

Ratios, Rates, and the Whole

Name: _____

Date: _____

Study two methods. A drink uses 2 cups concentrate to 3 cups water. For 8 cups concentrate, scale by 4 to get 12 cups water. Or use $\frac{3}{2}$ cups water per cup concentrate: $8 \times \frac{3}{2} = 12$. Concentrate is $\frac{2}{5}$ of the total, not $\frac{2}{3}$.

Keep the comparison clear

1. Complete the same recipe.

Concentrate (cups)	2	6	10
Water (cups)	3		
Total (cups)	5		

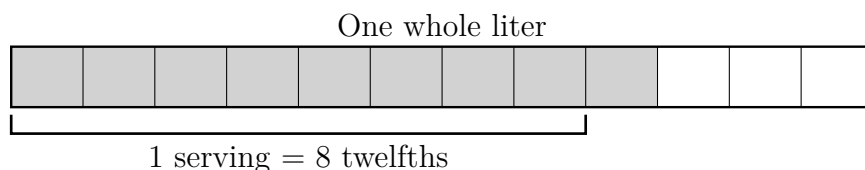
2. Complete: concentrate:water is 2 : 3, but concentrate:total is 2 : $\square$. Concentrate is $\square\%$ of the mixture. Name the whole.

3. Noah adds 4 to both amounts, changing 2 : 3 to 6 : 7. Does the taste stay the same? Repair the recipe for 6 cups concentrate.

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Fraction division: count serving units

Completed example. A container holds $\frac{3}{4}$ liter; each serving is $\frac{2}{3}$ liter. In twelfths, these are 9 units and 8 units per serving.



There is 1 serving plus 1 extra twelfth of a liter. That extra unit is $\frac{1}{8}$ of a serving. Thus $\frac{3}{4} \div \frac{2}{3} = \frac{9}{8}$ servings. Check: $\frac{9}{8} \times \frac{2}{3} = \frac{3}{4}$ liter.

4. Explain why the leftover is $\frac{1}{8}$ of a serving, not $\frac{1}{12}$ of a serving.

5. Connect the method to an equation: $\frac{2}{3}q = \frac{3}{4}$. Multiply both sides by $\frac{3}{2}$ to obtain $q = \square$. How does this record the same answer?

6. Predict and calculate the number of servings in $\frac{3}{4}$ liter when each serving is (a) $\frac{1}{4}$ liter, (b) $\frac{1}{2}$ liter, and (c) $\frac{2}{3}$ liter. Why does a larger serving size give fewer servings?

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Apply independently

7. A different recipe uses 3 cups concentrate to 5 cups water. For 24 cups mixture, find each ingredient. Show a table, diagram, or equation.

8. A container holds $\frac{5}{6}$ liter. A serving is $\frac{3}{4}$ liter. How many servings are available, including part of a serving? Choose a representation or equation; check by multiplication.

9. A ribbon costs \$9 for $\frac{3}{2}$ meters. Find its cost per meter and the cost of $2\frac{1}{2}$ meters. Explain the units in the rate.

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Think Like a Mathematician

Optional extension. Explain why your reasoning works.

10. A drink begins with concentrate:water 2 : 3. After 4 cups water are added, the ratio is 1 : 2. No concentrate is added. Find the original amounts. Explain with equal-sized parts and check both ratios.

11. A $1\frac{1}{2}$ -meter ribbon is cut completely into pieces of $\frac{1}{8}$ meter and $\frac{3}{16}$ meter, with at least one of each. Find every possible pair of piece counts. Which gives the most pieces? Explain why the list is complete.