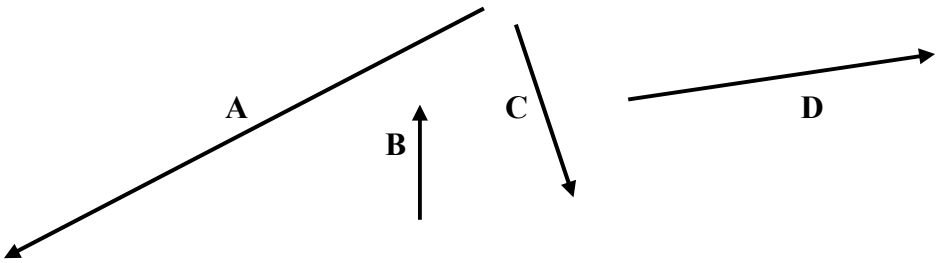
PHYSICS 12 VECTORS WORKSHEET

1. Label each quantity as being **vector** or **scalar**: distance, time, mass, area, energy, impulse, temperature, displacement, volume, speed, acceleration, momentum, work, velocity, force.

2. Sketch the following vectors on a separate piece of paper and draw the resultant:
   a) C+A
   b) D-B
   c) A+D+B
   d) B-(C+D)
   e) C-2B
   f) 3C-2D+A



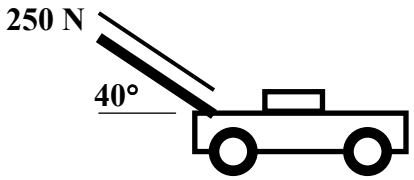
3. A jogger runs 300 m due west and then turns and runs 500 m due south.
   a) What is the total distance that she ran?
   b) What is her total displacement?
   c) If it takes her 135 s to complete the route, calculate her speed and velocity.

4. Two ropes are attached to a heavy object. The ropes are given to two strong physics students (is there any other kind?) with instructions for each to pull with 1000 N of force. Determine the resultant force if the two students pull:
   a) in the same direction east. b) in opposite directions. c) at right angles, south and east.

5. A force of 200 N due South and another force of 300 N due East each act on an object sinultaneously.
   a) Determine the resultant net force.
   b) A third force now acts on the object so that the net force is 0. Determine its magnitude and direction.

6. A pilot flies a plane 10 000 km in a direction 30° N of W. How much farther: a) north and b) west has he gone from his starting point?

7. An environmentally conscious physics student mows her lawn with a push mower, exerting a force of 250 N along the handle as shown. How much force is actually being used to push the mower along the ground?

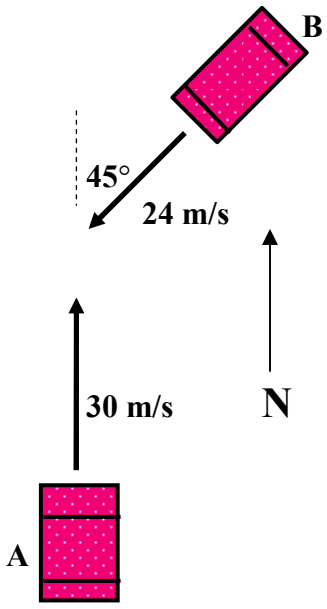


8. Phreddie Physics, while driving his turbo scooter, is exactly 5000 m due west from the line marking the eastern time zone. He travels at 30.0 m/s along a straight road that runs in a direction 30° N of E. How much time does it take Phreddie to get to the eastern time zone?

9. A boat heads due east across a 100. m-wide stream with a velocity of 20.0 m/s. The stream is flowing from north to south at a rate of 5.00 m/s.
   a) What is the resultant velocity of the boat?
   b) How long does it take the boat to reach the other side?
   c) How far downstream is the boat when it reaches the other side?
   d) In which direction should the boat head in order to end up directly across the stream?

10. A plane that is capable of travelling at 140 m/s wishes to travel due north from City A to City B, 500 km away, but encounters a constant crosswind that blows 25 m/s due west.
a) What must the plane's heading be in order to reach its destination?
b) Suppose the pilot has no navigational expertise and decides to aim straight for City B. How far west of City B will the plane end up?

11. In a large parking lot, two vehicles head toward each other as shown to the right, with speeds and directions as indicated.
a) Relative to the driver in vehicle **A**, what is the velocity of vehicle **B**?
b) Relative to the driver in vehicle **B**, what is the velocity of vehicle **A**?



1. s,s,s,s,s,v,s,v,s,s,v,v,s,v,v 2. check with wise and humble instructor 3. a) 800 m b) 583 m @ 59° S of W
c) 5.93 m/s, 4.32 m/s @ 59° S of W 4. a) 2.0×10^3 N, due E b) 0 N c) 1.4×10^3 N @ 45° S of E
5. a) 361 N @ 56.3° E of S b) 361 N @ 56.3° W of N (opposite direction to resultant) 6. a) 5000 km b) 8660 km
7. 192 N 8. 190 s 9. a) 21 m/s @ 14.0° S of E b) 4.9 s c) 24 m d) 14.5° N of E 10. a) 10° E of N b) 89 km
11. a) 50 m/s @ 20° W of S b) 50 m/s @ 20° E of N