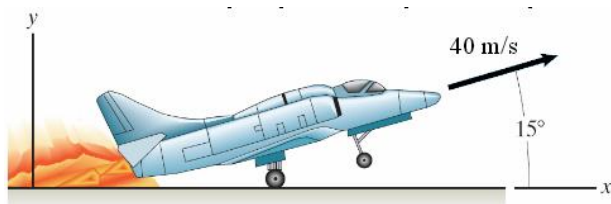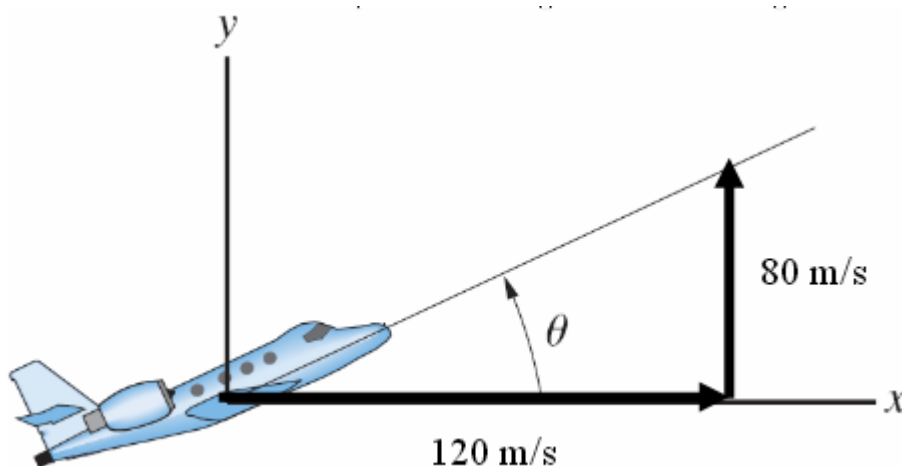# Physics 12 – *Vector Refresher*

1) Label each quantity as either a scalar (S) or a vector (V).

_____ Distance   _____ Displacement   _____ Velocity
_____ Force   _____ Time   _____ Acceleration
_____ Speed   _____ Area   _____ Mass

2) Find the x and y components of the Jet's initial velocity (answers on last page)


3) If the x and y components of the plane velocity are shown. Determine how fast the plane was going and at what angle.

4) For each vector described below, draw a coordinate system (x and y axis) and sketch the vector. Be sure to indicate where the angle is and label the vector on your diagram.

   a) A man walks 800m in a direction of 20.0° West of North.
   b) A worker lifts a sign by exerting a force along a rope of 250. N at an angle of 50.0° with respect to the ground.
   c) An aimless Physics teacher walks at 30.0 m/s [50.0° E of S]

5) A jogger runs 300 m [E] and then turns and runs 500m [S].

   a) What is the total *distance* that she ran?
   b) What is her *displacement*?

6) A pilot flies a plane 1.00×10^4 km in a direction 30.0° N of W.

   a) How much further North is she than when she started?
   b) How much farther West is she than when she started?

7) A man drives a car starting 5.00 km 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 30.0° N of E. How much time does it take the man to get to the Eastern time zone? (The man must travel along the road: no off-roading!)
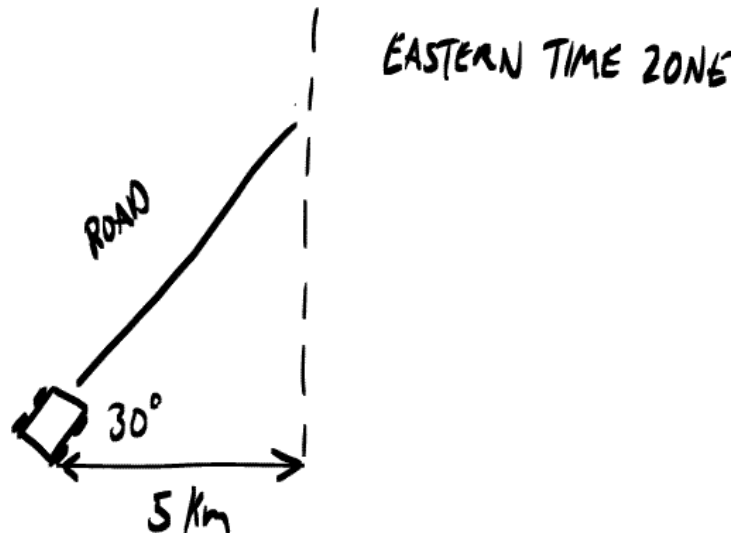
8) A boat heads East across a stream with a velocity of 20.0 m/s. The stream flows from the North at 5.00 m/s.

   a) What is the resultant velocity of the boat as seen by an observer on the starting bank of the river?
   b) If the stream is 100 m wide, how much time does it take the boat to reach the other side?
   c) How far downstream is the boat when it reaches the other side?

Challenge Problems (not mandatory – only for bonus)

A plane attempts to fly 200km/h @ 60° [North of East] If the wind blowing at 120km/h 45° [South of East]. Determine the actual ground speed of the plane.
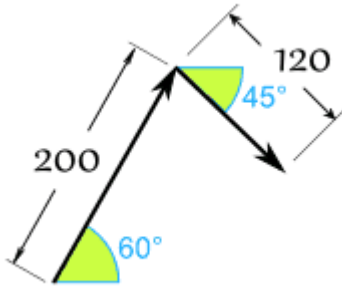
Answer: 205 km/h @ 26° [North of East]

Determine the Total force caused by the forces A and B shown below. Note that you need to describe both the size of the force and its direction.
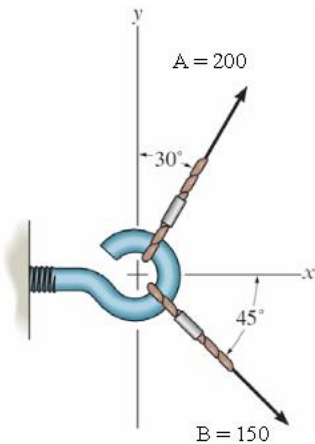
Answer: [217 @ 18.1° N of E]

Answers: 2) $[v_X = 38.6 \text{ m/s } v_Y = 10.4 \text{ m/s}]$ 3) $[v = 144 \text{ m/s } \theta = 33.7°]$

 5a) 800 m b) 583 m [59.0° S of E]   6a) 5.00 x 10^3 km [N] b) 8660 km [W]
7) 192 s   8a) 20.6 m/s [E 14.0° S] b) 5.00 s c) 25.0