

Vector Lab - FORMAL

Purpose - to apply vector concepts to determine the effects of rivers on boats and wind on airplanes.

Part 1 - Day 1 - Experimentation

Procedure -

Part I

- 1.) Open the Interactive Physics Player program and use File → Open → Sim 05 to access the simulation.
- 2.) Record the x and y velocity components of the boat.
- 3.) Run the simulation and record the time to cross the river. Show a calculation using this time to determine the width of the river.
- 4.) Determine the resultant velocity of the boat.
- 5.) Sketch the path of the boat as viewed from the shore person.
- 6.) Reset and change the Reference frame to that of the fishing boat. Run and sketch the path of the boat as viewed from the fishing boat.
- 7.) Show a calculation of the heading which will allow the boat to travel straight across the river.
Verify your calculation with the simulation.

Part II

- 1.) Open the Interactive Physics Player program and use File → Open → Sim 06 to access the simulation.
- 2.) Using the scales on the side of the diagram record the X and Y displacement to the airport.
Show a calculation of the angle between the plane and the airport.
- 3.) The airplane will always have $\vec{v}_p = +206 \frac{m}{s}$, now set the wind speed to $50 \frac{m}{s}$ and the wind direction to 45° (this is $45^\circ N$ of E). Show a calculation of the ground speed of the plane.
- 4.) Run the simulation, do you land at the airport?
- 5.) Use the angle you found in procedure 2 as the direction for \vec{v}_g its magnitude will be $247.23 \frac{m}{s}$.

Then use the formula $\vec{v}_p + \vec{v}_w = \vec{v}_g$ (where \vec{v}_p is plane, \vec{v}_g is ground and \vec{v}_w is wind) to find the components of \vec{v}_p , show detailed calculations of the components of \vec{v}_g , \vec{v}_w , and \vec{v}_p .

- 6.) Determine and record the magnitude and direction of \vec{v}_p . Verify your answer by entering your angle as the aircraft heading.