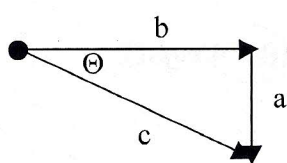


- 1) A river flows at a speed of 12 m/s from north to south. A powerboat can move at a constant maximum speed of 23 m/s in still water.
- What is the maximum velocity of the boat upstream (upstream means traveling against the current)? 11 m/s N
 - What is the maximum velocity of the boat downstream? 35 m/s S
 - If the boat were headed east across the river at its maximum speed, what would the resultant velocity of the boat be?



$$a = 12 \quad b = 23 \quad c = ?$$

$$c = \sqrt{12^2 + 23^2} = 26 \frac{m}{s}$$

$$\tan \Theta = \frac{12}{23} \quad \Theta = 28^\circ$$

26 m/s, 28° S of E

- 2) A plane is travelling toward the east with a velocity of 120 km/h. It encounters a wind blowing toward the east at 0.20 km/min. What is the velocity of the plane in km/h?

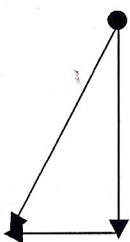
Both vectors are east, so they are added together; however, they must both be in identical units.

$$? \frac{km}{h} = 0.20 \frac{km}{min} \times \frac{60 min}{1 h} = 12 \frac{km}{h}$$

$$12 \frac{km}{h} + 120 \frac{km}{h} = \boxed{132 \frac{km}{h} \text{ or } 130 \frac{km}{h}}$$

130 or 132 km/h (East)

- 3) A girl walks 26 m at an angle of 39° W of S.



- How far west of her starting point is she?
 $\Theta = 39^\circ \quad c = 26 \quad a = \text{west} = ? \quad b = \text{south} = ?$

$$\sin 39^\circ = \frac{\text{west}}{26} \quad \text{west} = 16 \text{ m}$$

16 m (W)

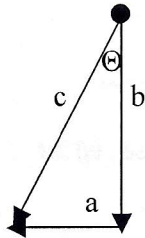
- How far south of her starting point is she?

$$\cos 39^\circ = \frac{\text{south}}{26} \quad \text{south} = 20. \text{ m}$$

20. m (S)

4) A pitcher can throw a ball at a velocity of 125 km/h straight ahead (draw this down on your paper). If he throws the ball straight when a cross-wind is blowing at 28 km/h to the left,

a. What will be the **magnitude** of the ball's resultant velocity?



$$a = 28 \quad b = 125 \quad c = ?$$

$$c = \sqrt{28^2 + 125^2} = 130 \frac{\text{km}}{\text{h}}$$

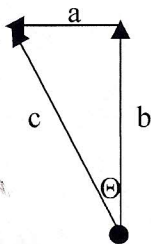
130 km/h

b. The direction of the ball will be off 13° to the (left), right).

Using the diagram above...

$$\tan \Theta = \frac{28}{125} \quad \Theta = 13^\circ$$

5) A plane heads due north, but because of a wind blowing to the west, the plane flies at a **resultant** velocity of 620 mi/h, 22° W of N. What was the velocity of the wind?



$$\Theta = 22^\circ \quad c = 620 \quad a = \text{west} = ?$$

$$\sin 22^\circ = \frac{\text{west}}{620} \quad \text{west} = 230 \text{ mph } W$$

230 mph W