Lesson 27: Word Problems Leading to Rational Equations

Classwork

Exercise 1

1. Anne and Maria play tennis almost every weekend. So far, Anne has won 12 out of 20 matches.
   a. How many matches will Anne have to win in a row to improve her winning percentage to 75%?

   b. How many matches will Anne have to win in a row to improve her winning percentage to 90%?

   c. Can Anne reach a winning percentage of 100%?

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d. After Anne has reached a winning percentage of 90% by winning consecutive matches as in part (b), how many matches can she now lose in a row to have a winning percentage of 50%?

Example

Working together, it takes Sam, Jenna, and Francisco two hours to paint one room. When Sam works alone, he can paint one room in 6 hours. When Jenna works alone, she can paint one room in 4 hours. Determine how long it would take Francisco to paint one room on his own.

Exercises 2–4

2. Melissa walks 3 miles to the house of a friend and returns home on a bike. She averages 4 miles per hour faster when cycling than when walking, and the total time for both trips is two hours. Find her walking speed.

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3. You have 10 liters of a juice blend that is 60% juice.

   a. How many liters of pure juice need to be added in order to make a blend that is 75% juice?

   b. How many liters of pure juice need to be added in order to make a blend that is 90% juice?

   c. Write a rational equation that relates the desired percentage p to the amount A of pure juice that needs to be added to make a blend that is $p\%$ juice, where $0 < p < 100$. What is a reasonable restriction on the set of possible values of p? Explain your answer.

   d. Suppose that you have added 15 liters of juice to the original 10 liters. What is the percentage of juice in this blend?

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e. Solve your equation in part (c) for the amount A. Are there any excluded values of the variable p? Does this make sense in the context of the problem?

4. You have a solution containing 10% acid and a solution containing 30% acid.

a. How much of the 30% solution must you add to 1 liter of the 10% solution to create a mixture that is 22% acid?

b. Write a rational equation that relates the desired percentage p to the amount A of 30% acid solution that needs to be added to 1 liter of 10% acid solution to make a blend that is $p\%$ acid, where $0 < p < 100$. What is a reasonable restriction on the set of possible values of p? Explain your answer.

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c. Solve your equation in part (b) for A. Are there any excluded values of p? Does this make sense in the context of the problem?

d. If you have added some 30% acid solution to 1 liter of 10% acid solution to make a 26% acid solution, how much of the stronger acid did you add?

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