

## Work Problems - Homework due 5/23/14

- 1) The following problems make use of the formula:  $RT = J$  where  $R$  is the rate of work,  $T$  is the time it takes to do the work, and  $J$  is the number of jobs the work completes.

To find an individual rate, use  $R = \frac{J}{T}$ .

For these problems, the jobs are all one job, such as "paint a fence" or "pick 40 bushels of apples" or "inflate twenty balloons". So, for all of these problems,  $J$  will be 1.

(Note: this formula will work when  $J$  is not always 1, but this simplifies the problems for us.)

To find the time for two people working together, use the formula  $T = \frac{J}{R_1 + R_2}$  where  $R_1 = \frac{J}{T_1}$  and  $R_2 = \frac{J}{T_2}$ .

Two examples are shown.

Solve each question. Round your answer to the nearest hundredth.

- 2) Working alone, it takes Jennifer nine hours to paint a fence. Joe can paint the same fence in eight hours. How long would it take them if they worked together?

let  $R_1$  = Jennifer's Rate and  
 $R_2$  = Joe's Rate

$$R_1 = \frac{1}{9} \frac{\text{job}}{\text{hours}} \quad R_2 = \frac{1}{8} \frac{\text{job}}{\text{hours}}$$

$$T = \frac{1}{R_1 + R_2} = \frac{1}{\frac{1}{9} + \frac{1}{8}}$$

↑  
Need common denominator of 72

$$T = \frac{1}{\frac{1}{9} \cdot \frac{8}{8} + \frac{1}{8} \cdot \frac{9}{9}} = \frac{1}{\frac{8}{72} + \frac{9}{72}}$$

$$T = \frac{1}{\frac{17}{72}} \quad \leftarrow \text{To divide, multiply the reciprocal.}$$

$$T = 1 \cdot \frac{72}{17} \approx 4.24$$

working together, they can paint the fence in 4.24 hrs.

- 3) Working alone, Shanice can pick forty bushels of apples in 13 hours. One day her friend Julia helped her and it only took 6.24 hours. Find how long it would take Julia to do it alone.

let  $R_1$  = Shanice's rate and  
 $R_2$  = Julia's Rate

$$R_1 = \frac{1}{13} \frac{\text{job}}{\text{hours}} \quad R_2 = \frac{1}{x} \frac{\text{job}}{\text{hours}} \text{ unknown}$$

$T = 6.24$  hours combined.

$$T = \frac{1}{R_1 + R_2} \Rightarrow 6.24 = \frac{1}{\frac{1}{13} + \frac{1}{x}}$$

↑  
need common denominator of  $13x$

$$6.24 = \frac{1}{\frac{1(x)}{13(x)} + \frac{1(13)}{x(13)}} = \frac{1}{\frac{x+13}{13x}} \quad \leftarrow \text{to divide, multiply by the reciprocal}$$

$$6.24 = 1 \cdot \frac{13x}{x+13} = \frac{13x}{x+13}$$

Now solve for  $x$ :

$$\frac{6.24}{1} = \frac{(13x)}{(x+13)} \Rightarrow 6.24(x+13) = 13x$$

$$6.24x + 81.12 = 13x$$

$$\frac{81.12}{6.76} = \frac{6.76x}{6.76}$$

$$x = 12$$

It would take Julia 12 hours to do it alone.

- 4) Working alone, Mike can sweep a porch in 8 minutes. Stefan can sweep the same porch in 13 minutes. Find how long it would take them if they worked together.
- 5) Working together, Cody and Ndiba can clean an attic in 4.63 hours. Had he done it alone it would have taken Ndiba 11 hours. How long would it take Cody to do it alone?
- 6) Working alone, Elisa can mop a warehouse in ten hours. One day her friend Kayla helped her and it only took 4.74 hours. Find how long it would take Kayla to do it alone.
- 7) Krystal can inflate twenty balloons in 15 minutes. Abhasra can inflate the same twenty balloons in 12 minutes. If they worked together how long would it take them?