## Vector Practice Problems

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 south the second day. With plenty of rest they travel the final 65 km the third day. At this point they turn and head west for 80 mkm and make it to their research station on the fourth day. What was their displacement?
2. Amit flies due east from San Francisco to Washington, D.C., a displacement of 5600 km . He then flies from Washington to Boston, a displacement of 900 km at an angle of $55^{\circ}$ east of north. What is Amit's total displacement?
3. While following a treasure map, Captain Jack Sparrow walks 45 m north. He then turns and walks 7.5 m east. You want to beat him to the treasure by traveling in a straight line. What single straight-line displacement could you take to reach the treasure first?
4. Emily passes a soccer ball 6 m directly across the field to Kara, who then kicks the ball 14.5 m directly down the field to Mike. What is the ball's total displacement as it travels from Emily to Mike?
5. A hummingbird flies 1.2 m along a straight path at a height of 3.4 m above the ground. Upon spotting a flower below, the bird drops straight down 1.4 m to hover in front of the flower. What is the hummingbird's total displacement?
6. Payton Manning takes the ball from the line of scrimmage, runs backward for 10 yards, and then scrambles sideways parallel to the line of scrimmage for 15 yards. At this point he throws a pass 50 yards straight down the field to his receiver. What is the magnitude and direction of the football's total displacement?
7. Ivan pulls a sled loaded with logs to his cabin in the woods. If Ivan pulls with a force of 800 N in a direction $20^{\circ}$ above the horizontal axis, what are the X (horizontal) and Y (vertical) components of the force exerted by Ivan?
8. Dwight pulls Jim in a wagon around the office while Michael, the boss, is out for the day. If he pulls with a force of 65 N at an angle of $50^{\circ}$ north of east, what are the X and Y components of the force exerted by Dwight?
9. Esther dives off a 3-meter springboard and initially bounces up with a velocity of $8 \mathrm{~m} / \mathrm{s}$ at an angle of $80^{\circ}$ north of east. What are the $X$ and $Y$ components of her velocity?
10. Add together these two vectors:
a. Vector 1 is 25.5 km at $35^{\circ}$ south of east
b. Vector 2 is 41 km at $65^{\circ}$ north of east
11. Add together these two vectors:
a. Vector 1 is 75 km at $30^{\circ}$ west of north
b. Vector 2 is 155 km east of north
12. A plane travels 2.5 km at an angle of $35^{\circ}$ to the ground, then changes direction and travels 5.2 km at an angle of $22^{\circ}$ to the ground. What is the magnitude and direction of the plane's total displacement?
