6th Grade Learning Guide Math
What Your Student is Learning:

- Use ratios to describe the relationship between two quantities and use bar diagrams/double number lines to model those ratio relationships.
- Use multiplication and division to find equivalent ratios, solve problems by finding equivalent ratios, then represent equivalent ratios in tables and on graphs.
- Compare ratios to solve problems (using ratio tables and graphs).
- Use rates to describe ratios in which the terms have different units. Use these rates and unit rates to solve problems.
- Use ratio reasoning to compare rates and solve problems.
- Use unit rates to solve problems involving speed, unit price, and an equation.

Background and Context for Parents: In 6th grade, students are formally seeing Ratios and Rates for the first time. It is important that students are able to interpret/create different representations of ratios and rates (double number lines, tables, graphs, numerically, etc.) so they conceptually understand the relationship between the two values and how changing one affects the value of the other. Students in 6th grade are not setting up proportions (to cross multiply and divide). Have students represent the ratio/rate in one of the ways shown below to help them find the missing information. They will learn the way we learned it in future grades.

- **Ratios and Graphs** In Lesson 5-4, students make tables of equivalent ratios and graph the pairs of values on the coordinate plane. Equivalent ratios form a straight line when graphed on the coordinate plane. Other points on this line represent other equivalent ratios.

- **The Concept of a Ratio** In Lesson 5-1, students learn to write ratios to represent the relationship between two quantities. They also use bar diagrams and double number line diagrams to model ratio relationships and solve problems.

In Lessons 5-2 and 5-3, students make tables of equivalent ratios to solve problems and compare ratios.
Ways to support your student:
● Talk with your student about ratios/rates as much as possible since they are all around us.
● Read the problem out loud to them.
● Before giving your student the answer to their question or specific help, ask them “What have you tried so far?”, “What do you know?”, “What might be a next step?”, or “Is there a representation you can draw to help you?”
● After your student has solved it, and before you tell them it’s correct or not, have them explain to you how they got their solution and if they think their answer makes sense. For this topic, making sense of the situation is especially important.

Online Resources for Students:
Kahn Academy (only do ratios and rates):
https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic
Ratios- https://www.mathplayground.com/ASB_RatioBlaster.html
Learning Support for Mathematics

For students that are approaching grade level and have learning gaps/ differences in mathematics, provide numerous opportunities for explorations at the concrete (manipulatives) and representational (visual) levels before progressing to the abstract (numbers) level. Students that need learning supports should be provided with:

- Intensive Direct Instruction and daily guided practice
- scaffolded supports
- the use of visuals as models and aids
- numerous opportunities to think out loud
- support to help them understand the why
- use of manipulatives and tools to support understanding
- Bar Modeling Representations to decode word problems
- the use of mnemonics to enhance retention of skills
- daily practice with basic facts
- the presentation of content in varied contexts and varied levels
- opportunities to use diagrams and draw math concepts
- graph paper to support understanding
- numerous opportunities to draw pictures of word problems
- the use of smaller numbers to address number operations
- opportunities for success to build a growth mindset
- computer time to allow for needed practice
- opportunities to engage in metacognition (the building and reinforcing of thinking and reasoning) skills

See examples for each bulleted item on the following pages
- **Intensive Direct Instruction and daily guided practice**  
  (Intensive Direct Instruction means to explain the skill / concept to the student with several examples repeatedly to help them understand)  

- **Scaffolded Supports**  
  (Scaffolded supports means to introduce the skill one step at a time – allowing the student to understand one section part, before moving on to the next part) ex. 5+ 1=6, 9+1=10, 24+1=25- it is the same as “what number comes after 5, after 9, after 24”  
  [https://youtu.be/5hWDbSx_kdo](https://youtu.be/5hWDbSx_kdo)

- **Visuals as models and aides**  
  (Pictures of objects that can be used to help students understand the math)  
  [https://studentsatthecenterhub.org/resource/helping-struggling-students-build-a-growth-mindataset/](https://studentsatthecenterhub.org/resource/helping-struggling-students-build-a-growth-mindataset/)

- **Thinking out loud**  
  (Allows students to talk and think about the skills they are learning, which allows them to better remember the skill)  
  [https://youtu.be/f-4N7OxSMok](https://youtu.be/f-4N7OxSMok)

- **Understanding the why**  
  (When students understand why a strategy works, they will apply it to other skills) ex. 5x = 5, 45x1= 45, 320x1=320

- **Manipulatives and Tools**  
  (Manipulatives can be counters, beans, blocks, etc. – Tools can be rulers, calculators, scales, etc.)  

- **Bar Modeling Representations**  
  (Bar Modeling Representations consist of visuals that help students understand the skill they are learning. Ex.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>

[https://youtu.be/TbayTZvS_bc](https://youtu.be/TbayTZvS_bc)
· **Mnemonics**
(Mnemonics consist of strategies to help students remember skills – ex.

https://youtu.be/dXvvGc9TldY

· **Basic Facts**
(Basic facts include addition, subtraction, division, multiplication facts – ex. 8+2=10, 2+8=10, 10-2=8, 10-8=2 / 2x5=10, 5x2=10, 10/2=5, 10/5=2
https://youtu.be/TbayTZvS_bc

· **Content with varied contexts and varied levels**
Means to show student how to solve a problem different ways to allow them to use the skill that way they understand best
https://youtu.be/FVg9n0l0Gf0

· **Diagrams**
(Diagrams provide students with visuals / pictures that help them solve the problem and they help them read the problem with less words)
https://youtu.be/TbayTZvS_bc

· **Graph paper**
(Graph paper helps students to solve the problem by making it visual / easier to see the answer)
https://youtu.be/mX43cn3lASI

· **Drawing Pictures**
(Drawing pictures allow students to show they can solve the problem without using words that they may not know or be able to write)
https://youtu.be/TbayTZvS_bc
· Smaller Numbers
(The use of smaller numbers can help students understand the process of a skill, so that when they move on to bigger numbers, they will see that the process is still the same, they acquire understanding of the skill) ex. 5x = 5, 45x1= 45, 320x1=320

· Growth Mindset
(A growth mindset is a process that helps to improve intelligence (thinking), ability (skill) and performance (actions). This means that by helping students to develop a growth mindset, we can help them to learn to think and be problem solvers. This is a process that occurs over time by helping them improve by building success over time.
https://studentsatthecenterhub.org/resource/helping-struggling-students-build-a-growth-min
dset/

· Computer Time
(Computer time allows students to use websites, games, activities that will help them learn math skills and concepts)
mathgametime.com, pbs.com, bestkidsolutions.com, firstinmath.com, helpingkidsrise.org

· Metacognition
(Metacognition means to help students think about what they are thinking, the steps they are using, the words and numbers that they are using- It helps students to better focus on the skills they are using- it is a process that occurs over time) /
https://youtu.be/HKFOhd5sMEc/
http://www.spencerauthor.com/metacognition/
1. Round the value 16.758 to the nearest hundredth.
   A. 16.75
   B. 16.76
   C. 16.8
   D. 17.0

2. Which coordinate pair correctly identifies the location of point A?
   A. (5, 4)
   B. (4, 6)
   C. (4, 5)
   D. (4, 4)

3. Jordan paid $682 for 124 cupcakes that each cost the same amount. Find the price of one cupcake.
   A. $5.05
   B. $5.50
   C. $6.05
   D. $6.50

4. Solve the equation for x: 126 = 3x.
   A. x = 378
   B. x = 129
   C. x = 123
   D. x = 42

5. Cenisa ran 1 kilometer. How many meters did she run?
   A. 10,000 meters
   B. 1,000 meters
   C. 100 meters
   D. 10 meters

6. Which equation represents the pattern shown in the table below?

<table>
<thead>
<tr>
<th>x</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

   A. y = x + 2
   B. y = x + 1
   C. y = 3x
   D. y = x - 1
7. Mateo finds a special on apples for $0.80 per pound. Which price is a better deal?
   A $0.78 per pound
   B $0.85 per pound
   C $0.90 per pound
   D $1.25 per pound

8. Which value is the solution of the equation \(8r = 536\)?
   A 63
   B 64
   C 67
   D 72

9. Kaitlyn buys 3 T-shirts for $14.95 each. What is the total cost?
   A $42.95
   B $43.85
   C $44.85
   D $45.00

10. Determine the next three points on the number line.

    [Diagram of number line with +6 and +6 markers]

   A 9, 15, 21
   B 6, 12, 18
   C 9, 14, 20
   D 10, 16, 22

11. Which measure is equivalent to 4 feet 5 inches?
    A 53 inches
    B 60 inches
    C 45 inches
    D 4.5 inches

12. Akikta bought 25 trees for $15.40 each. Chloe bought 35 trees for $14.30 each. What was the difference between the total amounts that the girls paid for the trees?
    A $1.10
    B $50.00
    C $115.50
    D $150.05
Review What You Know!

Vocabulary
Choose the best term from the box to complete each definition.

1. Fractions that name the same amount are called ____________.
2. The number 3 is a ______________ of 9 and 12.
3. A number that can be used to describe a part of a set or a part of a whole is a(n) ______________.

Equivalent Fractions
Write two fractions equivalent to the given fraction.

4. \( \frac{3}{4} \)  
5. \( \frac{7}{8} \)  
6. \( \frac{12}{5} \)

7. \( \frac{1}{2} \)  
8. \( \frac{8}{9} \)  
9. \( \frac{2}{3} \)

Equations
Write an equation that represents the pattern in each table.

10. | \( x \) | 2 | 3 | 4 | 5 | 6 |  
    | \( y \) | 16 | 24 | 32 | 40 | 48 |

11. | \( x \) | 2 | 4 | 6 | 8 | 10 |  
    | \( y \) | 5 | 7 | 9 | 11 | 13 |

Units of Measure
Choose the best unit of measure by writing inch, foot, yard, ounce, pound, ton, cup, quart, or gallon.

12. serving of trail mix  
13. height of a person  
14. weight of a newborn kitten  
15. gasoline

Measurement Conversions
16. Michael is 4 feet tall. Explain how Michael could find his height in inches. Then explain how he could find his height in yards.
A ratio is a comparison of two numbers or the number of items in two groups. Each quantity in a ratio is called a term. Ratios can be written with the word “to” separating the terms (a to b), with a colon separating the terms (a : b), or in fraction form \( \frac{a}{b} \).

The ratio 6:3 can be modeled using a bar diagram with a row of 6 equal boxes and a row of 3 equal boxes as shown on the right.

1. The chorus at an elementary school is made up of fifth and sixth graders. This year, the chorus has 12 fifth-grade girls, 9 fifth-grade boys, 14 sixth-grade girls, and 10 sixth-grade boys.
   a. The ratio of girls to boys is _____ to _____.
   b. The ratio of fifth graders to sixth graders is _____ : _____.
   c. The ratio of girls to the total number of students in the chorus is _____.

2. The school cafeteria orders 4 cartons of regular milk for every 3 cartons of chocolate milk.
   a. Complete the bar diagram to show the ratio.
   b. The school ordered 120 cartons of regular milk. Divide 120 cartons of regular milk by _____ because there are _____ boxes in the top row.
   c. Write the value of each box in both rows of the bar diagram.
   d. How many cartons of chocolate milk did the school order?

On the Back!

3. A photocopier can copy 4 pages every 2 seconds. How long will it take to copy 120 pages? Draw a diagram to solve the problem.
Read the problem below. Answer the SQRQCQ questions to help understand the problem.

Sam is packing gift boxes with fruit. For each apple, he packs 3 plums and 5 oranges. If he puts 3 apples in a box, how many plums and oranges will Sam put in the box? Draw a diagram to solve the problem.

Survey
1. What is the problem about?

Question
2. What question will be answered by solving the problem?

Reread
3. Underline the sentence that describes the ratio.

Question
4. Why might a bar diagram be better to use than a double number line diagram to solve the problem?

Construct
5. How many boxes will be drawn for apples? plums? oranges? Explain.

Question
6. How will the number written in each box of the bar diagram signal that the solution is correct?
Use the vocabulary terms from the list to complete the sentences. Each term may be used more than once.

<table>
<thead>
<tr>
<th>terms</th>
<th>bar diagram</th>
<th>a part</th>
<th>ratio</th>
<th>quantities</th>
<th>double number line diagram</th>
<th>the whole</th>
<th>relationship</th>
</tr>
</thead>
</table>

1. A __________________________ shows a ________________ between two quantities.

2. The two __________________________ compared in a ratio are called __________________________.

3. At a pet show, there are 5 dogs and 3 cats. The ratio 5:3 compares ________________ to ________________.

4. At a vegetable stand, there are 10 tomatoes and 7 cucumbers. The ratio 7:17 compares ________________ to ________________.

5. The ratio of cups to plates is \( \frac{2}{4} \). The __________________________ below illustrates this ratio.

   ![Cups and Plates Diagram]

6. The ratio of plates to cups is 4:2. The __________________________ below illustrates this ratio.

   ![Plates and Cups Diagram]
Two numbers are **equivalent** if they have the same value. Ratios are equivalent when they show the same relationship.

The table shows equivalent ratios. Each term of the ratio can be multiplied or divided by the same number to find equivalent ratios.

<table>
<thead>
<tr>
<th>Number of Petals</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Flowers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Bruno correctly answered 4 questions out of every 5 questions on a test.

1. Write the ratio of questions that Bruno answered correctly to the number of questions on the test. _____ : _____

2. Make a table with equivalent ratios to find the number of questions that Bruno answered correctly if there were 45 questions on the test.

<table>
<thead>
<tr>
<th>Number of Questions Correct</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Questions</td>
<td>5</td>
</tr>
</tbody>
</table>

There were _____ questions on the test. So, find the equivalent ratio with 45 as the second term.

3. If there were 45 questions on the test, then Bruno answered _____ questions correctly.

**On the Back!**

4. Write three ratios that are equivalent to \( \frac{6}{5} \).
Three sisters are saving for a special vacation. The ratio of Ada’s savings to Ellie’s savings is 7:3, and the ratio of Ellie’s savings to Jasmine’s savings is 3:4. Together all three girls have saved $56. How much has each girl saved? Complete the table. Explain how the table can be used to solve the problem.

<table>
<thead>
<tr>
<th>Ada’s savings</th>
<th>$7</th>
<th>$21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellie’s savings</td>
<td>$6</td>
<td></td>
</tr>
<tr>
<td>Jasmine’s savings</td>
<td>$4</td>
<td>$16</td>
</tr>
</tbody>
</table>

1. What are the sisters saving for? Is that important information to the problem? Explain.

2. What is another way, in words, to write “The ratio of Ada’s savings to Ellie’s savings is 7:3?”

3. Highlight both ratios given. What is the same about them? How will this information be added to the table?

4. Can it be said that Ada has saved $7, Ellie has saved $3, and Jasmine has saved $4? Use a fact from the problem to justify your answer.

5. Complete the table. Describe the change in savings amounts from left to right in the table.
Each table describes three ratios. Complete the tables, using a different format to write each ratio. Tell whether each ratio represents a part to a part, the whole to a part, or a part to the whole.

1. There are 10 quarters and 5 dimes in a coin bank.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 to 15</td>
<td>part to whole</td>
</tr>
<tr>
<td>Quarters to dimes</td>
<td>10:5</td>
<td>whole to part</td>
</tr>
<tr>
<td>Total coins to quarters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. On an ice hockey team, there are 3 forwards, 2 defensemen, and 1 goalie.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forwards to players</td>
<td>6:1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defence to forwards</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. A lemonade recipe calls for 1 cup each of sugar and lemon juice and 8 cups of water.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemonade to lemon juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water to lemon juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemon juice to sugar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Ratio tables** can be used to compare different ratios. The comparisons can be used to solve problems.

1. Printer A prints 15 pages in 3 minutes. Complete the table with equivalent ratios.

<table>
<thead>
<tr>
<th>Printer A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
</tr>
<tr>
<td>Time (min)</td>
</tr>
</tbody>
</table>

Printer B prints 24 pages in 5 minutes. Complete the table with equivalent ratios.

<table>
<thead>
<tr>
<th>Printer B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
</tr>
<tr>
<td>Time (min)</td>
</tr>
</tbody>
</table>

2. If printer A and printer B were each used to print continuously for 15 minutes, how many pages would each printer print?

   Printer A would print _____ pages in 15 minutes.

   Printer B would print _____ pages in 15 minutes.

3. Which printer can print more pages in 15 minutes? ____________

4. How long would it take each printer to print 120 pages?

   Printer A would take _____ minutes to print 120 pages.

   Printer B would take _____ minutes to print 120 pages.

5. Which printer is faster? ____________

**On the Back!**

6. Laine and Maddie are practicing free throws. Laine makes 5 baskets for every 9 shots. Maddie makes 4 baskets for every 6 shots. If each girl attempts 36 shots, which girl makes more baskets? Complete ratio tables to solve.
Name

Read the problem below. Then circle True or False for each statement. When possible, highlight the text that supports any true statements and write the problem number above it.

In the first week, 2 out of 3 campers were boys. In the second week, 3 out of 5 campers were boys. There were 15 total campers each week. In which week were there more boy campers? Explain.

1. The ratio of boy campers to total campers was 2:3 in the first week.  
   True  False

2. The ratio of girl campers to boy campers was 5:3 in the second week.  
   True  False

3. There was the same ratio of girl campers to boy campers each week of camp.  
   True  False

4. For every five campers in the second week, three of them were boys.  
   True  False

5. The total number of campers in both weeks was the same.  
   True  False

6. The solution to the problem will tell whether there were more boy campers in the first week or the second week.  
   True  False

7. Ratio tables cannot be used to explain the problem solution.  
   True  False
Use the list of vocabulary terms to complete the crossword puzzle.

<table>
<thead>
<tr>
<th>equivalent</th>
<th>fraction</th>
<th>quantities</th>
<th>solve</th>
<th>terms</th>
<th>whole</th>
</tr>
</thead>
<tbody>
<tr>
<td>extend</td>
<td>multiply</td>
<td>ratio</td>
<td>table</td>
<td>three</td>
<td></td>
</tr>
</tbody>
</table>

Down
1. A ratio that compares pets to dogs is the ________ to a part.
2. One way a ratio can be expressed is a(n) ________.
3. A(n) ________ is a relationship in which for every $x$ units of one quantity there are $y$ units of another quantity.
4. There are ________ ways to express a ratio.
5. You compare ratios to ________ problems.
6. To find equivalent ratios, ________ both terms of the original ratio by the same nonzero number.

Across
5. A ratio is a mathematical way to compare ________.
6. The quantities $x$ and $y$ in a ratio are called ________.
7. A ratio ________ helps organize the terms of a ratio.
8. ________ ratio tables to identify common terms.
9. The ratios 1:2 and 5:10 are ________.
**Equivalent ratios** show the same relationship. You can multiply each term of a ratio by the same number to find an equivalent ratio.

To find equivalent ratios using a table, use repeated addition or repeated subtraction. The ratios from the table can then be graphed as points on a coordinate plane.

The bank offers Ryo an exchange rate of 5 U.S. dollars for every 4 British pounds.

1. Complete the table by writing equivalent ratios.

<table>
<thead>
<tr>
<th>U.S. Dollars ( x )</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Pounds ( y )</td>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on the table, for 30 U.S. dollars Ryo gets ____ British pounds.

2. On the coordinate plane, the ratio of 5 U.S. dollars to 4 British pounds is represented by the point \((5, 4)\).

Plot the remaining pairs of values from the table on the coordinate plane. Draw a dashed line from \((0, 0)\) to the edge of the graph to connect the points.

3. How many British pounds can Ryo get for 35 U.S. dollars? Use the line to answer.

Find ____ on the \(x\)-axis, and move ____ until you reach your line to find the \(y\)-value, ____.

Ryo can get ____ British pounds for ____ U.S. dollars.

**On the Back!**

4. Laura uses 3 balls of yarn to make 5 scarves. If Laura has 15 balls of yarn, how many scarves can she make? Make a table to find equivalent ratios. Then plot the pairs of values on a coordinate plane.
Graph for #4 on Re-teaching
Name __________________________

Review Example 2 from the lesson. Answer the questions to help understand how to read an example.

**EXAMPLE 2**

**Graph Ratios Using Repeated Addition**

Jack is making juice. He has 25 celery sticks. If Jack uses all 25 celery sticks, how many apples will he need to make the juice?

Use repeated addition to complete the ratio table.

<table>
<thead>
<tr>
<th>Celery Sticks</th>
<th>Apples</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
</tr>
</tbody>
</table>

Plot the pairs of values on a coordinate plane.

The point (25, 10) shows that 10 apples are needed for 25 celery sticks.

Jack needs 10 apples to make the juice.

1. Circle each item in the example (text, ratio table, and graph) that represents the basic ratio of celery sticks to apples.

2. What are two ways to solve the problem that are shown in the example?

3. Why do the ratio table and graph stop at 25 celery sticks?

4. Highlight every part of the example that represents the solution to the problem.

5. Is the solution to the problem different when using a different method of solving? Explain.
Use the words, expressions, and equations from the list to complete the graphic organizer about the study of ratios.

<table>
<thead>
<tr>
<th>division</th>
<th>ratio</th>
<th>equivalent</th>
<th>x units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.00b$</td>
<td>graph</td>
<td>$y$ units</td>
<td>7:11</td>
</tr>
<tr>
<td>$2 + 4 = 5 + 1$</td>
<td>3 cats to 5 dogs</td>
<td>$\frac{x}{y}$</td>
<td>relationship</td>
</tr>
</tbody>
</table>

**Definition**

A _______________ is a relationship in which for every _______________ of one quantity there are _______________ of another quantity.

**Facts**

- Ratios are considered to be _______________ if they express the same _______________.
- A ratio compares two like or unlike quantities by _______________.
- Ratios can be shown visually using a _______________ or a ratio table.

**Examples**

**Nonexamples**

Ratios
Name ________________________________

A rate is a special type of ratio that compares quantities with unlike units of measure.

Amy ran 18 miles in 3 days, which is a rate that can be written as \( \frac{18 \text{ miles}}{3 \text{ days}} \).

A unit rate is a rate with a denominator of 1 unit.

Four rates are listed below. The unit rates are circled.

\[
\begin{array}{ccc}
\$13.20 & \text{7 quarts} & \text{350 miles} & \$13 \\
6 \text{ pounds} & 1 \text{ car} & 7 \text{ hours} & 1 \text{ tree}
\end{array}
\]

1. A baseball team plays 8 games in 2 weeks.
   a. Complete the ratio table to find rates that are equivalent to \( \frac{8 \text{ games}}{2 \text{ weeks}} \).

2. Elena earns $100 in 4 hours. Write this statement as a rate. \( \frac{\square \text{ dollars}}{\square \text{ hours}} \) or \( \square \text{ dollars} \) per \( \square \text{ hours} \).

3. How much does Elena earn per hour?
   To find the unit rate, start with the rate you wrote in Exercise 2. Divide each term by the denominator so that the denominator is 1.

   \[
   \frac{100}{4} = \frac{\square}{\square} \div \frac{\square}{\square} = \square
   \]
   Elena earns ______ per ______.

4. At this rate, how much money would Elena earn in 16 hours?
   To find an equivalent rate, start with the unit rate, which is the amount Elena made in 1 hour. Multiply each term by 16.

   \[
   \square \times 16 = \square
   \]
   In 16 hours, Elena would earn ______.

On the Back!

5. Find the unit rate. \( \frac{42 \text{ pages}}{3 \text{ days}} \)
Name

Read the problem. Answer the questions to help understand the problem. Tell whether the information used to answer the question was directly stated in the text (DS), implied in the text (I), or based only on previous knowledge (PK).

A machine takes 1 minute to fill 6 cartons of eggs. At that rate, how long will it take to fill 420 cartons?

1. How long does it take to fill 6 cartons?

2. Highlight the statement in the problem that describes the relationship between the cartons that are filled and the time it takes to fill them. Write the statement as a rate.

3. To solve the problem, would you use a unit rate for 1 carton or a unit rate for 1 minute? Use words from the problem to explain.

4. Does the machine fill each carton in the same amount of time? Explain.

5. What might be a follow-up question for this problem in which the solver would need to find the unit rate for the other unit?
Use the vocabulary terms from the list to complete the sentences.

<table>
<thead>
<tr>
<th>unit rate</th>
<th>ratio</th>
<th>rate</th>
<th>numerator</th>
</tr>
</thead>
<tbody>
<tr>
<td>denominator</td>
<td>equivalent ratios</td>
<td>unit</td>
<td>graph</td>
</tr>
</tbody>
</table>

1. A __________ is a special type of ratio that compares quantities with unlike units of measure.

2. In a fraction, the value that represents the number of parts as compared to the whole is the __________.

3. A quantity, such as foot or gallon, chosen as a standard in which other quantities may be expressed is a __________.

4. A __________ is a comparison of two like or unlike quantities by division.

5. In the fraction \( \frac{2}{3} \), the number 3 represents the __________ of the fraction or the number of parts that the whole is divided into.

6. __________ name the same comparison.

7. In mathematics, a __________ is the ratio of two measurements in which the second quantity in the comparison is 1 unit.

8. A __________ is a mathematical tool that is used to visually represent the relationship between quantities.
A unit rate is a rate in which the comparison is to 1 unit.

Daniel painted 22 wooden planks in 11 minutes.
Divide to find Daniel’s unit rate.

\[
\frac{22 \text{ planks}}{11 \text{ min}} \div 11 = \frac{2 \text{ planks}}{1 \text{ min}}
\]

Daniel’s unit rate is 2 planks per minute.

A **unit price** is a unit rate that gives the price of 1 item.

Tickets are sold in sheets of 24 for $6.
To find the unit price, or the cost of 1 ticket, divide the price by the number of tickets.

\[
\frac{6}{24 \text{ tickets}} = 0.25 \text{ per ticket}
\]

1. Earl and Mia danced in a charity fundraiser. Earl raised $275 when he danced for 5 hours. Mia raised $376 when she danced for 8 hours. Write each rate as a fraction.

   Earl: \(\frac{\$275}{\square \text{ hours}}\)

   Mia: \(\frac{\$376}{\square \text{ hours}}\)

2. How much money did each dancer raise in 1 hour? Find each unit rate.

   Earl raised \(\frac{275}{5}\) in one hour.

   Mia raised \(\frac{376}{8}\) in one hour.

3. Which dancer raised more money per hour?

   Complete the statement below and use < or > to compare Earl’s and Mia’s earnings per hour.

   Earl \(\square\) Mia \(\square\); \(\square\) raised more money per hour.

   On the Back!

4. Compare the unit prices to find which is the better deal.

   6 songs for $8 or 10 songs for $12
Read the problem. Answer the questions to help understand the problem.

Car A travels 115 miles on 5 gallons of gas. Car B travels 126 miles on 6 gallons of gas. How can you find which car gets better gas mileage?

1. Which skill is the main focus of the problem?
   A ordering   B comparing   C dividing   D subtracting

2. Can the question be answered by simply comparing the number of miles car A travels to the number of miles car B travels? Explain.

3. What does “gas mileage” mean?

4. How can the gas mileage of each car be calculated?

5. What type of ratio is gas mileage? Explain.

6. Is it necessary to calculate the gas mileage of each car to answer the question? Explain.
Draw a line from each vocabulary term on the left to either an example of the term or its definition on the right.

1. Equivalent ratios
   a ratio that compares quantities with unlike units of measure

2. Unit
   5 miles and 10 miles
   1 week and 2 weeks

3. Unit price
   a relationship in which for every x units of one quantity there are y units of another quantity

4. Rate
   a rate that gives the price of one item

5. Ratio
   the quantities x and y in a ratio

6. Ratio table
   foot, dollar, gallon

7. Terms

<table>
<thead>
<tr>
<th><strong>Field Trip</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Students</strong></td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>80</td>
</tr>
</tbody>
</table>
If an object travels at a **constant speed**, then its speed stays the same over time.

A train travels at a constant speed of 68 miles per hour. The table shows how far the train travels after 1 hour, 2 hours, and 3 hours.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$68 \times 1 = 68$</td>
</tr>
<tr>
<td>2</td>
<td>$68 \times 2 = 136$</td>
</tr>
<tr>
<td>3</td>
<td>$68 \times 3 = 204$</td>
</tr>
</tbody>
</table>

A unit price is a unit rate that gives the price of 1 item.

Write the price of the cereal as a rate. $\frac{\$2.88}{32 \text{ oz}}$

Divide to find the unit price: $0.09$ per ounce.

1. A cruise ship travels at a constant speed. In 3 hours, the ship travels 72 nautical miles. If the ship continues to travel at the same rate, how far would it travel in 11 hours?

   a. How far does the ship travel in 1 hour? Find the ship’s unit rate of speed.

      The ship travels ______ nautical miles in 1 ______.

   b. At this rate, how far would the ship travel in 11 hours?

      Find an equivalent rate.

      In 11 hours, the ship would travel ______ nautical miles.

2. Noah spent $66 for 20 gallons of gasoline. Lydia spent $81.25 for 25 gallons of gasoline. Which person got the better buy?

   a. How much did each person spend for 1 gallon of gasoline?

      Noah: ________    Lydia: ________

   b. ________ spent less money per gallon than ________ did, so she got the better buy.

**On the Back!**

3. A thunderstorm travels at a constant speed. In 15 minutes, the storm travels 12 miles. If the storm continues to travel at the same rate, how far would it travel in 90 minutes?
Read the problem below. Answer the questions to help understand the problem.

On a family vacation, Amy’s dad drove the car at a constant speed and traveled 585 miles in 13 hours. At this rate, how long would it have taken the family to travel 810 miles? What was the car’s rate of speed?

1. Highlight the words that describe the given rate.

2. Write the rate in a fractional form, including the units.

3. Underline the questions in the problem. What two answers will be found by solving this problem?

4. Which answer should be found first? Explain.

5. Describe how to find the unit rate. What does the answer represent?
Write a definition and an example for each vocabulary term.

<table>
<thead>
<tr>
<th>Word or Phrase</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. constant speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. unit price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. rate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. equivalent ratios</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. unit rate</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Answer Keys
1. Round the value 16.758 to the nearest hundredth.
   A  16.75
   B  16.76
   C  16.8
   D  17.0

2. Which coordinate pair correctly identifies the location of point A?
   A  (5, 4)
   B  (4, 6)
   C  (4, 5)
   D  (4, 4)

3. Jordan paid $682 for 124 cupcakes that each cost the same amount. Find the price of one cupcake.
   A  $5.05
   B  $5.50
   C  $6.05
   D  $6.50

4. Solve the equation for x: 126 = 3x.
   A  x = 378
   B  x = 129
   C  x = 123
   D  x = 42

5. Cenisa ran 1 kilometer. How many meters did she run?
   A  10,000 meters
   B  1,000 meters
   C  100 meters
   D  10 meters

6. Which equation represents the pattern shown in the table below?
<table>
<thead>
<tr>
<th>x</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
   A  y = x + 2
   B  y = x + 1
   C  y = 3x
   D  y = x - 1
7. Mateo finds a special on apples for $0.80 per pound. Which price is a better deal?
   A. $0.78 per pound
   B. $0.85 per pound
   C. $0.90 per pound
   D. $1.25 per pound

8. Which value is the solution of the equation $8r = 536$?
   A. 63
   B. 64
   C. 67
   D. 72

9. Kaitlyn buys 3 T-shirts for $14.95 each. What is the total cost?
   A. $42.95
   B. $43.85
   C. $44.85
   D. $45.00

10. Determine the next three points on the number line.

    +6 +6 +6
    3

   A. 9, 15, 21
   B. 6, 12, 18
   C. 9, 14, 20
   D. 10, 16, 22

11. Which measure is equivalent to 4 feet 5 inches?
    A. 53 inches
    B. 50 inches
    C. 45 inches
    D. 4.5 inches

12. Akikta bought 25 trees for $15.40 each. Chloe bought 35 trees for $14.30 each. What was the difference between the total amounts that the girls paid for the trees?
    A. $1.10
    B. $50.00
    C. $115.50
    D. $150.05
Review What You Know!

Vocabulary
Choose the best term from the box to complete each definition.
1. Fractions that name the same amount are called ______equivalent fractions_____.
2. The number 3 is a ______common factor____ of 9 and 12.
3. A number that can be used to describe a part of a set or a part of a whole
   is an ______fraction_____.

Equivalent Fractions
Write two fractions equivalent to the given fraction. Sample answers shown.
4. \( \frac{3}{4} \) \( \frac{6}{8} \) \( \frac{9}{12} \)
5. \( \frac{7}{5} \) \( \frac{14}{10} \) \( \frac{21}{14} \)
6. \( \frac{12}{5} \) \( \frac{24}{10} \) \( \frac{120}{50} \)
7. \( \frac{1}{2} \) \( \frac{3}{6} \)
8. \( \frac{8}{9} \) \( \frac{16}{18} \) \( \frac{24}{27} \)
9. \( \frac{2}{3} \) \( \frac{6}{9} \) \( \frac{8}{12} \)

Equations
Write an equation that represents the pattern in each table. Sample answers shown.
10. \[ \begin{array}{c|cccccc}
        x & 2 & 3 & 4 & 5 & 6 \\
        y & 16 & 24 & 32 & 40 & 48
    \end{array} \quad \text{y = 8x} \]
11. \[ \begin{array}{c|cccccc}
        x & 2 & 4 & 6 & 8 & 10 \\
        y & 5 & 7 & 9 & 11 & 13
    \end{array} \quad \text{y = x + 3} \]

Units of Measure
Choose the best unit of measure by writing inch, foot, yard, ounce, pound, ton, cup, quart, or gallon.
12. serving of trail mix cup
13. height of a person foot or inch
14. weight of a newborn kitten ounce
15. gasoline gallon

Measurement Conversions
16. Michael is 4 feet tall. Explain how Michael could find his height in inches.
   Then explain how he could find his height in yards.
   Sample answer: Because there are 12 inches in 1 foot, multiply 4 by 12 to find Michael's height in inches. Because there are 3 feet in 1 yard, divide 4 by 3 to find Michael's height in yards.
A ratio is a comparison of two numbers or the number of items in two groups. Each quantity in a ratio is called a term. Ratios can be written with the word “to” separating the terms (a to b), with a colon separating the terms (a : b), or in fraction form \( \frac{a}{b} \).

The ratio 6:3 can be modeled using a bar diagram with a row of 6 equal boxes and a row of 3 equal boxes as shown on the right.

1. The chorus at an elementary school is made up of fifth and sixth graders. This year, the chorus has 12 fifth-grade girls, 9 fifth-grade boys, 14 sixth-grade girls, and 10 sixth-grade boys.
   
   a. The ratio of girls to boys is 26 to 19.
   
   b. The ratio of fifth graders to sixth graders is 21 : 24.
   
   c. The ratio of girls to the total number of students in the chorus is \( \frac{26}{45} \).

2. The school cafeteria orders 4 cartons of regular milk for every 3 cartons of chocolate milk.
   
   a. Complete the bar diagram to show the ratio.

   b. The school ordered 120 cartons of regular milk. Divide 120 cartons of regular milk by 4 because there are 4 boxes in the top row.

   c. Write the value of each box in both rows of the bar diagram.

   d. How many cartons of chocolate milk did the school order? 90 cartons of chocolate milk

On the Back!

3. A photocopier can copy 4 pages every 2 seconds. How long will it take to copy 120 pages? Draw a diagram to solve the problem. 60 seconds; Check students’ diagrams.
Read the problem below. Answer the SQRQCQ questions to help understand the problem.

Sam is packing gift boxes with fruit. For each apple, he packs 3 plums and 5 oranges. If he puts 3 apples in a box, how many plums and oranges will Sam put in the box? Draw a diagram to solve the problem.

Survey
1. What is the problem about?
   Sample answer: Packing a certain number of each type of fruit in a gift box

Question
2. What question will be answered by solving the problem?
   How many plums and oranges will Sam put in the box?

Reread
3. Underline the sentence that describes the ratio.
   Check students’ work.

Question
4. Why might a bar diagram be better to use than a double number line diagram to solve the problem?
   Sample answer: A bar diagram is better because the problem is about packing fruit into boxes and a bar diagram uses boxes to show the number of items. Also, the pictures of the fruit in the problem are arranged in ratio order like the bar diagram boxes will be.

Construct
5. How many boxes will be drawn for apples? plums? oranges? Explain.
   1; 3; 5; Sample answer: The ratio of fruit to be packed in a gift box is given as “for each apple, he packs 3 plums and 5 oranges.”

Question
6. How will the number written in each box of the bar diagram signal that the solution is correct?
   Sample answer: When the solution is correct, the same number will be written in each box in the bar diagram.
Use the vocabulary terms from the list to complete the sentences. Each term may be used more than once.

terms | bar diagram | a part | ratio
quantities | double number line diagram | the whole | relationship

1. A _________ shows a _________ between two quantities.

2. The two _________ compared in a ratio are called _________.

3. At a pet show, there are 5 dogs and 3 cats. The ratio 5:3 compares _________ to _________.

4. At a vegetable stand, there are 10 tomatoes and 7 cucumbers. The ratio 7:17 compares _________ to _________.

5. The ratio of cups to plates is 2:4. The _________ below illustrates this ratio.

6. The ratio of plates to cups is 4:2. The _________ below illustrates this ratio.
Two numbers are **equivalent** if they have the same value. Ratios are equivalent when they show the same relationship.

The table shows equivalent ratios. Each term of the ratio can be multiplied or divided by the same number to find equivalent ratios.

<table>
<thead>
<tr>
<th>Number of Petals</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Flowers</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Bruno correctly answered 4 questions out of every 5 questions on a test.

1. Write the ratio of questions that Bruno answered correctly to the number of questions on the test. \(4 : 5\)

2. Make a table with equivalent ratios to find the number of questions that Bruno answered correctly if there were 45 questions on the test.

<table>
<thead>
<tr>
<th>Number of Questions Correct</th>
<th>4</th>
<th>28</th>
<th>32</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number of Questions</td>
<td>5</td>
<td>35</td>
<td>40</td>
<td>45</td>
</tr>
</tbody>
</table>

   There were 45 questions on the test. So, find the equivalent ratio with 45 as the second term.

3. If there were 45 questions on the test, then Bruno answered 36 questions correctly.

**On the Back!**

4. Write three ratios that are equivalent to \(\frac{6}{5}\).
   
   **Sample answer:** \(\frac{2}{3}, \frac{12}{18}, \frac{18}{27}\)
Name

Read the problem below. Answer the questions to help understand the problem.

Three sisters are saving for a special vacation. The ratio of Ada’s savings to Ellie’s savings is 7:3, and the ratio of Ellie’s savings to Jasmine’s savings is 3:4. Together all three girls have saved $56. How much has each girl saved? Complete the table. Explain how the table can be used to solve the problem.

<table>
<thead>
<tr>
<th></th>
<th>Ada’s savings</th>
<th>Ellie’s savings</th>
<th>Jasmine’s savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$7</td>
<td>$3</td>
<td>$4</td>
</tr>
<tr>
<td></td>
<td>$14</td>
<td>$6</td>
<td>$8</td>
</tr>
<tr>
<td></td>
<td>$21</td>
<td>$9</td>
<td>$12</td>
</tr>
<tr>
<td></td>
<td>$28</td>
<td>$12</td>
<td>$16</td>
</tr>
</tbody>
</table>

1. What are the sisters saving for? Is that important information to the problem? Explain.
   A special vacation; No; Sample answer: The reason they are saving money does not give any clues to how much they have saved.

2. What is another way, in words, to write “The ratio of Ada’s savings to Ellie’s savings is 7:3?”
   Sample answer: For every seven dollars Ada has saved, Ellie has saved three dollars.

3. Highlight both ratios given. What is the same about them? How will this information be added to the table?
   Check students’ work. Sample answer: Both ratios refer to Ellie’s savings (3); $3 should be written in the first column for Ellie’s savings.

4. Can it be said that Ada has saved $7, Ellie has saved $3, and Jasmine has saved $4? Use a fact from the problem to justify your answer.
   No; Sample answer: The problem states that “together, all three girls have saved $56,” and $7 + $3 + $4 is only $14.

5. Complete the table. Describe the change in savings amounts from left to right in the table.
   Sample answer: Each sister’s savings will increase by a different constant amount.
Each table describes three ratios. Complete the tables, using a different format to write each ratio. Tell whether each ratio represents a part to a part, the whole to a part, or a part to the whole.

1. There are 10 quarters and 5 dimes in a coin bank.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimes to total coins</strong></td>
<td>5 to 15</td>
<td>part to whole</td>
</tr>
<tr>
<td>Quarters to dimes</td>
<td>10:5</td>
<td><strong>part to part</strong></td>
</tr>
<tr>
<td>Total coins to quarters</td>
<td><strong>15</strong> <strong>10</strong></td>
<td>whole to part</td>
</tr>
</tbody>
</table>

2. On an ice hockey team, there are 3 forwards, 2 defensemen, and 1 goalie.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forwards to players</td>
<td><strong>3 to 6</strong></td>
<td><strong>part to whole</strong></td>
</tr>
<tr>
<td><strong>Players to goalies</strong></td>
<td><strong>6:1</strong></td>
<td>whole to part</td>
</tr>
<tr>
<td>Defensemen to forwards</td>
<td><strong>2</strong> <strong>3</strong></td>
<td><strong>part to part</strong></td>
</tr>
</tbody>
</table>

3. A lemonade recipe calls for 1 cup each of sugar and lemon juice and 8 cups of water.

<table>
<thead>
<tr>
<th>Ratio in Words</th>
<th>Ratio in Numbers</th>
<th>Type of Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemonade to lemon juice</td>
<td><strong>10 to 1</strong></td>
<td><strong>whole to part</strong></td>
</tr>
<tr>
<td>Water to lemon juice</td>
<td><strong>8:1</strong></td>
<td><strong>part to part</strong></td>
</tr>
<tr>
<td>Lemon juice to sugar</td>
<td><strong>1</strong> <strong>1</strong></td>
<td><strong>part to part</strong></td>
</tr>
</tbody>
</table>
Ratio tables can be used to compare different ratios. The comparisons can be used to solve problems.

1. Printer A prints 15 pages in 3 minutes. Complete the table with equivalent ratios.

<table>
<thead>
<tr>
<th>Printer A</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>Time (min)</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

Printer B prints 24 pages in 5 minutes. Complete the table with equivalent ratios.

<table>
<thead>
<tr>
<th>Printer B</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
<td>24</td>
<td>48</td>
<td>72</td>
<td>96</td>
<td>120</td>
</tr>
<tr>
<td>Time (min)</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

2. If printer A and printer B were each used to print continuously for 15 minutes, how many pages would each printer print?

   Printer A would print **75** pages in 15 minutes.

   Printer B would print **72** pages in 15 minutes.

3. Which printer can print more pages in 15 minutes? **Printer A**

4. How long would it take each printer to print 120 pages?

   Printer A would take **24** minutes to print 120 pages.

   Printer B would take **25** minutes to print 120 pages.

5. Which printer is faster? **Printer A**

On the Back! Maddie; Check students’ tables.

6. Laine and Maddie are practicing free throws. Laine makes 5 baskets for every 9 shots. Maddie makes 4 baskets for every 6 shots. If each girl attempts 36 shots, which girl makes more baskets? Complete ratio tables to solve.
Name ____________________________

Read the problem below. Then circle True or False for each statement. When possible, highlight the text that supports any true statements and write the problem number above it.

**Check students’ work.**

In the first week, 2 out of 3 campers were boys. In the second week, 3 out of 5 campers were boys. There were 15 total campers each week. In which week were there more boy campers? Explain.

1. The ratio of boy campers to total campers was 2 : 3 in the first week. **True**  **False**

2. The ratio of girl campers to boy campers was 5 : 3 in the second week. **True**  **False**

3. There was the same ratio of girl campers to boy campers each week of camp. **True**  **False**

4. For every five campers in the second week, three of them were boys. **True**  **False**

5. The total number of campers in both weeks was the same. **True**  **False**

6. The solution to the problem will tell whether there were more boy campers in the first week or the second week. **True**  **False**

7. Ratio tables cannot be used to explain the problem solution. **True**  **False**
Use the list of vocabulary terms to complete the crossword puzzle.

**Vocabulary Terms:**
equivalent, fraction, quantities, solve, terms, whole, extend, multiply, ratio, table, three

---

**Down**
1. A ratio that compares pets to dogs is the ________ to a part.
2. One way a ratio can be expressed is a(n) ________.
3. A(n) ________ is a relationship in which for every $x$ units of one quantity there are $y$ units of another quantity.
4. There are ________ ways to express a ratio.
5. You compare ratios to ________ problems.
6. To find equivalent ratios, ________ both terms of the original ratio by the same nonzero number.

---

**Across**
5. A ratio is a mathematical way to compare ________.
6. The quantities $x$ and $y$ in a ratio are called ________.
7. A ratio ________ helps organize the terms of a ratio.
8. ________ ratio tables to identify common terms.
9. The ratios 1:2 and 5:10 are ________.
Equivalent ratios show the same relationship. You can multiply each term of a ratio by the same number to find an equivalent ratio.

To find equivalent ratios using a table, use repeated addition or repeated subtraction. The ratios from the table can then be graphed as points on a coordinate plane.

The bank offers Ryo an exchange rate of 5 U.S. dollars for every 4 British pounds.

1. Complete the table by writing equivalent ratios.

<table>
<thead>
<tr>
<th>U.S. Dollars (x)</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Pounds (y)</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>24</td>
</tr>
</tbody>
</table>

Based on the table, for 30 U.S. dollars Ryo gets 24 British pounds.

2. On the coordinate plane, the ratio of 5 U.S. dollars to 4 British pounds is represented by the point (5, 4).

Plot the remaining pairs of values from the table on the coordinate plane. Draw a dashed line from (0, 0) to the edge of the graph to connect the points.

3. How many British pounds can Ryo get for 35 U.S. dollars? Use the line to answer.

Find 35 on the x-axis, and move up until you reach your line to find the y-value, 28.

Ryo can get 28 British pounds for 35 U.S. dollars.

On the Back! 25 scarves; Check students’ tables and graphs.

4. Laura uses 3 balls of yarn to make 5 scarves. If Laura has 15 balls of yarn, how many scarves can she make? Make a table to find equivalent ratios. Then plot the pairs of values on a coordinate plane.
Review Example 2 from the lesson. Answer the questions to help understand how to read an example.

**EXAMPLE 2**  
Graph Ratios Using Repeated Addition

Jack is making juice. He has 25 celery sticks. If Jack uses all 25 celery sticks, how many apples will he need to make the juice?

Use repeated addition to complete the ratio table.

<table>
<thead>
<tr>
<th>Celery Sticks</th>
<th>Apples</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
</tr>
<tr>
<td>25</td>
<td>10</td>
</tr>
</tbody>
</table>

For each row in the table, add 5 to the number of celery sticks and add 2 to the number of apples.

Plot the pairs of values on a coordinate plane.

The point (25, 10) shows that 10 apples are needed for 25 celery sticks.

Jack needs 10 apples to make the juice.

1. Circle each item in the example (text, ratio table, and graph) that represents the basic ratio of celery sticks to apples.  
**Check students’ work.**

2. What are two ways to solve the problem that are shown in the example?  
**Sample answer: Using repeated addition in a ratio table and using repeated addition on a graph**

3. Why do the ratio table and graph stop at 25 celery sticks?  
**Sample answer: The problem states that Jack has only 25 celery sticks.**

4. Highlight every part of the example that represents the solution to the problem.  
**Check students’ work.**

5. Is the solution to the problem different when using a different method of solving? Explain.  
**No; Sample answer: The answer will be the same no matter which method is used because the basic ratio stays the same.**
Use the words, expressions, and equations from the list to complete the graphic organizer about the study of ratios.

<table>
<thead>
<tr>
<th>division</th>
<th>ratio</th>
<th>equivalent</th>
<th>$x$ units</th>
</tr>
</thead>
<tbody>
<tr>
<td>$4.00b$</td>
<td>graph</td>
<td>$y$ units</td>
<td>7:11</td>
</tr>
<tr>
<td>2 + 4 = 5 + 1</td>
<td>3 cats to 5 dogs</td>
<td>$\frac{x}{y}$</td>
<td>relationship</td>
</tr>
</tbody>
</table>

**Definition**

A **ratio** is a relationship in which for every **$x$ units** of one quantity there are **$y$ units** of another quantity.

**Facts**

- Ratios are considered to be **equivalent** if they express the same **relationship**.
- A ratio compares two like or unlike quantities by **division**.
- Ratios can be shown visually using a **graph** or a ratio table.

**Examples**

3 cats to 5 dogs
7:11
$\frac{x}{y}$

**Nonexamples**

2 + 4 = 5 + 1
$4.00b$
A **rate** is a special type of ratio that compares quantities with unlike units of measure.

Amy ran 18 miles in 3 days, which is a rate that can be written as \( \frac{18 \text{ miles}}{3 \text{ days}} \).

A **unit rate** is a rate with a denominator of 1 unit.

Four rates are listed below. The unit rates are circled.

- \( \frac{13.20}{6 \text{ pounds}} \)
- \( \frac{7 \text{ quarts}}{1 \text{ car}} \)
- \( \frac{350 \text{ miles}}{7 \text{ hours}} \)
- \( \frac{13}{1 \text{ tree}} \)

1. A baseball team plays 8 games in 2 weeks.
   
   a. Complete the ratio table to find rates that are equivalent to \( \frac{8 \text{ games}}{2 \text{ weeks}} \).
   
   b. If the baseball team continues to play games at the same rate, how many weeks will it take for the baseball team to play 32 games? **8 weeks**

2. Elena earns $100 in 4 hours. Write this statement as a rate. \( \frac{100}{4 \text{ hours}} \) or \( \frac{100}{4} \)

3. How much does Elena earn per hour?
   
   To find the unit rate, start with the rate you wrote in Exercise 2. Divide each term by the denominator so that the denominator is 1.
   
   \[ \frac{100}{4} = \frac{100}{4} \div 4 = \frac{25}{1} \]
   
   Elena earns **$25 per hour**.

4. At this rate, how much money would Elena earn in 16 hours?
   
   To find an equivalent rate, start with the unit rate, which is the amount Elena made in 1 hour.

   Multiply each term by 16.

   In 16 hours, Elena would earn **$400**.

**On the Back!**

5. Find the unit rate. \( \frac{42 \text{ pages}}{3 \text{ days}} \)

\[ \frac{42 \text{ pages} \div 3}{3 \text{ days} \div 3} = \frac{14 \text{ pages}}{1 \text{ day}} \]
Read the problem. Answer the questions to help understand the problem. Tell whether the information used to answer the question was directly stated in the text (DS), implied in the text (I), or based only on previous knowledge (PK).

A machine takes 1 minute to fill 6 cartons of eggs. At that rate, how long will it take to fill 420 cartons?

1. How long does it take to fill 6 cartons?  
   1 minute; (DS)

2. Highlight the statement in the problem that describes the relationship between the cartons that are filled and the time it takes to fill them. Write the statement as a rate.
   **Check students’ work:** 6 cartons / 1 minute; (DS)

3. To solve the problem, would you use a unit rate for 1 carton or a unit rate for 1 minute? Use words from the problem to explain.
   **Unit rate for 1 carton; Sample answer:** Because the question asks how long it will take to fill 420 cartons, you need to find out how long it will take to fill one carton and then multiply that time by 420.; (I)

4. Does the machine fill each carton in the same amount of time? Explain.
   **Sample answer:** Yes, because the text calls the number of cartons filled in a certain amount of time a “rate.”; (I)

5. What might be a follow-up question for this problem in which the solver would need to find the unit rate for the other unit?
   **Sample answer:** How many cartons can the machine fill in 45 minutes?; (PK)
Use the vocabulary terms from the list to complete the sentences.

<table>
<thead>
<tr>
<th>term</th>
<th>unit rate</th>
<th>ratio</th>
<th>rate</th>
<th>numerator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>denominator</td>
<td>equivalent ratios</td>
<td>unit</td>
<td>graph</td>
</tr>
</tbody>
</table>

1. A **rate** is a special type of ratio that compares quantities with unlike units of measure.

2. In a fraction, the value that represents the number of parts as compared to the whole is the **numerator**.

3. A quantity, such as foot or gallon, chosen as a standard in which other quantities may be expressed is a **unit**.

4. A **ratio** is a comparison of two like or unlike quantities by division.

5. In the fraction \( \frac{2}{3} \), the number 3 represents the **denominator** of the fraction or the number of parts that the whole is divided into.

6. **Equivalent ratios** name the same comparison.

7. In mathematics, a **unit rate** is the ratio of two measurements in which the second quantity in the comparison is 1 unit.

8. A **graph** is a mathematical tool that is used to visually represent the relationship between quantities.
A unit rate is a rate in which the comparison is to 1 unit.

Daniel painted 22 wooden planks in 11 minutes. Divide to find Daniel’s unit rate.

\[
\frac{22 \text{ planks}}{11 \text{ min}} = \frac{2 \text{ planks}}{1 \text{ min}}
\]

Daniel’s unit rate is 2 planks per minute.

A unit price is a unit rate that gives the price of 1 item.

Tickets are sold in sheets of 24 for $6.

To find the unit price, or the cost of 1 ticket, divide the price by the number of tickets.

\[
\frac{6}{24 \text{ tickets}} = \$0.25 \text{ per ticket}
\]

1. Earl and Mia danced in a charity fundraiser. Earl raised $275 when he danced for 5 hours. Mia raised $376 when she danced for 8 hours. Write each rate as a fraction.

Earl: \[
\frac{275}{5 \text{ hours}}
\]

Mia: \[
\frac{376}{8 \text{ hours}}
\]

2. How much money did each dancer raise in 1 hour? Find each unit rate.

Earl raised \$55 in one hour.

Mia raised \$47 in one hour.

\[
\frac{275}{5} = 55 \quad \frac{376}{8} = 47
\]

3. Which dancer raised more money per hour?

Complete the statement below and use < or > to compare Earl’s and Mia’s earnings per hour.

\[
\text{Earl} \quad \frac{55}{5} < \frac{47}{8}
\]

Earl raised more money per hour.

On the Back!

4. Compare the unit prices to find which is the better deal.

6 songs for $8 or 10 songs for $12

\[
\frac{8}{6 \text{ songs}} = \$1.33 \text{ per song}, \quad \frac{12}{10 \text{ songs}} = \$1.20 \text{ per song};
\]

6 songs for $8 is the better deal.
Name _______________________________________

Read the problem. Answer the questions to help understand the problem.

Car A travels 115 miles on 5 gallons of gas. Car B travels 126 miles on 6 gallons of gas. How can you find which car gets better gas mileage?

1. Which skill is the main focus of the problem?
   A ordering   B comparing   C dividing   D subtracting

2. Can the question be answered by simply comparing the number of miles car A travels to the number of miles car B travels? Explain.
   No; Sample answer: To determine which car gets the better gas mileage, you also need to consider the amount of gas that was used.

3. What does “gas mileage” mean?
   The number of miles a car can travel on 1 gallon of gas

4. How can the gas mileage of each car be calculated?
   Divide the number of miles each car traveled by the number of gallons it took to travel that distance.

5. What type of ratio is gas mileage? Explain.
   A unit rate; Sample answer: Because gas mileage compares a quantity (number of miles) to 1 unit of another quantity (gallons of gas), it is a unit rate.

6. Is it necessary to calculate the gas mileage of each car to answer the question? Explain.
   No; Sample answer: The question does not ask which car gets better gas mileage; it only asks how you can find which car gets better gas mileage.
Name

Draw a line from each vocabulary term on the left to either an example of the term or its definition on the right.

1. Equivalent ratios
   - a ratio that compares quantities with unlike units of measure

2. Unit
   - 5 miles \(\frac{1\text{ week}}{2\text{ weeks}}\), and 10 miles

3. Unit price
   - a relationship in which for every \(x\) units of one quantity there are \(y\) units of another quantity

4. Rate
   - a rate that gives the price of one item

5. Ratio
   - the quantities \(x\) and \(y\) in a ratio

6. Ratio table
   - foot, dollar, gallon

7. Terms

<table>
<thead>
<tr>
<th>Field Trip</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students</td>
<td>Number of Chaperones</td>
</tr>
<tr>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>60</td>
<td>12</td>
</tr>
<tr>
<td>80</td>
<td>16</td>
</tr>
</tbody>
</table>
If an object travels at a **constant speed**, then its speed stays the same over time.

A train travels at a constant speed of 68 miles per hour. The table shows how far the train travels after 1 hour, 2 hours, and 3 hours.

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Distance (mi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$68 \times 1 = 68$</td>
</tr>
<tr>
<td>2</td>
<td>$68 \times 2 = 136$</td>
</tr>
<tr>
<td>3</td>
<td>$68 \times 3 = 204$</td>
</tr>
</tbody>
</table>

A unit price is a unit rate that gives the price of 1 item.

Write the price of the cereal as a rate. \(\frac{\$2.88}{32 \text{ oz}}\)

Divide to find the unit price: $0.09 per ounce.

1. A cruise ship travels at a constant speed. In 3 hours, the ship travels 72 nautical miles. If the ship continues to travel at the same rate, how far would it travel in 11 hours?
   
   a. How far does the ship travel in 1 hour? Find the ship’s unit rate of speed.

   The ship travels **24** nautical miles in 1 **hour**.

   b. At this rate, how far would the ship travel in 11 hours? Find an equivalent rate.

   In 11 hours, the ship would travel **264** nautical miles.

2. Noah spent $66 for 20 gallons of gasoline. Lydia spent $81.25 for 25 gallons of gasoline. Which person got the better buy?

   a. How much did each person spend for 1 gallon of gasoline?

   Noah: $3.30 \quad$ Lydia: $3.25$

   b. **Lydia** spent less money per gallon than **Noah** did, so she got the better buy.

**On the Back!**

3. A thunderstorm travels at a constant speed. In 15 minutes, the storm travels 12 miles. If the storm continues to travel at the same rate, how far would it travel in 90 minutes?

   **72 miles**
On a family vacation, Amy’s dad drove the car at a constant speed and traveled 585 miles in 13 hours. At this rate, how long would it have taken the family to travel 810 miles? What was the car’s rate of speed?

1. Highlight the words that describe the given rate.
   Check students’ work.

2. Write the rate in a fractional form, including the units.
   \[
   \frac{585 \text{ miles}}{13 \text{ hours}}
   \]

3. Underline the questions in the problem. What two answers will be found by solving this problem?
   Check students’ work; How long it would take the family to travel 810 miles and the car’s rate of speed

4. Which answer should be found first? Explain.
   The car’s unit rate of speed; Sample answer: The unit rate must be found first because that value is needed to calculate the time it will take to travel 810 miles.

5. Describe how to find the unit rate. What does the answer represent?
   Sample answer: Divide 583 miles by 13 hours; The number of miles the car travels in 1 hour, or miles per hour
Write a definition and an example for each vocabulary term.

<table>
<thead>
<tr>
<th>Word or Phrase</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. constant speed</td>
<td>Constant speed means that the speed of an object stays the same over time.</td>
<td>Sample answer: Drives 60 miles every hour for the entire length of a trip</td>
</tr>
</tbody>
</table>
| 2. unit price      | A unit price is a unit rate that gives the price of one item.             | Sample answer: $2
1 bottle of water       |
| 3. rate            | A rate is a ratio that compares quantities with unlike units of measure. | Sample answer: 5 kilometers
2 hours                  |
| 4. unit            | A unit is a quantity used as a standard of measurement.                   | Sample answer: mile                                                    |
| 5. equivalent ratios | Equivalent ratios are ratios that express the same relationship.        | Sample answer: 3 : 5 and 9 : 15                                      |
| 6. unit rate       | A unit rate compares a quantity to 1 unit of another quantity.           | Sample answer: Runs 3 yards per second                                 |