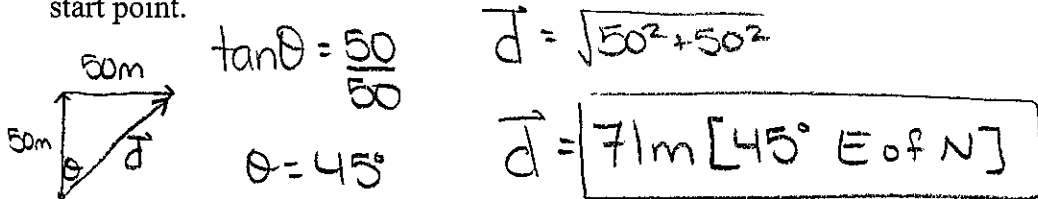


Physics 20
Directional and Navigational Problems

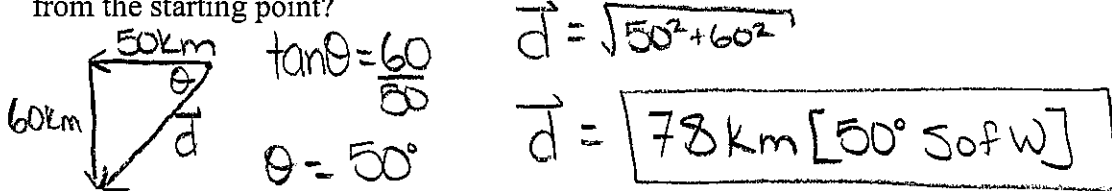
Name: Key

Draw a sketch to show what the problem looks like. Show all work, including formulas, answer with magnitude and direction. For the direction use rectangular coordinates or polar coordinates.

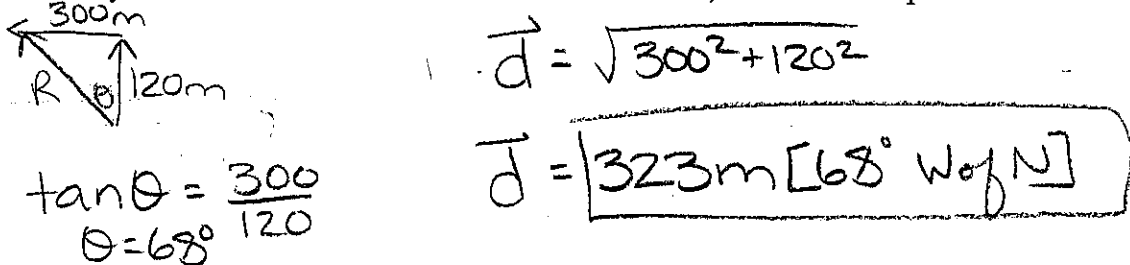
1. Sam travels 50 m North and then 50 m East. What is Sam's displacement from the start point.



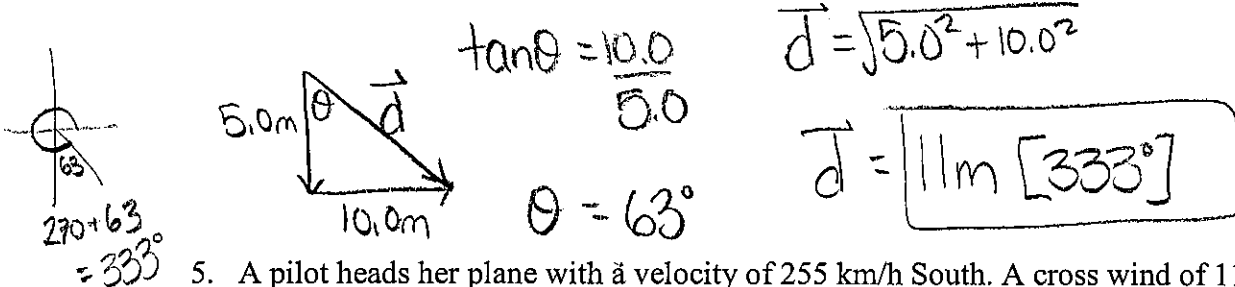
2. Karen travels 50 km West and then 60 km South, what is Karen's displacement from the starting point?



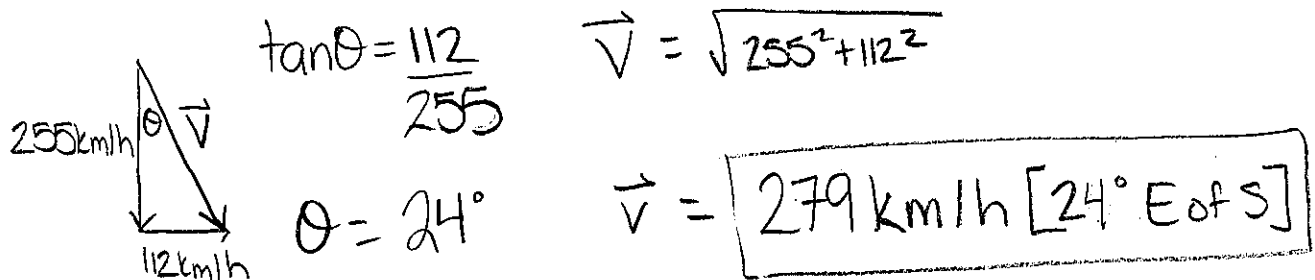
3. Sawyer travels 120m at 90° and then 300m at 180° , what is his displacement?



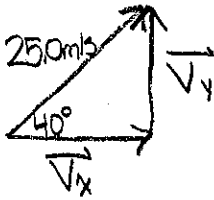
4. BIGS travels 5.0m at 270° and 10.0m at 0° , what is his displacement?



5. A pilot heads her plane with a velocity of 255 km/h South. A cross wind of 112 km/h blows east. What is her velocity relative to the ground?



6. A soccer ball is kicked into the air with an initial velocity of 25.0 m/s at an angle of 40.0° with the ground. What are the horizontal and vertical components of the velocity?



$$\sin 40^\circ = \frac{V_y}{25.0}$$

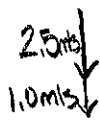
$$V_y = 16.1 \text{ m/s}$$

$$\cos 40^\circ = \frac{V_x}{25.0}$$

$$V_x = 19.2 \text{ m/s}$$

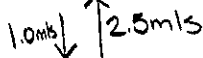
7. A boat's speed in still water is 2.5 m/s in a river whose velocity is 1.0 m/s south. What is the relative velocity of the boat to the shore if it is

- a) heading south?



$$V = 3.5 \text{ m/s [S]}$$

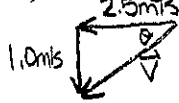
- b) heading north?



$$2.5 - 1.0$$

$$V = 1.5 \text{ m/s [N]}$$

- c) heading west?



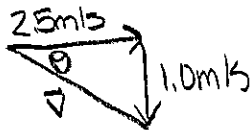
$$\tan \theta = \frac{1.0}{2.5}$$

$$V = \sqrt{1.0^2 + 2.5^2}$$

$$\theta = 22^\circ$$

$$V = 2.7 \text{ m/s [22^\circ S of W]}$$

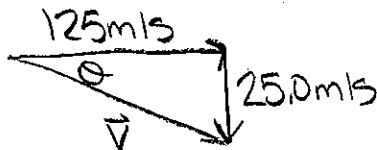
- d) heading east?



$$\theta = 22^\circ$$

$$V = 2.7 \text{ m/s [22^\circ S of E]}$$

8. An airplane is travelling east at an airspeed of 125 m/s. If a 25.0 m/s wind is blowing south, what is the velocity of the plane relative to the ground?



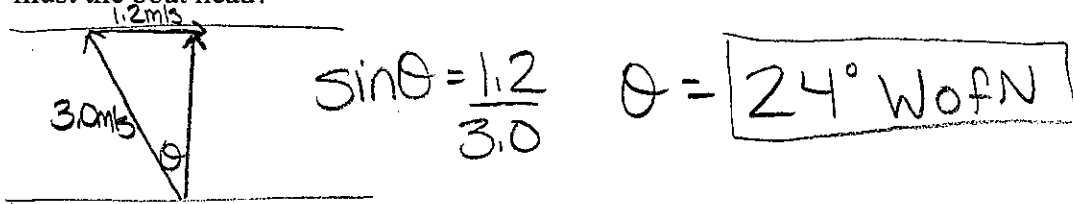
$$V = \sqrt{25.0^2 + 125^2}$$

$$\tan \theta = \frac{25.0}{125}$$

$$V = 127 \text{ m/s [11^\circ S of E]}$$

$$\theta = 11^\circ$$

9. A boat can travel in still water at a speed of 3.0 m/s wants to travel north perpendicular to the river current. If the river current is 1.2 m/s east, at what angle must the boat head?

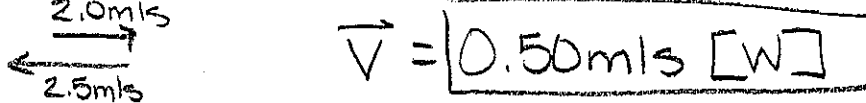


10. A boat can travel 2.5 m/s on still water, the boat is on a river that flows east 2.0 m/s. What is the velocity of this boat with a reference to a point on the shore when

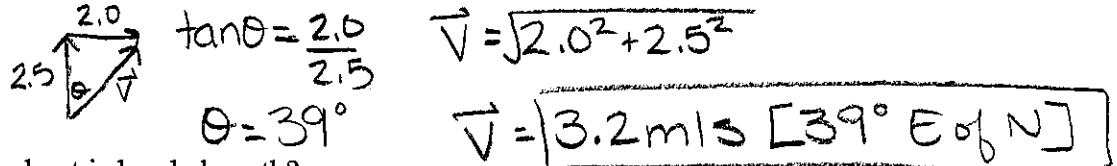
- a) the boat is headed east?



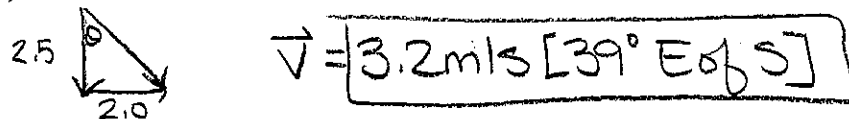
- b) the boat is headed west?



- c) the boat is headed north?

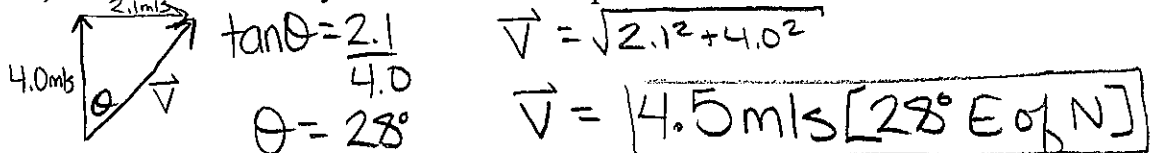


- d) the boat is headed south?

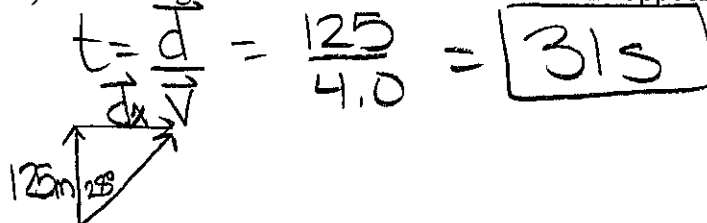


11. A boat can travel 4.0 m/s on still water heads directly north across a river that is 125 m wide. If the current is 2.1 m/s east,

- a) What is the velocity of the boat with respect to the shore?



- b) How long does it take the boat to reach the opposite shore?



- c) How far downstream is the boat when it reaches the opposite shore?

