GRADE 6 MATH: SHARE MY CANDY

UNIT OVERVIEW

The length of this unit is approximately 2-3 weeks. Students will develop an understanding of dividing fractions by fractions by building upon the conceptual knowledge gained in grade 5 of dividing fractions by whole numbers and whole numbers by unit fractions (5.NF7). Students use the meaning of fractions, the meaning of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Following this unit, students can use this knowledge to reason about ratio and rate problems.

TASK DETAILS

Task Name: Share My Candy

Grade: 6

Subject: Math

Depth of Knowledge: 3

Task Description:

In the task “Share My Candy,” students show their ability to interpret and compute quotients of fractions in a real-world problem. Students may choose to perform the division of the fractions using either visual models or numerical symbols.

Standards:

6.NS.1: Interpret and compute quotients of fractions, and solve real word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to interpret the problem.

Standards for Mathematical Practice:

MP.1. Make sense of problems and persevere in solving them.
MP.2. Reason abstractly and quantitatively.
MP.3. Construct viable arguments and critique the reasoning of others.
MP.6. Attend to precision.
## TABLE OF CONTENTS

The task and instructional supports in the following pages are designed to help educators understand and implement Common Core–aligned tasks that are embedded in a unit of instruction. We have learned through our pilot work that focusing instruction on units anchored in rigorous Common Core–aligned assessments drives significant shifts in curriculum and pedagogy. Callout boxes and Universal Design for Learning (UDL) support are included to provide multiple entry points for diverse learners.

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</tbody>
</table>

Acknowledgements: The unit outline and culminating performance task was developed by Common Core Math Fellow Laginne Walker, District 7, X224. Feedback and revisions of the final unit were also given by Common Core Math Fellows Jennifer Hernandez, Prema Vora, Alice Grgas, and Cheryl Schafer.
GRADE 6 MATH: SHARE MY CANDY
PERFORMANCE TASK
Share My Candy

Jason has 3$\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

PART A: How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

SHOW WORK:

ANSWER SENTENCE: __________________________________________________________

PART B: How much of the candy bar will Jason keep for himself? Show your work and write your answer in a complete sentence.

SHOW WORK:

ANSWER SENTENCE: __________________________________________________________
PART C: Explain your reasoning for parts A and B.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

PART D: Show how you can check if your responses to parts A and B are correct.
GRADE 6 MATH: SHARE MY CANDY

RUBRIC

Attached is a rubric to assess student mastery of the learning standards in the performance task “Share My Candy.” This rubric assesses five categories: presentation, implementation, precision, communication, and solving. All categories are based on a 4-point scale with a maximum possible of 20 total points.
## Share My Candy

**Student Name:** ________________________  **Date:** ________________

**Teacher Name:** ________________________  **Class:** ________________________

<table>
<thead>
<tr>
<th>Category</th>
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<tr>
<td>Final Answer</td>
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Total Points/20

Total Points\(\times\) Score/4

\(\frac{\text{Score}}{4}\times 25\rightarrow\) Score/100
GRADE 6 MATH: SHARE MY CANDY
ANNOTATED STUDENT WORK

This section contains annotated student work at a range of score points. The student work shows examples of understandings and misunderstandings of the task.
Jason has 3 1/2 candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible 3/4 of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give 3/4 of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[
3 \frac{1}{2} \div \frac{3}{4} = 3 \cdot 2 + 1 \div \frac{3}{4} = \frac{7}{2} \div \frac{3}{4} = \frac{4 \cdot 2}{3} = \frac{8}{3} = 2 \frac{2}{3}
\]

**ANSWER SENTENCE:** He can give 3/4 of a candy bar to 2 friends.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{2}{3} \cdot \frac{3}{4} = \frac{6}{12} = \frac{1}{2}
\]

**ANSWER SENTENCE:** He will get half of a candy bar.

**PART C:** Explain your reasoning for parts A and B.

The whole was 3 1/2. The size of each part was 3/4. So to figure out how many "3/4" are in "3 1/2" you can divide. The whole # of the quotient tells you how many people because you can't have 3/4 of a person. For part B, I needed to find 3/3 of 3/4 because 3/4 means 3 of 3/4 total 3/3 of 3/4. 3/3 of 3/4 equals 1/2, which tells me he gets half a candy bar.

**PART D:** Show how you can check if your responses to parts A and B are correct.

Friends + Jason = Whole

\[
\frac{4}{1} \cdot \frac{3}{4} + \frac{1}{2} = ?
\]

\[
\frac{12}{3} \div \frac{3}{4} = \frac{12}{3} \div \frac{1}{2} = \frac{12}{3} \cdot \frac{2}{1} = 3 \frac{1}{2}
\]

**6.NS.1:** Student uses equations to represent a solution to a word problem involving division of fractions.

**6.NS.1:** Student interprets the quotient of 3 1/2 ÷ 3/4 using a clear and correct explanation. Student properly explains the meaning of both the whole number and the fraction within the context of this problem.
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<td>Mathematical Accuracy</td>
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<td>2</td>
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<td>0</td>
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Total Pts/20 20

Total Points ÷ 5 \( \Rightarrow \) Score/4 4

Score/4 \( \times 25 \) \( \Rightarrow \) Score/100 100
6th Grade Task

Share My Candy

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{3\cdot\frac{3}{4}}{2\cdot\frac{1}{2}} = \frac{\frac{9}{4}}{\frac{1}{2}} = \frac{9}{4} \div \frac{1}{2} = \frac{9}{4} \times 2 = \frac{18}{4} = \frac{9}{2} = 4.5
\]

**ANSWER SENTENCE:** He can give $4\frac{1}{2}$ friends $\frac{3}{4}$ of the candy bar.

**6.NS.1, MP.1**

The 4 is improperly labeled “how much his friends get” when it should be labeled “how many friends get the portion of the candy bar.”

**MP.1** Answer sentence does not indicate the interpretation of the product. This could be interpreted as half of the candy bar or half of the total number of candy bars.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{3}{6} = \frac{1}{2}
\]

**ANSWER SENTENCE:** He will keep $\frac{1}{2}$ for himself.

**MP.3, MP.6** The explanation is partially correct. Student properly identifies the number of friends who get candy, but does not adequately explain why it is 4 and not $4\frac{2}{3}$. Student also should have identified $\frac{2}{3}$ of what in the response.

**PART C:** Explain your reasoning for parts A and B.

To do part A, I had to $3\frac{1}{2} : \frac{3}{4}$. When I did that, I got $4\frac{1}{2}$. The question asked how many friends got candy bars, $4$ friends got candy bars, and the $\frac{3}{4}$ is how much he gets. Then, part B I had to figure out how much he gets $3\frac{1}{2} : \frac{1}{2}$. And then I got $\frac{1}{2}$, he got a half for himself.

**PART D:** Show how you can check if your responses to parts A and B are correct.

\[
4\frac{3}{4} - 4\frac{3}{4} = \frac{12}{4} - \frac{12}{4} = 0
\]

\[
3 + \frac{1}{2} = 3\frac{1}{2} \neq \frac{3}{2}
\]
## LEVEL 3 STUDENT WORK SAMPLE

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<tr>
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Total Pts/20: 18

Total Points ÷ 5 = Score/4: 3.6

Score/4 × 25 = Score/100: 90

Score: 90
LEVEL 2 SAMPLE RESPONSE WITH ANNOTATIONS

6th Grade Task

Jason has \(3\frac{1}{2}\) candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible \(\frac{3}{4}\) of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give \(\frac{3}{4}\) of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{\frac{1}{2}}{\frac{3}{4}} = \frac{\frac{1}{2}}{\frac{3}{4}} \times \frac{\frac{4}{3}}{\frac{4}{3}} = \frac{\frac{1}{2} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}} = \frac{\frac{2}{3}}{1} = \frac{2}{3}.
\]

**ANSWER SENTENCE:** He can give \(4\) friends a candy bar.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{\frac{2}{3}}{\frac{3}{4}} = \frac{\frac{2}{3}}{\frac{3}{4}} \times \frac{\frac{4}{3}}{\frac{4}{3}} = \frac{\frac{2}{3} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}} = \frac{\frac{8}{9}}{1} = \frac{8}{9}.
\]

**ANSWER SENTENCE:** He will keep a part of candy bar.

**PART C:** Explain your reasoning for parts A and B.

I figure part A out by writing the expression and doing it. I did part B by multiplying the fraction from how much friends will get \(\frac{3}{4}\) (how much is possible).

**PART D:** Show how you can check if your responses to parts A and B are correct.

\[
\frac{\frac{3}{4}}{\frac{3}{4}} = \frac{\frac{3}{4}}{\frac{3}{4}} \times \frac{\frac{4}{3}}{\frac{4}{3}} = \frac{\frac{3}{4} \times \frac{4}{3}}{\frac{3}{4} \times \frac{4}{3}} = \frac{\frac{1}{1}}{1} = \frac{1}{1}.
\]

**MP.3, MP.6** Although the work is correct, the answer sentence, is incorrect. Each of the friends get three fourths of a candy bar, rather than a whole candy bar as noted in the answer sentence.

**6.NS.1** Although the check is correct and complete, part C lacks any clear explanation of the reasoning used in parts A and B. There also is not explanation of why each step was taken.
# Share My Candy Rubric

## LEVEL 2 STUDENT WORK SAMPLE

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14
Share My Candy

6th Grade Task

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

$3 \frac{1}{2} \div \frac{3}{4} = \frac{7}{2} \div \frac{3}{4} = \frac{7 \times 4}{2 \times 3} = \frac{28}{6} = \frac{14}{3} = 4 \frac{2}{3}$

**ANSWER SENTENCE:**

he can give the candy bar to 4 friends

**MP.3, MP.6** Although the student’s work is correct, the answer sentence is incorrect. Each friend gets three quarters of a candy bar rather than a whole bar.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

$2 \div 3 = \frac{2}{3}$

**ANSWER SENTENCE:**

he would keep $\frac{1}{3}$ for himself

**PART C:** Explain your reasoning for parts A and B.

A was I redused $3 \frac{1}{2} \div \frac{3}{4}$ and got $4 \frac{2}{3}$ and 3 divided by 14 is $\frac{4 \frac{2}{3}}{14}$

**PART D:** Show how you can check if your responses to parts A and B are correct.

You can do the whole number times the fraction

**MP.1, MP.3, MP.6** The work in B, C, and D is incorrect. The explanations show a limited conceptual understanding and difficulty using mathematical language.
## Share My Candy Rubric

### LEVEL 1 STUDENT WORK SAMPLE

<table>
<thead>
<tr>
<th>Category</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Presentation</strong></td>
<td>The work is presented in a neat and clear manner in an organized fashion that is easy to read.</td>
<td>The work is presented in a neat and clear manner in an organized fashion that is mostly easy to read, but lacks some labels.</td>
<td>The work appears sloppy and unorganized. It is hard to know what information goes together.</td>
<td>No attempt was made to organize the problem.</td>
<td></td>
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<tr>
<td>Neatness and Organization</td>
<td>Efficient and effective strategies are implemented in solving this problem.</td>
<td>Efficient and effective strategies are partially implemented in solving this problem.</td>
<td>A correct strategy was attempted, but improperly executed.</td>
<td>An ineffective or incorrect strategy was implemented.</td>
<td>No attempt was made to solve the problem.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>Efficient and effective strategies are implemented in solving this problem.</td>
<td>Efficient and effective strategies are partially implemented in solving this problem.</td>
<td>A correct strategy was attempted, but improperly executed.</td>
<td>An ineffective or incorrect strategy was implemented.</td>
<td>No attempt was made to solve the problem.</td>
<td>1</td>
</tr>
<tr>
<td>Strategy/Procedures</td>
<td>All steps and solutions are accurate and labeled.</td>
<td>Most steps and solutions are accurate and labeled.</td>
<td>Most steps and solutions are inaccurate and/or mislabeled.</td>
<td>No attempt was made to show work.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Precision</strong></td>
<td>Explanation is clear and detailed, and includes critical components needed to solve the problem.</td>
<td>Explanation is clear, but a critical component of the problem is missing.</td>
<td>Explanation is a little too difficult to follow or lacks some critical components needed to solve the problem.</td>
<td>Explanation is difficult to understand and is missing several components needed to solve the problem.</td>
<td>No attempt was made to explain the work.</td>
<td>1</td>
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<tr>
<td>Mathematical Accuracy</td>
<td>All steps and solutions are accurate and labeled.</td>
<td>Most steps and solutions are accurate and labeled.</td>
<td>Most steps and solutions are inaccurate and/or mislabeled.</td>
<td>No attempt was made to show work.</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>Explanation is clear and detailed, and includes critical components needed to solve the problem.</td>
<td>Explanation is clear, but a critical component of the problem is missing.</td>
<td>Explanation is a little too difficult to follow or lacks some critical components needed to solve the problem.</td>
<td>Explanation is difficult to understand and is missing several components needed to solve the problem.</td>
<td>No attempt was made to explain the work.</td>
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</tr>
<tr>
<td>Explanation</td>
<td>The solutions make sense. The question is answered in a complete sentence.</td>
<td>The solution has a minor error, an incorrect label, an incomplete answer, or an incomplete statement.</td>
<td>The solution contains a major error, no label, a partial answer, or an incomplete statement.</td>
<td>There is no solution, a wrong solution, or an inappropriate solution.</td>
<td>No attempt was made to answer the problem.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Solving</strong></td>
<td>The solutions make sense. The question is answered in a complete sentence.</td>
<td>The solution has a minor error, an incorrect label, an incomplete answer, or an incomplete statement.</td>
<td>The solution contains a major error, no label, a partial answer, or an incomplete statement.</td>
<td>There is no solution, a wrong solution, or an inappropriate solution.</td>
<td>No attempt was made to answer the problem.</td>
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<td>Total Pts/20</td>
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<td>Score/4 × 25</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Score/100 37.5</td>
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</table>
Share My Candy

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[ \begin{array}{c}
\frac{3}{2} \cdot \frac{3}{4} = \frac{9}{8} \\
\frac{9}{8} \cdot \frac{3}{3} = \frac{27}{24} = 1 \frac{3}{24} = 1 \frac{1}{8} \\
\end{array} \]

\[ 4 \]

Student uses both visual model and equation correctly.

**ANSWER SENTENCE:**

You can give four of your friends \(\frac{3}{4}\) of a candy bar and have the half left over.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[ \frac{7}{2} \cdot \frac{4}{3} = \frac{28}{6} = 4 \frac{2}{3} \]

Student sees the \(\frac{1}{2}\) left in the visual model, but incorrectly writes \(1\frac{2}{3} = 4 \frac{1}{2}\).

**ANSWER SENTENCE:**

He will have the half left over.

**PART C:** Explain your reasoning for parts A and B.

I made 3 and \(\frac{1}{2}\) boxes and wrote how many \(\frac{3}{4}\) their can be. I had 4 with the half of the bar left over. I used KCF keep first number, change 4 to a flip second number \(\times\) reciprocal and first changed mixed number to improper fraction.

**PART D:** Show how you can check if your responses to parts A and B are correct.

\[ \begin{array}{c}
\frac{14}{3} \cdot \frac{3}{4} = \frac{14}{4} = 3 \frac{1}{2} \\
\end{array} \]

Student uses multiplication correctly to check answer.
Share My Candy

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

PART A: How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

WORK: [Diagram showing division of candy bars]

A correct visual model is shown.

ANSWER SENTENCE: Four kids can get $\frac{3}{4}$ of a candy bar.

PART B: How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

WORK: [Diagram showing division of candy bars]

The remainder is correctly shown.

ANSWER SENTENCE: He will have $\frac{1}{2}$ to himself.

PART C: Explain your reasoning for parts A and B.

I used pictures because they are helpful for me and they show the left over.

PART D: Show how you can check if your responses to parts A and B are correct.

\[3\frac{1}{2} \div \frac{3}{4} = \frac{7}{2} \times \frac{4}{3} = \frac{14}{3} = 4\frac{1}{2}\]

\[\frac{14}{3} \neq 4\frac{1}{2}\]

Student may not know how to correctly interpret the remainder without a picture.

4 friends get chocolate.

2 candy bars left for Jason.
Share My Candy

Jason has \(3 \frac{1}{2}\) candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible \(\frac{3}{4}\) of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give \(\frac{3}{4}\) of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\begin{array}{c c c}
1 & 1 & 2 \\
2 & 3 & 3 \\
3 & 4 & 4 \\
\end{array}
\]

\(\text{Student correctly uses a visual model}\)

**ANSWER SENTENCE:**

Jason can give 4 friends \(\frac{3}{4}\) of the candy bars.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[
\frac{2}{3}
\]

\(\text{Student confuses the remainder. Only } \frac{1}{2} \text{ of the bar is left, NOT } \frac{2}{3}.\)

**ANSWER SENTENCE:**

Jason can have \(\frac{2}{3}\) for himself.

**PART C:** Explain your reasoning for parts A and B.

Jason can give 4 friends \(\frac{3}{4}\) of the candy bar because when you count to see how many \(\frac{3}{4}\) go into the candy bars, its 4 times. The rest of the candy bar is \(\frac{2}{3}\), and that's what Jason keeps.

**PART D:** Show how you can check if your responses to parts A and B are correct.

**Part A check:**

\[
3 \frac{1}{2} = \frac{7}{2} \quad \frac{7}{2} \div \frac{3}{4} = \frac{7}{2} \times \frac{4}{3} = \frac{14}{3} = \frac{4}{3} \text{ friends}
\]

**Part B check:**

Jason has \(\frac{2}{3}\) or \(\frac{2}{4}\) for himself.
Share My Candy

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

**PART A:** How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

**WORK:**

\[
3\frac{1}{2} \text{ candy bars} = 3\frac{1}{2} \div \frac{3}{4} = \frac{7}{2} \div \frac{3}{4} = \frac{7 \times 4}{2 \times 3} = \frac{14}{6} = \frac{7}{3} = 2\frac{1}{3}
\]

**ANSWER SENTENCE:** He can only give $\frac{3}{4}$ candy bar to 4 of his friends.

**PART B:** How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

**WORK:**

\[
3\frac{1}{2} \div \frac{3}{4} = 4\frac{5}{3}
\]

$2/3$ left over for Jason

**ANSWER SENTENCE:** He will keep $2/3$ of the $3\frac{1}{2}$ candy bars for himself.

**PART C:** Explain your reasoning for parts A and B.

I drew the picture of Jason's candy bars. Then sectioned them into halves then fourths, then shaded 3 fourths and saw how many $3/4$ I can make.

**PART D:** Show how you can check if your responses to parts A and B are correct.

I divided and drew a picture to show my work.
GRADE 6 MATH: SHARE MY CANDY

INSTRUCTIONAL SUPPORTS

The instructional supports on the following pages include a unit outline with formative assessments and suggested learning activities. Teachers may use this unit outline as it is described, integrate parts of it into a currently existing curriculum unit, or use it as a model or checklist for a currently existing unit on a different topic.
Unit Outline

Grade 6 in Math: Share My Candy

UNIT TOPIC AND LENGTH:
The length of this unit is approximately 2-3 weeks. It will focus on developing an understanding of dividing fractions by fractions by building upon the students' basic conceptual knowledge gained in Grade 5 of dividing fractions by whole numbers and whole numbers by unit fractions (5.NF.7). Students use the meaning of fractions, the meaning of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Subsequent to this unit, students will use this knowledge to reason about ratio and rate problems.

COMMON CORE CONTENT STANDARDS:

- 6.NS.1: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g. by using visual fraction models and equations to interpret the problem.

MATHEMATICAL PRACTICES

- MP.1: Make sense of problems and persevere in solving them.
  Students are required to "make conjectures about the form and meaning of the solution." Additionally, students are expected to be able to "check their answers to problems."

- MP.2: Reason abstractly and quantitatively.
  Students are required to "make sense of quantities and their relationships in problem situations." Students are also asked to attend "to the meaning of quantities, not just how to compute them."

- MP.3: Construct viable arguments and critique the reasoning of others.
  Students are required to "justify their conclusions and communicate them to others."

- MP.4: Model with mathematics.
  Students are required to "apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. They can analyze relationships mathematically to draw conclusions."

- MP.6: Attend to precision.
  Students are required to "calculate accurately and efficiently and express numerical answers with a degree of precision appropriate for the problem context."
### Big Ideas/Enduring Understandings:
- There are several ways to divide fractions by fractions.
- It does not always make sense to have an answer that is a mixed number.
- Division means repeatedly making equivalent groups.
- Division and multiplication are inverse operations and, therefore, can be used to check each other.

### Essential Questions:
- What real life situations can be modeled by dividing a fraction by a fraction?
- Why does the division of fractions algorithm work (i.e., multiplying by the reciprocal)?
- How can the fractional portion of a mixed number be interpreted?

### Content:
**Prior Knowledge:**
- Fluency with multiplication and division of whole numbers to generate factors and multiples
- Understanding of fractions and fraction equivalence
- Ability to convert a mixed number to an improper fraction
- Understand when to multiply a fraction by a mixed number
- Ability to explain why the procedure used to multiply a fraction by a mixed number works

### Skills:
- **Ascertain** the reasonableness of answers.
- **Write** all answers in complete sentences with appropriate labels.
- Adequately **justify** a response or explain the applied strategy
- Procedurally **demonstrate** the ability to **multiply** a fraction and a mixed number.

### Vocabulary/Key Terms:
- part, whole, product, quotient, partial number, remainder, solution, mixed number, common denominator, inverse operations, sum, difference, fraction, portion
Understanding of Division of Fractions: Understanding division with fractions presents considerable difficulties for elementary, middle, and junior high school students. Most are unable to provide any justification for the standard algorithm, “invert and multiply.” Consequently, many students learn the algorithm and apply it mechanically without understanding the rich mathematical ideas behind it. Understanding the relationships among fractional quantities requires multiplicative reasoning which is the building block to proportional reasoning. Throughout this unit, students should consider “why, when dividing fractions, do we invert and multiply?” In order to promote optimal conceptual understanding, it is essential to connect prior understanding of unit fractions obtained in Grade 5 to the learning in this unit. Students will begin to move away from a strict memorization of algorithms and procedures and move toward deeper conceptual understanding of fractions and their applications.

Class Discussions: Students should know that the rule of “invert and multiply” applies to division in general. It is a general principle, for example: $20 \div 5, 1$ can invert and multiply $20 \times 1/5 = 4$. With whole numbers, division can be thought of as making equal parts. When you divide something by 5, you are dividing it into 5 parts. In 5th grade, students learn that dividing by 5 is the same as multiplying by 1/5. We can also think of fractional division as “how many times does the divisor fit into the dividend?” Students can also use this question to consider the reasonableness of their answers. In the example $1 \frac{2}{8} \div \frac{1}{2}$, clearly 1/2 can fit into $1 \frac{2}{8}$ more than two times. Or consider $2/8 \div 11/12$. Here the divisor is greater than the dividend. It will not even fit once. Students can begin to see the reasonableness of their answers before even performing any calculations.

An alternative method for fraction division is to first change both the divisor and dividend into equivalent denominators, and then divide the numerators:

$$\frac{3}{5} \div \frac{1}{3} = \frac{9}{15} \div \frac{5}{15} = \frac{9}{1} = \frac{9}{5} = \frac{1}{5}$$

The quotient makes sense because $1/3$ can go into $3/5$ almost two times. This helps to make sense of the procedure. So instead of a student asking how many times does $5/15$ go into $9/15$, by making the denominators the same it becomes easier to see how many times 5 goes into 9. Students sometimes have an easier time understanding the idea of having 9 unit fractions and making groups of 5 unit fractions.

Inverting and multiplying as an algorithm can be used as a shortcut, but only after students begin to understand the rationale behind it. Shortcuts are okay, but we also want to build on the conceptual knowledge.

In addition, students should be taught how to check if division equations are true by multiplication. In the above example, students should know that if $\frac{3}{5} \div \frac{1}{3} = 1 \frac{4}{5}$ then it must be true that $1 \frac{4}{5} \times \frac{1}{3} = \frac{3}{5}$
## INITIAL ASSESSMENT

- Application problems for adding, subtracting, multiplying fractions

## FORMATIVE ASSESSMENTS

1. Merry Models: Creating visual models from numerical models
2. Minding My Dividing: Dividing fractions by whole numbers and interpreting quotients and remainders
3. Penny's Pieces: Dividing fractions by fractions and interpreting remainders

## ADDITIONAL INSTRUCTIONAL TASKS

1. Cherry Pies
2. Pound Cakes

## FINAL PERFORMANCE TASK

- Share My Candy: Students may choose to perform the division of the fractions using either visual models or numerical symbols. Not specifying the method in which students should solve the problem makes the task more accessible to different types of learners.

### 6.NS.1 UNIT MAP

<table>
<thead>
<tr>
<th>DAY</th>
<th>PURPOSE</th>
<th>STANDARD</th>
<th>SUPPORTS</th>
</tr>
</thead>
</table>
| 1   | Initial Assessment  
Review adding, subtracting, and multiplying two fractions. | various | Review using visual models to add, subtract, and multiply fractions. |
| 2   | Realistic Remainders  
Students explore when it makes sense to have a partial number and when does it not. | 6.NS.1 |    |
| 3 - 5 | Modeling fraction division  
- Area model  
- Number line  
- Fraction strips  
- Grouping tallies | 6.NS.1 |  
- Various types of models support learners of different learning modalities.  
- Have students justify any numerical expression with a visual model to help build understanding of the link between the two representations |
<table>
<thead>
<tr>
<th>Day</th>
<th>Stage</th>
<th>Purpose</th>
<th>Standard</th>
<th>Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Formative Assessment 1</td>
<td>Assess whether students can model division of fractions visually.</td>
<td>6.NS.1</td>
<td></td>
</tr>
</tbody>
</table>
| 7-8 | Whole numbers divided by a fraction and fractions divided by whole numbers | Building upon what students learned in Grade 5 (dividing only by unit fractions), students now learn how to divide by any fraction, including ones where the numerator is not 1 and improper fractions. Also included in these lessons is a review of converting mixed numbers to improper fractions. | 5.NF.7 | • Use visual models and manipulatives.  
• Scaffold by starting with common denominators, progressing to denominators where one is a multiple of the other, then moving to relatively prime denominators. |
| 9-10| Solving and creating word problems that involve 1 fraction and 1 whole number | Focus on key words that indicate division. Also review modelling with BOTH numbers and pictures and use one method to check the other. | 5.NF.7 6.NS.1 | • Use visual models and manipulatives.  
• Scaffold by starting with common denominators, progressing to denominators where one is a multiple of the other, then moving to relatively prime denominators. |
| 11  | Formative Assessment 2 | Assess division involving fractions, whole numbers, and mixed numbers. | Various | |
| 12-14| Word problems with all types of positive rational numbers | Students explore problems that include fractions, mixed numbers, and whole numbers. | 6.NS.1 5.NF.7 | • Provide some carefully selected, scaffolded problems.  
• Students should also be encouraged to create and complete problems of their own. |
| 15  | Formative Assessment 3 | Assess division involving fractions, whole numbers, and mixed numbers. | Various | |
| 16  | Unit Review | Students can create word problems and create answer keys. Students can then swap problems with one another and explore various methods of solving the same problem. | 6.NS.1 | • Problems should be scaffolded from easier to more complex.  
• Word problems should always start by finding key words that indicate the function. |
| 17  | Culminating Task: Share My Candy | | 6.NS.1 | |
Initial Assessment

For each of the following questions, show your work and write your answer in a complete sentence.

PART A: On Monday, Paul walked $2\frac{1}{5}$ miles. On Tuesday, Paul walked $1\frac{3}{5}$ miles. On Wednesday, Paul walked $4\frac{2}{5}$ miles. How many miles did Paul walk all together?

Answer Sentence:____________________________________________________________________________________

PART B: If Jaime runs $2\frac{1}{4}$ kilometers per day, how many kilometers can Jaime run in 14 days?

Answer Sentence:____________________________________________________________________________________

PART C: Sarah lives $6\frac{1}{4}$ blocks from school. If she walked $4\frac{1}{2}$ blocks so far, how much further does she have to walk?

Answer Sentence:____________________________________________________________________________________
PART D: Evaluate the following expressions. Show your work and write your answer on the line.

1. \[ 3 \times \frac{1}{4} \]

Answer: 

2. \[ 3 \div \frac{1}{4} \]

Answer: 

3. \[ 3 - \frac{1}{4} \]

Answer: 

4. \[ 3 + \frac{1}{4} \]

Answer: 

5. \[ 3 \times 1 \frac{1}{4} \]

Answer: 

6. \[ 3 - 1 \frac{1}{4} \]

Answer: 

7. \[ \frac{1}{5} \times \frac{1}{4} \]

Answer: 

8. \[ 3 \frac{1}{2} - 2 \frac{1}{4} \]

Answer: 

9. \[ 3 \frac{1}{8} - 1 \frac{3}{4} \]

Answer: 

Initial Assessment Answer Key

PART A: \( 2\ 1/5 + 1\ 3/5 + 4\ 2/5 = 7\ 6/5 = 8\ 1/5 \)  
\( \)  
\( Paul \) \( walker \ 8\ 1/5 \) \( miles \) \( all \) \( together. \)

PART B: \( 2\ 1/4 \cdot 14 = 9\ 14/1 = 126/4 = 31\ 1/2 \)  
\( Jaime \ runs \ 31\ 1/2 \) \( kilometers. \)

PART C: \( 6\ 1/4 - 4\ 1/2 = 6\ 1/4 - 4\ 2/4 = 5\ 5/4 - 4\ 2/4 = 1\ 3/4 \)  
\( Sarah \ has \ 1\ 3/4 \) \( blocks \) \( left. \)

PART D:

1. \( 3/4 \)
2. 12
3. \( 2\ 3/4 \)
4. \( 3\ 1/4 \)
5. \( 3\ 3/4 \)
6. \( 1\ 3/4 \)
7. \( 1/5 \)
8. \( 1\ 1/4 \)
9. \( 1\ 3/8 \)
Formative Assessment 1
Merry Models

Draw a picture or model that represents each of the following problems. Then write your quotient on the line.

1. \( 8 \div 2 \)

2. \( 8 \div 5 \)

3. \( \frac{2}{5} \div \frac{1}{5} \)

Quotient: ______  Quotient: ______  Quotient: ______

4. \( \frac{7}{3} \div \frac{1}{3} \)

5. \( \frac{1}{3} \div \frac{7}{3} \)

6. \( \frac{3}{2} \div \frac{1}{4} \)

Quotient: ______  Quotient: ______  Quotient: ______

7. Explain the model you created for problem #6.

____________________________________________________________________________________________________

____________________________________________________________________________________________________

____________________________________________________________________________________________________
Formative Assessment 1 - ANSWER KEY

Merry Models

NOTE: There are various picture models that are complete and correct. This answer key is completed using grouping with tally marks. Any correct picture model is acceptable. Students are not required to use all types of models, but rather only those that make sense to them.

1. \( 8 \div 2 \)

\begin{align*}
\hline
\text{Quotient: 4} \\
\end{align*}

2. \( 8 \div 5 \)

\begin{align*}
\hline
\text{Quotient: } 1 \frac{3}{5} \\
\end{align*}

3. \( \frac{2}{5} \div \frac{1}{5} \)

\begin{align*}
\hline
\text{Quotient: 2} \\
\end{align*}

4. \( \frac{7}{3} \div \frac{1}{3} \)

\begin{align*}
\hline
\text{Quotient: 7} \\
\end{align*}

5. \( \frac{1}{3} \div \frac{7}{3} \)

\begin{align*}
\hline
\text{Quotient: } \frac{1}{7} \\
\end{align*}

6. \( \frac{3}{2} \div \frac{1}{4} \)

\begin{align*}
\hline
\text{Quotient: 6} \\
\end{align*}

7. Explain the model you created for problem #6.

I got a common denominator so that the size of the unit piece in the total could be the same as the size of the unit piece in the divisor. Then I divided the total unit pieces that I started with into 6 equal pieces, as specified by the divisor. We can ignore the denominator now because both denominators are the same, which means the size of the unit pieces are the same. (Or similar response)
PART A: Jose solved a division problem. He got a quotient of $5 \frac{2}{3}$. He cannot remember what the problem was about. Below are 5 choices that Jose can choose from. Which ones can he eliminate? Write “possible” next to the quotient that could be true or “impossible” next to the quotient that could not be true. For each impossible quotient, briefly explain why it is not possible.

$5 \frac{2}{3}$ people: ________________________________________________________________

$5 \frac{2}{3}$ candy bars: __________________________________________________________

$5 \frac{2}{3}$ blocks: ______________________________________________________________

$5 \frac{2}{3}$ chairs: ______________________________________________________________

$5 \frac{2}{3}$ cups of water: ________________________________________________________

PART B: Write a question that could be represented by the expression $4 \frac{2}{5} \div 3$.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

PART C: Solve the question that you created in Part B. Show your work and write your answer in a complete sentence.

Answer Sentence: _______________________________________________________________

Name: __________________________ Class: __________ Date: ______________
**Formative Assessment 2 – ANSWER KEY**

**Minding My Dividing**

**PART A:** Jose solved a division problem. He got a quotient of $5 \frac{2}{3}$. He cannot remember what the problem was about. Below are 5 choices that Jose can choose from. Which ones can he eliminate? Write “possible” next to the quotient that could be true or “impossible” next to the quotient that could not be true. For each impossible quotient, briefly explain why it is not possible.

$5 \frac{2}{3}$ people: Impossible – Cannot have two thirds of a person

$5 \frac{2}{3}$ candy bars: Possible. I can break up a candy bar into thirds

$5 \frac{2}{3}$ blocks: Possible. I can break up a block into thirds OR Impossible – Can’t break a child’s wooden building block into thirds

$5 \frac{2}{3}$ chairs:Impossible – I cannot have two thirds of a chair

$5 \frac{2}{3}$ cups of water: Possible. I can measure water in thirds of a cup

**PART B:** Write a question that could be represented by the expression $4 \frac{2}{5} \div 3$.

Various correct responses...

**PART C:** Solve the question that you created in Part B. Show your work and write your answer in a complete sentence.

$$4 \frac{2}{5} \div 3 = \frac{22}{5} \div 3 = \frac{22}{15} = 1 \frac{7}{15}$$

OR

Answer Sentence: Varies depending on question created for PART C.
Penny had a piece of string that was $3\frac{1}{4}$ yards long. She wanted to cut the string into strips that were $1\frac{1}{2}$ yards long. Use this information to answer the following questions.

**PART A:** Show how you can use a picture or diagram to find how many pieces Penny can cut.

**PART B:** Write a number sentence that represents this situation. ________________

**PART C:** How many full strips can Penny cut? Show your work and write your answer in a sentence.

Answer Sentence: ________________________________________________________________

**PART D:** How many yards of string does Penny have left after she cuts as many strips as possible? Show how you know, and write your answer in an answer sentence.

Answer Sentence: ________________________________________________________________
Penny had a piece of string that was 3$\frac{1}{4}$ yards long. She wanted to cut the string into strips that were 1$\frac{1}{2}$ yards long. Use this information to answer the following questions.

**PART A:** Show how you can use a picture or diagram to find how many pieces Penny can cut.

1 piece + 1 piece + $\frac{1}{6}$ piece

Whole = 6 unit fractions

**PART B:** Write a number sentence that represents this situation. $3\frac{1}{4} \div 1\frac{1}{2}$

**PART C:** How many full strips can Penny cut? Show your work and write your answer in a sentence.

See above diagram OR

Answer Sentence: Penny can cut two strips.

**PART D:** How many yards of string does Penny have left after she cuts as many strips as possible? Show how you know and write your answer in an answer sentence.

From diagram: $\frac{13}{4} - \frac{12}{4} = \frac{1}{4}$

Answer Sentence: Penny has one fourth of a yard of string left.
POSSIBLE SOLUTION PATHS FOR TEACHERS

Share My Candy

Jason has $3\frac{1}{2}$ candy bars. He wants to share the candy bars with his friends. He gives as many of his friends as possible $\frac{3}{4}$ of a candy bar. He keeps the rest for himself.

PART A: How many friends can he give $\frac{3}{4}$ of a candy bar to? Show your work and write your answer in a complete sentence.

WORK:

SOLUTION PATH 1:

$$3 \frac{1}{2} \div \frac{3}{4} = \frac{7}{2} \div \frac{3}{4} = \frac{7}{2} \times \frac{4}{3} = \frac{28}{6} = 4 \frac{4}{6} = 4 \frac{2}{3}$$

He can give $\frac{3}{4}$ of the candy bar to 4 friends (and he’ll have some left.)

SOLUTION PATH 2: (Let F represent Friend so F1 means Friend 1)

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ANSWER SENTENCE: He can give 4 friends $\frac{3}{4}$ of a candy bar.

PART B: How much of the candy bar will he keep for himself? Show your work and write your answer in a complete sentence.

WORK:

SOLUTION PATH 1: $3 \frac{1}{2} \div \frac{3}{4} = 4 \frac{2}{3}$ of $3 \frac{3}{4} = \frac{2}{3} \times \frac{3}{4} = \frac{2}{4} or \frac{1}{2}$

SOLUTION PATH 2: From the picture above, he has $\frac{2}{4}$ or $\frac{1}{2}$ left. He can’t share it with his friends because he wants each of his friends to get $\frac{3}{4}$, which is greater than $\frac{2}{4}$

ANSWER SENTENCE: He has $\frac{2}{4}$ or $\frac{1}{2}$ candy bar left for himself.

PART C: Explain your reasoning for parts A and B.

SOLUTION PATH 1: Jason wants to share his 3 $\frac{1}{2}$ candy bars with his friends. So we can use division to find out how many friends he can give $\frac{3}{4}$ of a candy bar to. We can use the division algorithm to find the solution by finding out how many $\frac{3}{4}$ are in 3 $\frac{1}{2}$, which is the same as $3 \frac{1}{2} \div \frac{3}{4}$

SOLUTION PATH 2: Jason wants to share 3 $\frac{1}{2}$ candy bars with his friends. I can draw 3 $\frac{1}{2}$ candy bars and then split each whole candy bar into 4ths because he only wants to give $\frac{3}{4}$ to each friend.
PART D: Show how you can check if your responses to parts A and B are correct.

SOLUTION PATH 1: \( 3 \frac{1}{2} \div \frac{3}{4} = 4 \frac{2}{3} \) so to check I can use multiplication and distributive property of multiplication over addition.

\[
4 \frac{2}{3} \times \frac{3}{4} = \left(4 + \frac{2}{3}\right) \times \frac{3}{4} = \left(4 \times \frac{3}{4}\right) + \left(\frac{2}{3} \times \frac{3}{4}\right) = 3 + \frac{1}{2} = 3 \frac{1}{2}
\]

SOLUTION PATH 2: Each candy bar is split into fourths. To give \( \frac{3}{4} \) of each candy bar to a friend, I need to give 3 parts of the 4 equal parts from each candy bar. (This solution may be easier for some kids because they can visualize by drawing pictures.)
Cherry Pies

1. Heather bought $3\frac{1}{4}$ cherry pies. She decides she wants to serve each of her guests $\frac{1}{3}$ of a pie. How many guests can she serve?

Number Line

![Number Line Diagram]

Tally Model

![Tally Model Diagram]

III---------

Algorithm

$$3\frac{1}{4} \div 1\frac{1}{3} = \frac{13}{4} \div \frac{4}{3} = \frac{39}{12} \div \frac{4}{12} = \frac{39}{12} \div 1 = \frac{39}{12} \div 1 = \frac{39}{4} = 9\frac{3}{4}$$

9 Guests

2. What fraction of the pie will she have left?

Number Line

Three bars remain of a total of twelve possible bars... so that would give a remainder of $\frac{3}{12} = \frac{1}{4}$ pie.

Tally Model

Three tallies remain of a total of twelve possible tallies... so that would give a remainder of $\frac{3}{12} = \frac{1}{4}$ pie.
Algorithm

\[
\frac{3}{4} \text{ of a pie piece remain and each pie piece was cut into } \frac{1}{3}, \text{ so:}
\]

\[
\frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4} \text{ of a pie remaining.}
\]
Pound Cakes

1. Jack has $1 \frac{1}{2}$ pound cakes. He wants to cut the cake in $\frac{2}{3}$ equal pieces. How many pieces can he make?

**Picture Model**

\[
1 \text{ cake} + \frac{1}{2} \text{ cake} = \frac{6}{6} + \frac{3}{6}
\]

\[
\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6} \quad \text{There are 2 groups of $\frac{4}{6}$ or $\frac{2}{3}$ in the pound cakes}
\]

**Number Line**

\begin{figure}
\begin{center}
\begin{tikzpicture}
\draw[->] (0,0) -- (10,0);
\foreach \x in {0,1,2,3,4,5,6,7,8,9,10}
\draw[fill=white] (\x,0) -- (\x,-0.2) -- (\x,-0.2);
\foreach \x in {0,1,2,3,4,5,6,7,8,9,10}
\draw[->,blue] (\x,0) -- (\x,0.2);
\foreach \x in {1,2}
\draw[fill=blue] (\x,0) -- (\x,-0.2) -- (\x,-0.2);
\foreach \x in {1,2}
\draw[->,blue] (\x,0) -- (\x,0.2);
\end{tikzpicture}
\end{center}
\end{figure}

\begin{itemize}
\item 1
\item 2
\end{itemize}

(Pieces)

0

1

(Pound Cakes)

**Tally Model**

\[
\begin{array}{c}
\text{I I I I I I I}
\end{array}
\]

\[
\begin{array}{c}
\text{- - - I I I}
\end{array}
\]

2 Pieces

**Algorithm**

\[
1 \frac{1}{2} \div \frac{2}{3} = \frac{3}{2} \div \frac{2}{3} = \frac{9}{6} \div \frac{4}{6} = \frac{9 \div 4}{6 \div 6} = \frac{9}{4} = 2 \frac{1}{4}
\]

2 Guests

2. What fraction of the pound cake will he have remaining?

**Picture Model**

One rectangle representing $\frac{1}{6}$ remains, so there is $\frac{1}{6}$ pound cake remaining.

**Number Line**

One bar remains of a total of six possible bars... so that would give a remainder of $\frac{1}{6}$ pound cake.
Tally Model

One tally remains of a total of six possible tallies... so that would give a remainder of $\frac{1}{6}$ pie.

Algorithm

$\frac{1}{4}$ of a cake piece remains, and each cake piece was cut into $\frac{2}{3}$, so:

$$\frac{1}{4} \text{ of } \frac{2}{3} = \frac{1}{4} \times \frac{2}{3} = \frac{2}{12} = \frac{1}{6}$$ of a pound cake remaining.