

7-8 Work Problems

Objective: To solve work problems.

Vocabulary

Work rate The fractional part of a job done in a given unit of time. For example, if you can mow a lawn in 2 h, your work rate is $\frac{1}{2}$ job per hour. A whole job is done when the sum of the fractional parts is 1.

Example 1 Ted can paint a wall in 20 min. Vern can paint the same wall in 30 min. How long would it take them to paint the wall working together?

Solution

Step 1 The problem asks for the number of minutes needed to do the job.

Step 2 Let x = the number of minutes needed to do the job together.
Ted and Vern will each work x min.
Since Ted can do the whole job in 20 min, his work rate is $\frac{1}{20}$ job per min.
Vern's work rate is $\frac{1}{30}$ job per min.

	Work rate	\times Time	= Work done
Ted	$\frac{1}{20}$	x	$\frac{x}{20}$
Vern	$\frac{1}{30}$	x	$\frac{x}{30}$

Step 3 Ted's part of the job + Vern's part of the job = whole job

$$\frac{x}{20} + \frac{x}{30} = 1$$

Step 4

$$60\left(\frac{x}{20} + \frac{x}{30}\right) = 60(1) \quad \text{Multiply by the LCD, 60.}$$

$$3x + 2x = 60$$

$$5x = 60$$

$$x = 12$$

Step 5 The check is left to you. It would take 12 min for them to do the job together.

Solve.

1. A file clerk needs 6 h to file an average day's paperwork. It takes a trainee 12 h to do the same job. How long will it take if they work together?
2. Luis can load his truck in 24 min. It takes his brother Ramon 40 min to load the truck. How long would it take them to do the job together?
3. Ross can do a job in 8 h. Brock can do the same job in 12 h. How long would it take them working together?
4. Bernice can wallpaper a room in 4 h. Annie can wallpaper the room in 8 h. How long would it take them working together?

7-8 Work Problems (continued)

Example 2 Robot A takes 6 min to weld a frame. With the help of Robot B, the job can be done in 4 min. How long would it take Robot B working alone?

Solution

Step 1 The problem asks for the amount of time it would take Robot B to weld the frame.

Step 2 Let x = the number of minutes needed for Robot B to weld the frame.

Then Robot B does $\frac{1}{x}$ of the job per min.

	Work rate	Time	Work done
Robot A	$\frac{1}{6}$	4	$\frac{4}{6}$
Robot B	$\frac{1}{x}$	4	$\frac{4}{x}$

Step 3 A's part of the job + B's part of the job = whole job.

$$\frac{4}{6} + \frac{4}{x} = 1$$

Step 4

$$\begin{aligned} 6x\left(\frac{4}{6} + \frac{4}{x}\right) &= 6x(1) \\ 4x + 24 &= 6x \\ 24 &= 2x \\ 12 &= x \end{aligned}$$

Step 5 The check is left to you. It will take Robot B 12 min to weld the frame.

Solve.

- Sherry can do a job in 60 min. If her sister helps her, it takes them 36 min. How long does it take her sister alone?
- A roofer can shingle a house in 20 h. If an apprentice helps, they can do the job in 12 h. How long does it take the apprentice alone?
- It takes Cabin A 18 min to set the tables in the camp dining hall. If Cabin B helps them, the job can be done in 10 min. How long would it take Cabin B to set the tables by themselves?
- One machine can print a magazine in 30 min. If a second machine works with the first machine, the magazine can be printed in 18 min. How long does it take the second machine to do the job alone?

Mixed Review Exercises

Solve.

1. $\frac{1}{x+2} + \frac{4}{x+3} = 3$

2. $\frac{6}{n} = \frac{12}{5}$

3. $\frac{x+2}{5} = \frac{x+3}{10}$

4. $5a - 3 = 2(a + 6)$

5. $-0.4 + k = 0.6$

6. $-5k = 0$