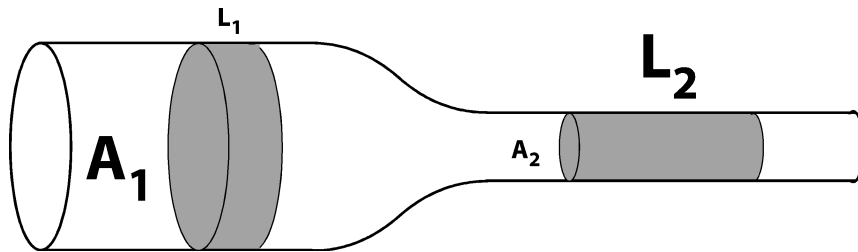


PHYS SPRINGBOARD: CONTINUITY

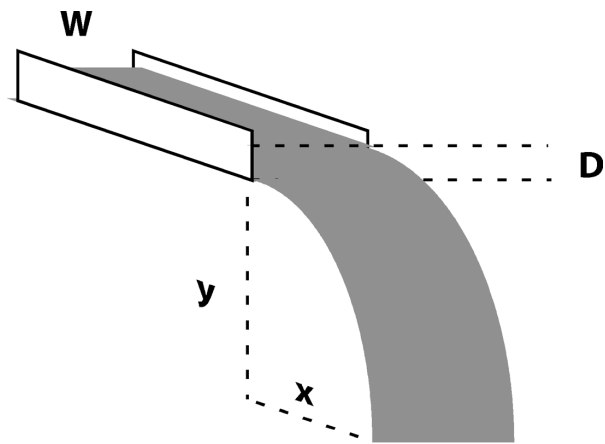


THE CONSTRICTION

A pipe with a constriction carries a continuous flow of water. Consider a mass of water in the wide section. Its volume is equal to the cross-sectional area A_1 of the wide section multiplied by the length L_1 along the pipe. The constriction has a cross-sectional area of A_2 and the same volume of water will have a length L_2 .



1. How do A_1 , A_2 , L_1 , and L_2 relate?
2. If that volume of water passes a point in the wide section in a time t , the same volume of water will pass a point in the constriction in a time t .
 - a. Express the volume flow rate (V/t) in both sections in terms of A , L , and t .
 - b. Rewrite those expressions taking into account that the speed of the flowing water is $v = L/t$.
 - c. Box the expression above: it's the continuity equation!



A SLUICE OF LIFE

A rectangular waterway (a sluice) $W = 0.50$ m wide carries water at a depth $D = 0.12$ m. The water passes over a precipice $y = 2.7$ m high and lands $x = 0.68$ m forward of the precipice.

1. How fast is the water traveling when it crests the precipice?
2. What is the volume flow rate of water in the sluice?
3. How long would it take for this flow to fill an 8.0 m^3 storage tank?