

Rate of Work Problems

total work = rate of work x time worked

1. Liza can paint the kitchen in 5 hours. David can paint the same kitchen in 3 hours. If they work together, how long will it take to paint the kitchen?

Liza's work rate = $\frac{1}{5}$ job/hr.

David's work rate = $\frac{1}{3}$ job/hr

t = ?

Liza + David = Total = 1

$\frac{1}{5} \cdot t + \frac{1}{3} \cdot t = 1$

$\frac{15}{1} \left(\frac{t}{5} + \frac{t}{3} = 1 \right)$

$\frac{15t}{5} + \frac{15t}{3} = 15$

$3t + 5t = 15$

$\frac{8t}{8} = \frac{15}{8}$

t = $1\frac{7}{8}$ hrs.
for L + D to paint kitchen

2. Rodney and Tomaso can build a cabinet together in 12 hours. Rodney can build the cabinet alone in 16 hours. How long will it take Tomaso to build the cabinet alone?

t = 12

R rate = $\frac{1}{16}$

T rate = $\frac{1}{r}$

$\frac{1}{16} \cdot 12 + \frac{1}{r} \cdot 12 = 1$

$\frac{16r}{1} \left(\frac{12}{16} + \frac{12}{r} = 1 \right)$

$12r + 192 = 16r$
 $192 = 4r$
 $r = 48$ hrs.

3. An Olympic sized pool can be filled by pipe A in 18 hours and by pipe B in 12 hours. There is also a drain pipe that drains the entire pool in 8 hours. If the valves of pipe A, pipe B and the drain pipe are open, how long will it take to fill the pool?

PA: $\frac{1}{18}$

PB: $\frac{1}{12}$

D pipe: $\frac{1}{8}$

$\frac{1}{18} \cdot t + \frac{1}{12} \cdot t - \frac{1}{8} \cdot t = 1$

$\frac{72}{1} \left(\frac{t}{18} + \frac{t}{12} - \frac{t}{8} = 1 \right)$

$4t + 6t - 9t = 72$

t = 72 hrs. to fill pool

4. Professor Minh can complete a set of experiments in 4 hours. Her assistant can do it in 6 hours. How long will it take them to complete the experiments working together?

PM: $\frac{1}{4}$

Asst.: $\frac{1}{6}$

$\frac{1}{4} \cdot t + \frac{1}{6} \cdot t = 1$

$3t + 2t = 12$

$\frac{12}{1} \left(\frac{t}{4} + \frac{t}{6} = 1 \right)$

$5t = 12$

$t = \frac{12}{5} = 2\frac{2}{5}$ hrs.

5. With one hose a swimming pool can be filled in 12 hours. Another hose can fill it in 16 hours. How long will it take to fill the pool using both hoses?

$\frac{1}{12} \cdot t + \frac{1}{16} \cdot t = 1$

$\frac{48}{1} \left(\frac{t}{12} + \frac{t}{16} = 1 \right)$

$4t + 3t = 48$

$7t = 48$

$t = 6.86$ hrs.

6. Susan can paint her living room in 2 hours. Her friend Jaime estimates it would take him 3 hours to paint the same room. If they work together, how long will it take them to paint Susan's living room?

$\frac{1}{2} \cdot t + \frac{1}{3} \cdot t = 1$

$3t + 2t = 6$

$6 \left(\frac{t}{2} + \frac{t}{3} = 1 \right)$

$5t = 6$

$t = 1.2$ hrs.

7. Together, two machines can harvest a tomato crop in 6 hours. The larger machine can do it alone in 10 hours. How long does it take the smaller machine to harvest the crop working alone?

t = 6

large mach. rate = $\frac{1}{10}$

rate of small mach. = $\frac{1}{r}$

$\frac{1}{10} \cdot 6 + \frac{1}{r} \cdot 6 = 1$

$\frac{10r}{1} \left(\frac{6}{10} + \frac{6}{r} = 1 \right)$

$\frac{60r}{10} + \frac{60r}{r} = 10r$

$6r + 60 = 10r$

$60 = 4r$

$r = 15$ hrs.