

FLUID SPEED AND VOLUME FLOW RATE

- There are TWO main terms that deal with “how quickly” a fluid FLOWS:

Fluid Speed (—) → $v = \text{—}$



Volume Flow Rate (—) → $Q = \text{—} = \text{—}$

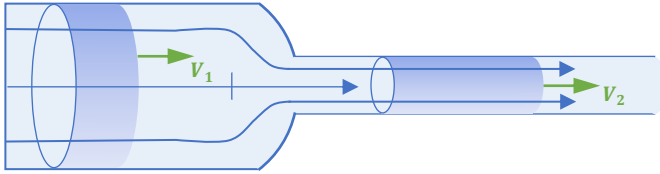


EXAMPLE: A long, horizontal pipe has a 2 m^2 cross-sectional area. If it takes water 5 seconds to traverse an 80-m segment of the pipe, calculate: **(a)** the fluid speed; **(b)** the volume flow rate.



FLOW CONTINUITY

- Flow CONTINUITY: Because an IDEAL Fluid is incompressible, its _____ (____) never changes!



$$\rightarrow \underline{\hspace{1cm}} = \underline{\hspace{1cm}} = \underline{\hspace{1cm}} = \text{Constant}$$

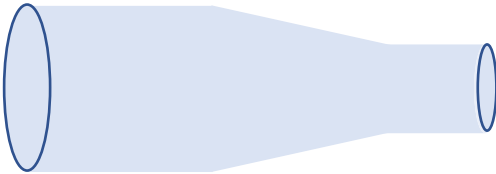
- This is often called the _____ Equation.

- So if Area changes, _____ changes:

$$\rightarrow \boxed{\underline{\hspace{1cm}} = \underline{\hspace{1cm}}}$$

- Pipe are usually cylindrical $\rightarrow A = \underline{\hspace{1cm}}$

EXAMPLE 2: A garden hose with a radius of 2 cm has water flowing into it with 2 m/s. At the end of the hose is a nozzle with a radius of 1 cm. **(a)** Find the speed of water in the nozzle. **(b)** In how many minutes does it fill up a 350 L bath tub?



EXAMPLE: CONTINUITY / PROPORTIONAL REASONING

EXAMPLE: Water flows in a horizontal cylindrical pipe. If the water has speed V at point A, and point B has double the diameter of A, what is the water speed at B?

- a) $V / 4$
- b) $V / 2$
- c) V
- d) $2 V$
- e) $4 V$