

Applications of Rational Equations

Objective 1: Work Rate Problems

If it takes me 5 hours to paint a room, then I can do $\frac{1}{5}$ of the job in one hour. So, the part of the job that I can do in one hour is $\frac{1}{5}$. The part of the job that I can do in one hour is always 1 over the time it takes me to do the whole job. Also my rate is $\frac{1}{5}$ of the job per hour.

Example: A park fountain has two sprinklers which are used to fill a fountain. One sprinkler can fill the fountain in 30 minutes, while the second sprinkler can fill the fountain in 20 minutes. How long will it take to fill the fountain with both sprinklers operating?

Example: It takes Sylvester and Tom 4 hours to paint a room working together. Sylvester is a very slow painter. It takes him twice as long to paint as it does Tom. How long would it take each of them individually to paint the room?

Example: It takes 2 hours to empty a certain tank if it started out completely full. It takes 3 hours to fill that same tank. If both the fill pipe and drain are accidentally left open, how long would it take to empty a full tank?

Pause the video and try these problems on your own. Once you have finished, restart the video and review the answers.

Solve the following word problems.

1. Three fill pipes can each fill a tank in 20 min., 30 min. and 60 min. respectively. How long would it take to fill the tank if all three fill pipes were used?

2. An experienced roofer can roof a house in 20 hours. If his apprentice helps they can do the job together in 12 hours. How long would it take the apprentice to roof the house if she was working by herself?

3. Tova and Meesha worked together to word process a research paper. Tova types twice as fast as Meesha. Together they can word process the paper in 4 hours. How long would it take each of them to word process the research paper if they were working by themselves?

4. The fill pipe can fill a tank in 3 hours and the drain pipe can drain the tank in 4 hours. If both pipes are accidentally opened, how long will it take to fill an empty tank?

Objective 2: Distance, Rate, Time Problems

Example: Humberto and Wakesha went for a run. Humberto ran 6.5 miles in the same time that it took Wakesha to run 5 miles. Wakesha runs 1.5 mph slower than Humberto. How fast do each of them run?

Example: Danika flew her Beechcraft Baron to Santa Fe, New Mexico a distance of 2700 miles. She had a tailwind for the entire flight. On her return trip after traveling for the same amount of time, she noticed that she had only gone 2160 miles. She had a headwind for the entire flight back. The wind was blowing at 25 mph. What was the airspeed of her plane?

Example: Tatiana and Nikolai went for a run from their house to the park. Tatiana ran at 8 mph and Nikolai ran at 6 mph. Nikolai arrived one half hour after Tatiana did. How far is it from their house to the park?

Pause the video and try these problems on your own. Once you have finished, restart the video and review the answers.

Solve the following word problems.

1. Danika flew her Beechcraft Baron to Santa Fe, New Mexico a distance of 1800 miles. She had a tailwind for the entire flight. On her return trip after traveling for the same amount of time, she noticed that she had only gone 1200 miles. She had a headwind for the entire flight back. The wind was blowing at 25 mph. What was the airspeed of her plane?

2. Sofia and Yolanda competed in a long distance race. Sofia ran at 6 mph. Yolanda ran at 8 mph. Yolanda finished an hour before Sofia. How long was the race?

3. Zoe rode her bike for 85 miles in the same time that it took Wyatt to ride 100 miles. Wyatt rode 3 mph faster than Zoe did. How fast did each of them ride?

Objective 3: Proportion Problems

Example: If 6 out of 15 homes in a community have wells for their water supply, how many homes have wells in a community of 18,000 homes?

Example: Today's exchange rate for the Australian Dollar is 1.26744 Australian dollars equals 1 U.S. dollar. Porter has 324 Australian dollars. How many U.S. dollars will he get in trade?

Example: The ratio of employees at a small company who have their paychecks directly deposited into their bank accounts to those who do not is 9 to 2. If the number of people who have direct deposit is 14 more than the number who do not, how many employees do not have direct deposit?

Example: Javier can run 300 yards in 34 seconds. At that rate, how far can he run in 52 seconds?

Example: Alberto uses $\frac{3}{4}$ cup of sugar in his banana muffin recipe. The recipe makes 12 muffins. Alberto is baking for his daughter's school bake sale. He wants to make 52 muffins. How much sugar will he need?

Pause the video and try these problems on your own. Once you have finished, restart the video and review the answers.

Solve the following word problems.

1. Today's exchange rate for the Dutch Guilder is 1.78860 Dutch Guilders equals 1 U.S. dollar. Carla has 524 Dutch Guilders. How many U.S. dollars will she get in trade?
2. White pine trees can grow 10" per year. Based on this rate, how old is a tree that is 24' tall?
3. Alberto uses $\frac{3}{4}$ cup of sugar in his banana muffin recipe. The recipe makes 12 muffins. Alberto is baking for his daughter's school bake sale. He wants to make 64 muffins. How much sugar will he need?
4. Dustin is designing plans for an office building. The scale that he is using is 1" = 8'. How long of a line should he use to represent the front of the building if he is planning for the actual length to be 75'?

5. In a survey of 500 students at U.C. Riverside, 415 people said that they have a car with them on campus. Of the 22921 students at UCR, how many students does the survey suggest will have a car on campus?

Objective 4: Number Problems

Example: The numerator of a certain fraction is one less than the denominator. If 3 is added to both the numerator and denominator the result is equal to $\frac{7}{8}$. What was the original fraction?

Pause the video and try these problems on your own. Once you have finished, restart the video and review the answers.

Solve following word problem.

1. The numerator of a certain fraction is two less than the denominator. If 3 is added to both the numerator and denominator the result is equal to $\frac{4}{5}$. What was the original fraction?