

PROBLEM 1 Start Applying Yourself, Rational Function!

Recall that a rational expression is the ratio of two polynomials. Rational expressions can be used to solve problems that involve comparing two quantities of the same unit of measure.



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1. Delilah is making her own salad dressing out of red vinegar and olive oil. It's a new recipe so she has to determine the correct proportions. She mixes 10 teaspoons of vinegar and 16 teaspoons of olive oil. After she stirs the mixture, she realizes it's not the consistency she wants, so she adds more olive oil.

a. What is the ratio of red vinegar to olive oil if she adds 6 teaspoons more of olive oil?

b. What is the ratio of red vinegar to olive oil if she adds 10 teaspoons more of olive oil?

c. Write an expression to represent the ratio of red vinegar to olive oil. Let x represent the number of additional teaspoons of olive oil added to the recipe.

d. Describe the behavior of the ratio as the number of additional teaspoons of olive oil increases. Show all of your work and explain your reasoning.

e. The recommended ratio of vinegar to olive oil is 1:7. Determine the amount of olive oil that she must add to the mixture. Show all of your work and explain your reasoning.

Remember to use your proportional reasoning skills.



f. What are the domain and range of the function? Explain your reasoning.

3. Tracy and Adrian model the following problem with a rational function.

Crunchy College Kid Snack Company manufactures a new brand of trail mix containing peanuts, almonds, and chocolate. Each package contains 400 grams of trail mix, with 50% peanuts, 35% almonds, and 15% chocolate. Herbert loves chocolate. When he gets the bag home, he wants to add enough chocolate so that the mixture is 50% chocolate. How many grams of chocolate should he add?

Tracy

I must first determine the amount of chocolate in the bag.

$$(0.15) \cdot (400) = 60\text{g}$$

The ratio of chocolate to total trail mix must increase to 50%. Adding chocolate increases the total amount of trail mix, so the new ratio is $\frac{60 + x}{400 + x}$. I can set up the proportion $\frac{60 + x}{400 + x} = 0.50$. The x -value represents the amount of additional chocolate.

Adrian

The current chocolate to trail mix ratio is $\frac{15}{100}$. Adding chocolate to get a mixture with 50% chocolate, add x to the percent chocolate as well as the total, so the rational equation becomes $\frac{15 + x}{100 + x} = 0.50$. The x -value of the intersection point represents the amount of chocolate Herbert must add.

- a. Who is correct? Explain your reasoning. If necessary, include the error in the student's reasoning.

- b. Determine the grams of chocolate that Herbert must add to the trail mix to get a mixture that is 50% chocolate.

Use proportional reasoning to solve each equation.



3. What is the least possible positive value for the sum of an integer and its reciprocal? Show all of your work and explain your reasoning.

4. Scott is taking a test that has two different parts to it. His goal is to get a 90%. He finished Part 1, and a quick scan by the teacher reveals that he got 18 out of the 23 questions correct. He begins Part 2. If he answers each consecutive question correctly, how many must he answer correctly for his grade to be higher than a 90%? Show all of your work and explain your reasoning.

5. Manuel enjoys racquetball, so he is considering joining a local gym. Joining the gym costs \$30 each month, and they charge \$2 per hour for using the racquetball courts. They also allow people who are not members of the club to use the courts for \$7 per hour. If he joins the gym, how many hours would he have to play before the average cost is less than \$7 per hour? Show all work and explain your reasoning.