

## Conditions

two pipes running together can fill a cistern in  $40/13$  mins. if one pipe takes 3 mins more than the other to fill the cistern, find the time in which each pipe would fill the cistern.

## Solution

Let's the velocity of 1<sup>st</sup> pipe is  $x$ , of 2<sup>nd</sup> is  $y$ . Then:

$$\begin{cases} \frac{1}{x+y} = \frac{40}{13} \\ \frac{1}{x} - \frac{1}{y} = 3 \end{cases}$$

$$\begin{cases} 40(x+y) = 13 \\ y-x = 3xy \end{cases}$$

$$x = \frac{y}{3y+1}$$

$$40\left(\frac{y}{3y+1} + y\right) = 13$$

$$40\left(\frac{2y+3y^2}{3y+1}\right) = 13$$

$$120y^2 + 80y - 39y - 13 = 0$$

$$120y^2 + 41y - 13 = 0$$

$$D = 1681 + 6240 = 7921$$

$$y = \frac{-41 + 89}{240} = 0.2$$

The negative value of  $y$  is rejected as velocity can't be negative.

$$x = \frac{y}{3y+1} = \frac{0.2}{0.6+1} = 0.125$$

$$\frac{1}{x} = 8$$

$$\frac{1}{y} = 5$$

**Answer: One pipe fills a cistern in 5 min, the other pipe – in 8 min**