# Reviewing Using the IMET: Mathematics

**Module 102:** Rigor and Balance (Alignment Criterion 1)

Participant Materials

## Essential Questions:

- How does the **Instructional Materials Evaluation Tool (IMET)** reflect the major features of the Standards and the Shifts?

- What understandings support high-quality, accurate application of the IMET metrics?

## Goals:

✓ Understand how aligned materials embody the shifts inherent in the Common Core State Standards

✓ Understand the precise meaning of each metric of the IMET

✓ Recognize examples and non-examples related to each metric of Alignment Criterion 1 of the IMET

**<u>AC Metric 1A:</u>** The materials support the development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.

- Where the Standards explicitly require students to understand concepts, do the assignments that students work on build that understanding and do assessment tasks reveal whether students understand the mathematics in question?

4.OA.A Use the four operations with whole numbers to solve problems.

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

4.OA.B.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

4.MD.A.3 Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

**AC Metric 1A:** The materials support the development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.

- Do the materials feature high-quality conceptual problems and conceptual discussion questions?

**Standard/Cluster:** 4.NF.A Extend understanding of fraction equivalence and ordering

**a.** Write three fractions equivalent to $\frac{40}{10}$ with numerators smaller than 40.

__________________ __________________ __________________

**b.** Sketch a number line diagram and show all three fractions on it. Then, describe what you see.

**AC Metric 1A:** The materials support the development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.

- Do the materials feature high-quality conceptual problems and conceptual discussion questions?

**Standard/Cluster:** 4.NF.C Understand decimal notation for fractions, and compare decimal fractions.

.

Which number is larger?

1.7 or 17 twelfths

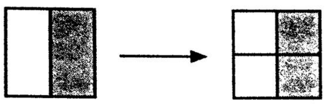
Explain how you can tell without drawing a picture.

**AC Metric 1A:** The materials support the development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.

**Standard/Cluster:** 4.NF.A.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

## 1) Breaking all parts into two equal parts to create equivalent fractions.

Draw the first picture below on the board. Tell students that a parent and a child were sharing a cake, so the parent divided the cake into two pieces. The child wanted two pieces, so the parent cut the cake again and gave the child two pieces. Now draw the second picture.



ASK: How did the shape change? How did the size of the pieces change? Did the child get more cake be getting two pieces? Why or why not?

Ask students to write a fraction to represent each picture. Have students discuss which fraction is greater (or if they are equal.)

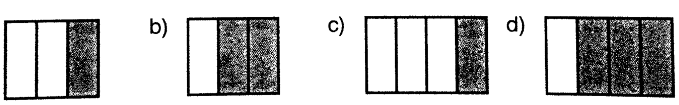
After the discussion, write the following equation on the board.

$$\frac{1}{2} = \frac{2}{4} \longrightarrow \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$$

SAY: The fractions are equal because the pictures have the same amount shaded. Then show how the numerators and denominators are related by multiplication, as in the second picture above. SAY: Both people get twice as many pieces, but the same amount of cake as before.

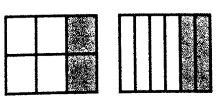
**Exercises**: Copy the shapes in your notebook. Break each part in half to create equivalent fractions. Write the fractions in your notebook.

a) b) c) d)

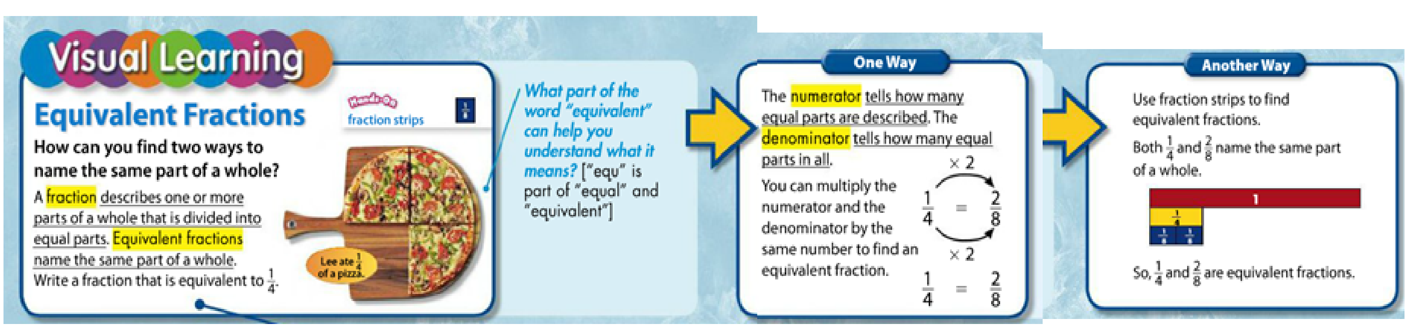


**Answers:** a) $\frac{1}{3} = \frac{2}{6}$, b) $\frac{2}{3} = \frac{4}{6}$, c) $\frac{1}{4} = \frac{2}{8}$, d) $\frac{3}{4} = \frac{6}{8}$

**Sample pictures for a):**



## 2)



**<u>AC Metric 1A:</u>** The materials support the development of students' conceptual understanding of key mathematical concepts, especially where called for in specific content standards or cluster headings.

**<u>Cluster:</u>** 4.NF.C Understand decimal notation for fractions, and compare decimal fractions

ACTIVITY

20 MIN PAIRS CLASS

## 1 Comparing 0.25 and 0.3

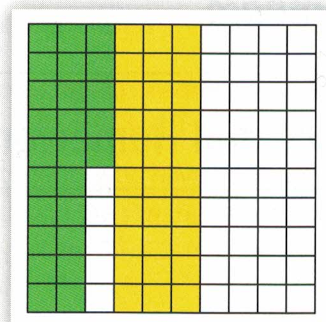
Distribute copies of 10 × 10 Squares (M15) to students.

Write 0.25 and 0.3 on the board.

**Which of these two decimal fractions of the square is a larger portion of the square? How do you know?** ❶

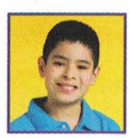
Ask students to use their 10 × 10 squares to illustrate their explanations. They should work with a partner and then be ready to share their thinking with the group. As students work, if you see some representations that you think will be useful for students to look at together, ask the students to copy those onto the transparency 10 × 10 Squares (T67).

Bring the class together to share a few responses. Some responses might be based on a drawing like the one below.



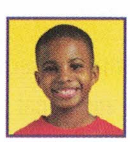
**Students might say:**

"I know that 0.25 is halfway between 0.2 and 0.3 (two tenths and three tenths) and 3 tenths is more than 2 and a half tenths."



"0.25 is the same as $\frac{25}{100}$, and 0.3 is the same as $\frac{30}{100}$. $\frac{30}{100}$ is more than $\frac{25}{100}$ because it is 30 pieces out of 100 instead of 25 pieces."

"0.25 is two and one half tenths. And 0.3 is 3 whole tenths, so it is $\frac{1}{2}$ of a tenth more."



"I thought 0.25 was bigger because it has more numbers in it. But when I drew the picture it was obvious that the 5 in the 0.25 is half of a tenth, so it is pretty small."

Write 0.5 and 0.45 on the board and ask students to determine which decimal is greater. Allow students to work for a few minutes and then bring them together to share their ideas.[1]

**Students might say:**

"I always look at the tenths first. I saw that 0.45 has $\frac{4}{10}$ and 0.5 has 5 tenths, so I knew that 0.5 is a larger number."

"I got confused because 45 is a bigger number than 5. But then Amelia reminded me that the 4 in 0.45 and 5 in 0.5 are tenths and the 5 in 0.45 is 5 hundredths, which is really small compared to a tenth."

## ONGOING ASSESSMENT: Observing Students at Work

Students compare decimal fractions of a 10 × 10 square.

- **Can students represent tenths and hundredths as part of the square?**
- **Can students use the representations and/or reason about the meaning of the decimal numbers to compare them?**

## DIFFERENTIATION: Supporting the Range of Learners

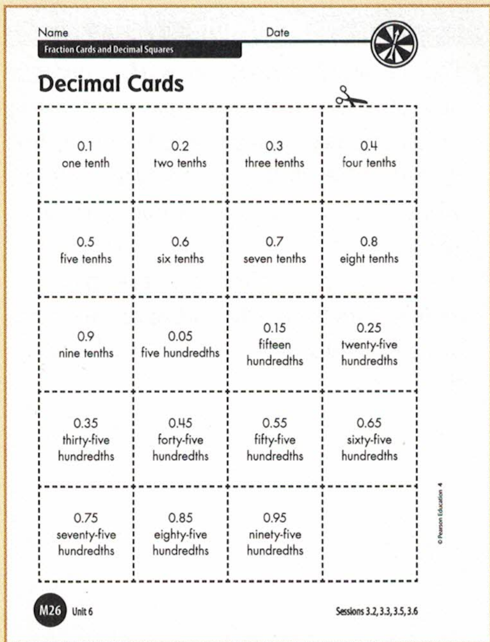
**Intervention** If some students have difficulty comparing tenths and hundredths, they may need more time comparing decimals that are multiples of 0.1.

**Extension** Challenge students who can easily explain the given comparisons to compare 0.75 and 0.8 or 0.05 and 0.3. Ask them to determine not only which of the two is greater but how much greater it is.

**ELL** English Language Learners may have difficulty understanding the first question because of the complexity of its structure. A shorter series of questions with fewer prepositional phrases will enhance understanding. For example, say, 0.25 is a decimal fraction of this square. 0.3 is the decimal fraction of this square. Which is a larger part of the square? How do you know? Use models and write the questions on the board as needed.

### Math Note

[1] **Place Value of Decimal Fractions** Many apply their knowledge of whole numbers to decimals. They may think that 0.25 is g 0.3 because they are thinking of the whol 25 and 3. If no one brings up this issue, br yourself. Why is 0.3 larger than 0.25 wher much smaller than 25? This allows studen explicitly think through the place value of in these numbers in comparison to the va digits in 25 and 3.



Name Date

Fraction Cards and Decimal Squares

**Decimal Cards**

| | | | |
|---|---|---|---|
| 0.1 one tenth | 0.2 two tenths | 0.3 three tenths | 0.4 four tenths |
| 0.5 five tenths | 0.6 six tenths | 0.7 seven tenths | 0.8 eight tenths |
| 0.9 nine tenths | 0.05 five hundredths | 0.15 fifteen hundredths | 0.25 twenty-five hundredths |
| 0.35 thirty-five hundredths | 0.45 forty-five hundredths | 0.55 fifty-five hundredths | 0.65 sixty-five hundredths |
| 0.75 seventy-five hundredths | 0.85 eighty-five hundredths | 0.95 ninety-five hundredths | |

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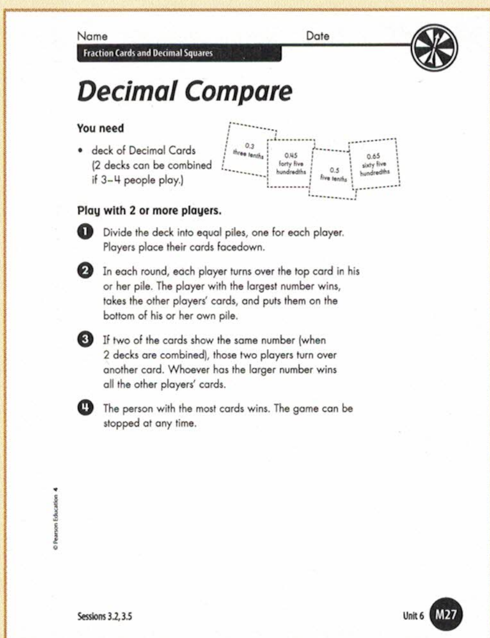
M26 Unit 6 Sessions 3.2, 3.3, 3.5, 3.6

▲ Resource Masters, M26; T71



Name Date

Fraction Cards and Decimal Squares

***Decimal Compare***

**You need**

- deck of Decimal Cards (2 decks can be combined if 3–4 people play.)

**Play with 2 or more players.**

1. Divide the deck into equal piles, one for each player. Players place their cards facedown.
2. In each round, each player turns over the top card in his or her pile. The player with the largest number wins, takes the other players' cards, and puts them on the bottom of his or her own pile.
3. If two of the cards show the same number (when 2 decks are combined), those two players turn over another card. Whoever has the larger number wins all the other players' cards.
4. The person with the most cards wins. The game can be stopped at any time.

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Sessions 3.2, 3.5 Unit 6 M27

▲ Resource Masters, M27

ACTIVITY

# 2 Decimal Compare

40 MIN PAIRS

Students use their Decimal Cards (M26) to play *Decimal Compare.* They compare two decimal fractions that are multiples of 0.1 or of 0.05 and determine which is greater. Comparing these decimals provides an opportunity for students to become familiar with reading and writing decimals and determining the relative sizes of these numbers.

Introduce the game by writing two decimals from the deck of cards on the board or by showing two transparent Decimal Cards (T71) on the overhead. In this first example, choose two multiples of 0.1, such as 0.4 and 0.9, and ask students which is greater.

Although it should be fairly obvious to students that 0.9 is greater than 0.4, it is important to make sure that all students can read 0.9 as $\frac{9}{10}$ and be able to picture how much closer it is to 1 than $\frac{4}{10}$. Use a few more examples, including one or two in which students compare hundredths with hundredths and hundredths with tenths.

- How do you say this number?
- How do you know which number is larger?
- What does the digit in the tenths place mean? What does the digit in the hundredths place mean?
- Is this number more or less than 0.5? Is it more or less than 1?
- How many tenths more is the larger number?
- Can you show each of these numbers on a 10 × 10 square?

*Students compare using Decimal Cards.*

After examining a few examples for about ten minutes, explain to students that they will use their own set of Decimal Cards (M26) to play *Decimal Compare* with a partner. Although students have played several other types of "compare" games and will be familiar with the structure of the game, make available copies of the game rules *Decimal Compare* (M27).

## ONGOING ASSESSMENT: Observing Students at Work

Students compare decimal numbers with digits in the tenths and/or hundredths places.

- **Can students read these numbers?**
- **Can students determine the value of each number?**
- **Can students determine which number is greater?** Do they have more difficulty with certain comparisons?
- **Do students visualize representing these numbers on the 10 × 10 square?** Do they reason about the relationship of the numbers to 1 or to 0.5?

## DIFFERENTIATION: Supporting the Range of Learners

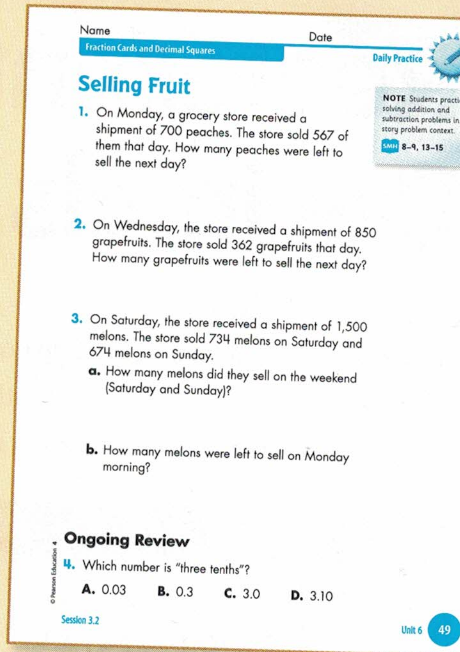
**Intervention** Some students may be able to visualize the numbers on a 10 × 10 square, but other students may need to actually represent each number in order to compare them. If students who need to shade in a grid for each number find that it takes too long to play each round, suggest a variation of the game: students pick a card, represent the number on a 10 × 10 Square (M15), and decide whether it is closer to 0, $\frac{1}{2}$, or 1.

## 3 SESSION FOLLOW-UP
# Daily Practice and Homework

**Daily Practice:** For ongoing review, have students complete *Student Activity Book* page 49.

**Homework:** On *Student Activity Book* page 50, students shade in the value of various decimals in tenths and hundredths on a 10 × 10 grid.

**Student Math Handbook:** Students and families may use *Student Math Handbook* pages 69 and G4 for reference and review. See pages 170–176 in the back of this unit.


Name Date
Fraction Cards and Decimal Squares
Daily Practice

### Selling Fruit

NOTE Students practi… solving addition and subtraction problems in… story problem context.
SMH 8–9, 13–15

1. On Monday, a grocery store received a shipment of 700 peaches. The store sold 567 of them that day. How many peaches were left to sell the next day?
2. On Wednesday, the store received a shipment of 850 grapefruits. The store sold 362 grapefruits that day. How many grapefruits were left to sell the next day?
3. On Saturday, the store received a shipment of 1,500 melons. The store sold 734 melons on Saturday and 674 melons on Sunday.
   a. How many melons did they sell on the weekend (Saturday and Sunday)?
   b. How many melons were left to sell on Monday morning?

**Ongoing Review**

4. Which number is "three tenths"?
   A. 0.03 B. 0.3 C. 3.0 D. 3.10

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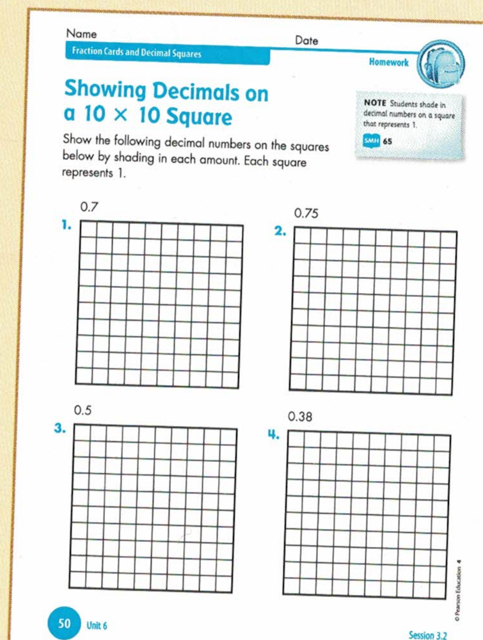
Session 3.2 Unit 6 49

▲ Student Activity Book, p. 49


Name Date
Fraction Cards and Decimal Squares
Homework

### Showing Decimals on a 10 × 10 Square

NOTE Students shade in decimal numbers on a square that represents 1.
SMH 65

Show the following decimal numbers on the squares below by shading in each amount. Each square represents 1.

1. 0.7
2. 0.75
3. 0.5
4. 0.38

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50 Unit 6 Session 3.2

▲ Student Activity Book, p. 50

<u>**AC Metric 1B:**</u> The materials are designed so that students attain the fluencies and procedural skills required by the Standards.

- Is progress toward fluency and procedural skill interwoven with students' developing conceptual understanding of the operations in question?

<u>**Standard/Cluster:**</u> 4.NBT.C Use place value understanding and properties of operations to perform multi-digit arithmetic.

**BIG IDEA 1** **Multiplication with Tens and Hundreds**

Common Core State Standards 4.NBT.1, 4.NBT.5

1 **Arrays and Area Models**
ACTIVITIES Arrays of Ones • Arrays of Tens

2 **Connect Place Value and Multiplication**
ACTIVITIES Discuss a Product of Tens • Arrays of Hundreds

3 **Mental Math and Multiplication**
ACTIVITIES Review Multiplication with Tens • Mental Multiplication

**BIG IDEA 2** **Multiply by One-Digit Numbers**

Common Core State Standards 4.OA.3, 4.NBT.2, 4.NBT.3, 4.NBT.5, 4.MD.2

4 **Model One-Digit by Two-Digit Multiplication**
ACTIVITIES Multiplication Modeling • Practice Multiplication • Multiplication with Dollars

5 **Estimate Products**
ACTIVITIES Estimate Products • Practice Estimation

6 **Use Place Value to Multiply**
ACTIVITIES Model the Place Value Sections Method • Model the Expanded Notation Method

7 **Algebraic Notation Method**
ACTIVITIES The Distributive Property and Multiplication • Connect Models and the Distributive Property

8 **Compare Methods of One-Digit by Two-Digit Multiplication**
ACTIVITIES Multiplication Methods • Practice Multiplication

9 **Discuss Different Methods**
ACTIVITIES Compare Multiplication Methods • Analyze the Shortcut Method

10 **One-Digit by Three-Digit Multiplication**
ACTIVITIES Multiply One-Digit Numbers by Hundreds • Use the Area Model to Multiply Hundreds • Practice One-Digit by Three-Digit Multiplication

**BIG IDEA 3** **Multiplication with Two-Digit Numbers**

Common Core State Standards 4.OA.3, 4.NBT.2, 4.NBT.5

12 **Two-Digit by Two-Digit Multiplication**
ACTIVITIES Represent Multiplication • Practice Multiplication

13 **Different Methods for Two-Digit Multiplication**
ACTIVITIES Multiply Two-Digit Numbers • The Shortcut Multiplication Method

14 **Check Products of Two-Digit Numbers**
ACTIVITIES Compare Methods • Estimate Products of Two-Digit Numbers • Practice Multiplication

## Chapter 3

# Lesson 3.3 Addition with Regrouping in Ones, Tens, and Hundreds

COMMON CORE

**LESSON OBJECTIVE**

- Add greater numbers with regrouping in ones, tens, and hundreds.

**AC Metric 1B:** The materials are designed so that students attain the fluencies and procedural skills required by the Standards.

- Is progress toward fluency and procedural skill interwoven with students' developing conceptual understanding of the operations in question?
- Do the materials in grades K-6 provide repeated practice toward attainment of fluency standards? Evaluate

**Standard/Cluster:** 4.NBT.B.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

COMMON CORE 3.NBT.2, SMP.1, SMP.2, SMP.4, SMP.5, SMP.8

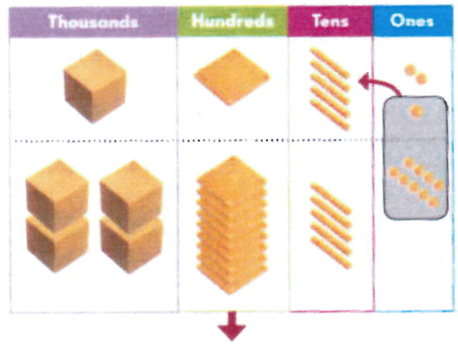
# Lesson 3.3 Addition with Regrouping in Ones, Tens, and Hundreds

**Lesson Objective**

- Add greater numbers with regrouping in ones, tens, and hundreds.

Learn **Sometimes you regroup more than once.**

1,153 + 4,959 = ?




**Step 1**

Add the ones.

$$\begin{array}{r} 1,\,1\,5\,\overset{1}{3} \\ +\;4,\,9\,5\,9 \\ \hline 2 \end{array}$$

3 ones + 9 ones = 12 ones

Regroup the ones.

12 ones = 1 ten 2 ones



Student Book A p. 84

DAY 1 **Teach**

Learn

## Sometimes You Regroup More Than Once

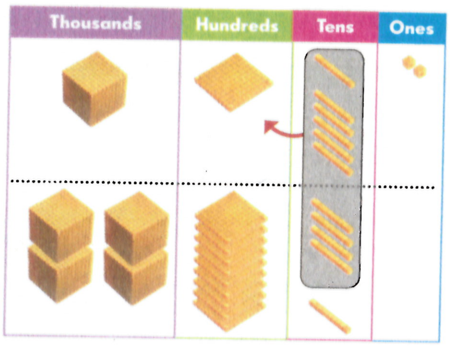
(pages 84 to 86)

Students learn to find the sum of two 4-digit numbers with regrouping in ones, tens, and hundreds.

- Using **base-ten blocks**, review regrouping concepts: 10 ones = 1 ten, 10 tens = 1 hundred, and 10 hundreds = 1 thousand.
- Write the numbers 1,153 and 4,959 on the board and show students how to add, using base-ten blocks on a **Place-Value Mat** (TR01).
- Revise the strategy of adding numbers from right to left.
- Show the addition steps with regrouping in the ones, tens and hundreds.
- Add the ones:

  3 ones + 9 ones = 12 ones = 1 ten and 2 ones
- Then add the tens:

  5 tens + 5 tens + 1 ten = 11 tens = 1 hundred 1 ten

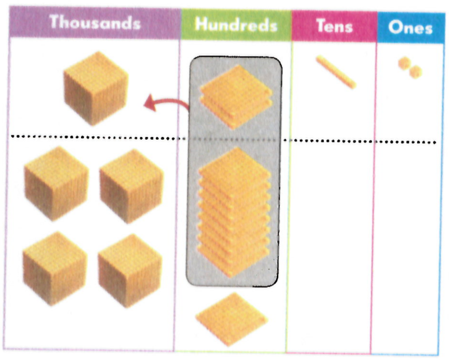



**Step 2**
Add the tens.

$$\begin{array}{r} \phantom{0}^{1}\phantom{,0}^{1}\phantom{00} \\ 1,\ 1\ 5\ 3 \\ +\ 4,\ 9\ 5\ 9 \\ \hline 1\ 2 \end{array}$$

1 ten + 5 tens
+ 5 tens
= 11 tens

Regroup the tens.
11 tens
= 1 hundred 1 ten




**Step 3**
Add the hundreds.

$$\begin{array}{r} ^{1}\phantom{,}\ ^{1}\ ^{1}\phantom{00} \\ 1,\ 1\ 5\ 3 \\ +\ 4,\ 9\ 5\ 9 \\ \hline 1\ 1\ 2 \end{array}$$

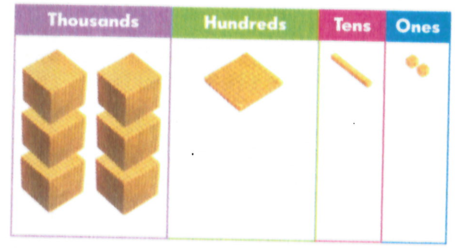
1 hundred
+ 1 hundred
+ 9 hundreds
= 11 hundreds

Regroup the hundreds.
11 hundreds
= 1 thousand
1 hundred

Continued on next page



Student Book A p. 85




**Step 4**
Add the thousands.

$$\begin{array}{r} ^{1}\phantom{,}\ ^{1}\ ^{1}\phantom{00} \\ 1,\ 1\ 5\ 3 \\ +\ 4,\ 9\ 5\ 9 \\ \hline 6,\ 1\ 1\ 2 \end{array}$$

1 thousand
+ 1 thousand
+ 4 thousands
= 6 thousands

The sum of 1,153 and 4,959 is 6,112.

## Guided Practice

**Add. Use base-ten blocks to help you.**

1. 
$$\begin{array}{r} 3,628 \\ +\ 1,795 \\ \hline 5,423 \end{array}$$

2. 
$$\begin{array}{r} 5,348 \\ +\ 3,792 \\ \hline 9,140 \end{array}$$

**Solve.**

3. One year, the population of Crystal Town is 7,325. Within the same year, 2,501 people move into the town. How many people are now in Crystal Town? 9,826 people

4. Mr. Streep makes 4,728 dinner rolls in a day. Mr. Wu makes 1,584 more dinner rolls than Mr. Streep. How many dinner rolls does Mr. Wu make? 6,312 rolls

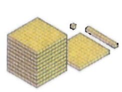


Student Book A p. 86

- Then add the hundreds:
  9 hundreds + 1 hundred + 1 hundred = 11 hundreds = 1 thousand 1 hundred
- Lastly add the thousands:
  4 thousands + 1 thousand + 1 thousand = 6 thousands
- So, 1,153 + 4,959 = 6,112
- Repeat the addition, showing how it is done using vertical form.

### Check for Understanding

### ✓ Guided Practice (page 86)



1 and 2 These exercises provide practice in adding 4-digit numbers with regrouping in ones, tens, and hundreds. Allow students to use base-ten blocks, as needed. Working in pairs will also help them verbalize and reflect on their processes.

3 and 4 Have students apply the addition strategies with regrouping in ones, tens, and hundreds to solve real-world problems involving addition.

**Best Practices** This activity can be applied to the problem in the remainder of the lesson. It can provide practice and th benefit of hearing someone else's thinking. Put students in pairs and ask them to exchange papers. If they find an error, have students write a brief explanation of the mistake. Partn can discuss their findings.

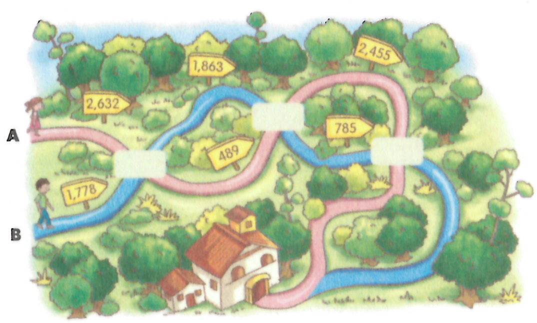
## Let's Practice

**Add. Use base-ten blocks to help you.**

1. The sum of 3,562 and 4,729 is ____. 8,291
2. The sum of 6,185 and 2,847 is ____. 9,032
3. 8,943 + 268 = ____ 9,211
4. 1,628 + 4,586 = ____ 6,214

**Solve.**

5. Cathy and Jordan take a walk through the forest.
Cathy takes Route A and Jordan takes Route B.
There are 3 places where Route A and Route B cross.
They agree to meet at each place to add the two numbers that they see along the way.
Find the three answers.




4410, 2352, 3240

ON YOUR OWN
Go to Workbook A: Practice 3, pages 51–54



Student Book A p. 87

### Problem of the Lesson

A school library has 1,573 Spanish books. It has 2,429 more English books than Spanish books. How many English books does the library have?

**Solution:**
Spanish books: 1,573
English books: 1,573 + 2,429 →

$$\begin{array}{r} {}^{1}1,5{}^{1}7\,3 \\ +\,2,4\,2\,9 \\ \hline 4,0\,0\,2 \end{array}$$

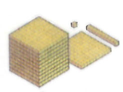
**Answer:** There are 4,002 English books.

### Differentiated Instruction

**English Language Learners**

Some students may struggle with the language in the word problems on page 86. You may want to provide paraphrased versions. For example, you can rephrase Exercise 3 as follows: *Crystal Town has 7,325 people. Then 2,501 more people move in. Crystal Town now has ____ people.*
Exercise 4 would be: *Mr. Streep makes 4,728 rolls. Mr. Wu makes 1,584 more rolls than Mr. Streep. Mr. Wu makes ____ rolls.*

### Let's Practice (page 87)



Exercises 1 to 4 provide reinforcement for the addition of 4-digit numbers with regrouping more than once. Let students use base-ten blocks, if necessary. Ensure that students align the digits correctly in vertical form. Exercise 5 requires students to apply addition strategies with regrouping in ones, tens, and hundreds to solve the problem. Distribute copies of **Forest Routes** (TR10) to students so that they have a larger illustration to refer to.

**Common Error** Students may record the regrouping number in the wrong place or add the wrong regrouping number if the problem is not written neatly. Suggest that these students complete the problem on grid paper and use a different color to record the regrouping numbers.

### ON YOUR OWN

Students practice adding with regrouping in ones, tens, and hundreds in Practice 3, pages 51 to 54 of **Workbook 3A**. These pages (with the answers) are shown on page 87A.

**Differentiation Options** Depending on students' success with the Workbook pages, use these materials as needed.
**Struggling:** Reteach 3A, pp. 47–50
**On Level:** Extra Practice 3A, pp. 35–40

# Practice and Apply
## Workbook pages for Chapter 3, Lesson 3.3

Name: ________________ Date: ________________

### Practice 3 Addition with Regrouping in Ones, Tens, and Hundreds

**Follow the steps to add. Fill in the blanks.**

1. **Step 1**

```
      1
  5,5 3 2
+ 2,9 8 9
        1
```

Add the ones and regroup the ones.

2 ones + 9 ones

= 11 ones

= 1 ten 1 one

**Step 2**

```
    1 1
  5,5 3 2
+ 2,9 8 9
      2 1
```

Add the tens and regroup the tens.

1 ten + 3 tens + 8 tens

= 12 tens

= 1 hundred 2 tens

**Step 3**

```
  1 1 1
  5,5 3 2
+ 2,9 8 9
    5 2 1
```

Add the hundreds and regroup the hundreds.

1 hundred + 5 hundreds + 9 hundreds

= 15 hundreds

= 1 thousand 5 hundreds

**Step 4**

```
  1 1 1
  5,5 3 2
+ 2,9 8 9
  8,5 2 1
```

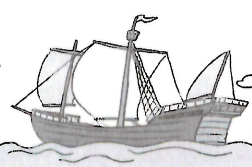
Add the thousands.

1 thousand + 5 thousands + 2 thousands

= 8 thousands



**Add.**



*Example*

```
  1 1
  8 9 7
+ 9 2 4
1,8 2 1
```

2.
```
  2 1 5
+ 7 9 6
  1,011
```

3.
```
  1,0 6 3
+   4 2 9
  1,492
```

4.
```
  1,1 9 8
+   6 2 2
  1,820
```

5.
```
  3,3 2 9
+ 1,5 9 7
  4,926
```

6.
```
  6,2 5 8
+ 2,9 3 7
  9,195
```

7.
```
  1,4 0 6
+     8 6
  1,492
```

8.
```
  3,6 7 4
+ 1,6 6 7
  5,341
```

9.
```
  6 5 7
+ 9 4 3
  1,600
```

10.
```
  6,4 3 5
+ 2,6 8 9
  9,124
```

**Fill in the blank.**

11. Christopher Columbus landed in America in the year 1492.
(Hint: The value appears twice on this page.)





# Practice and Apply
## Workbook pages for Put on Your Thinking Cap!

Name: ________________ Date: ________________

### Put On Your Thinking Cap!
#### Challenging Practice

**Use the digits below. Make as many 4-digit numbers as you can.**
**Do not begin with '0'.**
**For each number, use each digit only once.**
**Then add two 4-digit numbers where you do not need to regroup.**

3 5 9 2 0 7

```
  5,2 0 7
+ 3,0 7 2
  8,2 7 9
```

1. Now you try it!

Answers vary.
Sample answers:

| | |
|---|---|
| 2,035 | 5,370 |
| 2,073 | 7,309 |
| 3,592 | 7,523 |
| 3,905 | 7,950 |
| 5,037 | 9,237 |
| 5,239 | 9,752 |

```
  2,0 3 5     2,0 7 3
+ 7,9 5 0   + 3,9 0 5
  9,9 8 5     5,9 7 8
```



Name: ________________ Date: ________________

### Put On Your Thinking Cap!
#### Problem Solving

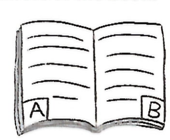
**Find the missing numbers.**

1.
```
  3, 6 2 5
+ 2, 2 6 4
  5, 8 8 9
```

2.
```
  2, 4 8 8
+ 3, 6 1 5
  6, 1 0 3
```

**Find the page numbers of the book.**

3.





Each of the pages has a 3-digit page number.
The number on Page A is an even number.
The sum of its digits is 7.
The number on Page B is an odd number.
The sum of its digits is 8.
What are the two possible page numbers for Page A and Page B?

Page 123:
Sum of digits
= 1 + 2 + 3
= 6

Answers vary.
Sample answer:
Page A – 502, 322, 304, 214
Page B – 521, 323, 305, 125

<u>**AC Metric 1C:**</u> The materials are designed so that teachers and students spend sufficient time working with applications, without losing focus on the Major Work of each grade.

- Are there are single- and multi-step contextual problems that develop the mathematics of the grade, afford opportunities for practice, and engage students in problem solving?

<u>**Standard/Cluster:**</u> 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

1) A grower packs 4,568 peaches. He packs the most peaches possible, dividing them equally into 9 boxes, and then gives away the remaining peaches.

- How many peaches does he give away?
- If he sells 7 boxes, how many peaches does he have left?

2) **Divide.**

| | | | |
|---|---|---|---|
| **6.** 270 ÷ 9 | **7.** 350 ÷ 7 | **8.** 490 ÷ 7 | **9.** 320 ÷ 8 |
| **10.** 240 ÷ 6 | **11.** 720 ÷ 8 | **12.** 200 ÷ 5 | **13.** 300 ÷ 6 |
| **14.** 1,800 ÷ 2 | **15.** 5,600 ÷ 7 | **16.** 3,000 ÷ 5 | **17.** 1,000 ÷ 2 |

**18.** There are 150 cheerleaders marching in the parade in 5 equal groups. If each group has the same number of cheerleaders, how many are in each group?

**19.** The Fourth of July celebrations will feature a "Battle of the Bands." The 8 winning bands will share equally the total prize money of $2,400. How much will each band receive?

**AC Metric 1C:** The materials are designed so that teachers and students spend sufficient time working with applications, without losing focus on the Major Work of each grade

- Do application problems particularly stress applying the Major Work of the grade?

1)

**Use a pattern to solve each problem.**

4. **Analyze** Diego is building a figure with 9 cans at the base. Each row has one less can than the row below. How many cans are in the fifth row he builds?

5. Mike reads the first 10 pages of his book on Monday. He reads 3 pages more each day than the day before. How many pages will he read on Friday?

2)

1) A clown needs 275 balloons for a party he is going to, but the balloons only came in packs of 8. How many packs of balloons does he need to buy?

2) A florist splits 878 flowers into vases by putting 9 flowers in each vase. She needs more flowers to fill the last vase. How many more flowers does she need so that the last vase also has 9?

**AC Metric 1C:** The materials are designed so that teachers and students spend sufficient time working with applications, without losing focus on the Major Work of each grade

- Does modeling build slowly across K–8, with applications that are relatively simple in earlier grades and when students are encountering new content? In grades 6–8, do the problems begin to provide opportunities for students to make their own assumptions or simplifications in order to model a situation mathematically?

**Standard/Cluster:** 2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

A pencil costs 59 cents, and a sticker costs 20 cents less. How much do a pencil and a sticker cost together?

**Standard/Cluster:** 7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

Shelbi is running in a half marathon today. About ½ hour before the race, she parks her car in a garage about ¼ mile from the starting line. The prices for parking are shown in the following table:

| | |
|---|---|
| Less than 1 hour | \$8 |
| 1 hour to less than 2 hours | \$12 |
| 2 hours to less than 3 hours | \$15 |
| 3 hours or more | \$18 |

As she is running, she remembers that she only has \$13. What is the slowest pace Shelbi can run, in minutes per mile, and still pay less than \$13 for parking? Explain your answer. State any assumptions you made.

**AC Metric 1C:** The materials are designed so that teachers and students spend sufficient time working with applications, without losing focus on the Major Work of each grade

- Are there are single- and multi-step contextual problems that develop the mathematics of the grade, afford opportunities for practice, and engage students in problem solving?
- Do application problems particularly stress applying the Major Work of the grade?
- Does modeling build slowly across K–8, with applications that are relatively simple in earlier grades and when students are encountering new content? In grades 6–8, do the problems begin to provide opportunities for students to make their own assumptions or simplifications in order to model a situation mathematically?

**Standard/Cluster:** 4.NF.B.4c Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

Lesson
13-3

Common Core

**Domain**
Number and Operations—Fractions

**Cluster**
Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

**Standards**
**4.NF.B.4b** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. Understand a multiple of $\frac{a}{b}$ as a multiple of $\frac{1}{b}$, and use this understanding to multiply a fraction by a whole number. **4.NF.B.4c** Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem.

# Multiplying a Fraction by a Whole Number: Using Symbols

Quick and Easy **Lesson Overview**

| Objective | Essential Understanding | Vocabulary | Materials |
|---|---|---|---|
| Students will multiply a whole number and a fraction to solve problems. | To multiply a fraction by a whole number, one must multiply the whole number by the numerator of the fraction and then divide the product by the denominator of the fraction. | | |

PROFESSIONAL DEVELOPMENT

**Math Background**

Students have used models to develop an understanding of multiplying a fraction by a whole number. With concrete materials and pictures, they have shown that for any fraction with $b \neq 0$, $\frac{a}{b}$, multiplied by a whole number, $n$, $n \times \frac{a}{b} = (n \times a) \times \frac{1}{b} = \frac{n \times a}{b}$. By developing this representation from appropriate contexts, students will be able to recognize when this type of mathematical representation is useful for solving a problem. In a situation where a number of the same-sized fractional parts are being joined together, students will know that the total amount is the product of the fraction and the number of parts.

## 2 Develop the Concept: Interactive

MATHEMATICAL PRACTICES

# Problem-Based Interactive Learning

10–15 min

Hands-On Minds-On

**Overview** Students work together to solve a problem that involves joining equal-sized parts and results in multiplication of a fraction by a whole number.

**Focus** When do you need to multiply a fraction by a whole number?

**Engage**

**Set the Purpose** *You have learned how to multiply a fraction by a whole number. Today, we'll think about the kind of problem situation that would require us to multiply a fraction by a whole number and find the product to solve the problem.*

**Connect** *Suppose you have three bags, each with 4 pounds of sugar in it. How can you show how much sugar there is in all?* [By adding 4 + 4 + 4 or by multiplying 3 × 4] *Why can you use multiplication to represent this situation?* [Because it joins equal-sized groups]

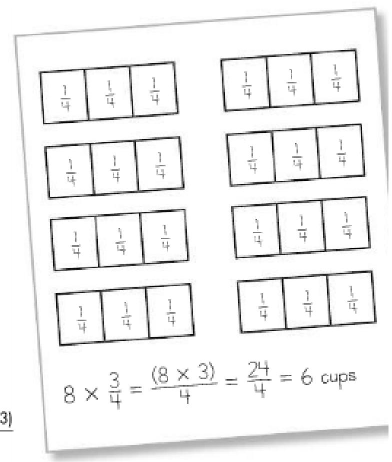
MATHEMATICAL PRACTICES

**MP.4 Model with Mathematics**
Encourage students to write expressions to model the information in the problem.

**Pose the Problem** *A recipe for 1 gallon of fruit punch calls for $\frac{3}{4}$ cup of orange juice. How much orange juice is needed to make 8 gallons of fruit juice?*

**Link to Prior Knowledge** Have a whole group discussion of possible ways to represent the problem such as drawing pictures, using a number line, and using repeated addition.

**Instruct in Small Steps** *How many gallons of fruit punch are being made?* [8] *How much orange juice does each gallon need?* [$\frac{3}{4}$ cup] *We can think of each gallon as a separate group. We can think of the amount of orange juice in each gallon as the size of each group. What addition sentence can you write to show how much orange juice there is in all?* [$\frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4}$] *Can you use multiplication to represent this addition sentence?* [Yes] *Why?* [All of the groups are an equal size] *Write a multiplication sentence for the addition sentence.* [$8 \times \frac{3}{4}$] *Now, use your knowledge from the previous lesson to find the product.* [$8 \times \frac{3}{4} = \frac{(8 \times 3)}{4} = \frac{24}{4} = 6$] *How much orange juice does it take to make 8 gallons of fruit punch?* [6 cups]




**Extend**

*Milo runs $\frac{2}{3}$ mile each day. How many miles does he run in one week?* [$4\frac{2}{3}$ miles]

STUDENT ACHIEVEMENT PARTNERS



## 2 Guided Practice

MATHEMATICAL PRACTICES

Suggest that students look for situations that describe joining equal groups. These will be situations that require multiplication.

Exercise 7

**Error Intervention**

**If** students have difficulty writing the number sentence,

**then** ask: *Are there equal groups?* [Yes] *What operation can be used to find how many granola bars Sarah's friend has?* [Multiplication]

**Reteaching** For another example and more practice, assign **Reteaching** Set B on p. 354.

## 3 Independent Practice

Ask students to look for patterns when multiplying a whole number and a fraction. They should notice that they can multiply the whole number by the numerator to find the numerator of the fraction that is the answer. Then they can check to see if the product can be written in simplest form.

Lesson 13-3

Common Core

# Multiplying a Fraction by a Whole Number: Using Symbols

**When can you use the product of a fraction and a whole number to solve a problem?**

At his job at the ice cream counter, Stanley makes large ice cream sundaes that contain $\frac{3}{4}$ pint of ice cream. Today, Stanley made 5 of these sundaes. How much ice cream did he use?

$\frac{3}{4}$ pt of ice cream in each sundae

## Guided Practice*

MATHEMATICAL PRACTICES

### Do you know HOW?

For **1–4**, multiply.

**1.** $8 \times \frac{1}{2} = \square$ 4 **2.** $13 \times \frac{3}{4} = \square$ $9\frac{3}{4}$

**3.** $7 \times \frac{2}{3} = \square$ $4\frac{2}{3}$ **4.** $9 \times \frac{1}{8} = \square$ $1\frac{1}{8}$

For **5** and **6**, write a multiplication equation for each situation.

**5.** Medicine taken in 10 days if the dose is $\frac{3}{4}$ ounce per day.
$10 \times \frac{3}{4} = \frac{(10 \times 3)}{4} = \frac{30}{4} = 7\frac{1}{2}$ oz

**6.** The total length needed to decorate 9 boxes if each box uses $\frac{2}{3}$ yard of ribbon.

### Do you UNDERSTAND?

Write a number sentence that describes each situation.

**7. Model** Sarah has $\frac{1}{2}$ of a granola bar. Her friend has 5 times as many granola bars. How many granola bars does Sarah's friend have?
$\frac{1}{2} \times 5 = 2\frac{1}{2}$ granola bars

**8. Model** Sue needs $\frac{5}{6}$ cup of cocoa to make one batch of chocolate pudding. She wants to make 4 batches of pudding to take to a party. Write and solve an equation to show how much cocoa Sue will

## Independent Practice

For **9–17**, multiply. Write the product in simplest form.

**9.** $4 \times \frac{1}{3} = \square$ $1\frac{1}{3}$ **10.** $6 \times \frac{3}{8} = \square$ $2\frac{1}{4}$ **11.** $8 \times \frac{2}{5} = \square$ $3\frac{1}{5}$

**12.** $12 \times \frac{5}{6} = \square$ 10 **13.** $11 \times \frac{2}{3} = \square$ $7\frac{1}{3}$ **14.** $5 \times \frac{7}{8} = \square$ $4\frac{3}{8}$

**15.** $7 \times \frac{3}{4} = \square$ $5\frac{1}{4}$ **16.** $9 \times \frac{3}{5} = \square$ $5\frac{2}{5}$ **17.** $4 \times \frac{5}{8} = \square$ $2\frac{1}{2}$

332 *For another example, see Set B on page 354.

For 18 and 19, write a number sentence for each situation and find the answer.

**18.** The total distance Mary runs in one week if she runs $\frac{7}{8}$ mile each day.
$7 \times \frac{7}{8} = \frac{(7 \times 7)}{8} = \frac{49}{8} = 6\frac{1}{8}$ miles

**19.** The length of 5 pieces of ribbon laid end to end if each piece is $\frac{2}{3}$ yard long.
$5 \times \frac{2}{3} = \frac{(5 \times 2)}{3} = \frac{10}{3} = 3\frac{1}{3}$ yards

**Problem Solving** MATHEMATICAL PRACTICES

**20. Model** Malik swims $\frac{9}{10}$ of a mile each day. How many miles will he swim in 8 days? Write a number sentence and solve. $8 \times \frac{9}{10} = \frac{(8 \times 9)}{10} = \frac{72}{10} = 7\frac{1}{5}$ miles

**21.** Sean is making picture frames. Each frame uses $\frac{4}{5}$ yard of wood. What is the total length of wood Sean will need to make 12 frames? $9\frac{3}{5}$ yards

**22. Persevere** Sun is making 7 fruit tarts. Each tart needs $\frac{3}{4}$ cup of strawberries and $\frac{1}{4}$ cup of blueberries. What is the total amount of fruit that Sun needs for her tarts?
*7 cups of fruit*

**23. Writing to Explain** Lydia is making 4 loaves of rye bread and 3 loaves of wheat bread. Each loaf takes $\frac{3}{4}$ cup of sugar. What is the total amount of sugar Lydia will need? Explain.
See margin.

**24.** Write a story to go along with the multiplication sentence $3 \times \frac{3}{10}$. Then, solve your problem.
See margin.

**25. Reason** Olivia is doing her math homework. For each problem, she uses $\frac{3}{4}$ of a sheet of paper. How many sheets of paper will she need to complete 20 problems?

**A** 4 sheets
**B** $5\frac{3}{4}$ sheets
**C** 15 sheets
**D** $20\frac{3}{4}$ sheets

**26.** It takes Mario $\frac{1}{4}$ hour to mow Mr. Harris's lawn. It takes him 3 times as long to mow Mrs. Carter's lawn. How long does it take Mario to mow Mrs. Carter's lawn? $\frac{3}{4}$ hour

## Problem Solving

MATHEMATICAL PRACTICES

Students use underlying processes and mathematical tools for Exercises 20–26. Remind students to check for reasonableness when solving each problem.

Exercise 22

**Persevere in Solving Problems** Students may have difficulty performing the multiple steps of this problem. Help by asking: *What number sentence can be used to find the amount of strawberries Sun needs?* [$7 \times \frac{3}{4} = \frac{(7 \times 3)}{4} = \frac{21}{4} = 5\frac{1}{4}$] *What number sentence can be used to find the amount of blueberries Sun needs?* [$7 \times \frac{1}{4} = \frac{(7 \times 1)}{4} = \frac{7}{4} = 1\frac{3}{4}$] *What number sentence can be used to find the total amount of berries Sun needs?* [$5\frac{1}{4} + 1\frac{3}{4} = 7$ cups]

**Early Finishers** *Write a problem to go along with $18 \times \frac{2}{3}$. Then, solve the problem.* [Each player on a soccer team ate $\frac{2}{3}$ of an orange as a snack. If there are 18 players, how many oranges did they eat in all? 12 oranges; $18 \times \frac{2}{3} = \frac{(18 \times 2)}{3} = \frac{36}{3} = 12$]