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Math Minds

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Math Minds – Fourth Grade
Instructional Strategies and Assessment Methods

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University Honors Capstone

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Senior Honors Project/Thesis

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Abstract

During this capstone project, three instructional and three formative assessment strategies were integrated into a fourth-grade math unit involving multiplication of fractions. This math unit consisted of seven instructional days including a pre-test and post-test. The strategies focused on student engagement and progression throughout the unit. Following analysis of the data collected on the instructional strategies and the formative assessments, the student's performance increased. I collected data from the pre- and post-tests that evidenced the turn and talks, think aloud, small groups, exit tickets, student whiteboards, and observation were effective instructional and assessment strategies to enhance student achievement. This capstone will address the strategies that were implemented and how they helped increase and improve student achievement on fractions.

Keywords: instructional strategies, assessment strategies

Background

For my clinical practice placement, I was placed at Picotte Elementary in a fourth-grade classroom in Omaha Public Schools district. This school has been open for 31 years. Picotte Elementary School consists of 390 students in grades Pre-Kindergarten to fifth grade. There are two or three classes per grade with one teacher per class. There are four special education teachers throughout Picotte who guide students on an Individualized Education Plan (IEP). The class sizes range from 20 to 26. The classroom I was placed in has twenty students. There are twelve girls and eight boys. My cooperating teacher supervised and assisted me within my capstone project. She has been teaching for 5 years, this being her first year at Picotte Elementary. We decided that I would plan and implement a math unit involving multiplication of fractions for our twenty fourth-grade students.

Introduction

For my capstone, the guiding question was, “*Will the integration of instructional and assessment strategies benefit student understanding of mathematical logic?*” The goal of the unit was for students to successfully solve math problems involving multiplication of fractions. Four objectives were created to guide the lessons in the unit. Objective 1: the students will be able to describe a fraction using a unit fraction, Objective 2: the students will be able to multiply a fraction by a whole number, Objective 3: the students will be able to use symbols to multiply a fraction by a whole number, Objective 4: the students will be able to solve problems involving time. This unit aligned with Nebraska State Standards.

Before instruction of the unit the students completed a pre-test. At the end of the unit the students completed a similar post-test. Each test had twelve questions aligning with each of the objectives. During direct instruction of the unit, I implemented three instructional strategies and four assessment strategies, which would have a positive impact on student learning. The instructional strategies consisted of turn and talks, think aloud, and small group instruction. The assessment strategies consisted of exit tickets, student whiteboards, observation, and a pre and post-test.

Understanding of Instructional Strategies

Turn and Talks

Turn and talks allow students to develop a deeper understanding of content by listening and providing feedback to a partner. Research conducted by Boardman (2018) highlighted the importance of utilizing turn-and-talks in student-centered coursework. Boardman noted that educators should make conscious efforts to implement strategies such as turn and talks, partner work, and general student-centered dialogue and discussions to create a richer learning

environment for students. These strategy implementation models can “increase the dialogic nature of classrooms and improve comprehension through collaboration and strategic conversations” (p. 2). Boardman further asserted that turn and talks were more effective when there was a higher ratio of student talk to teacher talk and less conversation that was solely meant to give information to students.

During the math unit, turn and talks were implemented during the middle of each lesson. As students started solving problems on their own, they turned to a partner and shared their answer with them. Along with their answer, they shared the way they solved each problem. This allowed students to think about a math problem in a deeper way as they were acquiring a new perspective on the content.

Think Aloud

A beneficial instructional strategy to actively engage students during direct instruction is a ‘think aloud.’ A think aloud is a teaching strategy in which the teacher verbally states their thinking as they read a text or complete a math problem. Using the think aloud strategy in math allows students to hear and observe how the teacher solves a problem as the problem is modeled step by step.

Ness (2018) conducted a study regarding the benefits of integrating think alouds during instruction. Ness (2018) stated, “It is the careful planning of a think aloud that matter most” (p. 2). She noted that a think aloud should be well thought out in advance to ensure the teacher is giving students the most possible information about the topic. A think aloud delves into the thought progress or cognitive reasoning of an individual to aid in their comprehension of content. If the think aloud isn’t sufficiently planned, it may leave more room for confusion among

students. When planning each lesson within the unit, I made sure to incorporate a think aloud at least once during direct instruction.

The think alouds that I integrated into the unit required the students to talk through the details of the problem, orally share the decisions they made as they tried to solve the problems, and provide the reasoning behind their decisions. The think alouds engaged my fourth graders into higher level thinking as they had to verbally state the steps they took to solve a problem.

Small Groups

Root, Jimenez, & Twine (2022) highlighted the importance of small group instruction for students with disabilities in the classroom. Differentiation is a key factor in teaching as all students have different learning styles. It is important to integrate a variety of instructional strategies to address multiple learning styles. Root, Jimenez, & Twine (2022) emphasize that “teachers need to make inevitable and necessary adaptations to meet the individualized contextual needs of their students” (p. 10). Small group instruction should be planned based on the needs of the students. Students with similar learning needs should be grouped together, so similar specific content can be taught. Small group instruction is more effected when personalized content is taught to groups based on their needs.

Following the pre-test taken by each student, I created small groups based on each student’s level. There were five groups with four students in each group. Content was taught to each group in different ways. The lower-level groups had more direct instruction and practice with manipulatives. The middle level groups had direct instruction with partner work to follow. The higher-level groups had more independent, challenging problems that they were able to solve.

Understanding of Assessment Strategies

Exit Tickets

A powerful assessment strategy that I have found to be beneficial throughout the unit was the integration of exit tickets. Exit tickets are a very quick way to assess students learning so far at the end of a lesson. The teacher writes a prompt or question(s) on the board. After the explanation of what is being asked, the students are asked to write their answer(s) on a notecard or sticky note. The teacher collects the exit ticket and reviews the responses to assess student understanding of the content that was taught. The responses provide the teacher with immediate feedback on the students understanding of the lesson. The student responses provide the teacher with immediate feedback on student understanding.

Akhtar and Saeed (2020) performed a study on the integration of exit tickets at the end of a lesson. They found that exit tickets are a beneficial method to summarize lessons. Akhtar and Saeed (2020) noted that an exit ticket, "...collects information about different concepts when planning for the next lesson" (p. 4). They found that when teachers reviewed the exit tickets, they could immediately determine student understanding and determine what may need to be retaught. In my class, if 50% of the students did not understand the objective, I would review and reteach the skill the next day.

Whiteboards

Throughout the math unit students were given a whiteboard to solve problems. The whiteboards provided the students with a hands-on tool to math solve problems. Nordengren (2020) noted that the integration of whiteboards, "...makes it easy for you [the teacher] to quickly grasp student understanding and adjust how you move forward" (p. 5). I found that I could quickly assess student understanding when students completed a math problem on the whiteboard. The ability to immediately assess student understanding provided me with direction

to either provide more examples or move on with the lesson. The integration of the whiteboards kept the students engaged and provided for me quick and immediate feedback on their understanding.

Observation

Throughout the unit I used observation as an assessment tool to inform my instruction. Wallach, T., & Even, R. (2005) stated that, “Many leading mathematics educators call for student assessment that informs and guides teachers as they make instructional decisions” (p. 3). I observed my students during each lesson and made mental note of their on-task or off-task behavior and their engagement during whole group, small group, and during seatwork. If I observed off-task behavior or students struggling with a task I was able to immediately adjust the lesson. The adjustments benefitted the students as I was able to remediate ‘in-the-moment’ versus post lesson. I gained valuable insight about each students’ individual strengths, as well as areas that needed improvement.

Pre and Post-test

Brack (2022) stated, “Pre-assessment data can provide teachers with the information they need to make strategic decisions about the support students will require” (p. 1). Prior to the first lesson of the unit, I administered a pre-test to assess students present level of understanding of multiplying fractions.

The baseline scores provided me with data to create small groups. The students that missed similar problems were grouped together. The pre-test data also impacted how I planned my lessons. As the students were placed in ‘like’ small groups I was able to differentiate the lessons to meet the needs of each group. For some of the lower performing groups I added extra instructional days.

Participants

The participants for this study were twenty fourth grade students at in the Omaha Public School District, Picotte Elementary. This class of twenty included twelve girls and eight boys. Of these twenty students, one qualified for English Language Learning (ELL) services. The five students receiving special education services had one or more Individualized Education Plans (IEP). The student received services in the following categories: (1) speech and language, (2) math and reading, (3) math and speech and language, (4) math, reading, and speech and language, and (5) math, reading, and speech and language.

Methods/Materials

The multiplications of fractions unit connected to three Nebraska State Standards.

- 4.N.3.e Multiply a fraction by a whole number using visual fraction models and properties of operations.
- 4.G.2.a Identify and use the appropriate tools, operations, and units of measurement, both customary and metric, to solve authentic problems involving time, length, weight, mass, and capacity.
- 4.G.2.b Determine the reasonableness of measurements involving time, length, weight, mass, capacity, and angles.

Based on these Nebraska State Standards, I created objectives that mirrored the standards for students to achieve.

A twelve-question pre-test (Appendix A) was given to all students on the first day of the unit. This pre-test would allow me to view students' prior knowledge on multiplying fractions and measurements of time. Based on the results of the pre-test, I created differentiated math small groups. There were five different groups, leveled from low to high. I worked with one

small group for each day of the unit, minus the pre-test and post-test days. I was able to create appropriate content for them, based on their pre-test. See Appendix B for an example of a worksheet we completed in the small group.

This unit was seven total days. The first day I administered the pre-test. The second, third, fourth, and fifth day were direct instruction lessons focused on the content, with small group lessons held during small group time. On the sixth day, we conducted a review of the content we had learned throughout the unit, which included the final small group session. There was the final small group on the sixth day, as well. The seventh day consisted of the post-test (Appendix C).

Each direct instruction lesson followed a similar structure. At the start of the lesson, students would complete an activity called solve and share (Appendix D). This was an introduction to what concept they were about to learn that day during math. They were to solve the problem independently after we read it together as a class. They were able to jot down what they knew and engage in some productive struggle. After they solved the problem independently, they would raise their hands and I would come check it. Before beginning direct instruction, I could observe any misconceptions or clear understanding they had about content. I allotted about five minutes for them to independently solve the problem, then I asked a few students to come up to the board and share the method they used to solve the problem.

After the anticipatory set, we watched a curriculum video provided by Omaha Public Schools. These videos were two minutes long and provided explanations for the content of that lesson. The curriculum video would pause three to five times. During the pauses I was able to ask the students questions. They would record their responses on a whiteboard, or they were asked to turn and talk with a partner. When all of the students had responded to the problem, I

would explain the correct answer and/or play the video which explained all of the steps of the problem.

After the students had a chance to watch and participate in the curriculum video, I gave them a meaningful think aloud, which outlined the math concept and accurate vocabulary. The think aloud was followed by guided practice problems (Appendix E) that we would solve together. The students would use their whiteboards or turn and talks to answer these questions. As they were solving the problem, I would walk around and observe them working or talking with a partner. This procedure was used until the end of the lesson.

Following guided practice, students had independent worktime on their homework (Appendix F). Based on what I observed during the lesson, either my cooperating teacher or I would pull students for a homework help small group. In this group, students received a more thorough explanation of a problem to enhance their understanding. Once they seemed to grasp the concept on their homework, they could return to their seats and work on it independently.

Once we reached the end of the unit each day, students were asked to complete an exit ticket (Appendix G). I would pass out a notecard and write a question on the board. I gave the students three minutes to solve the problem on their notecard independently. When they finished, they would turn in the notecard to me. The accuracy of the student work on the notecard guided the next day's lesson.

Results/Data Analysis

Table 1

Pre-Test

Student	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Question 11	Question 12
1	Green	Red	Red	Green	Green	Yellow	Red	Yellow	Red	Red	Red	Green
2	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
3	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
4	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
5	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
6	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
7	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
8	Red	Red	Red	Green	Yellow	Red	Red	Red	Red	Red	Red	Red
9	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
10	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
11	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
12	Green	Red	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green
13	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
14	Yellow	Red	Red	Red	Green	Green	Red	Red	Red	Red	Red	Red
15	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
16	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
17	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
18	Red	Red	Red	Green	Green	Green	Yellow	Green	Green	Green	Green	Green
19	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
20	Green	Red	Red	Red	Green	Red	Red	Yellow	Red	Red	Red	Red

Note. Table 1 includes the results of the pre-test data. The horizontal axis shows the question that students answered. The vertical axis shows each student. The red boxes indicate that the students answered the question entirely incorrectly. The yellow boxes signify partial correctness in the students’ responses. The green boxes represent students answering the problem correctly. This data allowed me to see who needed to be in what small groups to receive differentiated instruction.

Table 2

Post-Test

Student	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7	Question 8	Question 9	Question 10	Question 11	Question 12
1	Yellow	Red	Green	Green	Green	Red	Black	Red	Red	Red	Yellow	Red
2	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
3	Green	Green	Green	Red	Green	Green	Black	Green	Green	Green	Yellow	Green
4	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
5	Yellow	Red	Red	Red	Red	Red	Black	Red	Red	Red	Yellow	Yellow
6	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
7	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
8	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
9	Red	Black	Red	Red	Red	Red	Black	Red	Red	Yellow	Red	Black
10	Red	Red	Red	Red	Yellow	Red	Black	Red	Red	Red	Red	Black
11	Green	Red	Green	Green	Green	Green	Black	Green	Green	Green	Green	Yellow
12	Green	Yellow	Green	Green	Green	Green	Black	Green	Green	Green	Green	Green
13	Red	Red	Red	Red	Red	Red	Black	Red	Red	Yellow	Red	Yellow
14	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
15	Red	Yellow	Green	Red	Red	Yellow	Black	Red	Red	Red	Yellow	Red
16	Red	Red	Red	Red	Yellow	Red	Black	Red	Red	Red	Red	Yellow
17	Green	Red	Green	Green	Green	Green	Black	Green	Green	Green	Green	Green
18	Red	Red	Red	Red	Red	Red	Black	Red	Red	Red	Red	Red
19	Green	Red	Green	Green	Green	Green	Black	Green	Green	Yellow	Green	Green
20	Green	Red	Red	Red	Green	Red	Black	Red	Red	Red	Red	Yellow

Note. Table 2 includes the results of the post-test data. The colors of the boxes correspond to the pre-test data, with the exception of the black boxes. The boxes in the question 7 column are black

because it did not align with the standards that went with this unit. The boxes in the 9 and 10 row are black because they did not answer questions 2, 6, and 12. These students were exempted, as indicated in their Individualized Education Plans (IEPs). I analyzed the results based on the color differences of box in the table.

Discussion/Conclusions

When I started this unit, I created differentiated math small groups to help guide my instruction on the multiplication of fractions lesson. I went through all the pre-test data and formulated a plan of instruction based on the data. I identified students for the small groups based on the skills they needed to practice and master. Students 3, 4, 7, and 18 answered similar problems both correctly and incorrectly. These four students received the highest scores on the pre-test. As their scores were similar, I placed them in the same small group. The remaining students were also placed in small groups using the pre-test data.

There were 5 groups and each group had 4 students in it. I created content for each of the groups based on their commonly missed problems on the pre-test. During the 15-minute small group, we intensely remediated the deficit area. Frequent checks for understanding was integrated throughout small group time. Not all students fully understood the concept from the small group, but all of them gained something from it.

Based on the data tables, there was improvement on all questions on the pre and post-tests. On the pre-test, 54 out of 220 questions were answered correctly, which is 24.5% of the questions. On the post-test, 139 out of 214 questions were answered correctly, which is 64.9% of the questions. There was a 40.4% improvement rate from the pre-test to the post-test.

On the pre-test, every student answered #2 incorrectly. I concentrated on this problem and provided thorough think alouds on this skill during the unit, since so many were struggling with

the concept. On the post-test, 8 students got the answer correct or partially correct which was an improvement from the start of the unit. There was greater improvement on question 9. On the pre-test, two students answered the question correctly. On the post-test, 16 students answered the question correctly. This significant gains from the pre to post-test demonstrates the effectiveness of the instructional and assessment strategies I chose to focus on, worked.

Following the post-test, I realized the importance of continuing instruction over certain topics that students have yet mastered. The students who did not meet the objectives by the end of the unit were put into small groups to continue instruction on this material to increase their skills on the operations required to solve multiplication of fractions. These instructional strategies we have implemented have been successful thus far.

In addition, I also learned is that it is important to collaborate with special education teachers. The special education teachers provided us with strategies that best served their students. I have continued collaborating with one of the special education teachers as he has provided me with valuable insight on how to meet the needs of all students served in the classroom.

One of the most valuable lessons I've learned from the units following the capstone is the importance of planning for failure. Understanding the importance of planning lessons for students of all ability levels has been crucial. I have continued the practice of offering think alouds to address potential misconceptions and have already created materials for students who struggle to understand. If necessary, I'm ready to facilitate extra practice sessions in small groups required.

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Appendices

Appendix A

1. Margo practices her flute $\frac{1}{4}$ hour each day.

Units of Time
 1 week = 7 days
 1 hour = 60 minutes

A. Write and solve an equation to find how many hours Margo practices her flute in 1 week.

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{7}{4}$
 $\frac{7}{4} = 1\frac{3}{4} \times 60$
 420 mins

B. Write and solve an equation to find how many minutes Margo practices her flute in 1 day. Then use that to find the number of minutes she practices in 1 week.

60 mins in 1 day
 $\frac{60}{7} = 420$ mins in a week.

2. Which of the following represents the fraction $\frac{8}{9}$ as a multiple of a unit fraction?
 (A) $\frac{8}{9} = 1 \times \frac{8}{9}$
 (B) $\frac{8}{9} = 8 \times 9$
 (C) $\frac{8}{9} = 8 \times \frac{1}{9}$
 (D) $\frac{8}{9} = 4 \times \frac{2}{9}$

3. Ben played at a friend's house for 2 hours 35 minutes. Later he played at a park for 1 hour 10 minutes. He played for another 1 hour 20 minutes in his backyard. How long did Ben play in all?
 (A) 6 hours 27 minutes
 (B) 5 hours 15 minutes
 (C) 5 hours 5 minutes
 (D) 5 hours

4. Choose numbers from the list to fill in the missing values in the multiplication equations. Use each number once.
 1 2 3 4 5 6 7 8

$\frac{7}{8} = \square \times \frac{\square}{8}$ $3 \times \frac{\square}{4} = \frac{3}{4}$
 $\frac{\square}{6} = 5 \times \frac{1}{6}$ $8 \times \frac{1}{2} = \frac{\square}{2}$

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5. Chris found the products of whole numbers and fractions. Match each expression with its product.

$5 \times \frac{2}{3}$	$\frac{5}{3}$	$\frac{10}{3}$	$\frac{2}{15}$	$\frac{2}{15}$
$6 \times \frac{2}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$6 \times \frac{1}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$	$\frac{2}{3}$
$5 \times \frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

6. What is the product of 4 and $\frac{4}{3}$? Write another expression that is equal to the product of 4 and $\frac{4}{3}$.

$4 \times \frac{4}{3} = \frac{16}{3}$
 know? $\frac{16}{3}$
 $\frac{16}{3}$

7. Complete the multiplication equation that describes what is shown by the model.

$4 \times \frac{\square}{6} = 8 \times \frac{\square}{6}$

8. Use a unit fraction and a whole number to write a multiplication equation equal to $\frac{7}{8}$.

$1 \times \frac{7}{8} = \frac{7}{8}$

9. Juan is making cookies. He makes 2 batches on Monday and 4 batches on Tuesday. He uses $\frac{2}{3}$ cup of flour in each batch. How much flour does Juan use? Explain.

$\frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{16}{3}$

10. Lee uses $\frac{1}{5}$ yard of wire for each ornament he makes. He makes 3 ornaments for his grandmother and 2 ornaments for his mother. How many yards of wire did Lee use?
 (A) $\frac{3}{5}$
 (B) $\frac{1}{5}$
 (C) $\frac{2}{5}$
 (D) 1

11. Lucas is making one dozen snacks for his team. He uses $\frac{1}{5}$ cup of dried cherries and $\frac{2}{5}$ cup of dried apricots for each snack. How many cups of dried fruit does Lucas need for his one dozen snacks? Remember, there are 12 snacks in one dozen. Write and solve equations to show how you found the answer.

$\frac{1}{5} + \frac{2}{5} + \frac{1}{5} + \frac{2}{5} + \frac{1}{5} + \frac{2}{5} + \frac{1}{5} + \frac{2}{5} + \frac{1}{5} + \frac{2}{5} + \frac{1}{5} + \frac{2}{5} = \frac{30}{5} = 6$

Topic 10 | Assessment Practice 410
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Note. An example of a student pre-test.

Appendix B

Set A pages 385-388

Talia used $\frac{5}{8}$ yard of ribbon.

Write $\frac{5}{8}$ as a multiple of a unit fraction.

$$\frac{5}{8} = 5 \times \frac{1}{8}$$

Remember a unit fraction will always have a numerator of 1.

Reteaching
Write each fraction as a multiple of a unit fraction.

- $\frac{5}{8} = 5 \times \frac{1}{8}$
- $\frac{3}{8} = 3 \times \frac{1}{8}$
- $\frac{4}{3}$
- $\frac{6}{5}$
- $\frac{15}{8}$
- $\frac{7}{4}$

Set B pages 389-392

James runs $\frac{3}{5}$ mile each week. How far does James run after 2 weeks?

Use multiplication to find the product.

$$2 \times \frac{3}{5} = \frac{3}{5} + \frac{3}{5} = \frac{6}{5} = 1\frac{1}{5}$$

James ran $\frac{6}{5}$ or $1\frac{1}{5}$ miles.

Remember you can record answers as fractions or mixed numbers.

Write and solve an equation.

- $\frac{3}{10} \times 2 = \frac{6}{10}$
- $\frac{2}{3} \times 1 = \frac{2}{3}$

Set C pages 393-396

Alisa has 7 puppies. Each puppy eats $\frac{2}{3}$ cup of food each day. How many cups of food does Alisa need to feed the puppies each day?

Multiply $7 \times \frac{2}{3}$

Multiply the whole number and the numerator.

$$7 \times \frac{2}{3} = \frac{7 \times 2}{3} = \frac{14}{3} = 4\frac{2}{3}$$

Alisa needs $4\frac{2}{3}$ cups of food to feed the puppies each day.

Remember you multiply the whole number and the numerator and write the product above the denominator of the fraction.

- Milo makes 5 batches of muffins. In each batch he uses $\frac{2}{3}$ bag of walnuts. How many bags of walnuts does Milo use?
 $\frac{2}{3} \times 5 = \frac{10}{3}$
- A bird feeder can hold $\frac{1}{8}$ pound of seed. How many pounds of seeds can 4 bird feeders hold?
 $4 \times \frac{1}{8} = \frac{4}{8} = \frac{1}{2}$

Set D pages 397-400

You can add, subtract, multiply, and divide measures of time.

Units of Time

1 hour = 60 minutes ; 1 day = 24 hours
1 year = 12 months ; 1 week = 7 days

Remember you may need to regroup when solving problems with time.

- 7 hours 12 minutes + 3 hours 53 minutes
- $7 \times \frac{3}{4}$ hour
- 5 weeks 4 days - 3 weeks 6 days
- Divide 56 days into groups of
- Li Marie practices piano $1\frac{2}{3}$ hours during the week and $2\frac{1}{3}$ hours on the weekend. Show each time on the number line. How many more hours does she practice on the weekend than the weekdays?

Note. An example of small group material that some of the groups completed. The students completed the “sets” on skills they needed to practice.

Appendix C

Name _____ Topic 10 Assessment

1. Della brushes her teeth $\frac{1}{6}$ hour each day.

Units of Time
1 week = 7 days
1 hour = 60 minutes

A. Write and solve an equation to find how many hours Della brushes her teeth in 1 week.

B. Write and solve an equation to find how many minutes Della brushes her teeth in 1 day. Then use that to find the number of minutes she brushes her teeth in 1 week.

Which of the following represents the fraction $\frac{5}{3}$ as a multiple of a unit fraction?

A $\frac{5}{3} = 3 \times \frac{1}{5}$
 B $\frac{5}{3} = 3 \times \frac{2}{3}$
 C $\frac{5}{3} = 5 \times \frac{1}{3}$
 D $\frac{5}{3} = 1 \times \frac{5}{3}$

Tom played basketball for 2 hours 15 minutes. Later he played soccer for 1 hour 5 minutes. He then played football for 30 minutes. How long did Tom play sports in all?

A 3 hours 35 minutes
 B 3 hours 20 minutes
 C 3 hours 50 minutes
 D 3 hours

Choose numbers from the list to fill in the missing values in the multiplication equations. Use each number once.

1 2 3 4 5 6 7 8

$\frac{7}{10} = \square \times \frac{\square}{10}$
 $5 \times \frac{1}{\square} = \frac{\square}{4}$
 $\frac{\square}{6} = 3 \times \frac{1}{\square}$ $1 \times \frac{2}{8} = \frac{\square}{\square}$

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Karl found the products of whole numbers and fractions. Match each expression with its product.

	$3 \times \frac{6}{8}$	3	$\frac{1}{2}$	2
$3 \times \frac{2}{3}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$5 \times \frac{6}{8}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$4 \times \frac{3}{4}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$3 \times \frac{1}{2}$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Complete the multiplication equation that describes what is shown by the model.

$3 \times \frac{\square}{8} = 9 \times \frac{\square}{8}$

Use a unit fraction and a whole number to write a multiplication equation equal to $\frac{4}{5}$.

Beth is making brownies. She makes 3 batches of brownies on Saturday and 4 batches on Sunday. She uses $\frac{1}{4}$ cup of butter in each batch. How much butter does Beth use? Explain.

Joe uses $\frac{1}{3}$ yard of wood for each sculpture he makes. He makes 4 sculptures for his grandfather and 2 sculptures for his friend. How many yards of wood did Lee use?

A $\frac{1}{3}$
 B 2
 C $\frac{2}{3}$
 D 3

Tabitha is making 11 bags of trail mix. She uses $\frac{2}{4}$ cup of almonds and $\frac{1}{4}$ cup of pecans for each bag. How many cups of nuts does Tabitha need for her 11 bags of trail mix? Write and solve equations to show how you found your answer.

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Note. An example of a post-test that students completed following the lessons of this unit.

Appendix D

Name _____

Activity

Solve & Share

Kalil and Mara were working on their math homework. Mara wrote $\frac{4}{5}$ as $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$. Kalil looked at Mara's work and said, "I think you could use multiplication to rewrite your equation." Is Kalil's observation correct? Explain.

Lesson 10-1
Fractions as Multiples of Unit Fractions

I can ...
use fraction strips or number lines to understand a fraction as a multiple of a unit fraction.

I can also reason about math.

You can use **reasoning** to compare Mara's work and Kalil's observation.

$\frac{4}{5} \times 1 = \frac{4}{5}$

CREATI

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
---------------	---------------	---------------	---------------

$$\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{4}{5}$$

$\frac{2}{5} \times 2 = \frac{4}{5}$

Look Back! Model with Math Write an equation to show the

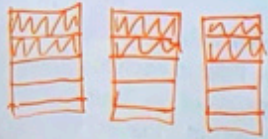
Note. An example of an anticipatory set handout. The students would complete the Solve and Share handout before direct instruction of each lesson.

Appendix E

☆ **Guided Practice**


Do You Understand?

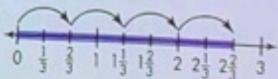
1. Draw a picture to explain how to find $3 \times \frac{2}{5}$.



Do You Know How?

For 2-3, write and solve a multiplication equation.

2.  $\frac{2}{6} \times 2 = \frac{4}{6}$

3. 

Note. An example of practice questions that students completed during the middle of each lesson.

Appendix F

Independent Practice ☆

Leveled Practice For 7-12, write each fraction as a multiple of a unit fraction.
Use a tool as needed.

7. $\frac{7}{8} = \square \times \frac{1}{8}$

8. $\frac{3}{6} = 3 \times \frac{1}{\square}$

9. $\frac{2}{5} = \square \times \frac{1}{5}$

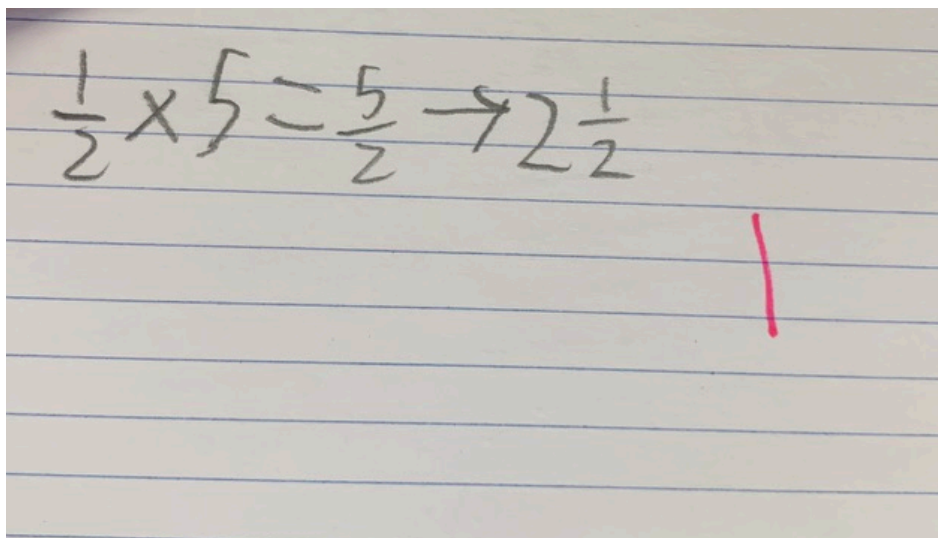
$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$ $\frac{1}{5}$

10. $\frac{6}{4}$ 11. $\frac{9}{6}$ 12. $\frac{8}{5}$

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Note. An example of student independent work. The students would complete the handout independently or in a small group based on their level of understanding.

Appendix G



A photograph of a student's handwritten work on lined paper. The student has written the equation $\frac{1}{2} \times 5 = \frac{5}{2} \rightarrow 2\frac{1}{2}$ in black ink. To the right of the equation, there is a single vertical red line.

Note. An example of an exit ticket from one of the lessons. Students completed one of these per lesson based on the content learned that day.