a vector diagram to represent travelling 9.0 m south and then 6.0 m  $30^\circ$  north of west.
- Draw a vector diagram to represent travelling 182 km east and 40.0 km  $20^\circ$  south of east.
- Draw a vector diagram to represent travelling 3.5 m  $40^\circ$  east of north and 4.3 m  $35^\circ$  north of west.

18. Draw a vector diagram to represent travelling 1.5 km  $20^\circ$  S of E and 2.5 km  $30^\circ$  N of E
19. Determine your displacement after travelling 0.50 m south and 1.20 m north.
20. Determine your displacement after travelling 19 m west and 19 m south.
21. Determine your displacement after travelling 145 m south and 82 m west.
22. Determine your displacement after travelling 9.0 km north and 3.4 km  $25^\circ$  east of south.
23. Determine the displacement between an initial  $p_i = 3.0$  m east and  $p_f = 10.0$  m west.
24. Determine the displacement between  $p_i = 11$  m  $32^\circ$  south of east and  $p_f = 10$  m south.
25. Determine the displacement between  $p_i = 320$  km east and  $p_f = 110$  km north.
26. A car travels 15 m/s south then 25 m/s west. What is the change in velocity?
27. An airplane heads due north at 75 m/s while the wind blows due west at 18 m/s. What is its speed relative to the ground?
28. A swimmer moves 6.2 km/h east in a current 3.0 km/h south.
  - a) Find velocity relative to the shore.
  - b) Find speed relative to a floating log.
29. Bob swims 2.6 m/s east in a current 1.4 m/s south. What is his velocity relative to the shore?
30. A duck swims 20.0 cm/s east, then 20.0 cm/s south. Find its change in velocity.
31. A plane flies 210 km/h south while wind 75 km/h west blows. At what angle should the pilot aim to continue due south?
32. An aircraft flies 56 m/s south relative to the air and has a ground speed of 62 m/s. The wind blows from the east.
  - a) What is the wind speed?
  - b) What is the direction of the aircraft's path over the ground?
33. Determine your displacement after travelling 1500 km  $40^\circ$  east of north and 2700 km south.
34. A dog is first seen 25 m north, later 12 m  $25^\circ$  north of west. What is its displacement?
35. Determine your displacement after travelling 984 m  $35^\circ$  north of east and 424 m  $10^\circ$  north of east.
36. Determine the displacement between  $p_i = 550$  km  $15^\circ$  west of north and  $p_f = 620$  km  $40^\circ$  north of west.

