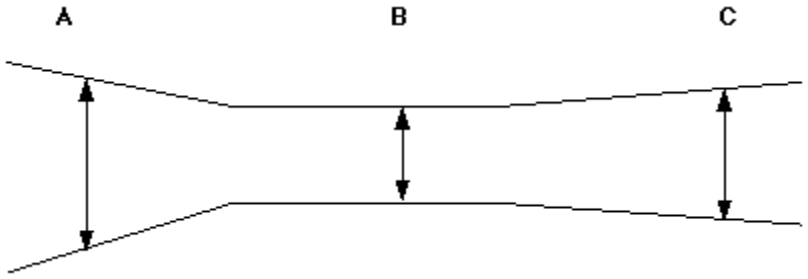
Experiment on Fluids:
Finding the Velocity of a Fluid in a Confined Container

Purpose:

This worksheet is for students to calculate the velocity of a confined fluid, given the cross-section area and velocity of another region.

Concept:

The drawing below is a cross-section of a circular cone attached to a circular cylinder.



When a fluid (liquid or gas) is in a confined space, one can use the equation of continuity to find the velocity of the fluid if one knows the cross-section area and velocity in one of the regions. The formula for this is

$$\mathbf{A_1 \cdot V_1 = A_2 \cdot V_2}$$

where A_x is the cross-section area of one location and V_x is the velocity for that location.

Analysis:

Given three different locations in a confined container, A, B, and C, all having different radii, can you find the other two velocities of the fluid, if the velocity at A is given?

Problems

1. If the cross-section at A has a radius of 6 meters, can you find the area of the slice through the cone
   (**Area = $\pi \cdot r^2$**)?

2. If the velocity of the fluid at location **A** is 10.0 m/s, and the radius at location **B** is 4.2 meters, can you find the velocity at location **B**?

3. If the velocity at location **C** is 8.6 m/s, can you find the radius at location **C**?

Extension:

4. If the radius of a fourth location, **D**, is one-half the radius of **A** , how would the velocity at location **D** compare to the velocity of the fluid at **A**? If **D** had one-third the radius of **A**, compare the velocity of the fluid at **D** to **A**. Explain your reasoning showing calculations.