G6-M1-Lesson 1: Ratios

1. At the local movie theatre, there are 115 boys, 92 girls, and 28 adults.
   a. Write the ratio of the number of boys to the number of girls.
      115: 92
   b. Write the same ratio using another form (A: B vs. A to B).
      115 to 92
   c. Write the ratio of the number of boys to the number of adults.
      115: 28
   d. Write the same ratio using another form.
      115 to 28

I know that I can represent a ratio using a colon or the word "to."

2. At a restaurant, 120 bottles of water are placed in ice at the buffet. At the end of the dinner rush, 36 bottles of water remained.
   a. What is the ratio of the number of bottles of water taken to the total number of water bottles?
      84 to 120, *or* 84: 120
   b. What is the ratio of the number of water bottles remaining to the number of water bottles taken?
      36 to 84, *or* 36: 84

I need to subtract the number of water bottles remaining from the total number of water bottles to determine the number of water bottles taken.

3. Choose a situation that could be described by the following ratios, and write a sentence to describe the ratio in the context of the situation you chose.
   a. 1 to 3
      For every one yard, there are three feet.
   b. 7 to 30
      For every 7 days in a week, often there are 30 days in a month.
   c. 26: 6
      For every 26 weeks, there are typically 6 months.

I should choose situations that make sense with the numbers in the ratios. I know that for every one yard, there are three feet.

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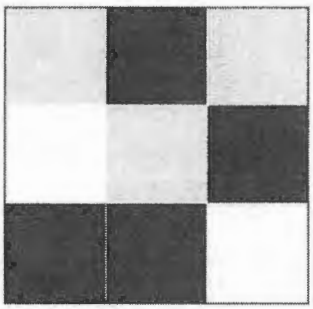
G6-M1-Lesson 2: Ratios

Examples

1. Using the design below, create 4 different ratios related to the image. Describe the ratio relationship, and write the ratio in the form $A:B$ or the form A to B.



I see that there are 2 white tiles, 3 grey tiles, and 4 black tiles. I also see that there are 9 tiles altogether. I can use these quantities, the words "for each," "for every," or "to." I can also use a colon.

For every 9 tiles, there are 4 black tiles.

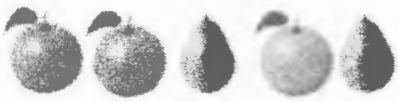
The ratio of the number of black tiles to the number of white tiles is 4 to 2.

The ratio of the number of grey tiles to the number of white tiles is 3: 2.

There are 2 black tiles for each white tile.

Answers will vary.

2. Jaime wrote the ratio of the number of oranges to the number of pears as 2: 3. Did Jaime write the correct ratio? Why or why not?



I see that there are 3 oranges and 2 pears. I also know that the first value in the ratio relationship is the number of oranges, so that number is represented first in the ratio. The number of pears comes second in the relationship, so that number is represented second in the ratio.

Jaime is incorrect. There are three oranges and two pears. The ratio of the number of oranges to the number of pears is 3: 2.

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G6-M1-Lesson 3: Equivalent Ratios

1. Write two ratios that are equivalent to $2:2$.

   $2 \times 2 = 4, 2 \times 2 = 4$; ***therefore, an equivalent ratio is*** $4:4$.

   $2 \times 3 = 6, 2 \times 3 = 6$; ***therefore, an equivalent ratio is*** $6:6$.

   Answers will vary.

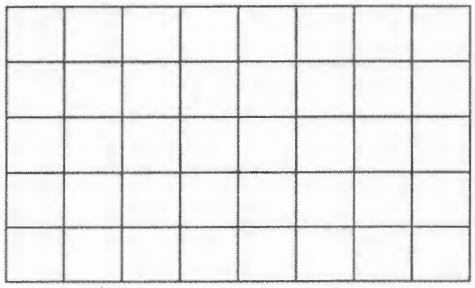
The ratio is in the form $A:B$. I must multiply the A and B values by the same nonzero number to determine equivalent ratios.

2. Write two ratios that are equivalent to $5:13$.

   $5 \times 2 = 10, 13 \times 2 = 26$; ***therefore, an equivalent ratio is*** $10:26$.

   $5 \times 4 = 20, 13 \times 4 = 52$; ***therefore, an equivalent ratio is*** $20:52$.

3. The ratio of the length of the rectangle to the width of the rectangle is ____ to ____.



The ratio of the length of the rectangle to the width of the rectangle is $8:5$.

The length of this rectangle is 8 units, and the width is 5 units. Because the value for the length is listed first in the relationship, 8 is first in the ratio (or the A value). 5 is the B value.

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4. For a project in health class, Kaylee and Mike record the number of pints of water they drink each day. Kaylee drinks 3 pints of water each day, and Mike drinks 2 pints of water each day.

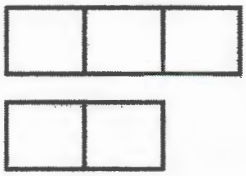
   a. Write a ratio of the number of pints of water Kaylee drinks to the number of pints of water Mike drinks each day.

   $3:2$

   b. Represent this scenario with tape diagrams.

   Number of pints of water Kaylee drinks

   Number of pints of water Mike drinks

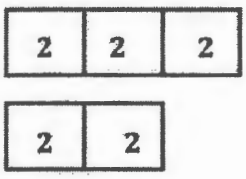


   c. If one pint of water is equivalent to 2 cups of water, how many cups of water did Kaylee and Mike each drink? How do you know?

   Kaylee drinks 6 cups of water because $3 \times 2 = 6$. Mike drinks 4 cups of water because $2 \times 2 = 4$. Since each pint represents 2 cups, I multiplied the number of pints of water Kaylee drinks by two and the number of pints of water Mike drinks by two. Also, since each unit represents two cups:

   Number of pints of water Kaylee drinks

   Number of pints of water Mike drinks



Each unit in the tape diagrams represents 2 because there are two cups for every pint of water.

   d. Write a ratio of the number of cups of water Kaylee drinks to the number of cups of water Mike drinks.

   The ratio of the number of cups of water Kaylee drinks to the number of cups of water Mike drinks is $6:4$.

   e. Are the two ratios you determined equivalent? Explain why or why not.

   $3:2$ and $6:4$ are equivalent because they represent the same value. The diagrams never changed, only the value of each unit in the diagram.

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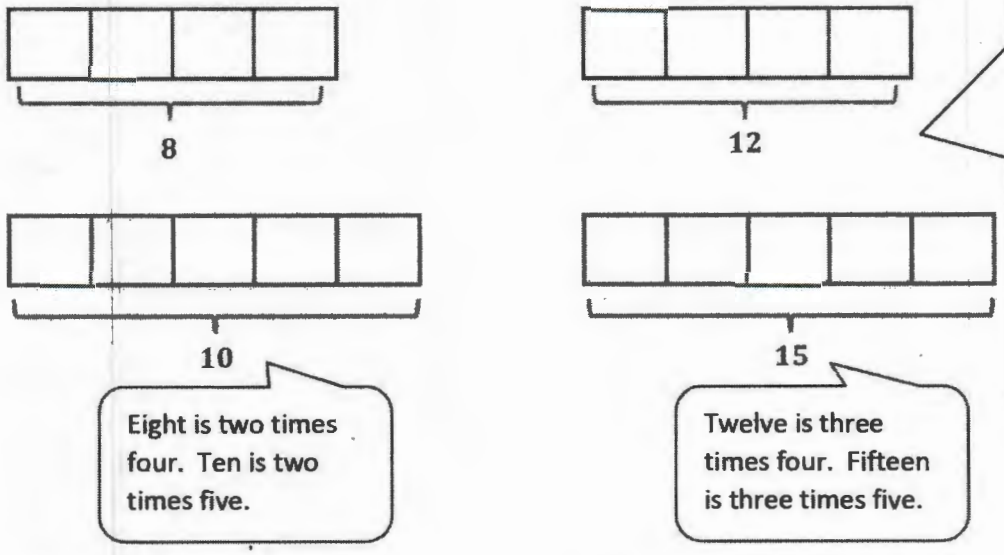
G6-M1-Lesson 4: Equivalent Ratios

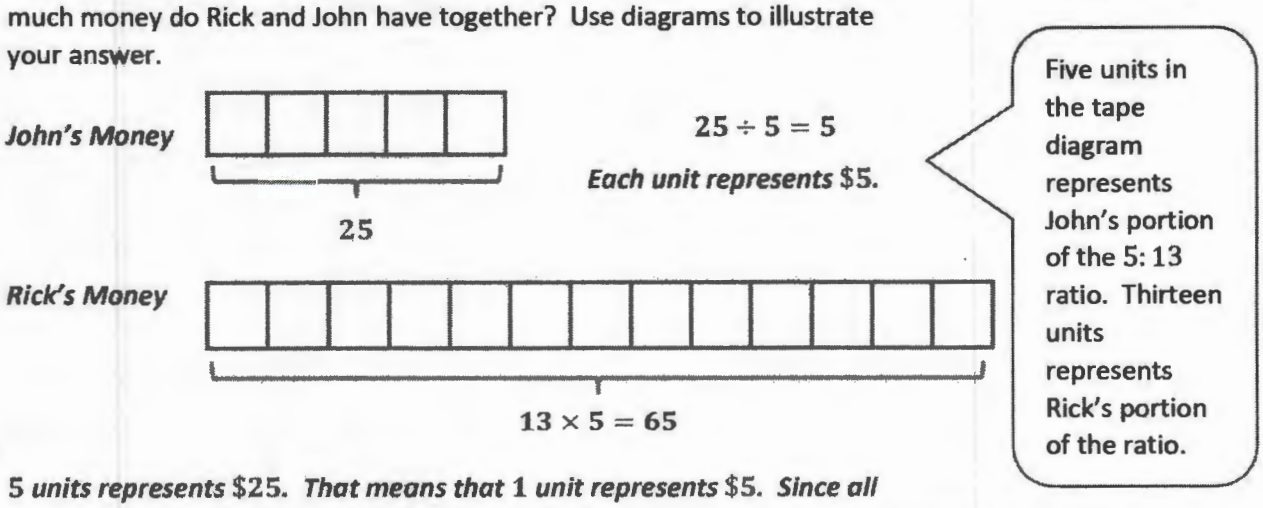
1. Use diagrams or the description of equivalent ratios to show that the ratios $4:5$, $8:10$, and $12:15$ are equivalent.



The constant number, c, is 2.

The constant number, c, is 3.

2. The ratio of the amount of John's money to the amount of Rick's money is $5:13$. If John has \$25, how much money do Rick and John have together? Use diagrams to illustrate your answer.



5 units represents $\$25$. *That means that* 1 *unit represents* $\$5$. *Since all of the units are the same,* 13 *units represents* $\$65$ *because* $13 \times 5 = 65$. *To determine how much money John and Rick have together, add the amounts.* $\$25 + \$65 = \$90$.

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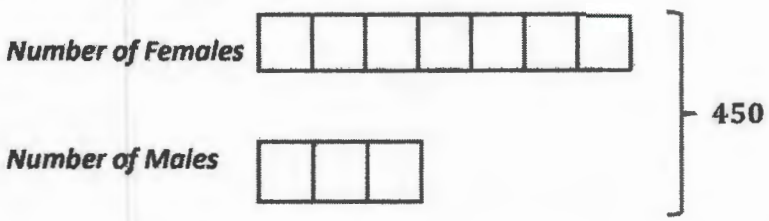
G6-M1-Lesson 5: Solving Problems by Finding Equivalent Ratios

1. The ratio of the number of females at a spring concert to the number of males is 7: 3. There are a total of 450 females and males at the concert. How many males are in attendance? How many females?



I know that there are a total of ten equal units. To determine the value of one unit, I need to divide 450 by 10. Each unit represents 45.

10 *units* $\rightarrow 450$

1 *unit* $\rightarrow 450 \div 10 = 45$

3 *units* $\rightarrow 45 \times 3 = 135$

7 *units* $\rightarrow 45 \times 7 = 315$

Because there are 3 units that represent the number of males, I need to multiply each unit by 3. $45 \times 3 = 135$.

Because there are 7 units that represent the number of females, I need to multiply each unit by 7. $45 \times 7 = 315$.

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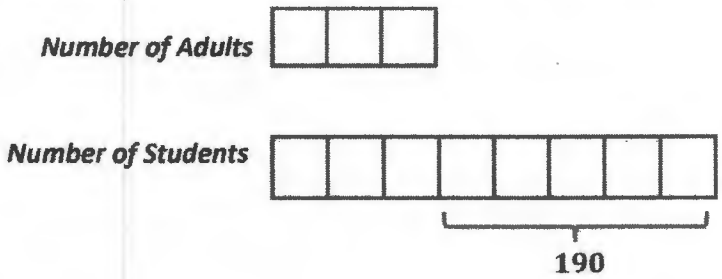
2. The ratio of the number of adults to the number of students at a field trip has to be $3:8$. During a current field trip, there are 190 more students on the trip than there are adults. How many students are attending the field trip? How many adults?



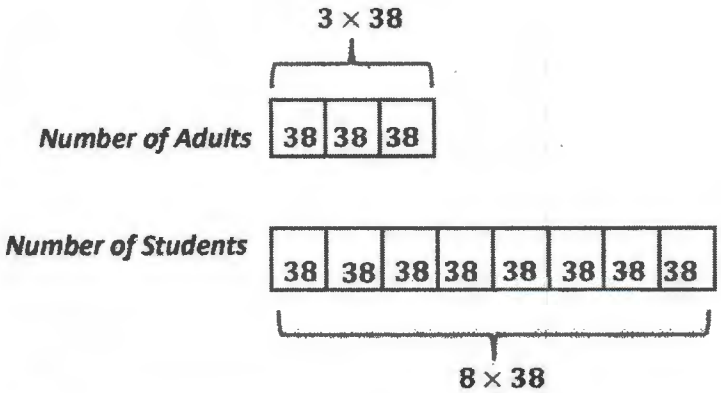
5 equal units represent the 190 more students than adults. To determine the value of one unit, I need to divide 190 by 5. Each unit represents 38.

5 *units* $\rightarrow 190$

1 *unit* $\rightarrow 190 \div 5 = 38$

3 *units* $\rightarrow 3 \times 38 = 114$

8 *units* $\rightarrow 8 \times 38 = 304$



There are 304 students and 114 adults attending the field trip.

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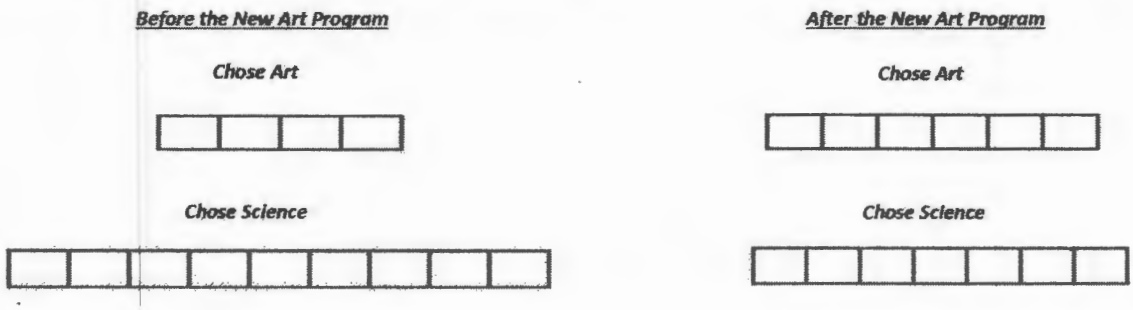
G6-M1-Lesson 6: Solving Problems by Finding Equivalent Ratios

Solving Ratio Problems

At the beginning of Grade 6, the ratio of the number of students who chose art as their favorite subject to the number of students who chose science as their favorite subject was $4:9$. However, with the addition of an exciting new art program, some students changed their mind, and after voting again, the ratio of the number of students who chose art as their favorite subject to the number of students who chose science as their favorite subject changed to $6:7$. After voting again, there were 84 students who chose art as their favorite subject. How many fewer students chose science as their favorite subject after the addition of the new art program than before the addition of the new art program? Explain.



6 *units* $\rightarrow 84$

1 *unit* $\rightarrow 84 \div 6 = 14$

9 *units* $\rightarrow 14 \cdot 9 = 126$

7 *units* $\rightarrow 14 \cdot 7 = 98$

$126 - 98 = 28$

I can draw and label tape diagrams to represent each ratio. If 84 students chose art after the new art program, then 6 units represent a value of 84, so 1 unit has a value of 14 (84 divided by 6). This information will allow me to determine the value of 9 units and 7 units. Now I'm able to find the difference and answer the question.

There were 28 fewer students who chose science as their favorite subject after the addition of the new art program than the number of students who chose science as their favorite subject before the addition of the new art program. 126 students chose science before, and 98 students chose science after the new art program was added.

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G6-M1-Lesson 7: Associated Ratios and the Value of a Ratio

1. Amy is making cheese omelets for her family for breakfast to surprise them. For every 2 eggs, she needs $\frac{1}{2}$ cup of cheddar cheese. To have enough eggs for all the omelets she is making, she calculated she would need 16 eggs. If there are 5.5 cups of cheddar cheese in the fridge, does Amy have enough cheese to make the omelets? Why or why not?

   - $2 : \frac{1}{2}$
   - *Value of the Ratio:* 4

     $2 : \frac{1}{2}$ $\qquad$ $16 : 4$

     2 *is four times as much as* $\frac{1}{2}$.

     16 *is four times as much as* 4.

     Amy needs 4 *cups of cheddar cheese. She will have enough cheese because she needs* 4 *cups and has* 5.5 *cups.*

   I need to determine the value of the ratio in order to find the amount of cheese that is needed. I can do this by dividing 2 by $\frac{1}{2}$. The number of cups of cheese needed is $\frac{1}{4}$ the number of eggs. I can also say the number of eggs is 4 times the number of cups of cheese.

2. Samantha is a part of the Drama Team at school and needs pink paint for a prop they're creating for the upcoming school play. Unfortunately, the 6 gallons of pink paint she bought is too dark. After researching how to lighten the paint to make the color she needs, she found out that she can mix $\frac{1}{3}$ of a gallon of white paint with 2 gallons of the pink paint she bought. How many gallons of white paint will Samantha have to buy to lighten the 6 gallons of pink paint?

   - $\frac{1}{3} : 2$
   - *Value of the Ratio:* $\frac{1}{6}$

   $\frac{1}{3}$ *is* $\frac{1}{6}$ *of* 2; 1 *is* $\frac{1}{6}$ *of* 6

   Samantha would need 1 *gallon of white paint to make the shade of pink she desires.*

   I need to determine the value of the ratio by dividing $\frac{1}{3}$ by 2. The number of gallons of white paint needed is $\frac{1}{6}$ of the number of gallons of pink paint. I can also say the number of gallons of pink paint is 6 times the number of gallons of white paint.

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G6-M1-Lesson 8: Equivalent Ratios Defined Through the Value of a Ratio

1. Use the value of the ratio to determine which ratios are equivalent to 9: 22.

   a. 10: 23

   b. 27: 66

   c. 22.5: 55

   d. 4.5: 11

   Answer choices (b), (c), and (d) are equivalent to 9: 22.

I can divide 9 by 22 in order to find the value of the ratio, which is $\frac{9}{22}$. To find the value of the ratio for all the answer choices, I need to divide:

$$\frac{10}{23}$$

$$\frac{27}{66} = \frac{9}{22}$$

$$\frac{22.5}{55} = \frac{9}{22}$$

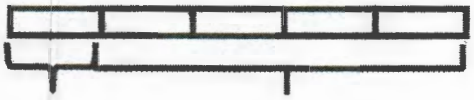
$$\frac{4.5}{11} = \frac{9}{22}$$

2. The ratio of the number of shaded sections to unshaded sections is 3: 5. What is the value of the ratio of the number of shaded sections to the number of unshaded sections?

$\frac{3}{5}$

To find the value of the ratio, I divide 3 by 5. The value of the ratio is $\frac{3}{5}$.

3. The middle school band has 600 members. $\frac{1}{5}$ of the members were chosen for the highly selective All-State Band. What is the value of the ratio of the number of students who were chosen for the All-State Band to the number of students who were not chosen for the All-State Band?



Students chosen for the All-State Band

Students not chosen for the All-State Band

The value of the ratio of the number of students who were chosen for the All-State Band to the number of students who were not chosen for the All-State Band is $\frac{1}{4}$.

In the tape diagram, $\frac{1}{5}$ of the members in the band were chosen for the All-State Band. I can divide 600 by 5, which is 120, so I know 120 students were selected for the All-State Band and 480 (600 – 120) were not. I also know the value of one unit, which is 120, and the value of 4 units, which is 480. The value of the ratio is $\frac{120}{480}$ or $\frac{1}{4}$.

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4. Tina is learning to juggle and has set a personal goal of juggling for at least five seconds. She tried 30 times but only accomplished her goal 14 times.

   a. Describe and write more than one ratio related to this situation.

   The ratio of the number of successful tries to the total number of tries is $14:30$.

   The ratio of the number of successful tries to the number of unsuccessful tries is $14:16$.

   The ratio of the number of unsuccessful tries to the number of successful tries is $16:14$.

   The ratio of the number of unsuccessful tries to the total number of tries is $16:30$.

   There is more than one ratio associated with this problem. I know the total, 30, and the number of times she was successful, 14. I can also determine the number of times she was unsuccessful ($30 - 14 = 16$).

   b. For each ratio you created, use the value of the ratio to express one quantity as a fraction of the other quantity.

   The number of successful tries is $\frac{14}{30}$ *or* $\frac{7}{15}$ *of the total number of tries.*

   The number of successful tries is $\frac{14}{16}$ *or* $\frac{7}{8}$ *the number of unsuccessful tries.*

   The number of unsuccessful tries is $\frac{16}{14}$ *or* $\frac{8}{7}$ *the number of successful tries.*

   The number of unsuccessful tries is $\frac{16}{30}$ *or* $\frac{8}{15}$ *of the total number of tries.*

   c. Create a word problem that a student can solve using one of the ratios and its value.

   If Tina tries juggling for at least five seconds 15 *times, how many successes would she anticipate having, assuming her ratio of successful tries to unsuccessful tries does not change?*

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