

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:

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

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

$A$  = area of cross-section of the pipe (  $\pi r^2$  )

Substituting for  $Q$  and  $A$  in (1):

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

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

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