

## Vector Review

1. Define the following words:
  - a) Magnitude
  - b) Direction
2. A car moves 9 blocks north, 6 blocks east, 5 blocks south, and 3 blocks west. Draw a diagram to represent this.
3. What is the car's displacement in #2?
4. What distance did the car travel?
5. A plane flies due east at 150 km/h, it encounters a wind blowing south at 75 km/h. What is the resultant ground speed of the aircraft?
6. A boat steers across a river at 15 m/s, the current flows at 5.0 m/s. What is the resultant velocity?
7. How long does it take to cross the river if the river in #6 is 40.0 m wide?
8. How far downstream does the boat end up in #7?
9. A boat wants to get directly across a stream; the engine is capable of attaining a speed of 13.0 m/s. If the current is 5.0 m/s, at what angle should the boat travel and what would its speed be as viewed from shore?
10. An airplane flies at 200 m/s at  $45^\circ$  E of N, a wind blows at 75 m/s at  $30^\circ$  W of N. What is the resultant velocity of the aircraft as seen from the ground?
11. Two boys pull on ropes tied to a rock by the following forces, 150 N at  $30^\circ$  E of S, 160 N at  $20^\circ$  W of S. Sketch vectors to represent this and calculate the applied force acting on the stump.
12. If the stump in the above question does not move what is the minimum force of friction (magnitude and direction) in this situation?
13. Add the following vectors:
  - a) 20 m/s at  $40^\circ$  S of E and 15 m/s at  $30^\circ$  N of E
  - b) 15 N at  $30^\circ$  W of N and 24 N at  $12^\circ$  E of S
14. A boat crosses a 100 m wide river flowing east at 5.0 m/s. If the boat is aimed due north and its motor can achieve a speed of 8.0 m/s in still water, determine the velocity as viewed from shore, and distance downstream the boat is when it reaches the other bank.
15. A plane is seen from the ground to be traveling at 120 m/s and  $30^\circ$  N of E. If the wind is measured to be 30 m/s at  $70^\circ$  E of S then find the aircraft's heading and speed in the air.
16. A change in any vector is a vector subtraction. If a car is seen traveling north at 10 m/s and later viewed going east at 12 m/s what was the change in its velocity?