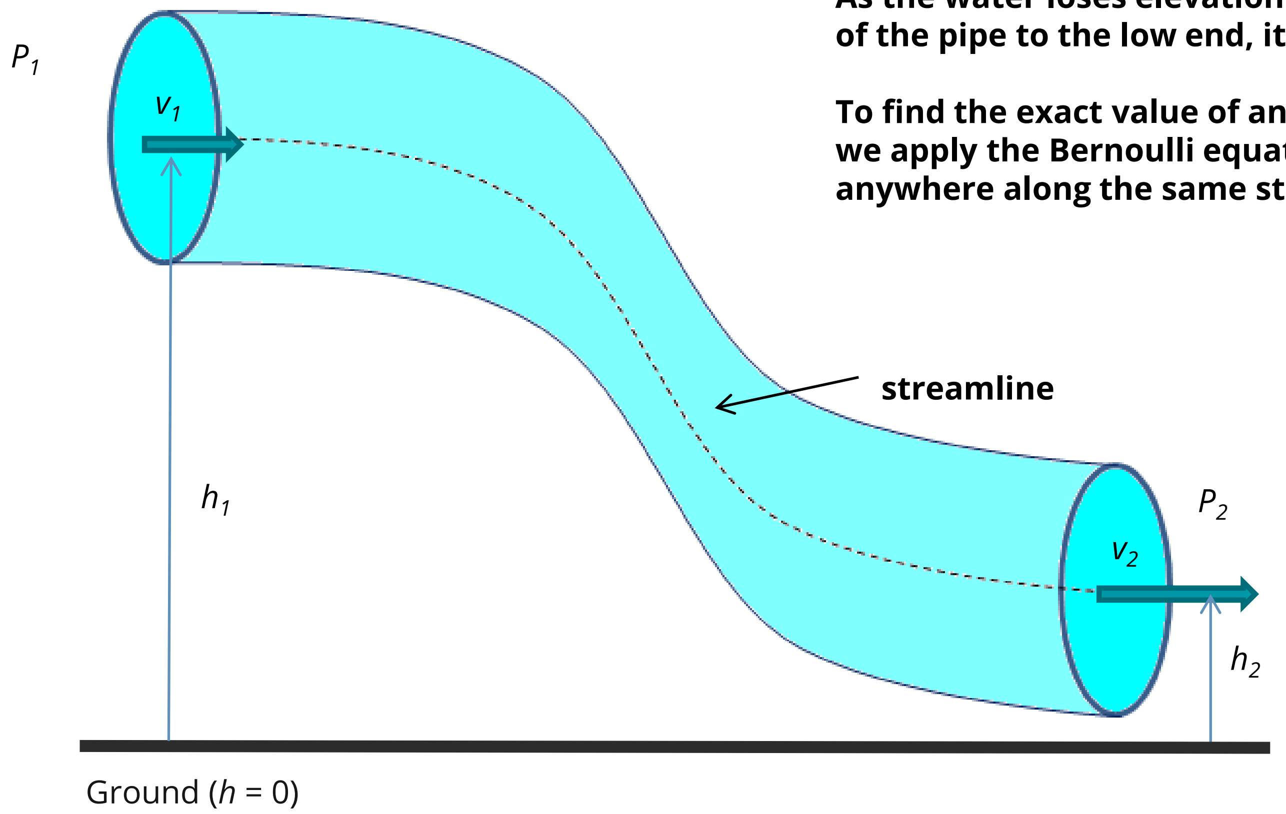
TeachEngineering

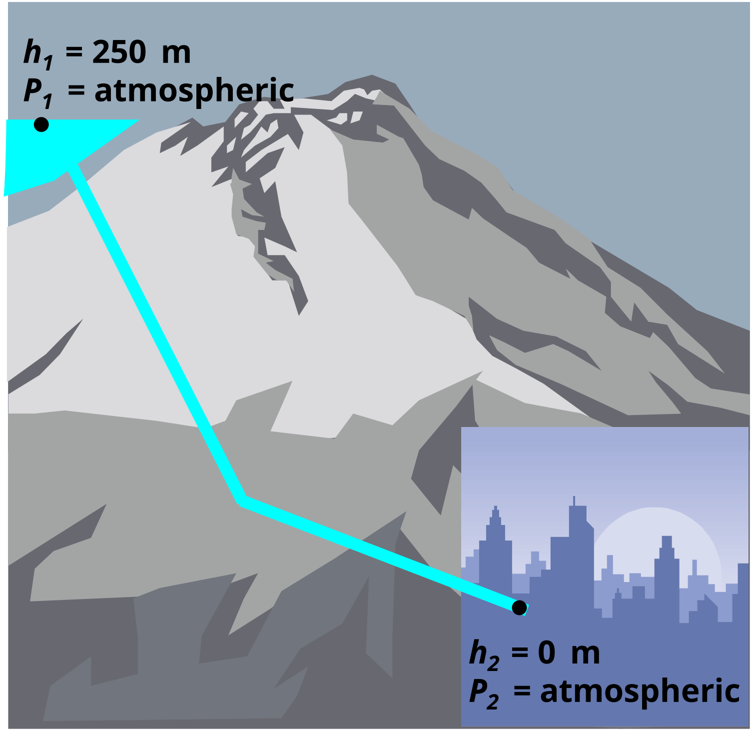
STEM Curriculum for K-12

BERNOULLI'S PRINCIPLE

As the water loses elevation from the high end of the pipe to the low end, it gains velocity.

To find the exact value of any parameter, we apply the Bernoulli equation to two points anywhere along the same streamline.





$$\frac{1}{2}\rho v_1^2 + \rho g h_1 + P_1 = \frac{1}{2}\rho v_2^2 + \rho g h_2 + P_2$$

The water at the top of the reservoir starts at rest, so v_1 is zero, and the first term drops out.

Since the final height (h_2) is also zero, this term drops out, too.

Lastly, $P_1 = P_2$, which is atmospheric pressure, so these terms drop out as well.

Plugging in the remaining the known parameters:

$$\rho_{water}\, g\, (250 \text{ m}) = ½\, \rho_{water}\, v_2^2$$

Now the ρ_{water} terms can be cancelled out.

Using g = 9.8 m/s² and solving for v_2, we have

$$v_2 = \text{sqrt}\,(2*9.8 \text{ m/s}^2 * 250 \text{ m})$$

$$v_2 = 70 \text{ m/s}$$