

Work problems are interesting and useful applications of rational expressions. Study the example and then try some for yourself.

Example: If a professional gardener can weed your garden in 6 hours and his helper can weed it in 10 hours, how long will it take them to do the job if they work together?

The formula for this kind of problem is “rate of work x time worked = portion of job completed” or  $rt = p$ .

Look at the problem in chart form.  $t$  = time worked in hours.

	rate of work	x	time worked	=	portion of job completed
Professional	1/6		t		t/6
Helper	1/10		t		t/10

Since it takes the professional 6 hours to weed the garden, he can weed 1/6 of the garden in 1 hour. The helper can weed 1/10 of the garden in 1 hour. Working together at those rates, they will complete 1 whole job. Add the portion each completed and make it equal to 1.

$$\frac{t}{6} + \frac{t}{10} = 1$$

Now solve for  $t$  to find how many hours are necessary to complete the job.

$$30 \left( \frac{t}{6} + \frac{t}{10} = 1 \right) \qquad 5t + 3t = 30$$

$$8t = 30 \qquad t = 3 \frac{3}{4} \text{ hours or } 3 \text{ hrs. } 45 \text{ min.}$$

*Always take a minute to think whether your solution is a logical answer to the original question. Making a chart is optional.*

- 1) A man can paint his garage in 8 hours and his son can paint it in 12 hours. How long will it take to paint the garage if father and son are working together?
- 2) Sally can make the family's dinner salad in 30 minutes. Her younger sister, Sue, can make the dinner salad in 45 minutes. How long would it take if they worked together? (In this case, “ $t$ ” will represent minutes, not hours.)
- 3) Our goat can eat all the grass and weeds in our field in 20 days if it is alone. Our cow can eat the same field in 10 days alone, and our sheep can eat the field in 12 days alone. How long will it be until all the grass and weeds are eaten if all three animals are allowed to graze at the same time? (Assume that all the animals will eat the same kinds of plants.)
- 4) Work can also be done by machines or pipes. Our bathtub can be filled in 15 minutes with both the hot and cold water faucets open and the drain closed. If the same tub is full, it can be emptied in 20 minutes with the drain open. If a toddler turns on both faucets and the drain is open, how long will it take for the bathtub to overflow?