The concept of Rates - 4/5/2013 www.askmath.weebly.com

Well lets say you can walk 10 mph. If you walked for 5 hours, how far did you walked? This is simple right? Walking 10 mph for 5 hours, you multiply them to get the distance that you walked. 10 mph is the rate at which you walked and 5 hours is the time that you walked. So we get the equation:

$$d = r \cdot t$$

This seems simple enough, but some tests hide this concept with more confusing questions.

Ex. Nick painted the house in 5 hours. His friend Barry painted the same house in 3 hours. How long would it take for them to paint the same house if they worked together?

We have to think here. If they work together, do you think they would finish painting the house in a less amount of time or a greater amount of time? They would take less time because they would both contribute to the painting. Two people helping out would take less time for one person to do it. So we can estimate that the time it would take is less than 3 hours.

Let's apply this to our formula that we have: $d = r \cdot t$. Nick did 1 house in 5 hours. His **distance** is 1, because he covered 1 house. His time is 5, because that is just common sense. Solving for the rate we get:

$$r = \frac{d}{t}$$

So Nick's rate is $r_{\text{Nick}} = \dfrac{1 \text{ house}}{5 \text{ hours}}$.

Barry did 1 house in 3 hours. So his rate is $r_{\text{Barry}} = \dfrac{1 \text{ house}}{3 \text{ hours}}$.

The question asked us what time would it take them to paint the house if **they worked together**.

So we can add their rates together to find the combined rates.

$$\begin{aligned} r_{\text{combined}} &= \frac{1}{5} + \frac{1}{3} \\ &= \frac{8}{15} \end{aligned}$$

Their combined rate is $r_{\text{combined}} = \dfrac{8 \text{ houses}}{15 \text{ hours}}$. But the question asked us to find the time for **one** house not 8 houses. So we divide the fraction by $\frac{8}{8}$ to get one house.

$$\begin{aligned} r_{\text{combined}} &= \frac{8}{15} \\ &= \frac{8/8}{15/8} \\ &= \boxed{\frac{1}{1.875}} \end{aligned}$$

So we find out that to paint one house it would that it would take them 1.875 hours to paint together.