

## Answer on Question 69323, Physics, Other

### Question:

2 pipes with different diameters are connected. Inside the pipes is flowing water. The velocity of the water in the larger pipe is  $5 \text{ m/s}$  while the velocity of the water in the smaller pipe is thrice as fast as the larger pipe. The cross-sectional area of the smaller pipe is  $0.0625 \text{ cm}^2$ . Find the radius of the larger pipe.

### Solution:

By the definition of the Law of Continuity we have:

$$A_1 v_1 = A_2 v_2,$$

here,  $A_1, A_2$  are the cross-sectional areas of the larger and smaller pipes, respectively,  $v_1, v_2$  are the velocities of the water flowing through the larger and smaller parts of the pipes, respectively.

From this formula we can find the cross-sectional area of the larger pipe:

$$A_1 = \frac{A_2 v_2}{v_1}.$$

From the other hand:

$$A_1 = \pi r_1^2.$$

Therefore, equating these two formulas, we can find the radius of the larger pipe,  $r_1$ :

$$\pi r_1^2 = \frac{A_2 v_2}{v_1},$$

$$r_1 = \sqrt{\frac{A_2 v_2}{\pi v_1}} = \sqrt{\frac{0.0625 \text{ cm}^2 \cdot \frac{1 \text{ m}^2}{10000 \text{ cm}^2} \cdot 15 \frac{\text{m}}{\text{s}}}{\pi \cdot 5 \frac{\text{m}}{\text{s}}}} = 2.4 \cdot 10^{-3} \text{ m}.$$

### Answer:

$$r_1 = 2.4 \cdot 10^{-3} \text{ m}.$$