

A pipe has an internal diameter of 12 mm. It fills a 10 L bucket in 30-s.
Determine the speed of the water exiting the pipe.

Given:

Diameter of the pipe:

$$d = 12 \text{ mm} = 0.012 \text{ m}$$

Radius of the pipe:

$$r = 6 \text{ mm} = 0.006 \text{ m}$$

Volume of water filled in the bucket:

$$V = 10 \text{ L} = 0.01 \text{ m}^3$$

Time taken to fill the bucket:

$$t = 30 \text{ s}$$

Determine: Speed of water exiting the pipe: v

Use formula:

$$Q = Av \quad \text{---(1)}$$

Q : Volume flow rate (volume of water flowing per unit time : V / t)

A = area of cross-section of the pipe (πr^2)

Substituting for Q and A in (1):

$$V / t = \pi r^2 \times v \quad \text{---(2)}$$

Rearranging (2) & substituting for V , t , and r in (2):

$$v = 0.01 / [3.14 \times (0.006)^2 \times 30] = 2.9 \text{ m/s}$$