

Ratios

Problems about ratios.

Problem 1 A certain punch is made by mixing 4 cups of fruit juice with 5 cups of sparkling water. Fill in the table below to find how many cups of fruit juice you will need to mix with 19 cups of sparkling water to get a punch in the same recipe.

4	<div><div>4</div><div>5</div></div>	<div><div>76</div><div>5</div></div>
	given	given
5	1	19
9	<div><div>1.8</div><div>given</div></div>	<div><div>34.2</div><div>given</div></div>

Problem 2 A contractor usually mixes 8 kilograms of sand with 11 kilograms of rocks to make a parking area for equipment. How many kilograms of sand should the contractor mix with 20 kilograms of rocks in order to make the same mixture, but for a larger parking area? Fill out the table below to answer this question.

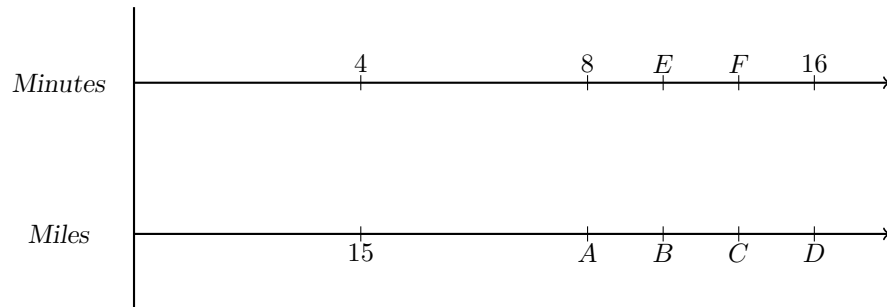
8	16	4	20
11	<div><div>22</div><div>given</div></div>	<div><div>5.5</div><div>given</div></div>	<div><div>27.5</div><div>given</div></div>
19	<div><div>38</div><div>given</div></div>	<div><div>9.5</div><div>given</div></div>	<div><div>47.5</div><div>given</div></div>

Problem 3 Jenny mixes $\frac{5}{7}$ of a cup of water with $\frac{1}{2}$ of a cup of insect repellent concentrate to spray around her yard. How much water and insect repellent will Jenny need in order to make 3 cups of this mixture? Fill out the table below to answer this question.

Learning outcomes:
Author(s): Bart Snapp and Brad Findell and Jenny Sheldon

$\frac{5}{7}$	$\frac{10}{17}$ given	$\frac{10}{17}$ given	$\frac{30}{17}$ given
$\frac{1}{2}$	$\frac{7}{17}$ given	$\frac{7}{17}$ given	$\frac{21}{17}$ given
	17	1	3

Problem 4 A bike is traveling at a constant rate of 4 miles every 15 minutes. How far does the bike travel in 35 minutes? We will use the double number line below to answer this question.

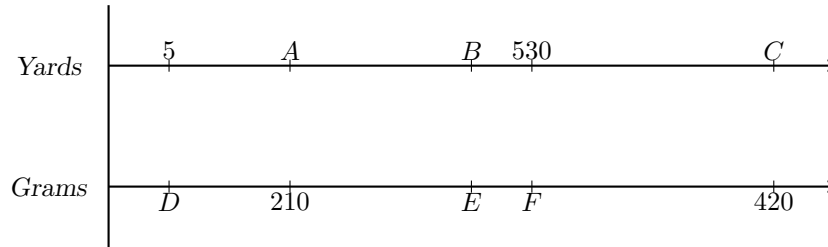


- (a) What is the value we should mark on the line at point A? $\frac{30}{17}$
given
- (b) What is the value we should mark on the line at point D? $\frac{45}{17}$
given
- (c) Which point on the line corresponds to 35 minutes?

Multiple Choice:

- (i) B ✓
- (ii) C
- (iii) E
- (iv) F
- (d) How far did the bike travel in 35 minutes? $8 + \frac{4}{3}$ miles
given

Problem 5 If 350 yards of yarn weighs 210 grams, how much does 530 yards of the same yarn weigh? Fill in the missing values on the double number line below, and then solve the problem.



We have $A = \boxed{350}$, $B = \boxed{525}$, and $C = \boxed{700}$.
given given given

We also have $D = \boxed{3}$, $E = \boxed{315}$, and $F = \boxed{318}$.
given given given

Finally, 530 yards of the yarn weighs $\boxed{318}$ grams.
given

Problem 6 We mix red and blue paint in a 2 : 4 ratio to make a lovely shade of violet paint. How many liters of each paint do we need to make 21 liters of paint total?

Suzi solves the above problem using the following picture.



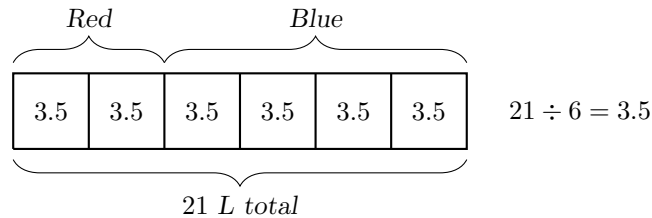
(a) Explain what Suzi has drawn, and how it relates to the problem.

Free Response: **Hint:** Suzi has drawn the 21 liters of paint to be made, one box for each liter. She then colors the boxes in the pattern 2 red, 4 blue, until she has fewer than 6 boxes remaining. At the end, she splits up the remaining boxes into six equal parts so that she can color two of the remaining parts red, and four blue.

(b) Use Suzi's picture to answer the original question. We should use $\boxed{7}$ given
 liters of red paint and $\boxed{14}$ given liters of blue paint.

Problem 7 We mix red and blue paint in a 2 : 4 ratio to make a lovely shade of violet paint. How many liters of each paint do we need to make 21 liters of paint total?

Marc solves the above problem using the following picture.

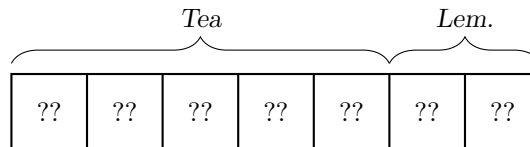


- (a) Explain what Marc has drawn, and how it relates to the problem.

Free Response: **Hint:** Marc has drawn the 6 parts of the ratio, and labeled the two parts red and four parts blue. He then figures out how to split up the 21 liters across the 6 boxes, and sees that we should put 3.5 liters in each part.

- (b) Use Marc's picture to answer the original question. We should use $\boxed{7}$ _{given} liters of red paint and $\boxed{14}$ _{given} liters of blue paint.

Problem 8 We mix 5 parts iced tea with 2 parts lemonade to make a refreshing summer beverage. How much lemonade should we mix with 1.5 cups of iced tea to make just one serving of this refreshing beverage? Use a method similar to Marc's method of the previous problem to answer this question.



- (a) What value should go in each box in this case? $\boxed{0.3}$ _{given} cups
- (b) How much lemonade should we mix with 1.5 cups of iced tea? $\boxed{0.6}$ _{given} cups

Problem 9 A certain shade of green paint is made by mixing 5 parts of yellow paint with 9 parts of blue paint. How many parts of yellow paint would you need to mix with 1 part blue paint? For fun, try to use a new method to solve this problem!

You would use $\frac{5}{9}$ parts yellow paint.
given

Problem 10 A certain shade of green paint is made by mixing 12 parts of yellow paint with 4 parts of blue paint. How many parts of blue paint would you need to mix with 1 part yellow paint? For fun, try to use a new method to solve this problem!

You would use $\frac{4}{12}$ parts blue paint.
given

Problem 11 Two kayakers are traveling at a constant speed. Doug travels 300 meters in 8 minutes, while Phil travels 350 meters in 9 minutes. Who is traveling faster?

Multiple Choice:

- (a) Phil travels faster, because he covers about 39 meters per minute. ✓
- (b) Doug travels faster, because he covers about 38 meters per minute.
- (c) Phil travels faster, because he travels farther.
- (d) Doug travels faster, because he travels for fewer minutes.

Problem 12 Vi is making biscuits. Her recipe calls for $2\frac{3}{4}$ teaspoons of baking powder and $2\frac{1}{3}$ cups of flour. She got a bit mixed up and instead added $3\frac{2}{4}$ teaspoons of baking powder to her bowl with $2\frac{1}{3}$ cups of flour. How much more flour should she add to the bowl in order to still be using the same recipe?

Vi should add $\frac{7}{11}$ of a cup of flour to the bowl.
given

Problem 13 Three snails are moving at a constant rate.

- Snail A travels 0 inches in 4 minutes.
- Snail B travels 4 inches in 0 minutes.
- Snail C travels 0 inches in 0 minutes.

How fast does each snail travel one inch? Select all correct answers below.

Select All Correct Answers:

- (a) Snail A travels 0 inches in 1 minute. ✓
- (b) Snail B travels 4 inches in 1 minute.
- (c) Snail C travels 0 inches in 1 minute.
- (d) We do not know how far Snail A travels in 1 minute.
- (e) We do not know how far Snail B travels in 1 minute. ✓
- (f) We do not know how far Snail C travels in 1 minute. ✓

Problem 13.1 We have different issues finding the distances traveled by the two snails in one minute. Explain how the two problems are different.

Free Response: **Hint:** With Snail B, the snail is not using any time to cover the distance. In this case, we have an impossible situation: movement without using time. With Snail C, however, as no time elapses, the snail does not move. This could mean essentially anything - after 1 minute, the snail could have moved essentially any distance. We do not have enough information to answer this question!

Problem 14 How is the previous problem related to division with zero?

Free Response: One way to solve the problem is to find the rate at which the snails move. In order to find this rate, we divide the distance by the number of minutes. Snail A's speed is $0 \div 4$ inches per minute, Snail B's rate is $4 \div 0$ inches per minute (which is undefined), and Snail C's rate is $0 \div 0$ inches per minute. Look again at the previous problem and think about what you know about $4 \div 0$ versus $0 \div 0$!
