## **Vector Word Problems 1**

- 1. You are looking for something you dropped in an empty parking lot. You finally find what you are looking for 25 meters away from you at an angle of 60° N of E. You walk over in 20 seconds.
  - a. What are the components of your distance vector? (Worded another way: How far East and how far North did you move?)

25 m

b. What was your velocity (as a magnitude and direction.)

c. Using your answer to part a, what are the horizontal and vertical components of your velocity?

d. Using your answer to part b, what are the horizontal and vertical components of your velocity? (Fingers crossed that you get the same answer as above. <sup>(iii)</sup>)

2. A dog is sitting next to its owner in a field when it notices a squirrel at the base of a tree. The tree is located 50 meters to the West and 75 meters North of the dog's original position. The dog takes off after the squirrel, reaching the tree in only 12 seconds.a. How far away is the tree from the dog's original position?

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b. What were the components of the dog's velocity?

c. Using your answer from part a, how fast was the dog running?

d. Using your answer from part b, how fast was the dog running?

- 3. A plane flies for 20 minutes with a velocity with the components 75 m/s West and 50 m/s North.
  a. What are the components of the distance vector? (Worded another way: how far West and North did the plane travel?)
  - b. How fast is the plane traveling?
  - c. Using your answer from part a, how far away from its starting point is the plane?
  - d. Using your answer from part b, how far away from its starting point is the plane?

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- 4. A cruise ship travels with a constant velocity of 25 km/h at an angle of  $35^{\circ}$  N of E for 8 hours.
  - a. What was its displacement in that time? (i.e. how far did it travel?)

b. What were the components of its velocity?

c. What were the components of its displacement?

5. A plane is flying with a constant velocity of 300 km/h at 70° N of E. How far North does it travel in 1.5 hours? (*Two steps to this one!*)

6. A car has a velocity of 22 m/s W and 17 m/s S. After 3 minutes, how far has it traveled? (Two steps to this one!)

7. A bird flew 3500 meters exactly NE\* in 5 minutes. What was the eastern component of its velocity? (*Two steps to this one!*) \* exactly NE means  $45^{\circ}N$  of E, or  $45^{\circ}E$  of N

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- 8. A turtle is trying to cross a road that is 15 meters wide (shown above.) Being a turtle however, it does not go straight across. Instead, the turtle moves with a velocity of 0.8 m/s at an angle of  $30^{\circ}$  N of E.
  - a. What are the horizontal and vertical components of the velocity of the turtle?

b. How long does it take the turtle to cross the road? (*Be careful!*)

c. How far sideways (East) does the turtle move in this time?

Answers:

1. a) x=12.5 m & y=21.7 m	b) 1.25 m/s @60° N of E	c&d) v <sub>x</sub> =0.63 m/s & v <sub>y</sub> =1.08 m/s
2. a) 90.1 m	b) 4.17 m/s W & 6.25 m/s N	c&d) 7.51 m/s
3. a) x=–90,000 m & y=60,000 m	b) 90.1 m/s	c&d) 108,000 m
4. a) 200 km	b) 20.5 km/h E & 14.3 km/h N	c) 164 km E & 115 km N
5) 423 km		
6) 5005 m		
7) 8.25 m/s		
8. a) v <sub>x</sub> =0.69 m/s & v <sub>y</sub> =0.4 m/s	b) 37.5 s	c) x=26 m