Work

The basic premise for setting up Work problems is the following: **If it takes t time units to do a job, then the portion of the job done in one time unit is $\frac{1}{t}$.**

For example: (a) If it takes **3** hours to do a job, then **1/3** of the job can be done in one hour. (b) If it takes $4\frac{1}{2}$ days to do a job, then $\frac{1}{4\frac{1}{2}} = \frac{1}{\frac{9}{2}} = \frac{2}{9}$ of the job can be done in one day. (c) If it takes $x + 2$ hours do to a job, then $\frac{1}{x+2}$ of the job can be done in one hour.

The quantity $\frac{1}{t}$ is a rate: **1** job per t time units. If two or more participants are involved, the key is to keep in mind that **the sum of the portions of the job each participant does alone per time unit equals the portion of the job they can do together in that time unit**.

For example: (1) Suppose Bill can paint a room in four hours, and Tom can paint it in six hours. Let T = number of hours to paint the room if they work together. Then

Bill's Rate + Tom's Rate = Rate working together

$$\frac{1}{4} \quad + \quad \frac{1}{6} \quad = \quad \frac{1}{T}$$

(2) Suppose it takes **5** hours to fill a tank when both inlet pipes are working. However, working alone, pipe A requires **2** hours less time than pipe B to fill the tank. Let b = number of hours for pipe B to fill the tank alone, then $b - 2$ is the number of hours needed by pipe A alone. So

Pipe A's Rate + Pipe B's Rate = Rate working together

$$\frac{1}{b-2} \quad + \quad \frac{1}{b} \quad = \quad \frac{1}{5}$$

Note that in writing the LEGEND we had to indicate the conditions on pipe B, namely when it was working alone. Simply writing "b = number of hours for pipe B to fill the tank" is NOT sufficient; you must include the word "alone".