ADDITION OF VECTORS

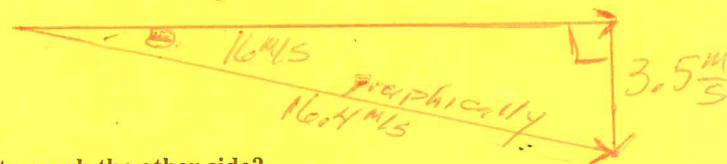1. A motorboat heads due east at 16 m/s across a river that flows due south at 3.5 m/s.
   a. Draw a vector diagram, to scale, that represents the situation.

   SCALE 1 m/s = 5mm

   b. Calculate the resultant velocity (speed and direction).

   $a^2 + b^2 = c^2$

   $c = \sqrt{a^2 + b^2} = \sqrt{16^2 + 3.5^2} =$

   $\theta = Tan^{-1}\left(\frac{3.5}{16}\right) =$

   16 M/S

   graphically

   16.4 M/S

   3.5 m/s

   c. If the river is 500 m wide, how long does it take the boat to reach the other side?

   d. How far downstream is the boat when it reaches the other side?

2. An airplane flies due west at 120 km/hr, fighting a wind that is blowing due north at 35 km/hr. Draw a vector diagram, to scale, to represent the situation. Calculate the resultant velocity (speed and direction).

   $C = \sqrt{35^2 + 120^2}$

   $C =$

   35 KM/HR

   SCALE 1mm = 1 KM/HR

   120 KM/HR

   126 KM/HR

   $Tan\,\theta = \frac{35}{120}$

   $\theta = Tan^{-1}\left(\frac{35}{120}\right)$

   $\theta =$

   Not u

3. A boat crosses a river to a dock 1000 m away in 5 minutes. The current flows perpendicular to the boat's heading at 3.0 km/hr. What speed and angle over the ground must the boat proceed to reach the dock?

VECTOR RESOLUTION

1. A boy pulls a loaded wagon with a force of 125 N. The handle makes a 30° angle with the ground. What amount of force causes the wagon to move forward?

2. A truck weighing 100,000 N is parked on a 12° hill. What force must the parking brake provide to keep the truck from rolling down the hill?

3. A 2000 N safe is rolled up an inclined plane that is 3.0 m long and 1.3 m high at the upper end. Calculate (a) the force that tends to make the safe roll down the ramp, and (b) the force that tends to want to break the ramp.

4. A block of wood slides down a 23° ramp at constant velocity. Calculate the coefficient of friction between the block and the ramp.

5. A mirrored ball hangs suspended by 2 cables which make 75° angles with the walls. If the tension in each cable is 3500 N, calculate (a) the weight of the ball and (b) the force trying to pull each cable out of the wall.