

## IM3- Chapter 10 Word Problem Notes

On working together problems, always use the following set-up...

First let  $x$  = amount of time it takes them to do the job together.

$$\text{Rate} * x + \text{Rate} * x = 1 \text{ job being done}$$

**Example:** If John takes 2 hours to paint a fence and Bob takes 3 hours to paint the same fence, how long will it take them to paint it together?

$$\begin{aligned} \frac{1}{2} \cdot x + \frac{1}{3} x &= 1 \\ 6 \left( \frac{x}{2} + \frac{x}{3} = 1 \right) & \rightarrow 5x = 6 \\ \frac{6x}{2} + \frac{6x}{3} &= 6 \\ 3x + 2x &= 6 \\ x &= \frac{6}{5} \\ x &= 1.2 \text{ hours} \end{aligned}$$

### Examples

- 1) Suppose it takes Judy 5 hours to clean her room and it takes Carol 4 hours to clean the same room, how long will it take them to do it together?

$$\begin{aligned} \frac{1}{5} x + \frac{1}{4} x &= 1 \\ 20 \left( \frac{x}{5} + \frac{x}{4} = 1 \right) & \rightarrow 4x + 5x = 20 \\ \frac{20x}{5} + \frac{20x}{4} &= 20 \\ 9x &= 20 \\ x &= \frac{20}{9} \\ x &= 2.22 \text{ hours} \end{aligned}$$

- 2) One garden hose can fill an above-ground pool in 10 hours. A second hose can fill the same pool twice as fast as the first hose. If both hoses are used together, how long will it take to fill the pool?

$$\begin{aligned} \frac{1}{10} x + \frac{1}{5} x &= 1 \\ 10 \left( \frac{x}{10} + \frac{x}{5} = 1 \right) & \\ \frac{10x}{10} + \frac{10x}{5} &= 10 \\ x + 2x &= 10 \\ 3x &= 10 \\ x &= \frac{10}{3} = 3.33 \text{ hours} \end{aligned}$$

IM3- Chapter 10 Word Problem Homework

Reminder....

First let  $x$  = amount of time it takes them to do the job together.

$$\text{Rate} * x + \text{Rate} * x = 1 \text{ job being done}$$

- 1) It takes Tom 4 hours to build a fence. It takes Jack 12 hours to build the same fence. How long will it take them to build it together?

$$\begin{aligned} \frac{1}{4}x + \frac{1}{12}x &= 1 \\ 12 \cdot \left( \frac{x}{4} + \frac{x}{12} = 1 \right) \\ \frac{12x}{4} + \frac{12x}{12} &= 12 \\ 3x + x &= 12 \\ 4x &= 12 \\ x &= 3 \end{aligned}$$

$$\boxed{3 \text{ hours}}$$

- 2) It takes one man an hour to mow his lawn and it takes his son 90 minutes to mow the lawn. How long will it take them to mow it together?

$$\begin{aligned} \frac{1}{60}x + \frac{1}{90}x &= 1 \\ 180 \cdot \left( \frac{x}{60} + \frac{x}{90} = 1 \right) \\ \frac{180x}{60} + \frac{180x}{90} &= 180 \\ 3x + 2x &= 180 \\ 5x &= 180 \\ x &= 36 \end{aligned}$$

$$\boxed{36 \text{ minutes}}$$

- 3) Suppose one painter can paint an entire house in 12 hours and a second painter can paint the entire house in 8 hours, how long will it take them to paint it together?

$$\begin{aligned} \frac{1}{12}x + \frac{1}{8}x &= 1 \\ 24 \cdot \left( \frac{x}{12} + \frac{x}{8} = 1 \right) \\ \frac{24x}{12} + \frac{24x}{8} &= 24 \\ 2x + 3x &= 24 \end{aligned}$$

$$\begin{aligned} 5x &= 24 \\ x &= 4.8 \text{ hours} \end{aligned}$$

- 4) It takes Maria 10 hours to pick 40 bushels of apples. Kayla can pick the same amount of apples in 12 hours. How long will it take if they work together?

$$\frac{1}{10}x + \frac{1}{12}x = 1$$

$$60 \cdot \left( \frac{x}{10} + \frac{x}{12} = 1 \right)$$

$$\frac{60x}{10} + \frac{60x}{12} = 60$$

$$6x + 5x = 60$$

$$11x = 60$$

$$x = 5.45 \text{ hours}$$

### Review Problem

- 5) How many lbs. of walnuts that cost \$.80 per lb. must be mixed with 8 lbs. of cashews that cost \$1.25 per lb. to make a mixture of nuts that costs \$1.00 per lb.?

$$x(.80) + 8(1.25) = (x+8)(1.00)$$

$$.8x + 10 = x + 8$$

$$-.2x = -2$$

$$x = 10$$

$$10 \text{ lbs}$$

### Challenge Problem

- 6) One pipe can fill a pool 1.25 times faster than a second pipe. When both pipes are opened, they fill the pool in 5 hours. How long would it take to fill the pool if only the slower pipe is used?

$$\frac{1}{x} \cdot 5 + \frac{1}{1.25x} \cdot 5 = 1$$

$$1.25x \left( \frac{5}{x} + \frac{5}{1.25x} = 1 \right)$$

$$\frac{6.25x}{x} + \frac{6.25x}{1.25x} = 1.25x$$

$$6.25 + 5 = 1.25x$$

$$11.25 = 1.25x$$

$$x = 9$$

9 hours for faster pipe

11.25 hours for slower pipe

