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Unit 2, Lesson 15: Part-Part-Whole Ratios

Let's look at situations where you can add the quantities in a ratio together.

15.1: True or False: Multiplying by a Unit Fraction

True or false?

$$\frac{1}{5} \cdot 45 = \frac{45}{5}$$

$$\frac{1}{5} \cdot 20 = \frac{1}{4} \cdot 24$$

$$42 \cdot \frac{1}{6} = \frac{1}{6} \cdot 42$$

$$486 \cdot \frac{1}{12} = \frac{480}{12} + \frac{6}{12}$$

15.2: Cubes of Paint

A recipe for maroon paint says, "Mix 5 ml of red paint with 3 ml of blue paint."

1. Use snap cubes to represent the amounts of red and blue paint in the recipe. Then, draw a sketch of your snap-cube representation of the maroon paint.
 - a. What amount does each cube represent?
 - b. How many milliliters of maroon paint will there be?

2. a. Suppose each cube represents 2 ml. How much of each color paint is there?

Red: _____ ml

Blue: _____ ml

Maroon: _____ ml

- b. Suppose each cube represents 5 ml. How much of each color paint is there?

Red: _____ ml

Blue: _____ ml

Maroon: _____ ml

3. a. Suppose you need 80 ml of maroon paint. How much red and blue paint would

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you mix? Be prepared to explain your reasoning.

Red: _____ ml

Blue: _____ ml

Maroon: 80 ml

- b. If the original recipe is for one batch of maroon paint, how many batches are in 80 ml of maroon paint?

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15.4: Invent Your Own Ratio Problem

1. Invent another ratio problem that can be solved with a tape diagram and solve it. If you get stuck, consider looking back at the problems you solved in the earlier activity.
2. Create a visual display that includes:
 - The new problem that you wrote, without the solution.
 - Enough work space for someone to show a solution.
3. Trade your display with another group, and solve each other's problem. Include a tape diagram as part of your solution. Be prepared to share the solution with the class.
4. When the solution to the problem you invented is being shared by another group, check their answer for accuracy.

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Lesson 15 Summary

A **tape diagram** is another way to represent a ratio. All the parts of the diagram that are the same size have the same value.

For example, this tape diagram represents the ratio of ducks to swans in a pond, which is 4 : 5.

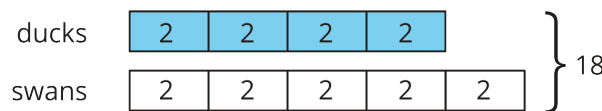


The first tape represents the number of ducks. It has 4 parts.

The second tape represents the number of swans. It has 5 parts.

There are 9 parts in all, because $4 + 5 = 9$.

Suppose we know there are 18 of these birds in the pond, and we want to know how many are ducks.



The 9 equal parts on the diagram need to represent 18 birds in all. This means that each part of the tape diagram represents 2 birds, because $18 \div 9 = 2$.

There are 4 parts of the tape representing ducks, and $4 \cdot 2 = 8$, so there are 8 ducks in the pond.

Lesson 15 Glossary Terms

- tape diagram

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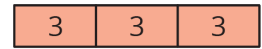
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Unit 2, Lesson 15: Part-Part-Whole Ratios

1. Here is a tape diagram representing the ratio of red paint to yellow paint in a mixture of orange paint.

a. What is the ratio of yellow paint to red paint?

cups of red paint



cups of yellow paint



b. How many total cups of orange paint will this mixture yield?

2. At the kennel, the ratio of cats to dogs is 4 : 5. There are 27 animals in all. Here is a tape diagram representing this ratio.

number of cats



number of dogs



a. What is the value of each small rectangle?

b. How many dogs are at the kennel?

c. How many cats are at the kennel?

3. Last month, there were 4 sunny days for every rainy day. If there were 30 days in the month, how many days were rainy? Explain your reasoning. If you get stuck, consider using a tape diagram.

4. Noah entered a 100-mile bike race. He knows he can ride 32 miles in 160 minutes. At this rate, how long will it take him to finish the race? Use each table to find the answer. Next, explain which table you think works better in finding the answer.

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Table A:

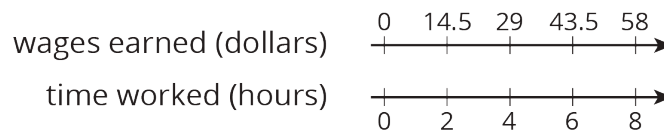
distance (miles)	elapsed time (minutes)
32	160
1	
100	

Table B:

distance (miles)	elapsed time (minutes)
32	160
96	
4	
100	

(from Unit 2, Lesson 12)

5. A cashier worked an 8-hour day, and earned \$58.00. The double number line shows the amount she earned for working different numbers of hours. For each question, explain your reasoning.



- How much does the cashier earn per hour?
- How much does the cashier earn if she works 3 hours?

(from Unit 2, Lesson 13)

6. A grocery store sells bags of oranges in two different sizes.

- The 3-pound bags of oranges cost \$4.
- The 8-pound bags of oranges for \$9.

Which oranges cost less per pound? Explain or show your reasoning.

(from Unit 2, Lesson 10)