

Operations with Numbers

Unit 2

Unit Overview

In this unit you will learn about adding, subtracting, multiplying, and dividing fractions and decimals. You will see why decimals and mixed numbers are really other forms of fractions. You will explore how mathematical properties are used with operations on numbers to make computations easier and to ensure that everyone follows the same order of operations when working with more than one operation at a time.

Academic Vocabulary

As you study mathematics concepts in this unit, add these terms to your vocabulary notebook.

- equation
- expression
- factoring
- integer
- order of operations
- property
- reciprocal

Essential Questions

- ? How are operations with fractions similar to and different from operations with whole numbers?
- ? What kinds of numbers do you know about and how do mathematical properties apply to operations with different kinds of numbers?

EMBEDDED ASSESSMENTS

These assessments, following activities 2.2, 2.5, and 2.10, will allow you to demonstrate your ability to add, subtract, multiply, and divide fractions and decimals.

Embedded Assessment 1

Adding and Subtracting Fractions and Mixed Numbers p. 81

Embedded Assessment 2

Using Fractions with Measurements p. 95

Embedded Assessment 3

Order of Operations p. 131

Getting Ready

Write your answers on notebook paper.
Show your work.

1. Add or subtract.

a. $\frac{3}{5} + \frac{2}{5}$

b. $\frac{3}{5} - \frac{2}{5}$

c. $\frac{7}{8} + \frac{5}{8}$

d. $\frac{7}{8} - \frac{5}{8}$

2. Multiply.

a. $4 \times \frac{1}{8}$

b. $3 \times \frac{1}{3}$

c. $5 \times \frac{7}{10}$

3. Write the letter for the fraction that is equivalent to $\frac{3}{4}$.

a. $\frac{3}{8}$

b. $\frac{6}{4}$

c. $\frac{6}{8}$

4. How many inches are in 6 feet? Explain how you found your answer.

5. Multiply.

a. 6×10

b. 6×100

c. 6×1000

Describe any pattern you notice.

6. Divide.

a. $8000 \div 10$

b. $8000 \div 100$

c. $8000 \div 1000$

Describe any pattern you notice.

7. Round each number to the nearest hundred.

a. 36

b. 249

c. 397

d. 750

Explain the rounding rules you used.

8. Compute. Use what you know about order of operations.

a. $8 \div 4 \times 3 + 12 - 6$

b. $8 + 4 \times 3 - 12 \div 6$

Adding and Subtracting Fractions

Setting the Stage

ACTIVITY

2.1

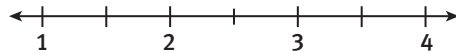
SUGGESTED LEARNING STRATEGIES: Marking the Text, Summarize/Paraphrase/Retell, Identify a Subtask, Create Representations, Quickwrite

My Notes

Selene and Gregg are decorating a stage set for the school play. They are creating a living room scene and need some fabric to make drapes, pillows, and a lampshade. Gregg found a piece of fabric on sale that he thought would be perfect for everything.

The piece of fabric was the right width, so Gregg measured its length. He found it was $6\frac{3}{4}$ feet long. Selene and he need $3\frac{1}{3}$ feet of fabric for the drapes, $2\frac{1}{2}$ feet of fabric for the pillows, and $1\frac{1}{4}$ feet of fabric for the lampshade.

1. Make a prediction about how much fabric you think is needed to make the drapes, the pillows, and the lampshade. Explain how you made your prediction.
2. Gregg decides to estimate the amount of fabric they need. He rounds each mixed number to the nearest whole number.
 - a. Plot each mixed number on the number line below. Then determine to which whole number each rounds.



- b. Add the rounded mixed numbers to find his estimate.
 - c. Using this estimate, will they have enough fabric? Explain.

Gregg thinks that he cannot use this estimate to decide whether they have enough fabric, so he will ask Selene to help him find the *exact* amount they need.

3. Explain why an estimate may not give enough information to make a decision.

My Notes

ACADEMIC VOCABULARY

An **expression** is a mathematical phrase that uses numbers or numbers with operations, such as 6 or $4 + 3$.

An **equation** is a statement showing that two numbers or expressions are equal, such as $4 + 3 = 7$. An equation has an equal sign while an expression does not.

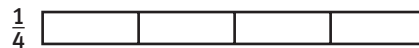
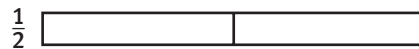
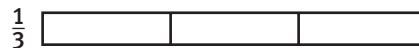
SUGGESTED LEARNING STRATEGIES: Quickwrite, Discussion Group, Create Representations, Think/Pair/Share

Since they have more than 6 feet of fabric, Selene knows there is enough fabric for the whole number part of the mixed numbers.

4. What she needs to know is whether the additional $\frac{1}{3}$ foot, $\frac{1}{2}$ foot, and $\frac{1}{4}$ foot lengths of fabric they need are more or less than the additional $\frac{3}{4}$ foot they have.

- a. Write a numerical **expression** Selene could use to find the amount of fabric needed for the fractional parts.

- b. Shade each bar model to represent the fraction.



- c. Can Selene use these models to evaluate her expression from Part a? Why or why not?

5. Selene decides first to convert from feet to inches.

- a. Complete the table below.

Length of Fabric	Number of Inches
$\frac{1}{3}$ foot	
$\frac{1}{2}$ foot	
$\frac{1}{4}$ foot	

Adding and Subtracting Fractions

Setting the Stage

ACTIVITY 2.1

continued

SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite




My Notes

- b. How many inches of fabric in all are needed to supply the $\frac{1}{3}$ foot, $\frac{1}{2}$ foot, and $\frac{1}{4}$ foot pieces?
- c. Is the total number of inches found in Part b *more* or *less* than the $\frac{3}{4}$ foot they have? Explain your answer.
- d. Will Gregg and Selene have enough fabric? Explain.

6. Selene can add the fractional parts of fabric by writing the equivalent fractions with a common denominator. What common denominator would be appropriate?

7. Explore Selene's idea for adding the fractional parts.

- a. Rewrite each fraction in the table as an equivalent fraction with a denominator of 12. Shade each figure in the last column to represent the fraction.

Fabric Length	Measure in Twelfths of a Foot	Representation
$\frac{1}{4}$ ft		
$\frac{1}{3}$ ft		
$\frac{1}{2}$ ft		

My Notes

SUGGESTED LEARNING STRATEGIES: Think Aloud, Create Representations, Quickwrite

- b. Use the fractions you rewrote in Part a to write an expression for the sum of these fractional parts.
- c. Evaluate your expression by shading each measure in twelfths on the models below. Be sure to shade the entire first line before moving to the second one.

- d. Write both a fraction and a mixed number to represent the shading in Part c.
- e. How could you evaluate the expression without shading models?

8. What conclusions can you make about adding fractions?

TRY THESE A

Write your answers in the My Notes space. Show your work.

Evaluate each expression.

a. $\frac{1}{2} + \frac{1}{6} + \frac{1}{12}$

b. $\frac{1}{2} + \frac{3}{4} + \frac{3}{8}$

c. $\frac{2}{5} + \frac{3}{10} + \frac{1}{15}$

d. $\frac{3}{4} + \frac{5}{6} + \frac{5}{8}$

Selene and Gregg want to know the difference between the fabric they have and the fabric they need. They know they can compare the fractional amount over 6 feet that they found in question 6c to the fractional amount over 6 feet that they have.

Adding and Subtracting Fractions

Setting the Stage

ACTIVITY 2.1

continued

SUGGESTED LEARNING STRATEGIES: Quickwrite, Identify a Subtask, Create Representations, Think/Pair/Share

My Notes

9. Selene and Gregg know they will have to subtract the smaller amount from the larger amount.
- a. Write an expression to show how they can use subtraction to find the difference.
- b. Show how Selene and Gregg can use a model to evaluate the expression. Explain your thinking.

10. How could you evaluate the subtraction expression without using models?
11. What conclusions can you make about subtracting fractions?

TRY THESE B

Write your answers on notebook paper. Show your work.

Evaluate each expression.

a. $\frac{5}{9} - \frac{2}{9}$

b. $\frac{6}{7} - \frac{3}{14}$

c. $\frac{2}{5} - \frac{1}{3}$

d. $\frac{3}{4} - \frac{1}{6} - \frac{1}{3}$

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.
Show your work.

1. Jan is making snacks for a party at her house. For three recipes, she needs these amounts of flour: $1\frac{3}{4}$ cups, $\frac{1}{2}$ cups, and $2\frac{1}{3}$ cups. Estimate the total amount of flour she needs.
2. It rained three times this week. On Monday it rained $\frac{3}{8}$ in., on Thursday $\frac{2}{8}$ in., and on Saturday $\frac{7}{8}$ in. How much rain fell this week?
3. If a plant grows $\frac{3}{4}$ in. one week and $\frac{3}{16}$ in. another, how much growth is there over the two-week period?
4. Compute. Write your answers in simplest form.
 - a. $\frac{5}{11} + \frac{7}{11}$
 - b. $\frac{6}{7} + \frac{2}{5}$
 - c. $\frac{22}{31} - \frac{6}{31}$
 - d. $\frac{5}{8} - \frac{3}{7}$
5. The class votes to determine which animal to buy as a class pet. The results show that $\frac{17}{24}$ of the students vote for a hamster, while $\frac{1}{6}$ of them vote for a lizard, and $\frac{1}{8}$ vote for a snake. How many more students prefer the hamster to the snake?
6. **MATHEMATICAL REFLECTION** Explain how what you learned about comparing and ordering fractions in Unit 1 helped you understand how to add and subtract fractions.

ACTIVITY

2.2

My Notes

1. Use Selené's method to evaluate $4\frac{2}{3} + 5\frac{3}{4} + 3\frac{1}{2}$

a. Represent each mixed number with a model.

$4\frac{2}{3}$	$5\frac{3}{4}$	$3\frac{1}{2}$
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[illegible]

My Notes

SUGGESTED LEARNING STRATEGIES: Quickwrite

Selene tested her method by using it to add $6\frac{3}{5} + 7\frac{7}{10}$.

She wrote the numbers horizontally.

$$\begin{aligned} 6\frac{3}{5} + 7\frac{7}{10} &= (6 + 7) + \left(\frac{3}{5} + \frac{7}{10}\right) \\ &= (6 + 7) + \left(\frac{6}{10} + \frac{7}{10}\right) \\ &= 13 + \frac{13}{10} = 13 + 1\frac{3}{10} = 14\frac{3}{10} \end{aligned}$$

She wrote them vertically.

$$\begin{array}{r} 6\frac{3}{5} = 6 + \frac{6}{10} \\ + 7\frac{7}{10} = 7 + \frac{7}{10} \\ \hline 13 + \frac{13}{10} = 13 + 1\frac{3}{10} = 14\frac{3}{10} \end{array}$$

She wrote them as improper fractions.

$$\begin{aligned} 6\frac{3}{5} + 7\frac{7}{10} &= \frac{33}{5} + \frac{77}{10} \\ &= \frac{66}{10} + \frac{77}{10} \\ &= \frac{143}{10} = 14\frac{3}{10} \end{aligned}$$

She found that the answer was the same whatever way she used.

3. Look back at Selene's work. Does it matter which of the methods above she uses to add the mixed numbers? Explain.

Adding and Subtracting Mixed Numbers

Confirming Calculations

ACTIVITY 2.2

continued

SUGGESTED LEARNING STRATEGIES: Create Representations, Close Reading

Rounding mixed numbers can help you use mental math when you want to estimate.

EXAMPLE 1

Round these mixed numbers: $3\frac{2}{9}$, $2\frac{7}{15}$, and $4\frac{4}{5}$.

Step 1: Look at the fraction portion of the number first, then round.

Since $\frac{2}{9}$ is close to 0, $3\frac{2}{9}$ rounds to 3.

Since $\frac{7}{15}$ is close to $\frac{1}{2}$, $2\frac{7}{15}$ rounds to $2\frac{1}{2}$.

Since $\frac{4}{5}$ is close to 1, $4\frac{4}{5}$ rounds to 5.

TRY THESE A

Round each mixed number. Show your work in the My Notes space.

a. $2\frac{1}{3}$

b. $3\frac{3}{8}$

c. $10\frac{7}{8}$

d. $9\frac{2}{3}$

e. $4\frac{2}{7}$

You can use estimation before you do a calculation to see about what your answer should be or afterwards to check the reasonableness of your answer. To estimate the sum of $3\frac{2}{9} + 2\frac{7}{15} + 4\frac{4}{5}$, think $3 + 2\frac{1}{2} + 5 = 10\frac{1}{2}$. This estimate is close to the actual sum of $10\frac{22}{45}$.

4. Find each sum. Then use estimation to determine the reasonableness of each of your answers in Question 4.

a. $4\frac{2}{5} + 2\frac{1}{5}$

b. $3\frac{2}{3} + 1\frac{1}{6}$

c. $2\frac{3}{4} + 2\frac{7}{8}$

My Notes

MATH TIP

Be sure you do not forget the whole number when writing equivalent fractions.

$$3\frac{1}{3} = 3\frac{4}{12}$$

but

$$3\frac{1}{3} \neq \frac{4}{12}$$

My Notes

SUGGESTED LEARNING STRATEGIES: Activate Prior Knowledge, Identify a Subtask, Create Representations, Quickwrite

When comparing the amount of fabric they had to the amount they needed, Selene and Gregg subtracted the fractional part of their mixed numbers. They wonder whether the methods they used when adding mixed numbers will work when subtracting.

5. Subtract. Use methods like those you used to add fractions. Show your work.

a. $5\frac{3}{4} - 3\frac{1}{3}$

b. $5\frac{3}{4}$
 $- 3\frac{1}{3}$

c. $\frac{23}{4} - \frac{10}{3}$

6. Use bar models to confirm your work.

TRY THESE B

Subtract these numbers. Show your work in the My Notes space.

a. $5\frac{3}{4} - 2\frac{1}{4}$

b. $9\frac{5}{6} - 2\frac{2}{3}$

c. $11\frac{4}{5} - 6\frac{2}{3}$

Adding and Subtracting Mixed Numbers

Confirming Calculations

ACTIVITY 2.2

continued

SUGGESTED LEARNING STRATEGIES: Activate Prior Knowledge, Quickwrite, Discussion Group, Self Revision/Peer Revision

Selene remembered that when she learned to subtract sometimes she had to regroup to be able to subtract.

7. Give an example of a subtraction problem that requires regrouping. Use 2-digit whole numbers in your example.

When subtracting mixed numbers, you may have to regroup. Look at this example for $6\frac{1}{5} - 3\frac{4}{5}$.

$$\begin{array}{r} 6\frac{1}{5} = 5 + 1\frac{1}{5} = 5 + \frac{6}{5} = 5\frac{6}{5} \\ - 3\frac{4}{5} \\ \hline = 2\frac{2}{5} \end{array}$$

8. Describe the process used to subtract fractions in the example above.

Sometimes you may need to do more than regroup. Look at this example for $8\frac{1}{3} - 2\frac{3}{4}$.

$$\begin{array}{r} 8\frac{1}{3} = 8\frac{4}{12} = 7 + 1\frac{4}{12} = 7 + \frac{16}{12} = 7\frac{16}{12} \\ - 2\frac{3}{4} = 2\frac{9}{12} \\ \hline = 5\frac{7}{12} \end{array}$$

9. How are these two examples the same and how are they different?

My Notes

My Notes

SUGGESTED LEARNING STRATEGIES: Quickwrite, Create Representations

TRY THESE C

Subtract these numbers. Show your work in the My Notes space.

a. $9\frac{1}{7} - 3\frac{4}{7}$

b. $11\frac{7}{15} - 7\frac{14}{15}$

10. You can use models of improper fractions to evaluate subtraction expressions with mixed numbers that require regrouping.

- a. Evaluate $2\frac{7}{12} - 1\frac{11}{12}$. Use bar models.

- b. Evaluate $5\frac{1}{4} - 2\frac{2}{3}$. Use improper fractions.

11. Evaluate $4\frac{1}{6} - 1\frac{2}{3}$. Use the method you prefer and explain why you like that method.

MATH TIP

If you are having trouble using a numeric method, draw models to help you.

Adding and Subtracting Mixed Numbers

Confirming Calculations

ACTIVITY 2.2

continued

SUGGESTED LEARNING STRATEGIES: Think/Pair/Share

12. Evaluate each expression. Write answers in **lowest terms** and show your work.

a. $2\frac{1}{4} - 1\frac{3}{4}$

b. $3\frac{2}{3} - 1\frac{1}{6}$

c. $3\frac{1}{5} - 2\frac{4}{5}$

d. $4 - 2\frac{2}{3}$

13. Use estimation to check whether each of your answers in Question 12 is reasonable. Show your estimates.

a. $2\frac{1}{4} - 1\frac{3}{4}$

b. $3\frac{2}{3} - 1\frac{1}{6}$

c. $3\frac{1}{5} - 2\frac{4}{5}$

d. $4 - 2\frac{2}{3}$

My Notes

MATH TERMS

A fraction is in **lowest terms** or **simplest form** when the numerator and denominator do not have any common factors other than 1.

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.

Show your work.

Write answers in simplest form.

1. Compute.

a. $4\frac{2}{5} + 5\frac{1}{5}$ b. $7\frac{7}{15} + 3\frac{1}{5}$

c. $34\frac{6}{7} + 22\frac{13}{14}$ d. $9\frac{4}{5} + 8\frac{3}{4}$

2. Hannah has $5\frac{3}{4}$ cups of salt. She is coloring the salt to make an art project. She needs $1\frac{1}{3}$ cups of red salt, $2\frac{3}{8}$ cups of blue salt, and $1\frac{1}{2}$ cups of green salt. Use estimation to determine if she has enough salt. Explain your reasoning.

3. Shane and his friends had a movie-a-thon. The first movie lasted $2\frac{3}{10}$ hr, the second movie lasted $1\frac{17}{20}$ hr, and the final movie

lasted $2\frac{2}{5}$ hr. Exactly how long did Shane and his friends spend watching movies?

4. Evaluate each expression.

a. $3\frac{9}{11} - 1\frac{2}{11}$ b. $7\frac{8}{21} - 4\frac{2}{7}$

c. $16\frac{3}{8} - 9\frac{13}{16}$ d. $9 - 2\frac{3}{4}$

5. Jacob is $4\frac{7}{8}$ ft tall, and Emily is $5\frac{3}{16}$ ft tall. Emily claims she is at least $\frac{1}{2}$ ft taller than Jacob. Is she? Explain.

6. Which is a better estimate for $13\frac{17}{32} - 6\frac{4}{16}$, 7 or $7\frac{1}{2}$? Explain your reasoning.

7. **MATHEMATICAL REFLECTION** How is adding and subtracting mixed numbers similar to and different from adding and subtracting fractions?

Adding and Subtracting Fractions and Mixed Numbers

Embedded Assessment 1

Use after Activity 2.2.

MY CAT SAM

Write your answers on notebook paper. Show your work.

Bodie is scrapbooking pet photos. His scrapbook has $12'' \times 12''$ pages.

1. At the top of the first page, he wants to spell “MY CAT SAM” in block letters. Look at the figure below to see the number of inches he needs for each letter and space.

M		Y		C		A		T		S		A		M
1	$\frac{1}{4}$	1	$\frac{7}{16}$	1	$\frac{3}{8}$	1	$\frac{3}{8}$	1	$\frac{7}{16}$	1	$\frac{1}{4}$	1	$\frac{1}{4}$	1

- a. How many inches long is this title?
- b. Use an estimate to check the reasonableness of your answer to Part a. Show how you made the estimate.
- c. Bodie left $\frac{3}{8}$ inch between each letter of CAT and $\frac{1}{4}$ inch between each letter of SAM. Which word has more space between each letter? How much more?
- d. How much leftover space will be on the line of this title?

Below the title, he will put photos of his cat Sam. He used a computer to adjust his photos to various sizes. He wants to fit as many photos as he can on one sheet of printer paper ($8\frac{1}{2}'' \times 11''$). Bodie’s printer prints all the way to the edge of a sheet.

2. Two photos are panoramic, which means they are long and skinny. Bodie has sized these photos so that they are both 11 in. long.
 - a. Estimate to predict whether two photos with *widths* $5\frac{9}{16}''$ and $3\frac{1}{8}''$ will both fit on one sheet. Explain your reasoning.
 - b. Compute to find out whether both photos will fit on one sheet. Explain how you did the computation.
 - c. If the photos do fit, how much space will be left on the sheet? If they do not fit, by how many inches is the sheet short? Show your work.

Adding and Subtracting Fractions and Mixed Numbers

MY CAT SAM

	Exemplary	Proficient	Emerging
Math Knowledge # 1a, 1b, 1c, 1d, 2a, 2b	Student accurately determines the length of the title (1a), uses logical estimation (1b), compares and subtracts fractions (1c), calculates leftover space (1d), and estimates and computes correctly with the panoramic measurements (2a, b).	Student accurately computes or estimates for at least 4 of the 6 items.	Student attempts at least 4 of the calculations and computes at least 2 of the calculations correctly.
Problem Solving # 2a, 2b	Student accurately determines whether both photos will fit on one sheet and supports with evidence (2a, b).	Student accurately determines whether both photos will fit on one sheet but may not support with evidence.	Student does not accurately determine whether both photos will fit on one sheet.
Communication # 1b, 2a, 2b	Student clearly communicates how the estimates were made (1b, 2a) and the calculations used to determine if the photos will fit (2b). The expressions used are given.	Student clearly communicates reasoning for two of the three items.	Student communicates reasoning for at least one of the items.

Multiplying Fractions and Mixed Numbers

Making Muffins

ACTIVITY

2.3

SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite, Look for a Pattern

Jack wants to use this recipe to make some muffins, but he has only 2 cups of flour. He thinks he can change the amounts of all the other ingredients so that the recipe uses 2 cups of flour.

Blueberry Cinnamon Muffins

8 cups whole-wheat flour	2 cups honey
$1\frac{1}{2}$ tbs. baking powder	$4\frac{1}{2}$ tsp. cinnamon
$2\frac{1}{3}$ cups applesauce	$\frac{3}{8}$ tsp salt
$3\frac{1}{2}$ cups blueberries	4 cups milk

Makes 48 muffins

My Notes

CONNECT TO MEASURES

1 cup = 16 tablespoons (tbs)

$\frac{1}{4}$ cup = 4 tbs

1 tbs = 3 teaspoons (tsp)

Think about how 2 cups of flour is related to 8 cups of flour.

1. How many 2-cup amounts are there in 8 cups? Make a drawing to show your answer.

2. What fraction of 8 is 2? Show how you found your answer.

3. Help Jack figure out how to change his recipe so he can use the 2 cups of flour that he has.

- a. How will he use the fraction to adjust the recipe?

- b. How much milk will he use?

- c. How much honey will he use?

- d. How many muffins will he make?

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Quickwrite

My Notes

4. Joy wants to use one-third of this recipe to make some muffins. She is wondering how much cornmeal she should use.

Cornmeal Muffins	
6 cups cornmeal	$1\frac{1}{2}$ tbs. salt
$\frac{3}{4}$ cups flour	$7\frac{1}{2}$ tsp. baking powder
$\frac{1}{4}$ cup sugar	$4\frac{1}{2}$ cups milk
$\frac{1}{2}$ cup corn oil	6 eggs
Makes 36 muffins	

- a. Make a drawing to show $\frac{1}{3}$ of 6 cups.

- b. How much cornmeal will Joy use?

5. Another way to find $\frac{1}{3}$ of 6 is by multiplying fractions. Each step is shown below. Explain what was done in each step.

Steps

$$\frac{1}{3} \times \frac{6}{1}$$

$$\frac{1 \times 6}{3 \times 1}$$

$$\frac{6}{3}$$

$$2$$

Explanation

6. What is $\frac{2}{3}$ of 6? Find the answer two ways. Show your work for each method.

MATH TIP

Remember that a fraction shows a division problem.

$$\frac{1}{4} = 1 \div 4$$

$$\frac{6}{4} = 6 \div 4$$

A whole number can always be represented as fraction with a denominator of 1.

$$3 = \frac{3}{1}$$

Multiplying Fractions and Mixed Numbers

Making Muffins

ACTIVITY 2.3

continued

SUGGESTED LEARNING STRATEGIES: Create Representations

Now look at the amounts of some other ingredients in Joy's recipe.

7. This grid is a model for 1 cup of sugar.



- Shade the grid to show $\frac{1}{4}$ cup of sugar.
 - Use an X to show what part of the drawing represents $\frac{1}{3}$ of $\frac{1}{4}$.
 - What fraction of the whole cup represents $\frac{1}{3}$ of $\frac{1}{4}$ cup?
 - Your model shows $\frac{1}{3}$ of $\frac{1}{4}$. Write and evaluate an expression to show multiplying $\frac{1}{3} \times \frac{1}{4}$.
8. Write and evaluate an expression to find $\frac{2}{3}$ of $\frac{1}{4}$.
9. Make a drawing in the My Notes space to represent $1\frac{1}{2}$ squares of baking chocolate. Then show what $\frac{1}{3}$ of that amount is.

EXAMPLE 1

Find $\frac{1}{3} \times 1\frac{1}{2}$.

When you write an expression for multiplication with a mixed number, change the mixed number to an improper fraction.

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

TRY THESE A

Write and evaluate an expression to find each product.

a. $\frac{2}{3} \times 1\frac{1}{2}$

b. $1\frac{3}{4} \times 2\frac{2}{3}$

My Notes

My Notes

SUGGESTED LEARNING STRATEGIES: Think/Pair/Share

10. Rewrite the amounts of all the ingredients so that Joy can make $\frac{1}{3}$ of the original recipe.

<i>Cornmeal Muffins</i>	
_____ cups cornmeal	_____ tbs. salt
_____ cups flour	_____ tsp. baking powder
_____ cup sugar	_____ cups milk
_____ cup corn oil	_____ eggs
Makes _____ muffins.	

11. Rewrite the amounts of all the ingredients in Jack's recipe so that he can make 12 Blueberry Cinnamon muffins.

<i>Blueberry Cinnamon Muffins</i>	
_____ cups whole-wheat flour	_____ cups honey
_____ tsp baking powder	_____ tsp cinnamon
_____ cups applesauce	_____ teaspoon salt
_____ cups blueberries	_____ cups milk
Makes _____ muffins.	

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.
Show your work.

1. Make a drawing to show $\frac{1}{3} \times 9$.

Find each product.

2. $\frac{1}{4} \times 2$
3. $\frac{2}{9} \times 6$

4. $1\frac{2}{3} \times 5$

5. Joe wants to find $\frac{1}{3}$ of $8\frac{1}{4}$ yards. Write and solve an equation to find the answer.

6. **MATHEMATICAL REFLECTION** Compare multiplying by $\frac{1}{5}$ and dividing by 5. Include diagrams with your explanation.

Dividing Fractions and Mixed Numbers

Cooking with Betty

ACTIVITY

2.4

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern

Joseph is taking a summer cooking class taught by a chef named Betty. She is an excellent cook but often forgets to tell the class how much of an ingredient to use. So Joseph is never quite sure if he has what he needs.

On the first day of class, he measures 6 cups of rice. When Betty sees it, she says “Too much rice! Only 2 cups of rice are needed for this recipe.”

1. Draw a model for 6 cups of rice. Use your drawing to find how many 2-cup amounts of rice are in 6 cups of rice.

2. You can use a number sentence to represent the process in your drawing. Complete the following number sentence to show how many 2-cup amounts of rice are in 6 cups of rice.

6 cups rice \div _____ cups per amount = _____ amounts

3. What arithmetic operation represents the process used to find the number of 2-cup amounts in 6 cups?

4. Suppose a recipe for red beans and rice required 3 cups of rice.

- a. Write a number sentence to indicate the number of batches of red beans and rice that can be made with 6 cups of rice.

- b. What operation did you use in Part a?

My Notes

CONNECT TO COOKING

A batch is the amount of food that is made when you use a recipe as it is written.

My Notes

SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite, Look for a Pattern

On the second day of class, Joseph measures 3 teaspoons of nutmeg. When Betty comes by, she says, “That’s way too much! We only need one-fourth teaspoon of nutmeg for each batch!”

5. In the My Notes space, draw a model of 3 teaspoons of nutmeg. Separate the model into one-fourth teaspoon amounts. How many one-fourths are in the model?

6. How many batches of Betty’s recipe can be made with the 3 teaspoons of nutmeg? Explain your reasoning.

7. Your model represents 3 teaspoons divided into $\frac{1}{4}$ -teaspoon amounts. You can write a number sentence to represent this.

$$3 \text{ tsp nutmeg} \div \underline{\hspace{1cm}} \text{ tsp per batch} = \underline{\hspace{1cm}} \text{ batches}$$

8. You can think about this situation in another way.

a. How many one-fourth teaspoons are in 1 teaspoon?

b. To find the number of one-fourth-teaspoon amounts that are in 3 teaspoons, you can represent this relationship in a number sentence.

$$3 \text{ tsp} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$$

$$\left[\frac{1}{4}\text{-tsp in 1 tsp} \right] \quad \left[\frac{1}{4}\text{-tsp in 3 tsp} \right]$$

9. What operations were used in Questions 7 and 8? How are they related?

10. Why does the equation $3 \div \frac{1}{4} = 3 \times 4$ make sense?

Dividing Fractions and Mixed Numbers

Cooking with Betty

ACTIVITY 2.4

continued

SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite, Think/Pair/Share

On the third day of class, Joseph measures 3 cups of walnuts. When class begins, Betty announces, “Today’s recipe calls for $\frac{3}{4}$ cup of walnuts for each batch.”

11. Joseph wants to know how many batches can be made with 3 cups of walnuts.

a. Draw a model to represent 3 cups of walnuts. Mark the model with $\frac{3}{4}$ cup parts.

b. How many $\frac{3}{4}$ cup parts are there?

c. Complete this number sentence to represent the situation.

3 c walnuts \div $\frac{3}{4}$ c of walnuts per batch = _____ batches

d. Why does the equation $3 \div \frac{3}{4} = \frac{3}{1} \times \frac{4}{3}$ make sense? Use your answer to Question 10 if it helps.

12. The method for dividing a fraction by a fraction is similar to the method for dividing a whole number by a fraction. Explain each step in the example below.

Step

Explanation

$$\frac{3}{4} \div \frac{4}{5} = \frac{3}{4} \times \frac{5}{4}$$

$$\frac{3}{4} \div \frac{5}{4} = \frac{3 \times 5}{4 \times 4}$$

$$\frac{3 \times 5}{4 \times 4} = \frac{15}{16}$$

13. What can you generalize about the process for dividing any number, including another fraction, by a fraction?

My Notes

ACADEMIC VOCABULARY

Reciprocals are two numbers whose product is 1. For example, $\frac{5}{6}$ and $\frac{6}{5}$ are reciprocals.

$$\frac{5}{6} \times \frac{6}{5} = \frac{5 \times 6}{6 \times 5} = \frac{30}{30} = 1$$

Another name for **reciprocal** is **multiplicative inverse**.

My Notes

MATH TIP

You can think of $1\frac{1}{4}$ as an improper fraction. Making a drawing may be helpful to visualize the situation.

SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite

On the fourth day of class, the people at Joseph's table have measured 5 cups of onions. Then Betty announces, "Today's recipe needs $1\frac{1}{4}$ cups of onions for each batch of soup!"

14. Write and simplify an expression using division to find the number of batches that can be made with 5 cups of onions. Be sure to use the appropriate units for the numbers.

15. On the last day of class, Joseph measures $7\frac{1}{2}$ cups of corn but Betty says the recipe calls for $1\frac{1}{2}$ cups. Using what you know about dividing by fractions, find the number of batches in $7\frac{1}{2}$ cups of corn. Explain how you found your answer.

16 The last recipe of the day involved servings of maple syrup for a pancake breakfast. Betty said, " $\frac{2}{3}$ divided by $\frac{3}{8}$." Write a story problem to match the division. Then solve the problem and explain the result.

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.
Show your work.

Divide.

1. $7 \div \frac{1}{2}$
2. $\frac{3}{8} \div 6$
3. $5 \div \frac{5}{16}$
4. $10 \div 1\frac{1}{3}$
5. Latanya has $\frac{5}{6}$ yard of ribbon to make spirit ribbons. Each spirit ribbon takes $\frac{1}{12}$ yard of ribbon. Write and

evaluate an expression to find the number of spirit ribbons Latanya can make.

6. A carpenter needs to cut pieces of lumber that are $\frac{1}{2}$ feet long. How many pieces can be cut from a board that is $13\frac{1}{2}$ feet long?
7. Write a story problem to match this division problem. Then solve the problem.
 $6\frac{1}{2} \div 2\frac{1}{6}$
8. **MATHEMATICAL REFLECTION** Compare the operations for "dividing by 3" and "dividing by $\frac{1}{3}$ ". How are they alike and different? Explain.

Multiplying and Dividing Fractions and Mixed Numbers **Let's Measure**

ACTIVITY

2.5

LEARNING STRATEGIES: Activating Prior Knowledge, Quickwrite

My Notes

Knowing how to compute with fractions and mixed numbers is necessary to work with the *customary measurement system*.

During track practice, Jenna ran $2\frac{1}{4}$ miles. LaDonna ran $1\frac{2}{3}$ times as far as Jenna. How far did LaDonna run? To find how far LaDonna ran, multiply the mixed numbers.

1. Explain each step of multiplying $2\frac{1}{4}$ by $1\frac{2}{3}$.

Step

Explanation

$$2\frac{1}{4} \times 1\frac{2}{3}$$

$$\frac{9}{4} \times \frac{5}{3}$$

$$\frac{3}{4} \times \frac{5}{3}$$

$$\frac{3 \times 5}{4 \times 1} = \frac{15}{4}$$

$$3\frac{3}{4} \text{ miles}$$

2. In the third step of the multiplication above, the expression $\frac{9}{4} \times \frac{5}{3}$ was simplified.

- a. If the expression were not simplified, what improper fraction would you get when you multiply?

- b. Is this answer equivalent to the answer in Question 1? Explain your answer.

- c. Find the products: $\frac{10}{7} \times \frac{3}{5}$ and $\frac{10}{7} \times \frac{5}{3}$.

MATH TIP

The *customary measurement system* is the one used by most people in the United States. Listed below are some often-used units of length.

Length

1 foot (ft) = 12 inches (in.)

1 yard (yd) = 3 ft

1 mile (mi) = 1760 yd

MATH TIP

For help with the abbreviations for some measurements, use the table of measures in the back of your book.

My Notes

LEARNING STRATEGIES: Quickwrite, Debriefing

- d. Could you have simplified the multiplication expressions in Part c before you multiplied? Use the numerical expressions to explain why or why not.

- e. Why is it important to write a 1 when you simplify?

Jorge will put square tiles along a wall that is $13\frac{1}{2}$ feet long. The tile sides are $1\frac{1}{2}$ feet long. To determine the number of tiles needed to put along the side of the room, divide the mixed numbers.

3. Explain each step of dividing $13\frac{1}{2}$ by $1\frac{1}{2}$.

Step

Explanation

$$13\frac{1}{2} \div 1\frac{1}{2}$$

$$\frac{27}{2} \div \frac{3}{2}$$

$$\frac{27}{2} \times \frac{2}{3}$$

$$\frac{\overset{9}{\cancel{27}}}{\underset{1}{\cancel{2}}} \times \frac{\underset{1}{\cancel{2}}}{\overset{3}{\cancel{3}}}$$

$$\frac{9 \times 1}{1 \times 1} = \frac{9}{1}$$

9 floor tiles

4. Explain how common factors were used to simplify the expression.

LEARNING STRATEGIES: Activating Prior Knowledge, Quickwrite

5. For the following problems, estimate first and then calculate.
Look at the estimate for each problem to check your answers.

a. $3\frac{1}{3} \times 1\frac{11}{15}$

b. $13\frac{3}{4} \div 2\frac{1}{5}$

c. $5\frac{1}{3} \div 2\frac{2}{5}$

Another use for fractions and mixed numbers is converting between measures in the customary system.

EXAMPLE 1

How many fluid ounces are in $3\frac{1}{3}$ cups of milk?

Step 1: Determine the number of fluid ounces in 1 cup.

$$1 \text{ cup} = 8 \text{ fl oz}$$

Step 2: Multiply $3\frac{1}{3}$ cups by 8 fl oz in a cup.

$$3\frac{1}{3} \text{ cups} \times \frac{8 \text{ fl oz}}{1 \text{ cup}} = \frac{10}{3} \times \frac{8}{1} = \frac{80}{3} = 26\frac{2}{3} \text{ fl oz}$$

Solution: There are $26\frac{2}{3}$ fluid ounces in $3\frac{1}{3}$ cups of milk.

EXAMPLE 2

A box is $39\frac{1}{2}$ inches long. How long is the box in feet?

Step 1: Determine the number of inches in 1 foot.

$$1 \text{ ft} = 12 \text{ in.},$$

Step 2: Divide $39\frac{1}{2}$ in. by 12 in. in a foot.

$$\text{Solution: } 39\frac{1}{2} \text{ in.} \div \frac{12 \text{ in.}}{1 \text{ ft}} = \frac{79}{2} \div \frac{12}{1} = \frac{79}{2} \times \frac{1}{12} = \frac{79}{24} = 3\frac{7}{24} \text{ ft}$$

TRY THESE A

- a. How many quarts are in $3\frac{1}{2}$ gallons?
- b. A package weighs $28\frac{4}{5}$ ounces. What is the weight of the package in pounds?

My Notes

MATH TIP

Capacity

$$1 \text{ cup} = 8 \text{ fl oz}$$

$$1 \text{ pt} = 2 \text{ cups}$$

$$1 \text{ qt} = 2 \text{ pt}$$

$$1 \text{ gal} = 4 \text{ qt}$$

Mass

$$1 \text{ lb} = 16 \text{ oz}$$

$$1 \text{ ton} = 2,000 \text{ lb}$$

My Notes

LEARNING STRATEGIES: Quickwrite, Debriefing

6. Example 1 used multiplication to convert units of measure and example 2 used division. Explain how you know when to use multiplication and when to use division.

7. Describe the process you would use to convert a number of miles to a number of yards. Use an example.

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

1. Estimate first, then multiply $3\frac{3}{4} \times 1\frac{1}{3}$.
Check your answer to see if it is close to the estimate.
2. Multiply: $5\frac{3}{5} \times 12\frac{1}{2}$.
3. Estimate first, then divide $6\frac{1}{8} \div 3\frac{1}{2}$.
Check your answer to see if it is close to the estimate.

4. Divide: $8\frac{4}{5} \div 5\frac{1}{2}$
5. How many ounces are in $7\frac{1}{3}$ pounds?
6. How many pints in $4\frac{3}{4}$ gallons?
7. How many yards are in 261 inches?
8. **MATHEMATICAL REFLECTION** Name two customary measurements that you could convert between and write a note to one of your classmates telling the steps needed to do this conversion. You may include an example in your note.

Using Fractions with Measurements

JUAN'S BOOKCASE

Embedded Assessment 2

Use after Activity 2.5.

Write your answers on notebook paper. Show your work.

Juan plans to build a bookcase to store his paperback books, DVDs, and CDs. He has lumber that he will use for the sides and back of the bookcase. Juan plans for his bookcase to have five shelves, including the top and bottom shelves. Each shelf will be $2\frac{1}{2}$ feet long.

1. Juan bought a piece of pine lumber that is 18 feet long. Does he have enough lumber to make the five shelves? If not, how much more does he need? If so, how much will be left over?
2. DVD cases are $\frac{9}{16}$ inches wide. If Juan has 60 DVDs, how many of them will fit on one shelf?
3. Juan has 28 paperback books. Each book is $1\frac{1}{4}$ inches wide. Will all his books fit on one shelf? If not, how many will fit and how many will have to go on another shelf? If yes, how many more paperback books fit on the same shelf? Explain.
4. Juan measured the location of his bookcase and realized that he could only fit a bookcase with shelves that are $1\frac{3}{4}$ feet wide. What is the maximum number of shelves Juan could build for this new bookcase using the lumber he bought?

Using Fractions with Measurements

JUAN'S BOOKCASE

	Exemplary	Proficient	Emerging
Math Knowledge # 1, 2a, 3, 4	Student provides correct calculations for the amount of wood left over (1), the number of DVDs and books that fit on the shelves (2a, 3), and the number of shelves (4).	Student attempts at least three items and provides two complete and correct items.	Student attempts at least two items and provides at least one complete and correct item.
Problem Solving # 1, 2b, 3, 4	Student correctly determines if there is enough wood (1), if the DVDs and books will fit (2b, 3), and the number of shelves for a different bookcase (4).	Student correctly determines three of the four decisions.	Student correctly determines only one of the decisions.
Communication # 2b, 3, 4	Student clearly explains whether or not the DVDs (2b) and books (3) will fit on the shelves, and describes the size bookcase that can be built (4).	Student provides a clear and reasonable explanation including measurements for two of the three items.	Student provides a clear and reasonable explanation including measurements for at least one of the three items.

Add, Subtract, and Multiply Decimals

Bookstore

ACTIVITY

2.6

SUGGESTED LEARNING STRATEGIES: Think/Pair/Share, Create Representations, Quickwrite, Debriefing

Mrs. Grace's middle school class operates a bookstore before school and during lunch. Juan and Isabel are in charge of ordering supplies and selling items. The table below lists the items they sell and the price per item.

Item	Price	Price in Dollars
Pencils	25¢	
Notebook Paper	\$1.32	
Ink Pens	43¢	
Markers	\$2.35	
Erasers	19¢	

1. Mrs. Grace asked Juan and Isabel to rewrite the price chart so that each price is written in dollars. Complete the chart.
2. Kalen buys two pencils, an ink pen, and a box of markers. What will they cost?
3. Elan purchases a pack of notebook paper and an eraser. What will they cost?
4. Who spent more on their purchases, Kalen or Elan? How much more? Explain how you arrived at your answer.
5. Alena has \$5.00 to spend at the bookstore and would like to buy a box of markers, 2 erasers, 1 pencil, and a pack of notebook paper. Does she have enough money? If yes, does she have any money left over? Explain.
6. Joey wants to buy 20 pencils but he may not have enough money. He can use repeated addition or multiplication to see what they cost. Which operation is more efficient? Why?

My Notes

WRITING MATH

When writing amounts of money, dollar or cents signs can be used. Sixty-five cents can be written as 65¢ or \$0.65. Writing sixty-five cents as 0.65¢ or \$0.65¢ is incorrect.

MATH TIP

To add or subtract decimals:

1. Line up the decimal points.
2. Use zeros as placeholders if needed.
3. Add or subtract.
4. Place the decimal point in the answer under the decimal points in the problem.

My Notes

MATH TIP

The 10×10 grid represents one whole, or 1. One tenth, or 0.1, can be represented by one row or one column of the grid.

MATH TIP

Think of an equivalent fraction when you need help with decimal multiplication.

$$0.3 \times 8 = ?$$

$$\frac{3}{10} \times 8 = \frac{24}{10} = 2\frac{4}{10}$$

$$0.3 \times 8 = 2.4$$

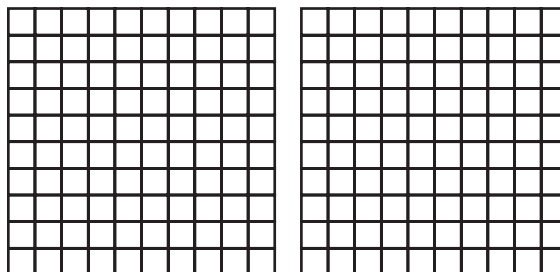
$$0.03 \times 8 = ?$$

$$\frac{3}{100} \times 8 = \frac{24}{100}$$

$$0.03 \times 8 = 0.24$$

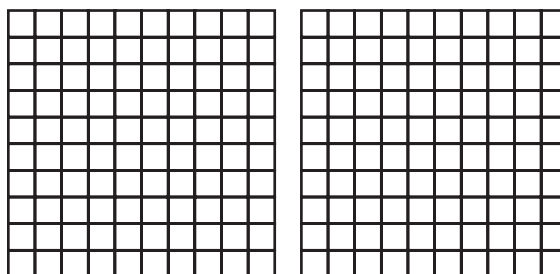
SUGGESTED LEARNING STRATEGIES: Think/Pair/Share, Create Representations

To investigate how to multiply decimals by whole numbers, let a 10×10 grid represent one whole. The model shown below represents two wholes, or 2.



7. Explore multiplying 0.7 times 2.

- Shade each grid above to represent 0.7.
- Find the value of the total shaded area.
- Shade the grids below with the value you found in Part b by completely filling one grid before moving to the next.



- Write the value of the shaded area as a decimal.
- Complete this number sentence.

$$0.7 \times 2 = \underline{\hspace{2cm}}$$

8. Study the products in the box to the right.

What do you think the product of 0.07×2 will be?

$$4 \times 8 = 32$$

$$4 \times 0.8 = 3.2$$

$$4 \times 0.08 = 0.32$$

$$4 \times 0.008 = 0.032$$

SUGGESTED LEARNING STRATEGIES: Discussion Group, Quickwrite, Think/Pair/Share, Create Representations

9. How do the number of decimal places in the products in Questions 7 and 8 compare to the number of decimal places in the factors?
10. Write a rule for multiplying a whole number and a decimal number. Be sure to include instructions for placing the decimal point.

Find each product.

11. 3×24.13 12. 1.4×6 13. 17×0.28

14. How much it will cost Joey to buy 20 pencils at the bookstore?

At the end of February, Mrs. Grace asks Juan and Isabel to estimate the monthly *income* from selling items in the bookstore.

15. Juan and Isabel decided to estimate by rounding. They rounded the prices of the items to the nearest tenth of a dollar and rounded the numbers of items sold to the nearest ten. Help them fill in their chart.

Item	Price in Dollars	Rounded Price	Items Sold	Rounded Items Sold	Estimated Income
Pencils			32		
Paper			17		
Pens			16		
Markers			8		
Erasers			27		

16. What is the estimated total income from selling school supplies during the month of February?
17. Mrs. Grace then asked them to calculate how close their estimate is to the actual total.
 - a. Find the exact income for each item in the table.
 - b. Find the exact amount of money collected during February.
 - c. How close is the estimate to the actual total?

My Notes

MATH TERMS

Income is the amount of money earned from selling a product or service.

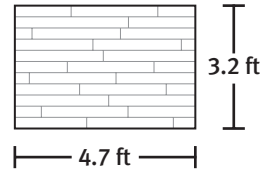
MATH TIP

To round, look at the digit to the right of the place that you are rounding. If that digit is 5, 6, 7, 8, or 9, add 1 to the place you are rounding; if that digit is 0, 1, 2, 3, or 4, the digit you are rounding remains the same.

My Notes

SUGGESTED LEARNING STRATEGIES: Use Manipulatives, Think/Pair/Share, Self Revision/Peer Revision, Predict and Confirm

Mrs. Grace has decided to carpet the bookstore floor. She asked Isabel and Juan to measure the rectangular room. Their measurements are shown below.



18. Predict what the area of the carpeted area will be.

Investigate some ideas about multiplying decimal numbers to help Isabel and Juan find the exact area of the bookstore!

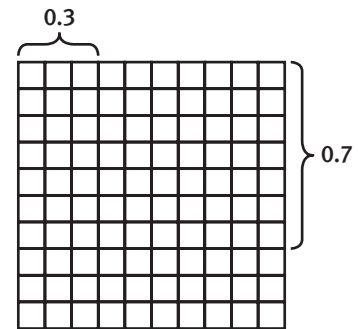
MATH TIP

The area of a rectangle is $A = l \times w$.

19. You can use a model to find the product of 0.7 and 0.3.

a. The entire 10×10 grid represents 1. What does each small square represent?

b. In the model, shade 0.3 in one color and 0.7 in another color.



Complete.

20. The number of one-hundredths shaded with both colors is _____. This shows that the product of 0.7 and 0.3 is _____. A number sentence for this is _____.

21. How does the number of decimal places in the product compare to the number of decimal places in the factors?

SUGGESTED LEARNING STRATEGIES: Self Revision/Peer Revision, Look for a Pattern, Group Presentation, Create Representations, Think/Pair/Share, Predict and Confirm

My Notes

22. Find each product.

a. 2.3×0.4

b. 4.27×1.3

c. 1.473×2.31

23. Write a rule for multiplying two decimal numbers. Remember to include instructions for placing the decimal point.

24. Remember that the floor of the bookstore measures 3.2 ft by 4.7 ft. What is the area of the floor in square feet?

Estimating is often helpful to check whether a product is reasonable. One method of estimating is **front-end estimation**.

25. Find each product. Use front-end estimation to check your answer.

a. 6.03×4.7

b. 32.14×2.7

26. Find the product of 0.02 and 0.7.

a. How many decimal places are needed in the answer?

b. You will need to use zeros as placeholders. Where will you place them in the product? How do you know?

c. Write the product.

Find each product.

27. 0.0032×0.08

28. 0.000132×0.5

MATH TIP

You can *think aloud* to make sense of a product. For $0.4 \times 0.6 = 0.24$, imagine the decimals as fractions: $\frac{4}{10} \times \frac{6}{10} = \frac{24}{100}$ and *think aloud* this way: “Four-tenths times six tenths is twenty-four hundredths.”

MATH TERMS

In **front-end estimation** the front-end digits (the leftmost digits) are used for computation. The other digits become zeros.

My Notes

SUGGESTED LEARNING STRATEGIES: Quickwrite, Work Backward

29. Mike multiplied 2.436×1.545 and found 0.376362 as the product. He counted 6 decimal places in the factors, so he knew that there should be 6 decimal places in his answer.

Then he used front end estimation to check his answer for reasonableness and saw that his answer should be close to 2. Now he thinks that he made a mistake. Help Mike find his mistake. Explain your thinking.

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

- Mark went to the movies one Saturday. After buying his ticket, he had \$7.00 left over. Does he have enough money to buy a small popcorn and large water? If yes, how much change will he receive? If no, how much more money does he need to make his purchase?

	Popcorn	Bottled Water
Small	\$3.75	\$2.50
Medium	\$4.50	\$3.00
Large	\$5.25	\$4.25

- The 4×100 relay team competed in the county track meet. Their clocked times were: 14.6 sec, 15.2 sec, 16.1 sec, and 14.2 sec. Compute the amount of time that it took the team to complete the race.
- Keisha would like to buy five pairs of socks that cost \$3.95 a pair. How much will she spend buying socks not including any taxes?

- Samson purchased the following items at the grocery store. Estimate his final bill, not including taxes. Explain your process.

3 kg. of bananas at 49¢ per kg.
 1 package of almonds at \$4.99 each
 2 packages of wheat crackers at \$2.39 each
 5 cans of cat food at 35¢ each
 2 tomatoes at \$1.19 each

- Kevin helped the coach prepare the soccer field for Tuesday's game. The field measures 64.01 meters by 82.3 meters. What is the area of the playing field in square meters?
- Find the product of 3.25 and 0.02.
- Maria multiplied 0.8 by 0.5 and got a product of 0.4. Is she correct? Explain.
- MATHEMATICAL REFLECTION** Will the product of a whole number and a decimal number less than one ever be larger than the whole number? Give examples to support your answer.

Dividing Decimals

Getting Ready for the Dance

SUGGESTED LEARNING STRATEGIES: Close Reading, Use Manipulatives, Look for a Pattern, Create Representations

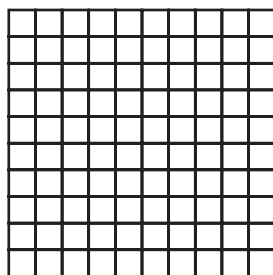
The middle school students at Montgomery Middle School are planning a dance. They will decorate the gym, hire a deejay, and provide refreshments. The students have listed their expenses and will share the cost of the dance.

Expense	Cost
Decorations	\$272.64
Deejay	\$168.64
Refreshments	\$113.28

Thirty-two students will attend the dance. What is each student's share of the total cost? You will have to divide to solve this problem, so first explore some ideas about division.

Think about a simpler problem: $0.72 \div 9$. Remember: 0.72 means 72 hundredths, or 72 out of 100.

1. This grid represents $\frac{100}{100}$ or 1 whole. Shade $\frac{72}{100}$ of the squares in the grid.



2. To divide by 9, you need to make 9 groups. Mark the shaded sections into 9 groups. How many squares are in each group?
3. What is the value of one small square?
4. What is the value of each group of squares that you made?
5. Complete this number sentence.

$$0.72 \text{ divided by } 9 = \underline{\hspace{2cm}}$$

My Notes

My Notes

MATH TERMS

An **algorithm** is a set of steps or a procedure used to carry out a computation or to solve a problem.

READING MATH

quotient
divisor $\overline{)$ dividend

A quotient is calculated by dividing a dividend by a divisor.

SUGGESTED LEARNING STRATEGIES: Quickwrite, Close Reading

6. Look at $0.72 \div 9$ set up as if dividing whole numbers.

$$9 \overline{)0.72}$$

- Place the answer from Question 5 above the dividend.
- How is the decimal point in the quotient placed in relationship to the decimal point in the dividend?

EXAMPLE 1

The decorations for the dance will cost \$272.64. What is each student's share of the cost of the decorations?

Step 1: Determine the total number of students.

32 (given on the previous page)

Step 2: Divide the cost of \$272.64 by 32.

The algorithm is the one used for dividing whole numbers.

$$\begin{array}{r} 8.52 \\ 32 \overline{)272.64} \\ \underline{-256} \\ 166 \\ \underline{-160} \\ 64 \\ \underline{-64} \\ 0 \end{array}$$

Solution: Each student will pay \$8.52 for dance decorations.

Notice that the decimal point is placed in the answer directly above the decimal point in the dividend.

TRY THESE A

Find the quotient.

a. $25 \overline{)168.75}$

b. $7 \overline{)339.5}$

Dividing Decimals

Getting Ready for the Dance

ACTIVITY 2.7

continued

SUGGESTED LEARNING STRATEGIES: Guess and Check, Create Representations, Think/Pair/Share, Quickwrite, Group Presentation

It is helpful to estimate a quotient beforehand to see if your solution makes sense. One method of estimating is to use **compatible numbers**. For example, to divide 272.64 by 32, think of the closest compatible numbers and find the quotient mentally.

$$272.64 \rightarrow 270$$

$$32 \rightarrow 30$$

$$270 \div 30 = 90$$

7. The deejay will cost \$168.64. What is each student's share of the cost? Use compatible numbers to estimate, then solve.

8. Is your answer in Question 7 an exact number of dollars and cents? If not, what should you do with the remainder?

9. Refreshments for the dance will total \$113.38. Estimate first, then find each student's share of the cost.

10. Is your answer in Question 9 an exact number of dollars and cents? If not, what should you do with the remainder?

11. When there is a remainder in a division problem involving money, how should you round the quotient?

12. The students want to get the best buys on the refreshments. They found three brands of pretzels at the grocery store.

Brand	Size	Cost	Cost of 1 Ounce
Bob's Pretzels	12 oz	\$1.68	
Crunchy Pretzels	14 oz	\$1.89	
Kettle Pretzels	16 oz	\$2.08	

a. For each brand, list the cost of an ounce of pretzels.

b. Which brand do you think will be the best buy? Explain.

My Notes

MATH TERMS

Compatible numbers are close in value to the original numbers in an arithmetic problem and are used in place of the original numbers to make it easier to estimate an answer to the problem.

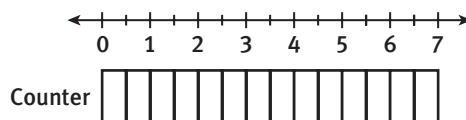
MATH TIP

When a division problem that involves a decimal has a zero remainder, we say that the quotient is a terminating decimal.

My Notes

SUGGESTED LEARNING STRATEGIES: Use Manipulatives, Quickwrite, Close Reading

13. The counter in the concession stand needs to be painted before the dance. The counter is seven feet long and the students want to alternate the colors blue and green in 0.5 ft sections.



- How many 0.5 ft. sections will be painted? Mark the counter to show the sections.
 - Complete this number sentence: $7 \div 0.5 = \underline{\hspace{2cm}}$
14. Suppose you wanted to divide 28.56 by 2.3. Why would it be difficult to use a pictorial model to answer this question?

WRITING MATH

$48 \div 1.2$ can also be written as $\frac{48}{1.2}$ or $1.2 \overline{)48}$.

MATH TIP

Recall that multiplying a fraction by 1 does not change its value because of the Property of One. If you multiply the fraction $\frac{3}{5}$ by $\frac{7}{7}$: $\frac{3}{5} \times \frac{7}{7} = \frac{21}{35}$, the resulting fraction is equivalent to $\frac{3}{5}$.

EXAMPLE 2

Divide 48 by 1.2.

Step 1: Write the division problem as a fraction.

$$\frac{48}{1.2}$$

Step 2: Rewrite the denominator so that it is a whole number.

The smallest number that we can use to do this is 10.

$$1.2 \times 10 = 12$$

Step 3: Since you multiplied the denominator by 10, you multiply the numerator by 10 so that you have equivalent fractions.

$$\frac{48}{1.2} \times \frac{10}{10} = \frac{480}{12}$$

Step 4: Divide 480 by 12.

$$\begin{array}{r} 40 \\ 12 \overline{)480} \\ \underline{-48} \\ 00 \end{array}$$

Solution: The quotient is 40.

Dividing Decimals

Getting Ready for the Dance

ACTIVITY 2.7

continued

SUGGESTED LEARNING STRATEGIES: Guess and Check, Think/Pair/Share, Create Representations, Close Reading

TRY THESE B

- a. For the fraction $\frac{5.8364}{2.173}$, find the smallest number by which you can multiply the denominator to make it a whole number. Then write an equivalent fraction with a whole-number denominator.

Write each division problem as a fraction, rewrite it as an equivalent fraction with a whole-number denominator, and then divide.

b. $2.7 \overline{)13.041}$

c. $0.52 \overline{)6.5676}$

15. The decorating committee spent \$22.95 on ribbon, which costs \$0.85 per meter. How many meters of ribbon did the committee buy?

Instead of multiplying the dividend and divisor by the same power of 10 to make them both whole numbers, you can move the decimal points.

EXAMPLE 3

Divide: $0.13 \overline{)72.8}$

Step 1: First move the decimal point in this divisor 2 places to the right to make it a whole number.

$$0.13 \overline{)72.8}$$

Step 2: Next move the decimal point in this dividend the same number of places. Notice that a zero must be inserted in the dividend.

$$0.13 \overline{)72.80}$$

Step 3: Then divide.

$$\begin{array}{r} 560 \\ 13 \overline{)7280} \\ \underline{65} \\ 78 \\ \underline{78} \\ 00 \end{array}$$

Solution:

560

My Notes

MATH TIP

Recall the rules for multiplying by powers of 10:

- Multiplying by 10 moves the decimal point one place to the right.
- Multiplying by 100 moves the decimal point two places to the right.

My Notes

SUGGESTED LEARNING STRATEGIES: Group Presentation, Create Representations, Marking the Text

TRY THESE C

Find each quotient.

a. $0.45 \overline{)103.5}$

b. $0.31 \overline{)682}$

16. Sharon wants to decorate each table with confetti. A bag of confetti holds 546 grams. She will scatter 45.5 grams on each table. How many tables will she be able to decorate?

17. The deejay will play music for 2.5 hours. Each song lasts approximately 3.75 minutes. What is the total number of songs that can be played during the dance?

Sometimes the dividend is not evenly divided by the divisor.

EXAMPLE 4

Find the quotient $0.31 \overline{)42}$ to the nearest tenth.

Step 1: Move the decimal point to create a whole number. Then divide. Notice the remainder of 15.

$$\begin{array}{r} 135. \\ 31 \overline{)4200.} \\ \underline{-31} \\ 110 \\ \underline{-93} \\ 170 \\ \underline{-153} \\ 15 \end{array}$$

Step 2: Continue dividing by adding two more zeros after the decimal point.

$$\begin{array}{r} 135.48 \\ 31 \overline{)4200.00} \\ \underline{-31} \\ 110 \\ \underline{-93} \\ 170 \\ \underline{-153} \\ 150 \\ \underline{-124} \\ 260 \\ \underline{-248} \\ 12 \end{array}$$

Step 3: There is still a remainder, but now there are enough places to round the quotient to the nearest tenth.

Solution: The rounded quotient is 135.5.

MATH TIP

$$0.3 = 0.30 = 0.300$$

because

$$\frac{3}{10} \cdot \frac{10}{10} = \frac{30}{100} \cdot \frac{10}{10} = \frac{300}{1000}$$

Dividing Decimals

Getting Ready for the Dance

ACTIVITY 2.7

continued

SUGGESTED LEARNING STRATEGIES: Group Presentation, Create Representations, Quickwrite, Close Reading, Look for a Pattern

TRY THESE D

Find each quotient to the nearest tenth.

a. $0.22 \overline{)1.3}$

b. $6.2 \overline{)27}$

18. After spending two hours planning the dance, Mark, LaNita, and Sam decide to go to the cafeteria and get a snack. The cafeteria sells three containers of yogurt for \$1.00.

- a. How much will Mark, LaNita, and Sam each pay for one container of yogurt?
- b. What do you notice about the quotient?

Numbers like these are called **repeating decimals**. Repeating decimals can either be written with a bar over the digits that repeat or can be rounded.

EXAMPLE 5

Divide 7 by 11.

Step 1: Set up the problem and divide.

$$\begin{array}{r} 0.6363 \\ 11 \overline{)7.0000} \\ \underline{-66} \\ 40 \\ \underline{-33} \\ 70 \\ \underline{-66} \\ 40 \\ \underline{-33} \\ 7 \end{array}$$

Step 2: Notice the repeating digits in the quotient.

Solution: The digits 63 repeat in the quotient, so it can be written with a bar as $0.\overline{63}$ or rounded to 0.64.

My Notes

MATH TERMS

A **repeating decimal** is a decimal that has one or more digits to the right of the decimal point that repeat forever.

My Notes

TRY THESE

a. $3\overline{)5}$

b. $11\overline{)2}$

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.
Show your work.

1. Use a model to show how many groups of 0.2 are in 1.
2. Estimate the quotient: $384.72 \div 19.475$. Explain your process.
3. Elliott is training for a 17.5 km race. His track coach has separated the course into 2.5 km sections. Into how many sections is the course separated?
4. A jar contains 189 grams of mustard. How many 4.5-gram portions can be made?
5. Sam paid \$5.75 for 2.3 pounds of apples. What was the cost for one pound?
6. Sam is saving \$5.75 per week to buy a CD player that costs \$46. How many weeks will he have to save before he can buy the CD player?
7. Compare the quotients of $\frac{5}{4}$ and $\frac{14}{11}$.
 - a. How are they alike?
 - b. How are they different?
8. **MATHEMATICAL REFLECTION** Why does moving the decimal point in the divisor and the dividend when dividing by a decimal work?

Metric Conversions

Measure This

ACTIVITY

2.8

SUGGESTED LEARNING STRATEGIES: Think/Pair/Share, Look for a Pattern, Quickwrite

My Notes

Clarissa and Ceteka want to do mental math with powers of 10. They know how to multiply mentally but want to learn how to divide. Help them investigate patterns when they multiply or divide by a power of 10.

They know that multiplication and division are inverse operations, so they want to look for patterns in both operations at the same time. They think this will help them with mental division.

1. Complete the chart.

Operation with powers of ten	Operation with standard numbers	Result
3.5×10^1	3.5×10	
45.2×10^2		
0.2758×10^3		
$98.7 \div 10^1$		
$36.5 \div 10^2$	$36.5 \div 100$	
$42.75 \div 10^3$		

2. What do you notice about the decimal point when you multiply by a power of 10?

3. Write a rule for multiplying any number by a power of 10.

4. What do you notice about the decimal point when you divide by a power of 10?

5. Write a rule for dividing any number by a power of 10.

WRITING MATH

Recall that we can write 100 and 1000 as powers of ten.

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

My Notes

CONNECT TO SCIENCE

Mass is the amount of matter that an object has.

WRITING MATH

Metric Units and Symbols

meter: m
kilometer: km
hectometer: hm
decameter: da or dk
decimeter: dm
centimeter: cm
millimeter: mm
liter: L
kiloliter: kL
milliliter: mL
gram: g
milligram: mg

SUGGESTED LEARNING STRATEGIES: Close Reading, Look for a Pattern, Guess and Check, Think/Pair/Share

TRY THESE A

Use the rules you developed to evaluate the following

a. 8.934×10^2

b. 16.25×10^3

c. $986.13 \div 10^2$

d. $1.485 \div 10^1$

Unlike our customary measurement system, the metric system is based on powers of 10, so converting from one measure to another is as easy as multiplying or dividing by 10, 100, or 1,000.

In the metric system, **meters** are used to measure length, **liters** are used to measure capacity, and **grams** are used to measure *mass*.

- The width of a fingernail is about 1 centimeter.
- Soda comes in 2 liter bottles.
- A paper clip has a mass of about 1 gram.

Prefixes are used to describe units that are smaller or larger than the base unit.

Thousands	Hundreds	Tens	Base Unit	Tenths	Hundredths	Thousandths
kilo	hecto	deca	meter liter gram	deci	centi	milli

Each unit of measure is ten times greater than the unit to its right.

Complete each conversion.

6. 1 kilogram = _____ gram(s)

7. 1 hectoliter = _____ liter(s)

8. 1 decameter = _____ meter(s)

9. 1 decigram = _____ gram(s)

10. 1 centiliter = _____ liter(s)

11. 1 millimeter = _____ meter(s)

Use the appropriate unit of measure to complete each sentence.

12. A pair of shoes has a mass of about 1 _____.

13. A new pencil is approximately 19 _____ long.

14. A glass of water contains about 0.47 _____ liquid.

SUGGESTED LEARNING STRATEGIES: Reading, Create Representations, Think/Pair/Share

Convert each measure.

15. Marvin's backpack weighs 4.75 kg. It weighs _____ grams.

16. A bottle of ketchup holds 275.3 mL. It holds _____ liters.

17. A 6K race is 6000 m long. The participants travel _____ millimeters to finish the race.

The sixth grade class decided to redecorate the reading room by putting a wallpaper border around the room. The top view of the room is in the shape of a quadrilateral, but not all of the walls have the same length.



Mr. Webster divided the class into four groups so that each group could measure a different wall. The measurements each group recorded are in the chart below.

Group	Length of wall	Length in meters
A	3.2 m	
B	365.76 cm	
C	4,358.64 mm	
D	402.3 cm	

Mr. Webster noticed that the groups used different units of measure. He told them that wallpaper border is sold by the meter and asked the groups to convert their measurements to meters.

18. Complete the chart by converting the measured widths to meters if necessary.

19. What is the total number of meters of wallpaper border that students will need to purchase?

20. The wallpaper border that students plan to use is sold in rolls that are 3 meters in length. How many rolls will the students need to purchase? Explain.

My Notes

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

1. Find each product or quotient.
 - a. 32.754×100
 - b. 0.4283×1000
 - c. $834.2 \div 100$
 - d. $1.982 \div 10$
2. Name an appropriate metric unit to measure:
 - a. the capacity of a medicine dropper
 - b. the mass of a television set
 - c. the distance across your classroom
3. Rewrite each sentence with the appropriate operation and power of 10.
 - a. To convert from milligrams to decigrams, you _____ by _____.
 - b. To convert from kilometers to meters, you _____ by _____.
 - c. To convert from deciliters to kiloliters, you _____ by _____.
4. A piece of paper weighs 5.2 grams. What is its weight in milligrams?
5. Find the area of the rectangle that has a width of 18 mm and a length of 32 mm in square centimeters.
6. List the measures in order from least to greatest:
3000 liters, 30 centiliters,
0.003 decaliters, 0.3 kiloliters
7. **MATHEMATICAL REFLECTION** Explain how converting between metric units is similar to and different from converting between customary units. Use examples in your explanation.

Order of Operations

A Fairly Ordered Operation

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Quickwrite

My Notes

Ayana and Zachary Wilson are excited about going to the Pace County Fair. General admission to the fair is \$8.00 per person. It covers visiting exhibits and some entertainment. Tickets for rides and games must be bought separately. Food and drinks are purchased at the concession stands. A ride ticket costs \$3.00.

1. Ayana loves to make lists of things to do to prepare for an activity. She made the following list for the morning of the fair.

To Do	Order
Take a shower	
Eat breakfast	
Put my clothes on	
Buy my tickets for the fair	
Put on my shoes	
Put on my socks	
Ride to the fair	
Get money out of piggy bank	

- a. Order the steps as you think Ayana will complete them.
 - b. Explain why the order of steps is important.
2. Ayana plans to go on 5 rides. She wrote the numerical expression $8 + 5 \times 3$ to represent the cost of her rides and admission to the fair.
 - a. What is the total cost of Ayana's admission to the fair and the rides she wishes to go on?
 - b. Do you think her expression represents this total cost? Explain.
 - c. Describe Ayana's expression using mathematical terms.

Order of Operations

A Fairly Ordered Operation

My Notes

SUGGESTED LEARNING STRATEGIES: Close Reading, Guess and Check, Quickwrite, Work Backward

3. Zachary intends on going on 8 rides in the morning and 5 rides in the afternoon. He wrote the expression $8 + 5 \times 3$ to represent the total cost of the rides he wishes to go on.
- What is the total cost of Zachary's rides?
 - Do you think his expression represents this total cost? Explain.
4. Is it a problem that both Ayana and Zachary used the same mathematical expression to represent two different costs? Explain.

Mathematicians have agreed that when evaluating an expression containing both addition and multiplication the operation of multiplication should be performed first.

5. Can Ayana use the expression $8 + 5 \times 3$ to represent the cost of her admission ticket and rides or can Zachary use it to represent the cost of his rides? Explain.

The day of the fair both Ayana and Zachary realized that they had not figured food into the cost of going to the fair.

6. Ayana has \$100 in her piggy bank. She took \$60 out to go to the fair. Then her dad gave her \$5 allowance. She does not need this \$5 for the fair so she puts it in her piggy bank. Ayana wrote the expression $100 - 60 + 5$ to represent the amount of money that is now left in her bank.
- What is the total amount left in Ayana's piggy bank?
 - Do you think her expression represents this total amount? Explain.

Order of Operations

A Fairly Ordered Operation

ACTIVITY 2.9

continued

SUGGESTED LEARNING STRATEGIES: Close Reading, Guess and Check, Work Backward, Quickwrite, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell

My Notes

7. Zachary has \$100 in his piggy bank. He took \$60 out for rides, food, and admission to the fair, and he took \$5 out for a souvenir. Zachary wrote the expression $100 - 60 + 5$ to represent the amount of money now left in his bank.

- a.** What is the total amount left in Zachary's piggy bank?
- b.** Do you think his expression represents this total amount? Explain.

Think about the order in which operations should be performed. When evaluating a numerical expression with addition and subtraction, the operations of addition and subtraction should be performed in the order in which they appear from left to right.

8. Does the expression $100 - 60 + 5$ represent the amount left in Ayana's bank or the amount left in Zachary's bank? Explain.

After that Zachary decided to take only \$60 to the fair.

Ayana and Zachary's mom decided they needed to take some snacks to the fair. She took a bag of 6 granola bars and divided the bars evenly into three sacks. She did the same thing with three more bags of 6 granola bars, sharing them evenly into the same three sacks. She then gave Ayana and Zachary each a sack.

- 9.** When Ayana asked Zachary how many granola bars were in each sack, he said the expression $6 \div 3 \times 4$ represented the number of granola bars.
 - a.** Ayana evaluated the expression and said the bag contained less than 1 whole granola bar. Explain how she arrived at this answer.
 - b.** How many granola bars were actually in each bag? Explain how Zachary derived his expression.

My Notes

ACADEMIC VOCABULARY

The **order of operations** is a set of rules for evaluating expressions with more than one operation. The order is:

- Do calculations inside parentheses first.
- Evaluate expressions with exponents.
- Multiply or divide from left to right.
- Add or subtract from left to right.

Tic-tack-two game card

8	1	6
3	5	7
4	9	2

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Guess and Check, Create Representations

Numerical expressions can contain the operations of addition, subtraction, multiplication, and division, so it is important to follow an **order of operations** to avoid confusion. The operations of multiplication and division are evaluated from left to right. The operations of addition and subtraction are also evaluated from left to right.

10. At the fair Ayana used one ticket to play Tic-Tack-Two. She was handed a Tic-Tack-Two game card and this score sheet.

To play, each person should fill in the spaces between the 2s with any operation sign: +, −, ×, or ÷ to equal the number at the end of the row. You can use an operation more than once in a row. When you get a number, put an X over that number on your Tic-Tack-Two card. The first player to get three in a row wins. An example, which is not a value on the game card, has been done for you.

Play this game with the members of your group. Remember to use the order of operations.

2	÷	2	+	2	÷	2	−	2	=	0
2		2		2		2		2	=	1
2		2		2		2		2	=	2
2		2		2		2		2	=	3
2		2		2		2		2	=	4
2		2		2		2		2	=	5
2		2		2		2		2	=	6
2		2		2		2		2	=	7
2		2		2		2		2	=	8
2		2		2		2		2	=	9

Order of Operations

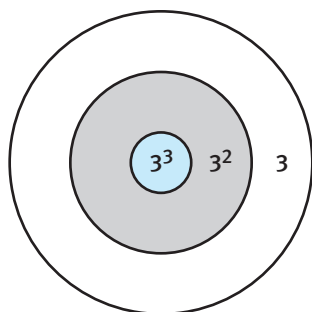
A Fairly Ordered Operation

ACTIVITY 2.9

continued

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Guess and Check, Work Backward, Quickwrite

- 11.** Zachary decided to join Ayana in a game of darts. They found the following target to be very unusual.



Each player gets to throw two darts at the target. The numbers on the target are the points a player gets for each dart that lands in that region of the target. Both of Zachary's darts landed in the gray region of the target.

- Ayana expressed his score as $3^2 + 3^2$. What did Ayana get for his Zachary's score?
- Zachary expressed his score as 2×3^2 . Explain how he would have to evaluate this expression so that he would get the same score as Ayana did?
- What do you think is the order that mathematicians have agreed upon when evaluating an expression with exponents and multiplication?

My Notes

Order of Operations

A Fairly Ordered Operation

My Notes

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Guess and Check, Work Backward

As they drove home from the fair, Zachary wondered if there was a way to change the order in which an expression is evaluated. Their father explained that parentheses can be placed around the numbers and operations to be performed first.

- 12.** Add parentheses to the expression $8 + 5 \times 3$ so that it can be evaluated in such a way as to give Zachary the cost of buying tickets for 8 rides in the morning and 5 rides in the afternoon at \$3.00 per ride.

Mathematicians have agreed that in evaluating an expression involving grouping symbols, such as parentheses or brackets, the operations inside the grouping symbols should be completed before completing those operations outside the grouping symbols.

- 13.** The Wilsons decide to stop at a restaurant on the way home from the fair. Part of the menu is shown below.

SNACKS	
Pizza	\$3.00
Salad	\$5.00
Juice	\$2.00
Apples	\$2.00
Yogurt	\$2.50
Homade Soup	\$4.00
VALUE MEALS	
Pizza, Yogurt, Juice	\$6.00
Hamburger, Soup, Juice	\$8.00

The Wilsons order one hamburger value meal, four apples, two juices, and two pizza value meals.

- Write an expression to find the total cost of the family's meal.
- Find the total cost of the family's meal. Show your work.

Order of Operations

A Fairly Ordered Operation

ACTIVITY 2.9

continued

SUGGESTED LEARNING STRATEGIES: Summarize/Paraphrase/Retell, Create Representations

- 14.** Since every numerical expression should have only one value, mathematicians have agreed upon an order of operations for evaluating expressions. Describe the steps involved in simplifying a numerical expression using order of operations.

When Ayana arrived home she wanted to figure out how much she and Zachary had left of the money they took to the fair.

- Both she and Zachary paid \$8 for an admission ticket.
- She went on a total of 5 rides and Zachary went on 8 rides in the morning and 5 rides in the afternoon at \$3 per ride.
- She played 2 games and he played 1 at \$3 per game.
- Zachary bought a \$5 souvenir.

The following expression represents the total amount of money she and Zachary have left of the \$60 that they each took with them to the fair.

$$60 \times 2 - [2 \times 8 + ((8 + 5) + 5) \times 3 + (1 + 2) \times 3 + 5]$$

Notice the parentheses within parentheses. These are called *nested parentheses*. You must always work the innermost parentheses first. Notice too that *brackets* have been used. Brackets can be used in place of parentheses, usually on the outside of parentheses.

My Notes

My Notes

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Guess and Check, Work Backward

- 15.** Ayana started to evaluate the expression. Finish her work.
Notice that parentheses around a single number can be dropped without changing any values.

$$60 \times 2 - [2 \times 8 + ((8 + 5) + 5) \times 3 + (1 + 2) \times 3 + 5]$$

$$60 \times 2 - [2 \times 8 + ((13) + 5) \times 3 + (1 + 2) \times 3 + 5]$$

$$60 \times 2 - [2 \times 8 + (18) \times 3 + (3) \times 3 + 5]$$

$$60 \times 2 - [2 \times 8 + 18 \times 3 + 3 \times 3 + 5]$$

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.

Show your work

Simplify using order of operations.

1. $18 - 12 \div 2 \times 3$
2. $9 \times 4 + 8 \div 2$
3. $2 \times (8 + 2) \div 4$
4. $(1 + 3)^2 \times 5$
5. $4 \times 42 \div (56 \div 8 \times 3)$
6. $4 \times 2^2 + 1$

Insert parentheses when needed to make the number sentence true.

7. $11 + 8 \times 4 = 43$
8. $5 \times 2 + 3 = 25$
9. $16 \times 4 - 4 \times 4 = 0$

Use parentheses and the symbols $+$, $-$, \times , and \div to make each number sentence true.

10. $7 \underline{\hspace{1cm}} 3 \underline{\hspace{1cm}} 1 \underline{\hspace{1cm}} 1 = 9$

11. $10 \underline{\hspace{1cm}} 5 \underline{\hspace{1cm}} 5 \underline{\hspace{1cm}} 2 = 10$

12. **MATHEMATICAL REFLECTION** Give some reasons why mathematicians had to agree on an order of operations to be used to simplify a numerical expression.

Mathematical Properties of Operations

It's the Law

ACTIVITY

2.10

SUGGESTED LEARNING STRATEGIES: Close Reading, Think Aloud, Marking the Text, Summarize/Paraphrase/Retell, Quickwrite

My Notes

Wendy and Peter and their parents are driving to Mexico to attend a dance festival. Last year their cousin Michael attended the festival where he saw their other cousins Betty and Patrik dance. He had written a letter to Wendy about the trip.

Wendy tried to tell Peter about the letter but had trouble remembering what was in it. She could not remember exactly how Michael explained things. She told Peter that Michael had either written that:

- A.** One peso can be exchanged for 0.949352 dollars.

or

One dollar can be exchanged for 0.949352 pesos.

- B.** Michael had one 200-peso note and two 20-peso coins.

or

Michael had two 20-peso coins and one 200-peso note.

- C.** Michael and Betty bought souvenirs for Patrik at the festival.

or

Michael bought souvenirs for Betty and Patrik at the festival.

- D.** Betty and Patrik along with Jane can dance the limbo.

or

Betty along with Patrik and Jane can dance the limbo.

- 1.** Describe how the sentences in each set differ. Do the sentences mean the same thing? Explain.

In mathematics, the **commutative property** of addition says that you can change the order of the numbers being added and have the same outcome. The **associative property** of addition says that when three or more numbers are being added, you can regroup and have the same outcome. The commutative and associative properties also apply to multiplication.

ACADEMIC VOCABULARY

A mathematical **property** is a rule or statement that is always true.

My Notes

MATH TERMS

A **numerical expression** is a collection of numbers and symbols, such as $+$, $-$, \times , and \div , and does not contain an equal sign.

SUGGESTED LEARNING STRATEGIES: Close Reading, Marking the Text, Create Representations, Look for a Pattern, Quickwrite

2. Look at addition.

- a. What does $3 + 5$ equal?
- b. What does $5 + 3$ equal?
- c. Is addition commutative? Explain.

3. Is subtraction commutative? Explain.

4. Is multiplication commutative? Explain.

5. Is division commutative? Explain.

6. When evaluating a **numerical expression**, you must first evaluate anything that is in parentheses.

- a. What is the value of $(3 + 5) + 1$?
- b. What is the value of $3 + (5 + 1)$?
- c. Is addition associative? Explain.

7. Is subtraction associative? Explain.

8. Is multiplication associative? Explain.

9. Is division associative? Explain.

Mathematical Properties of Operations

It's the Law

ACTIVITY 2.10

continued

SUGGESTED LEARNING STRATEGIES: Create Representations, Look for a Pattern, Guess and Check, Quickwrite

My Notes

TRY THESE A

- a. Rewrite $3 + 2$ using the commutative property.

Identify the property illustrated in each part.

b. $(2 \times 8) \times 9 = 2 \times (8 \times 9)$

c. $\left(\frac{1}{3} + \frac{1}{5}\right) + \left(\frac{1}{7} + 1\right) = \frac{1}{3} + \left(\frac{1}{5} + \frac{1}{7}\right) + 1$

d. $(3.6 + 5.7) = 5.7 + 3.6$

Give an example of each.

- e. Commutative Property of multiplication using fractions.

- f. Associative Property of addition using whole numbers.

10. In each box write a number that makes the number sentence true. What do you notice about the numbers in all the boxes?

$$3 + \square = 3$$

$$\square + 3 = 3$$

$$7 + \square = 7$$

$$\square + 7 = 7$$

11. Each number you found in Item 10 is called an additive identity. List as many numbers as you can that would be examples of additive identities. How many did you find?

12. Give three examples of applying the additive identity. Use a whole number, a fraction, and a decimal.

My Notes

SUGGESTED LEARNING STRATEGIES: Close Reading, Marking the Text, Create Representations, Look for a Pattern, Quickwrite

- 13.** Fill in each box with a number that makes the number sentence true. What do you notice about the numbers in all the boxes?

$$3 \times \square = 3$$

$$\square \times 3 = 3$$

$$7 \times \square = 7$$

$$\square \times 7 = 7$$

- 14.** Each number you found in Item 13 is called a multiplicative identity. List as many numbers as you can that would be examples of multiplicative identities. How many did you find?
- 15.** Explain why there is not an identity for subtraction.
- 16.** Explain why division does not have an identity.
- 17.** You used the Property of One to find equivalent fractions in Unit One. Now use the multiplicative identity to explain why the Property of One works.

SUGGESTED LEARNING STRATEGIES: Close Reading, Quickwrite

A set of numbers is **closed under an operation** if you can use that operation on any two members of the set, and the result of the operation is also a member of the set. For example, the set of *whole numbers* is not closed under subtraction because 7 and 9 are whole numbers, but $7 - 9 = -2$ and -2 is not a whole number.

18. Explain why each set is or is not closed under addition.

- a. natural numbers
- b. whole numbers
- c. integers
- d. even integers
- e. odd integers

19. Explain why each set is or is not closed under multiplication.

- a. natural numbers
- b. whole numbers
- c. even whole number
- d. odd whole numbers

My Notes

MATH TIP

The numbers 1, 2, 3, 4, and so on are called *natural numbers*.

The numbers 0, 1, 2, 3, 4, and so on are called *whole numbers*.

The set of **integers** consists of all of natural numbers, their opposites, and zero.

My Notes

SUGGESTED LEARNING STRATEGIES: Close Reading, Quickwrite

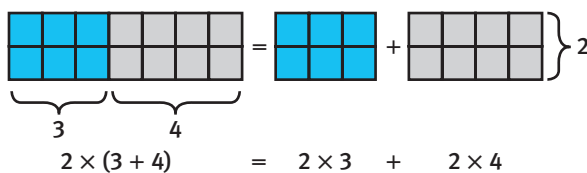
Drew and Seth were in charge of collecting the money for the class yearbook. They had collected the estimated cost of \$10 a book from each of the 16 girls and 14 boys in their class. The actual cost of the yearbook was \$8 a book.

20. To figure out the total amount of money due back to the class, Drew wrote the expression $(16 + 14) \times 2$. Seth wrote the expression $16 \times 2 + 14 \times 2$. Do they both represent the amount to be returned to the class? Explain.

Writing $(16 + 14) \times 2 = 16 \times 2 + 14 \times 2$ is an example of using the **Distributive Property**. Notice that the multiplication by 2 has been distributed to both the 16 and the 14.

An area model is a way to visualize how the Distributive Property works.

21. Study the area model and the equation written below it. Compare the rows and the columns and the total number of squares in the three rectangles. Then compare the two expressions on each side of the equation.



- a. How are they alike?

- b. How are they different?

MATH TIP

You can distribute a number on either side of the parentheses.

$$2 \times (3 + 4) = 2 \times 3 + 2 \times 4$$

$$(3 + 4) \times 2 = 3 \times 2 + 4 \times 2$$

SUGGESTED LEARNING STRATEGIES: Close Reading, Create Representations, Quickwrite, RAFT

My Notes

22. You can use the Distributive Property to simplify problems.

- Use parentheses to rewrite and evaluate $19 \times 25 + 19 \times 75$.
- Is the problem now easier to evaluate? Explain.

23. Drew and Seth are also selling greeting cards to raise money for the school band. They sold 21 boxes for \$2.50 per box. They need to find the total amount of money for their sales.

- Seth used the Distributive Property to write the problem this way:

$$21 \times 2.50$$

$$(20 + 1) \times 2.50$$

$$20 \times 2.50 + 1 \times 2.50$$

Finish simplifying this expression for Seth.

- Drew used the Distributive Property to write the problem this way:

$$21 \times 2.50$$

$$(10 + 10 + 1) \times 2.50$$

$$10 \times 2.50 + 10 \times 2.50 + 1 \times 2.50$$

Finish simplifying this expression for Drew.

- Did the different ways Seth and Drew used the Distributive Property give the same result? Explain.
- Whose method did you like better? Explain.

24. Drew noticed that they had counted incorrectly and that they sold only 19 boxes. To find the total amount of money they collected, Drew must multiply $\$2.50 \times 19$. Explain how he can use the Distributive Property with subtraction to do this.

MATH TIP

The distributive property can be very useful in simplifying a problem so that it can be solved using mental math.

ACADEMIC VOCABULARY

Using the Distributive Property to rewrite an expression like $3 \times 7 + 3 \times 23$ as $3 \times (7 + 23)$ is called **factoring**. You will use factoring as you begin to study algebra.

WRITING MATH

The product $3 \times (7 + 23)$ can be written as $3(7 + 23)$.

READING MATH

The expression $3(7 + 23)$ consists of the two *factors*, 3 and $(7 + 23)$. The factor $(7 + 23)$ consists of two *terms*, 7 and 23.

CONNECT TO ALGEBRA

In algebra, you will use the distributive property to simplify algebraic expressions. Examples:

$$\begin{aligned} n + n &= 1 \times n + 1 \times n \\ &= (1 + 1)n = 2n \end{aligned}$$

$$\begin{aligned} 3(n + 5) &= 3 \times n + 3 \times 5 \\ &= 3n + 15 \end{aligned}$$

ACTIVITY 2.10 Mathematical Properties of Operations*continued***It's the Law****My Notes**

Fiona: 6 teddy bears
3 times as many key chains
$\frac{1}{2}$ as many posters
20 times as many stamps
$\frac{1}{3}$ as many shells

John: 8 posters
the same number of shells
20 times as many stamps
4 times as many key chains
$\frac{1}{4}$ as many teddy bears

SUGGESTED LEARNING STRATEGIES: Close Reading, Quickwrite

Drew and Seth were talking about the calculations Drew did to find the amount of money they collected. They wondered if it is always best to use the Distributive Property when multiplying.

25. On a separate sheet of paper, write Drew and Seth a note. Tell them how to use the Distributive Property when multiplying. Use 1.36×20 and 1.36×12 as examples in your note to them.

26. Fiona and John collect things. They counted their collections and decided to express all the amounts in terms of one of the things. Their lists are shown to the left.

Write and evaluate expressions for:

- the number of things Fiona has.
- the number of stamps they both have.
- how many more key chains John has than Fiona.
- the number of things in all their collections

CHECK YOUR UNDERSTANDING

Write your answers on notebook paper.

Show your work.

Copy and complete each number sentence to make it true. State which mathematical property applies.

- $7 \times 3 = 3 \times \square$
- $11 = \square + 0$
- $6 + (\square + 4) = (6 + 8) + 4$
- $\square \times 10 = 10$
- Are fractions closed under addition? Explain.
- Simplify 310×498 using the Distributive Property.

- Use the Distributive Property to simplify $53 \times 4 + 53 \times 6$.
- Write an expression for "2 more than 3 times 4" using mathematical symbols. Describe your expression using mathematical terms.
- Why is the expression $3x$ equivalent to the expression $x + x + x$?
- MATHEMATICAL REFLECTION** Why are mathematical properties useful?

Order of Operations

THE COST OF AFTER-SCHOOL ACTIVITIES

Embedded Assessment 3

Use after Activity 2.10.

Write your answers on notebook paper. Show your work.

Twins Terry and Tony attend Riverdale Middle School. They are on a student council committee that is deciding what the ticket price will be for a school dance.

1. Terry and Tony know:

- the decorations for the gym will cost \$189.26
- the costs for security are \$52.50 per hour
- the dance will be 3 hours long
- the deejay charges \$50.98 plus \$23.50 per hour
- refreshments will cost \$2.25 per student
- the student council has raised \$349.49 to help pay for the dance
- 95 students will share the cost of the dance

a. Write an expression to find the cost of the security guard and the deejay that models the distributive property.

b. Evaluate the expression you wrote.

c. How much will the student council pay for refreshments?

d. Write an expression to find the total cost of the dance.

e. How much money will the student council need to collect from the sale of tickets to be sure they “break even”?

2. Write a note to the twins telling them what you think the ticket price for the dance should be. Use the information provided and your work in Question 1 to support your suggestion.

3. Tony and Terry had 50 balloons to use for decorations. They put 30 on the tables and 4 at both ends of the refreshment table. Their advisor thought they needed balloons at the entrance and brought 10 more. The expression $50 - 30 - 4 \times 2 + 10$ shows the number of balloons they have for the entrance. Tony thinks they will have 42 balloons for the entrance, but Terry says there will only be 22. Which twin found the correct number of balloons for the entrance? Explain how he did the calculation correctly.

4. Tell what property $3.5 \times (0.2 \times 1.1) = (3.5 \times 0.2) \times 1.1$ illustrates, and explain how applying the property makes it easier to use mental math to evaluate the expression $3.5 \times (0.2 \times 1.1)$.

5. Use the expressions $2.5 \div 0.2$ and $0.2 \div 2.5$ to explain why division is not commutative.

Order of Operations

THE COST OF AFTER-SCHOOL ACTIVITIES

	Exemplary	Proficient	Emerging
Math Knowledge # 1b, 1c, 4	The student: <ul style="list-style-type: none"> Evaluates the cost of the security guard and the deejay expression correctly (1b) Finds the cost of refreshments (1c) Determines the property illustrated (4) 	The student correctly completes two of the three items.	The student provides a complete and correct response to at least one of the items.
Problem Solving # 1e, 3	The student: <ul style="list-style-type: none"> Finds the amount needed to “break even” (1e) Determines with supporting work whether Terry or Tony is correct (3) 	The student attempts both items, but only one is correct and complete.	The student attempts both items, but both are incorrect or incomplete.
Representation # 1a, 1d	The student writes correct expressions to find: <ul style="list-style-type: none"> The cost of the security guard and deejay (1a) The total cost of the dance (1d) 	The student provides two expressions, but only one is correct and complete.	The student provides at least one expression, but it may be incomplete or incorrect.
Communication # 2, 3, 4, 5	The student: <ul style="list-style-type: none"> Writes a note with supporting information about the proposed ticket price (2) Gives a correct explanation whether Tony or Terry is correct (3) Explains how using the property makes mental math easier (4) Explains why division is not commutative (5) 	The student attempts all four items, but only three are correct and complete.	The student attempts three of the four items, but only one is correct and complete.

ACTIVITY 2.1

- Myron spent $3\frac{1}{6}$ hours playing in the lake on Saturday, and $2\frac{1}{2}$ hours on Sunday. Estimate the total number of hours Myron spent playing in the lake this weekend.
- Find the error in the following student's work.

$$\frac{3}{7} + \frac{2}{7} = \frac{5}{14}$$
- Simplify the following expressions. Write your answers in simplest form.
 - $\frac{7}{15} + \frac{2}{15} + \frac{6}{15}$
 - $\frac{8}{9} + \frac{3}{4}$
 - $\frac{21}{22} - \frac{5}{22} - \frac{4}{22}$
 - $\frac{7}{12} - \frac{1}{3}$
- There is $\frac{9}{10}$ of a pizza left over. How much pizza can Jake eat if he needs to leave $\frac{3}{10}$ of the pizza for his brother?
- On Tuesday, Josh runs $\frac{3}{4}$ of a mile and he runs $\frac{3}{5}$ of a mile on Thursday. How much further does he run on Tuesday than on Thursday?

ACTIVITY 2.2

- Compute and estimate to check.
 - $7\frac{3}{5} + 4\frac{1}{5}$
 - $6\frac{5}{8} + 1\frac{7}{8}$
 - $12\frac{7}{12} + 14\frac{1}{4}$
 - $9\frac{5}{6} + 11\frac{1}{4}$
 - $1\frac{2}{3} + 4\frac{1}{4} + 2\frac{5}{6}$
- A rectangular garden has a length of $10\frac{3}{4}$ ft, and a width of $5\frac{2}{3}$ ft. Find the perimeter of the garden.
- The table below shows the number of hours Karen worked this week.

Mon	Tue	Wed	Thu	Fri
$8\frac{1}{2}$	$7\frac{7}{10}$	$8\frac{3}{20}$	$9\frac{1}{2}$	8

Find the total number of hours she worked this week.

- Compute and estimate to check.
 - $6\frac{14}{15} - 2\frac{7}{15}$
 - $5\frac{5}{8} - 4\frac{1}{4}$
 - $32\frac{5}{7} - 22\frac{1}{5}$
 - $2\frac{5}{11} - \frac{6}{7}$
 - $11 - 5\frac{3}{5}$
 - $9\frac{1}{4} - 8\frac{2}{3}$

- 10.** A rope swing hangs above $9\frac{3}{4}$ ft of water. During a drought, the water level drops by $3\frac{7}{12}$ ft. If $6\frac{1}{2}$ ft of water is needed in order to continue using the rope swing, is it still safe? Use math to explain how you know.
- 11.** Jan says that $1\frac{1}{4}$ rounds to 1, while Joe says it rounds to $1\frac{1}{2}$. Explain how they could both be correct.

ACTIVITY 2.3**Multiply.**

- 12.** $12 \times \frac{1}{2}$
- 13.** $8 \times \frac{1}{10}$
- 14.** $\frac{1}{5} \times 55$
- 15.** $10 \times \frac{3}{4}$
- 16.** $2 \times 2\frac{5}{6}$
- 17.** Janice has 8 yards of fabric. A school banner requires 3 yards of fabric. Write and evaluate a numerical expression to find the number of banners she can make from 8 yards.
- 18.** Roger has 18 feet of lumber. He is making $2\frac{1}{2}$ foot shelves. Write and evaluate a numerical expression to find the number of shelves he can make from 18 feet of lumber.

ACTIVITY 2.4**Divide.**

- 19.** $8 \div \frac{1}{6}$
- 20.** $12 \div \frac{2}{3}$
- 21.** $6 \div \frac{4}{5}$
- 22.** $9 \div 2\frac{1}{2}$
- 23.** Bart Taylor has 15 yards of fabric. How many suits can he make from this fabric if he needs $3\frac{3}{4}$ yards for each suit? How much fabric will be left over, if any?
- 24.** Sue Cooke has a 5 pound bag of flour. It says that there are $3\frac{1}{2}$ cups of flour per pound. How many batches of bread that use $2\frac{1}{2}$ cups of flour per batch can Sue make with the 5 pounds of flour?
- 25.** $7\frac{8}{9} \div \frac{2}{3}$
- 26.** $8\frac{5}{8} \div 2\frac{3}{8}$

ACTIVITY 2.5

27. How many pounds are there in $2\frac{1}{3}$ tons?

28. How many feet are there in $26\frac{1}{2}$ miles?

29. Estimate first and then multiply $5\frac{3}{5} \times 5\frac{1}{4}$.

Check your answer.

30. Multiply: $2\frac{5}{6} \times 2\frac{2}{3}$

31. How many feet are there in $47\frac{1}{4}$ inches?

32. How many quarts are there in $23\frac{1}{2}$ cups?

33. Estimate first and then divide $5\frac{5}{6} \div 2\frac{1}{12}$.

Check your answer.

34. Divide: $24\frac{1}{2} \div 4\frac{2}{3}$

35. Joe has a 32-ounce bottle of liquid fertilizer for his house plants. He adds $3\frac{1}{2}$ ounces to 2 quarts of water to feed his plants. How many times can he feed his plants with this bottle of fertilizer?

ACTIVITY 2.6

36. Mark bought three CD's at the store that cost \$12.99, \$15.25, and \$9.98. How much did he spend?

37. Find the product of 42 and 2.5.

38. The cost for 6 ft of fencing is \$54.98. What is the cost for 72 ft of fencing? Estimate to check the reasonableness of your solution.

39. The cost of a ticket to the amusement park is \$27.95. Estimate the amount of money that the park will earn from ticket sales if 12,000 people attend the park.

40. Find the area of a flag which is 10.64 ft long and 5.6 ft wide.

41. Marc makes \$2.50 an hour babysitting. How much will he earn if he babysits for 12.5 hours?

ACTIVITY 2.7

42. Estimate the quotient using compatible numbers, and then find the quotient.

a. $3 \overline{)128.22}$

b. $17 \overline{)36.55}$

43. Iman makes bracelets using colorful beads. She can buy 12 beads for \$2.04 or 17 beads for \$3.57. Which deal gives her the lowest cost for one bead? Explain.

44. Martinez is building some bookshelves. He has a piece of wood that is 12 feet long. How many shelves can he make if each one is to be 2.5 feet long? Explain.

Find the quotient.

45. $3.2 \overline{)17.472}$

46. $0.18 \overline{)0.06498}$

Find the quotient to the nearest tenth.

47. $1.2 \overline{)5}$

48. $0.35 \overline{)7.6}$

Write the quotient as a repeating decimal.

49. $3 \overline{)7}$

50. Divide 2, 3, 4, and 5 each by 9. What pattern do you see? Predict what the quotients for 6, 7, and 8 each divided by 9 will be. Then divide to verify.

ACTIVITY 2.8

51. Find each product.

a. 5.82×1000

b. 38.125×10

52. Find each quotient.

a. $375.2 \div 100$

b. $4.2 \div 1000$

53. Is the mass of a paper clip usually measured in grams or kilograms?

54. Is the capacity of a pitcher of water measured in deciliters or liters?

55. Convert 0.42 kilometers to meters.

56. Convert 3.872 milliliters to liters.

57. List three items that might be measured using kilograms.

58. List three items that might be measured using meters.

ACTIVITY 2.9

Write the number that makes the number sentence true. Then state which mathematical property you used to complete each statement.

59. $1.2 + \square = 7 + 1.2$

60. $26 + \square = 26$

61. $(4 + 11) + 1 = \square + (11 + 1)$

62. $\square \times 26 = 26$

63. Simplify 108×210 using the distributive property.

64. Simplify $19 \times 2 + 19 \times 8$ using the distributive property.

ACTIVITY 2.10

Simplify using order of operations.

65. $6 \div 3 - 2 + 3$

66. $7 + 3 \times 2 \times 5$

67. $6^2 \div 6 \div 3$

68. $18 \div 2 \times 3^2$

69. $32 \div (2 + 6) \times 5 + 5$

Insert parentheses when necessary to make each number sentence true.

70. $12 + 3 \times 7 = 105$

71. $17 \times 2 + 17 \times 8 = 170$

Use parentheses and any of the symbols $+$, $-$, \times , and \div to make each number sentence true.

72. $8 _ 3 _ 6 _ 5 _ 7 = 4$

73. $3 _ 3 _ 3 _ 3 _ 3 = 3$

74. $1 _ 3 _ 5 _ 3 _ 1 = 5$

Reflection

An important aspect of growing as a learner is to take the time to reflect on your learning. It is important to think about where you started, what you have accomplished, what helped you learn, and how you will apply your new knowledge in the future. Use notebook paper to record your thinking on the following topics and to identify evidence of your learning.

Essential Questions

- Review the mathematical concepts and your work in this unit before you write thoughtful responses to the questions below. Support your responses with specific examples from concepts and activities in the unit.
 - How are operations with fractions similar to and different from operations with whole numbers?
 - What kinds of numbers do you know about and how do mathematical properties apply to operations with different kinds of numbers?

Academic Vocabulary

- Look at the following academic vocabulary words:

- equation
- expression
- factoring
- integer
- order of operations
- property
- reciprocal

Choose three words and explain your understanding of each word and why each is important in your study of math.

Self-Evaluation

- Look through the activities and Embedded Assessments in this unit. Use a table similar to the one below to list three major concepts in this unit and to rate your understanding of each.

Unit Concepts	Is Your Understanding Strong (S) or Weak (W)?
Concept 1	
Concept 2	
Concept 3	

- What will you do to address each weakness?
 - What strategies or class activities were particularly helpful in learning the concepts you identified as strengths? Give examples to explain.
- How do the concepts you learned in this unit relate to other math concepts and to the use of mathematics in the real world?

1. Which property shows that the two expressions are equivalent? 1. (F) (G) (H) (I)
 $7 + (3 + 5) = (7 + 3) + 5$

F. Additive Identity Property

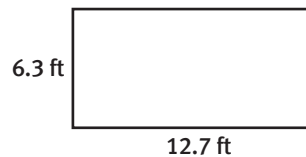
G. Commutative Property

H. Associative Property

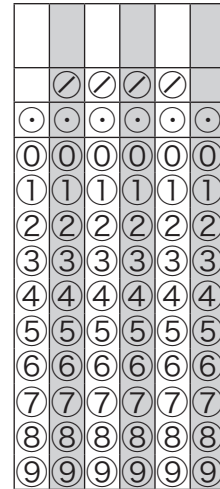
I. Multiplicative Identity Property



2. The carpet shown below is heavily soiled. Jason needs to find its area in order to decide how much carpet cleaner he needs to buy. What is the area of the carpet in square feet to the **nearest hundredth**?



2.



Read
Solve
Explain

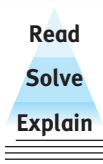
3. Pete has four pieces of oak framing that are 3 feet, 6 inches long. He wants to make two picture frames that are 24 inches by 18 inches. He has to use a single piece of framing for each side.

Part A: How many feet of oak framing does Pete have altogether? Explain the process used to find the answer.

Solve and Explain

Part B: Does Pete have enough oak to make two frames? Explain your answer.

Solve and Explain



4. In 15 weeks, Amber will be traveling to Europe with her parents during summer vacation. She wants to have 300 Euros, or 300€, to spend during the trip. She looked up the current exchange rate and found that $1\text{€} = \$1.35$. Her allowance is \$25 a week, but she must use part of it to pay for her lunches. She earns \$5 an hour babysitting from 9 to 3 every Saturday.

Part A: What is the dollar equivalent of 300€? Explain in your own words how you found your answer.

Part B: Make a plan for saving equal amounts each week that Amber can use for the next 15 weeks to be sure that she will have enough dollars to exchange for at least 300€ just before she and her family leave for Europe. Assume that the exchange rate will not change in the next 15 weeks.

Solve and Explain

Part C: Suppose that after six weeks of following the plan, Amber decides to use the money she has saved to buy a camera. She now needs to start again and she wants to save enough to exchange for 350€. Make a new plan for Amber.

Solve and Explain
