Student Handbook
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Dear Student,

You have already had a lot of experience with counting, but have you ever thought about why it is silly to count like this?

In this chapter, you will use your experience with counting to investigate topics, such as number lines.

You can use your counting skills to build your skills using operations, such as addition and subtraction.

Mathematically yours,
The authors of Think Math!
Animals come in all shapes and sizes. Here are some of the BIGGEST animals in the world. Are any of them your favorite animal?

**F A C T - A C T I V I T Y 1**

Use the animal information for Problems 1–4.

1. One blue whale is 10 feet shorter than the longest blue whale. How long is it?
2. The largest elephant can be 13 feet tall at shoulder height. How much shorter is it than the tallest giraffe?
3. One young elephant is 5 feet tall at its shoulder. How many feet must it grow to be as tall as an ostrich?
4. Draw a number line like the one below and mark the height of an ostrich and a giraffe on your number line.
A savannah is one of the landforms found in Africa. It is a dry and windy grassland with small plants and few trees. Giraffes are the tallest animal in the savannah. An adult giraffe can weigh as much as 3,000 pounds, and grow as tall as 18 feet.

For 1–4 use the number line and the animal facts to help complete the number sentences and find the answers.

1. Owls range from 5 to 28 inches tall. What is the difference in inches between the shortest and tallest owls? $28 - 5 = \_\_\_$

2. How much shorter is a 26-foot python than the longest python? $\_\_\_ - 26 = \_\_\_$

3. Find the difference in length between the longest fish and the longest python. $\_\_\_ \_\_ = \_\_\_\_$

4. Would the tallest ostrich fit through your classroom door without bending its neck? Use a yardstick (3 feet long) to find out.
   - Is the tallest ostrich taller or shorter than your classroom door?
   - Explain how skip counting by 3s helped you.

CHAPTER PROJECT

Use the library or other sources to find and choose a marine mammal, a land mammal, a snake, a fish, and a bird. Write the name and length or height of each of your animals. You might also want to draw a picture of your animals. Then write number sentences that compare each of your animals to the longest or tallest animal of the same type on page 2.

ALMANAC

A giraffe's tongue is 18 to 20 inches long and blue-black. Its feet are as large as a dinner plate!
Strategies for Counting

Find the number of pretzels in each group. Look for shortcuts that can help you.

Which groups have the same number of pretzels?
Introducing Addition Puzzles

In an addition puzzle like the one shown below, the sum of the objects in two touching boxes is written in the circle between them.

\[
\begin{array}{c}
\text{7} & \text{6} & \text{4} & \text{3} \\
\text{3} + 4 &= 7 & \text{2} + 1 &= 3
\end{array}
\quad
\begin{array}{c}
\text{6} & \text{4} & \text{3} & \\
\text{4} + 2 &= 6 & \text{3} + 1 &= 4
\end{array}
\]

In an addition puzzle like the one shown below, the sum of the numbers in two touching boxes is written in the circle between them.

\[
\begin{array}{c}
\text{1} & \text{1} & \text{0} & \text{4} & \text{5} & \text{3} \text{ 8} \text{ 5} \\
\text{1} + 0 &= 1 & \text{3} + 5 &= 8
\end{array}
\quad
\begin{array}{c}
\text{1} & \text{1} & \text{0} & \text{4} & \text{5} & \text{3} \text{ 8} \text{ 5} \\
\text{1} + 3 &= 4 & \text{0} + 5 &= 5
\end{array}
\]

✔ Check for Understanding

Find the missing sums.

1

\[
\begin{array}{c}
\text{1} & \text{4} & \text{3} & \text{5} \\
\text{1} + & \text{4} & \text{3} + & \text{5}
\end{array}
\]

2

\[
\begin{array}{c}
\text{3} & \text{4} & \text{5} & \text{1} \\
\text{3} + & \text{4} & \text{5} + & \text{1}
\end{array}
\]
How does the position of the number 6 make each number line different? Find the missing number for each tag.
**Using a Number Line to Add and Subtract**

You can use a number line to add and subtract.

1. **Addition Example:**
   - Problem: \(25 + 7 = \) [ ]
   - Solution:
     - Start at 25.
     - Jump forward 7 spaces.
     - Land on 32.
     - So, \(25 + 7 = 32\).

2. **Subtraction Example:**
   - Problem: \(40 - 6 = \) [ ]
   - Solution:
     - Start at 40.
     - Jump backward 6 spaces.
     - Land on 34.
     - So, \(40 - 6 = 34\).

You can use a number line to find a missing number.

1. **Addition Example:**
   - Problem: \(16 + \) [ ] \(= 24\)
   - Solution:
     - Start at 16.
     - Jump forward and land on 24.
     - Find the number of spaces you jumped.
     - So, \(16 + 8 = 24\).

2. **Subtraction Example:**
   - Problem: \(34 - \) [ ] \(= 29\)
   - Solution:
     - Start at 34.
     - Jump backward and land on 29.
     - Find the number of spaces you jumped.
     - So, \(34 - 5 = 29\).

**Check for Understanding**

Use the number line to complete the number sentence.

1. \(33 + 8 = \) [ ]
2. \(46 - 9 = \) [ ]
3. \(41 + \) [ ] \(= 50\)
4. \(50 - \) [ ] \(= 44\)
Think about patterns for the marked numbers.

1 Look at the numbers in order that are circled blue. If the pattern continues, what number would be circled next?

2 If the pattern continues, what would be the next number with a green X?

3 If the pattern continues, what would be the next number with both a blue circle and a green X?
Number sentences contain numbers, operation signs, and an equal sign.

Some number sentences are true.
Examples:
4 + 5 = 9
15 − 8 = 7

Some number sentences are false.
Examples:
2 + 3 = 8
13 − 5 = 10

Complete the number sentence.

Paula has 14 coins in her right pocket and 6 coins in her left pocket. How many more coins does Paula have in her right pocket than in her left pocket?

Which operation sign will make the sentence true?

14 ○ 6 = 8

Try +. 14 + 6 = 8 False.

Try −. 14 − 6 = 8 True.

So, the correct operation sign is −.

✓ Check for Understanding

Write + or − to complete the number sentence.

1 3 + 5 = 8
2 7 + 4 = 3
3 12 + 8 = 4
4 9 + 8 = 17
5 10 + 5 = 15
6 18 + 9 = 9

7 Write a true addition sentence.

8 Write a true subtraction sentence.
Jenny picked 6 flowers. Then she picked 7 more. Hector has 8 flowers. How many more flowers will Hector need to have the same number of flowers as Jenny?

**Strategy:** Act It Out

**Read to Understand**

What do you know from reading the problem?

Jenny picked 6 flowers and 7 flowers. Hector has 8 flowers.

**Plan**

How can you solve the problem?

You can use counters to act out the problem.

**Solve**

How can you act it out?

Place 6 counters in a group, and then place 7 more counters in the same group. Place 8 counters in another group. Compare the two groups.

There are 5 more counters in the first group than in second group. So, Hector will need 5 more flowers to have the same number as Jenny.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Use the strategy **act it out** to solve.

1. Andre is arranging 6 shells in 2 display boxes. How many ways can Andre separate the shells into 2 boxes?

2. There are 6 children in a group. Each child has 4 crayons. How many crayons are there in all?

**Mixed Strategy Practice**

Use any strategy to solve. Explain.

3. The sum of two numbers is 20. Their difference is 4. What are the numbers?

4. Mr. Perez wrote the numbers 86, 81, 76, 71, and 66 on the board. What are the next two numbers in his pattern?

5. Lenny has 3 blue marbles, 4 red marbles, and 1 green marble in his bag. What fractional part of his bag of marbles is red?

6. Sasha has 5 stuffed dogs, 7 stuffed cats, and 3 stuffed bears. She gives 8 of the stuffed animals to her baby sister. How many stuffed animals does Sasha have left?

7. George’s math group is skip-counting by fours. Each person says one number. They start with 12 and end with 36. How many people are in George’s group?

8. When Megan planted the rose bush in her garden, it was 8 inches tall. Now it is 21 inches tall. How many inches has the rose bush grown?
Chapter 1  Vocabulary

Choose the best term for each sentence. Use Word List A.

1. A number is made up of at least one ___.
2. The number 3,481 has 8 ___.
3. A(n) ____ has four related number sentences.
4. The operation sign is “–” for a(n) ___.
5. The size of a jump on a number line is the number of ____.
6. To subtract 8 – 5 on a number line, start at 8 and count 5 spaces ____.
7. You can use a number line to ____ by twos, threes, or fives.

Complete each analogy. Use Word List B.

8. Hundreds is to thousands as ____ is to tens.
9. Subtraction sentence is to backward as ____ is to forward.

Talk Math

Talk with a partner about what you have learned about operations. Use the vocabulary terms number sentence, sum, and operation sign.

10. You are given one addition sentence. How can you find the other number sentences in the fact family?
11. How can you use a number line to add?
12. How can you use a number line to subtract?
What’s in a Word?

**SUM** The word *sum* sounds just like the word *some*. Both words describe amounts. However, *sum* is an exact amount, but *some* is not. The sentence, “Ken buys *some* juice,” could mean that Ken buys a glass of juice or a gallon of juice. When you need to know the *sum* of two or more numbers, you want an exact number. For example, a banker needs to know exact *sums* of money rather than *some* amount of money.
Number Line Grab

**Game Purpose**
To practice labeling number lines, skip-counting, and adding one-digit numbers

**Materials**
- 3 number cubes (numbered 1–6)
- 2 different color markers, pencils, or crayons
- Activity Master 10: *Number Line Grab*

**How To Play the Game**

1. Work with a partner. Complete the number lines on Activity Master 10.

2. Choose a marker. Toss one of the number cubes. The player with the larger number goes first.

3. Toss all three number cubes. Choose a number to circle on any number line from these 3 choices:
   - a number that matches one of the numbers tossed.
   - a number that is the sum of two of the tossed numbers.
   - the number that is the sum of all three tossed numbers.

   **Example:** If you toss these numbers: 1 \ 3 \ 4
   - Possible numbers to circle: 1, 3, 5, 4 (1 + 3), 6 (1 + 5), 8 (3 + 5), or 9 (1 + 3 + 5)

4. Take turns tossing the number cubes and circling a number that is not already circled on any number line. If there is no number to circle, you lose a turn.

5. The first player to circle 12 numbers is the winner.
**Game Purpose**
To practice addition and subtraction

**Materials**
- 2 different color markers, pencils, or crayons
- paper bag
- Activity Master 11: *Missing Operation Signs*
- Activity Master 12: *Missing Operation Signs*

**How To Play The Game**

1. Play with a partner. Cut out the cards from Activity Master 11. Mix them up, and choose 20. Put those cards inside a paper bag.

2. Choose a marker. Decide who will play first.

3. Without looking, take a card from the bag.
   - Find a sentence on Activity Master 12 that is missing the operation sign on your card.
   - Write the operation sign in the sentence.
   - If you cannot find a sentence for your card, you lose a turn.
   - Set aside the operation card—do not put it back in the bag.

4. Take turns taking cards from the bag and writing the operation signs in the sentences.

5. Use all the cards if you can. The game ends when there are no cards left in the bag.

6. The winner is the player who has filled in more sentences.
Robby and Ricky Rabbit like to play a jumping game on the number line. They start each game at 0 and do not go above 20.

For each game, tell how many times Robby and Ricky will land on the same number. Then write all the numbers on which they will both land.

**Game 1** Robby makes jumps of 3 spaces. Ricky makes jumps of 5 spaces.

**Game 2** Robby makes jumps of 2 spaces. Ricky makes jumps of 3 spaces.

**Game 3** Robby makes jumps of 3 spaces. Ricky makes jumps of 6 spaces.

**Game 4** Robby makes jumps of 2 spaces. Ricky makes jumps of 6 spaces.

**Game 5** Robby makes jumps of 6 spaces. Ricky makes jumps of 10 spaces.

Sometimes their sister Randy Rabbit plays the jumping game with them.

**Game 6** Randy makes jumps of 2 spaces. Robby makes jumps of 3 spaces. Ricky makes jumps of 4 spaces. Will all three rabbits ever land on the same number? If so, tell the number of times and the landing numbers.
Dear Student,

Do you know what situations use multiplication instead of addition? Here are some examples:

Imagine a rectangle made of dots. There are four rows of dots and three dots in each row. How many dots in all?

Imagine a tiny town. It has four streets that run north-south and three streets that run east-west. Every north-south street crosses every east-west street. How many intersections are there?

Imagine that you work in a sandwich shop. There are four kinds of sandwich fillings. There are three kinds of bread. How many “one filling-one kind of bread sandwiches” can you make?

In this chapter, you will see different ways to picture and think about multiplication as you start to learn multiplication facts.

Mathematically yours,
The authors of *Think Math!*
There are three different types of rocks: igneous, sedimentary, and metamorphic. Suppose you collect rocks and have an equal number of igneous, sedimentary, and metamorphic rocks in your collection.

Use models to help you with the following problems.

1. Suppose you have 3 rocks of each type. How many rocks do you have in your collection?
2. Suppose you have 4 rocks of each type. How many rocks do you have in your collection?
3. Suppose you have 24 rocks in all. Show how you might arrange the rocks so that each row has the same number of rocks. Show four different arrays.

Ayers Rock in Australia
Rocks can be grouped into many different classifications including size, shape, color, and texture (how it feels). You decide to group your rocks by their color and texture.

1. You have white, brown, and black rocks. You have rocks in 5 different textures: fine, intermediate, coarse, glassy, and frothy. Make a list to show all possible combinations of color and texture for your collection of rocks.

2. Write a multiplication sentence that shows the total number of possible combinations of colors and textures.

### Chapter Project

**Materials:** grid paper for each student

Plan a display of 2 rock collections. One has 40 igneous rocks. The other has 60 sedimentary rocks.

- Use grid paper to show 3 possible ways to display the igneous rocks so that the same number of rocks are in each row.
- Write a multiplication sentence to represent each igneous rock display.
- Use grid paper to show 3 possible ways to display the sedimentary rocks so that the same number of rocks are in each row.
- Write a multiplication sentence to represent each sedimentary rock display.
- Use a $10 \times 10$ array. Show how you might arrange 40 igneous rocks and 60 sedimentary rocks together in one display.

### ALMANAC Fact

Ayers Rock is one of the largest rocks in the world. It is located in central Australia, where the native (Aboriginal) people call it Uluru. It is more than 986 feet high and 5 miles around.

<table>
<thead>
<tr>
<th>Colors</th>
<th>Textures</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Fine</td>
</tr>
<tr>
<td>Brown</td>
<td>Intermediate</td>
</tr>
<tr>
<td>Black</td>
<td>Coarse</td>
</tr>
<tr>
<td></td>
<td>Glassy</td>
</tr>
<tr>
<td></td>
<td>Frothy</td>
</tr>
</tbody>
</table>
EXPLORE
Exploring Lines and Intersections

1. The map shows all the streets of a tiny town.
   A. How many streets are in this town?
   B. How many streets are shown as horizontal?
   C. How many streets are vertical?
   D. How many intersections are there?

2. Draw a new map with 6 streets.
   All streets must be horizontal or vertical.
   A. How many horizontal streets are there?
   B. How many vertical streets are there?
   C. How many intersections are there?

3. Draw a map with 4 streets for each problem below.
   Write the number intersections.
   A. 0 vertical streets
   B. 1 vertical street
   C. 2 vertical streets
   D. 3 vertical streets
   E. 4 vertical streets
You can make a drawing to show a vertical line crossing a horizontal line. The point where the lines cross is called an intersection.

**Examples** Find the number of intersections

- 2 vertical lines crossing 1 horizontal line
  
  - 2 intersections

- 2 vertical lines crossing 2 horizontal lines
  
  - 4 intersections

- 0 vertical lines crossing 4 horizontal lines
  
  - 0 intersections

**Check for Understanding**

On a separate sheet of paper make a drawing for each problem. Write the number of intersections or the number of lines.

1. 3 vertical lines crossing 1 horizontal line
   - intersections

2. 3 vertical lines crossing 3 horizontal lines
   - intersections

3. 5 vertical lines crossing 2 horizontal lines
   - intersections

4. 6 vertical lines crossing 0 horizontal lines
   - intersections

5. 3 vertical lines crossing 15 horizontal lines
   - intersections

6. vertical lines crossing 12 intersections
EXPLORE
Exploring Hidden Intersections

1 All the intersections are covered on this map.
   A How many horizontal streets are there?
   B How many vertical streets are there?
   C How many intersections are there?

How many intersections are hidden under the card?

2

3

4

5

6 How many intersections are hidden under this card?
At the sandwich shop, there are 4 sandwich fillings to choose from. There are 3 kinds of bread to choose from.

1. Choose one filling and one kind of bread. How many different sandwiches can you make?

2. What sandwich names are missing from the labeled intersections?

3. The sandwich shop ran out of turkey and rye bread. How many different sandwiches can you make now?
You can use diagrams to show all the ways you can pair items from two different groups. This diagram shows the pairing of ice cream flavors with topping flavors.

**Step 1** Show the 4 ice cream flavors. Draw a line from each.

**Step 2** Show the 2 topping flavors. Draw a line from each.

**Step 3** Show the flavors that meet at the intersections. SF means strawberry ice cream with fudge topping.

The lines for the ice cream flavors and the lines for the topping flavors intersect at 8 points. So, there are 8 pairings.

**Check for Understanding**

Make a drawing to show the number of pairings.

1. How many pairings of 1 kind of bread and 1 sandwich filling can you make?
   - **Bread:** white, wheat, rye
   - **Fillings:** tuna, cheese, peanut butter

2. How many pairings of 1 snack and 1 drink can you make?
   - **Snacks:** crackers, muffins, pretzels, fruit, vegetables
   - **Drinks:** juice, water, milk
You can make an organized list to show all the combinations you can make from the choices in two different groups.

This list shows all the possible combinations for one sport and one time.

- Soccer in the morning
- Soccer in the afternoon
- Baseball in the morning
- Baseball in the afternoon
- Hockey in the morning
- Hockey in the afternoon
- Swimming in the morning
- Swimming in the afternoon

To check your work, you can multiply to find the total number of combinations.

\[
\begin{array}{c}
\text{Number of different sports} \\
4
\end{array} \times \begin{array}{c}
\text{Number of different times} \\
2
\end{array} = \begin{array}{c}
\text{Total number of combinations} \\
8
\end{array}
\]

The list shows 8 combinations. The multiplication sentence also shows that there should be 8 combinations possible.

**Check for Understanding**

Make a list of all the combinations. Then write a multiplication sentence to check.

1. **Clothes Choices**
   - Pants: black, tan, green
   - Shirts: red, white

2. **Music Lesson Choices**
   - Instrument: piano, guitar, drums, violin
   - Days: Mon., Tue., Thu., Fri.
# Writing Multiplication Sentences

You can write multiplication sentences to describe rectangular arrays.

## A
There are 4 rows and 3 columns.
\[
4 \times 3 = 12
\]
- rows
- columns
- dots

**or**
\[
3 \times 4 = 12
\]
- columns
- rows
- dots

## B
There is 1 row and 9 columns.
\[
1 \times 9 = 9
\]
- row
- columns
- dots

**or**
\[
9 \times 1 = 9
\]
- columns
- row
- dots

## C
There are 2 rows and 5 columns.
\[
2 \times 5 = 10
\]
- rows
- columns
- tiles

**or**
\[
5 \times 2 = 10
\]
- columns
- rows
- tiles

## D
There are 7 rows and 4 columns.
\[
7 \times 4 = 28
\]
- rows
- columns
- tiles

**or**
\[
4 \times 7 = 28
\]
- columns
- rows
- dots

---

## Check for Understanding

Write a multiplication sentence to describe each array.

1. ![Array 1](image1)
2. ![Array 2](image2)
3. ![Array 3](image3)
Think about maps that have 3 streets.

A Draw all the 3-street maps.

B For each 3-street map, you can write an addition sentence like this:

\[ \text{horizontal} + \text{vertical} = 3 \]

Write an addition sentence for each of your 3-street maps.

Think about maps that have 6 intersections.

A Draw all the 6-intersection maps.

B For each 6-intersection map, you can write an multiplication sentence like this:

\[ \text{horizontal} \times \text{vertical} = 6 \]

Write a multiplication sentence for each of your 6-intersection maps.

C Could there be a 6-intersection map with 0 horizontal streets? Draw a map or explain.

D Could there be a 6-intersection map with more than 6 horizontal streets? Draw a map or explain.

E Could there be a 6-intersection map with 4 horizontal streets? Draw a map or explain.
Carl is planning a garden. He wants to plant 48 seeds in 8 rows. How many seeds will be in each row?

**Strategy:** Draw a Picture

**Read to Understand**

What do you know from reading the problem?

Carl is planting 48 seeds in 8 rows.

**Plan**

How can you solve the problem?

You can draw a picture to find the number of seeds in each row.

**Solve**

How can you draw a picture of the problem?

You can draw an array using dots to represent the seeds. Draw a column of 8 dots, one dot for each row of seeds. Add 1 dot to each row until you have drawn a total of 48 dots. If you count the number of dots in each row, you will find 6 dots. So, there will be 6 seeds in each row.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Draw a picture to solve.

1. Jack has ten blocks numbered from 1 to 10. How many combinations of one odd-numbered block and one even-numbered block can he make?

2. The art teacher gives each student a piece of paper that is in the shape of a square. What figures can the students make if they draw a single, straight line that cuts the square in half?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Mia wants to buy a small toy that costs 35¢. The toy is sold from a machine that only accepts quarters, dimes, and nickels. What combinations could Mia use to buy the toy?

4. Three girls stand in line at the ticket counter. Twice as many boys stand in line. How many children stand in line in all?

5. A total of 65 third and fourth graders attended this month's Math Club meeting. There were 15 more third graders than fourth graders at the meeting. How many third graders and how many fourth graders attended the meeting?

6. Daryl is ordering pizza. His topping choices are onions, extra cheese, or peppers. He can choose either a thin crust or a thick crust. How many choices does Daryl have?
Chapter 2 Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. The directions on a map are north, south, ___?___ and west.
2. A(n) ___?___ line is one that goes from top to bottom.
3. A(n) ___?___ has both horizontal and vertical lines in it.
4. A(n) ___?___ is where two lines cross.
5. When you read 3 × 8, you say “three ___?___ eight.”
6. Dots arranged in columns and rows form a(n) ___?___.

Complete each analogy using the best term from Word List B.

7. Addend is to addition as ___?___ is to multiplication.
8. Sum is to addition as ___?___ is to multiplication.

Talk Math

Discuss with a partner what you have learned about modeling multiplication. Use the vocabulary terms factor, multiple, and product.

9. How can you use an array to model multiplication?
10. How can you use intersecting lines to model multiplication?
11. How can you use multiplication to check that you have listed all possible combinations?
Tree Diagram

Create a tree diagram for the term multiply. Use the terms column, row, array, intersection, grid, horizontal, and vertical.

Concept Map

Create a concept map for Multiplication Situations. Use the terms combinations, array, and intersections. Describe what each represents.

What’s in a Word?

COMBINATION The word combination is used in different ways. The combination for a lock is often made up of numbers in a particular order. Suppose the combination to a lock is 1-2-3. The lock will not open if you try 2-3-1 or 1-3-2. In math, the order of the items does not matter. For example, blue shirt with black pants is the same combination as black pants with blue shirt.
**FIT!**

**Game Purpose**
To form rectangular arrays

**Materials**
- crayons or markers
- 2 number cubes (numbered 1–6)
- about 40 beans or other objects
- Activity Master 19: *Fit!* gameboard

**How to Play the Game**

1. Two people can play the game. Each person chooses a different color of marker or crayon. Toss one of the number cubes. The player with the larger number goes first.

2. Start by tossing both number cubes. Use the numbers to create an array on the *Fit!* gameboard:
   - Count the number of rows using one number. Then count the number of columns using the other number.
   - Use the beans to make an array. Color the array.
   - Label your array with the total number of tiles.
   - If you can’t draw an array, check off a strike box.

3. Take turns until both players have three strikes, or the gameboard is full.
   - If one player gets three strikes, the other play may continue until they get three strikes or fill the board.

4. The player with more arrays is the winner.
Factor Maze

Game Purpose
To identify products with factors from 1 to 6

Materials
• number cube
• 2 different colors of crayons or markers
• Activity Masters 23 and 24

How to Play the Game
1. Toss the number cube. The player with the larger number goes first.
2. Start by tossing the number cube. Write the Toss number on the Factor Maze Recording Sheet.
3. Draw your move on the Factor Maze gameboard.
   • You may move one square horizontally or vertically (but not diagonally) to any square that your number is a factor of.
   For example, if you toss a 4, you can move to any square with a product that has 4 as a factor, such as 4, 8, 12, 16, 20, 24, 28, 32, 36, and so on. But you may not move to a space marked 2, because 4 is not a factor of 2.
   • Write your Moved To number on the Factor Maze Recording Sheet.
4. If the toss is not a factor of any of the numbers in adjacent squares, write an X in one of the strike boxes at the bottom of the gameboard.
5. The first player to reach the Finish square is the winner, or the first player with three strikes loses.
Each circle has all the numbers you need to make several multiplication sentences. Can you find all the multiplication sentences for each circle? You must use all the numbers in the circle. You can use each number only once.

Good luck!

1. One multiplication sentence in this circle is $2 \times 8 = 16$. Can you find two others?

2. Find 3 multiplication sentences in this circle.

3. Find 4 multiplication sentences in this circle.

4. How many multiplication sentences can you find in this circle?
Dear Student,

In Chinese legend, a curious pattern of numbers was once found on the back of a turtle shell. People have been studying the mystery of these numbers for centuries.

This arrangement of numbers has certain properties, so people began to call it a magic square. Do you know what makes the pattern of numbers in the magic square special? Could you make your own magic square?

In this chapter, you will be using your addition and subtraction skills to solve interesting questions and puzzles like the magic square. You will work with money, and you'll also learn about reading graphs similar to the graphs scientists use to see patterns.

Mathematically yours,
The authors of *Think Math!*
The durian is known as the “King of Fruits” in parts of Southeast Asia. It is a very popular tropical fruit found mainly in Malaysia, Indonesia, and Thailand. Durians are either round or oval in shape and covered with hard spikes. Some people love the melons, but others don’t because the fruit has a very strong smell.

**Fact-Activity 1**

The durian is known as the “King of Fruits” in parts of Southeast Asia. It is a very popular tropical fruit found mainly in Malaysia, Indonesia, and Thailand. Durians are either round or oval in shape and covered with hard spikes. Some people love the melons, but others don’t because the fruit has a very strong smell.

**Answer the following questions. Use the data in the Almanac Fact for Problems 2 and 3.**

1. If you buy three durians weighing 5 pounds, 10 pounds, and 8 pounds, what is the total weight of the melons?
2. Suppose a young durian tree bears only 10–50 melons. How old could the durian tree be?
3. If a durian tree is 11 years old, how many more years will the tree need to grow before it can produce more than 100 melons?
A tropical fruit salad is a great way to enjoy a variety of fruits. Three different mixed tropical fruit salads are shown below. To set the price of each salad, the chef first sets a price for each kind of fruit used in the salads. The price of the salad is the sum of the prices for the fruits used in the salad.

**Answer the questions based on the prices given.**

<table>
<thead>
<tr>
<th>Fruit Salad 1: Watermelon, Star Fruit, Pineapple</th>
<th>Fruit Salad 2: Mango, Papaya, Pineapple</th>
<th>Fruit Salad 3: Jambu, Guava, Watermelon, Pineapple</th>
</tr>
</thead>
</table>

1. What is the price of Fruit Salad 1?
2. If you pay for Fruit Salad 2 with 3 quarters, how much change should you receive? Explain.
3. What is the fewest number of coins you could use to buy Fruit Salad 3? Explain.

**Price of Tropical Fruits per Serving**

<table>
<thead>
<tr>
<th>Tropical Fruit (water apple)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jambu</td>
<td>3¢</td>
</tr>
<tr>
<td>Pineapple</td>
<td>5¢</td>
</tr>
<tr>
<td>Star Fruit</td>
<td>10¢</td>
</tr>
<tr>
<td>Guava</td>
<td>15¢</td>
</tr>
<tr>
<td>Watermelon</td>
<td>20¢</td>
</tr>
<tr>
<td>Papaya</td>
<td>25¢</td>
</tr>
<tr>
<td>Mango</td>
<td>30¢</td>
</tr>
<tr>
<td>Strawberries</td>
<td>35¢</td>
</tr>
<tr>
<td>Kiwi</td>
<td>40¢</td>
</tr>
</tbody>
</table>

**Materials: paper, markers or colored pencils**

Create a menu with 3 different tropical fruit salads. Use the list of fruits and prices from Fact Activity 2. You may use no more than 5 fruits in your salad. Each fruit salad must cost a total of 99 cents or less.

- Name your salads.
- List the ingredients of your salad.
- Calculate the total price of each salad on your menu.
- List the fewest coins needed to equal the price of the salad.

**ALMANAC Fact**

It takes about 6 years for a durian tree to bear fruit. Trees older than 10 years can bear 50-100 melons a year. Twenty-year-old trees can bear 100-200 melons.
What Is a Magic Square?

In a magic square like this one, every row, column, and diagonal has the same sum.

\[
\begin{array}{ccc}
7 & 17 & 3 \\
5 & 9 & 13 \\
15 & 1 & 11 \\
\end{array}
\]

\[
\begin{array}{ccc}
7 + 17 + 3 = 27 \\
5 + 9 + 13 = 27 \\
15 + 1 + 11 = 27 \\
\end{array}
\]

\[
\begin{array}{ccc}
7 + 5 + 15 = 27 \\
17 + 9 + 1 = 27 \\
3 + 13 + 11 = 27 \\
\end{array}
\]

\[
\begin{array}{ccc}
7 + 9 + 11 = 27 \\
15 + 9 + 3 = 27 \\
\end{array}
\]

**Check for Understanding**

1. If one row has a different sum than the others, is the array a magic square? Explain.

2. If you changed one of the numbers in this magic square to an even number, would it still be a magic square? Explain.
Magic Squares with Missing Addends

Fill in the blanks so that each row, column, and diagonal in the magic square has the same sum.

What is the special sum for this magic square? How do you know?

What is the special sum for this magic square? How do you know?

Describe any relationships you see between the two completed magic squares.
Exploring Odd and Even Numbers

Jackie had some marbles and two boxes—one blue box and one green box. Jackie put all the marbles in the two boxes.

What can you say about this situation? Write whether each statement is true or false.

Statement 1
If Jackie started with an even number of marbles, then she must have put the same number in each box.

Statement 2
If Jackie started with an even number of marbles, then she could have put the same number in each box.

Statement 3
If Jackie started with an odd number of marbles, then she could not have put the same number in each box.

Statement 4
If Jackie put the same number of marbles in each box, then the total number of marbles must have been even.

Statement 5
If Jackie put a different number of marbles in each box, then the total number of marbles must have been odd.
You can practice regrouping by exchanging coins to find the fewest coins for a given amount.

**Activity** Use quarters, dimes, nickels, and pennies to make 72¢. When possible, exchange for coins of greater value to find the fewest coins for 72¢.

**Step 1**
Look at the collection of coins. Is the amount made with the fewest coins?

The amount is not made with the fewest coins, because you can exchange some pennies for another nickel.

**Step 2**
Exchange 5 pennies for 1 nickel.

Can another exchange be made?

**Step 3**
Exchange 2 nickels for 1 dime.

No more exchanges can be made. So, the collection has the fewest coins possible for 72¢.

**Check for Understanding**

Show how to make the same amount using the fewest coins. Use quarters, dimes, nickels, and pennies.
When taking tests, you can use estimation to eliminate wrong answer choices.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Without calculating, quickly choose one answer that you are sure is wrong. Explain what makes you sure.</th>
<th>Without looking at any of the possible answers, make a quick estimate.</th>
<th>Choose the answer.</th>
</tr>
</thead>
</table>
| 1       | A. 9  
B. 32  
C. 93  
D. 103 | Estimate:  
A. 9  
B. 32  
C. 93  
D. 103 |  
|
| 2       | A. 9  
B. 19  
C. 75  
D. 85 | Estimate:  
A. 9  
B. 19  
C. 75  
D. 85 |  
|
| 3       | A. 21  
B. 35  
C. 45  
D. 131 | Estimate:  
A. 21  
B. 35  
C. 45  
D. 131 |  
|
| 4       | A. 532  
B. 900  
C. 990  
D. 1,000 | Estimate:  
A. 532  
B. 900  
C. 990  
D. 1,000 |  

Hint . . . You may want to write something like, “about 1,000,” or “between 900 and 1,100.”
Estimating Sums and Differences

You can estimate sums and differences by using various methods.

**Estimate** $32 + 29$.

**One Way**

**Step 1**
Use the digit in the greatest place-value position to approximate each number.

$32 + 29$
$30 + 20 = 50$

**Step 2**
Get a closer estimate by seeing if the digit in the next greatest place-value position will have an effect.

$32 + 29$
$2 + 9$ will make another 10.
$30 + 20 = 50$ and $50 + 10 = 60$

So, the sum is about 60.

**Another Way**

Use the closest multiples of 10.

$32 + 29$

The closest multiple of 10 for 32 is 30.

The closest multiple of 10 for 29 is 30.

$30 + 30 = 60$

So, the sum is about 60.

**Check for Understanding**

Estimate the sum or difference. Choose any method.

1. $43 + 28$
2. $84 - 66$
3. $602 + 275$

Chapter 3 43
Antonio has some nickels in his pocket. He puts 4 dimes in his pocket. Now he has 65¢. How many nickels does Antonio have?

**Strategy:** Work Backward

**Read to Understand**

What do you know from reading the problem?
- When Antonio put 4 dimes in his pocket he had 65¢.

What do you need to find out?
- The number of nickels Antonio has.

**Plan**

How can you solve the problem?
- You can work backward.

**Solve**

How can you work backward to solve the problem?
- Start with the total amount Antonio has: 65¢.
- Subtract 40¢ for the 4 dimes he put in his pocket: $65 - 40 = 25¢$. The difference of 25¢ represents the value of the nickels in his pocket. So, Antonio has 5 nickels.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Work backward to solve.

1. Ty has 18 marbles. Wes has 12 more marbles than Zach. Zach has the same number of marbles as Ty. How many marbles does Wes have?

2. Before going to the 2:45 P.M. movie, you need to practice the piano for 1 hour and then clean your room for 15 minutes. Allow 30 minutes to walk to the theater. What is the latest time you could begin piano practice and still get to the movie on time?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. On the first day of your 5-day vacation, you collect 25 shells. You collect 20 on the second day, 16 on the third day, and 13 on the fourth day. If the pattern continues, how many shells will you collect on the fifth day?

4. Today’s lunch menu lists turkey and roast beef. The vegetable choices are carrots, green beans, or broccoli. How many different choices of one meat and one vegetable are there?

5. Ice cream costs 50¢. Jackson has 2 quarters, 2 dimes, and 3 nickels. Find all the ways he can use his coins to pay for the ice cream with the exact amount.

6. Jennifer bought a cap and shirt and spent $27. The shirt cost twice as much as the cap. What was the cost of each item?
Chapter 3  Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. A(n) [term] describes a number that is close to an exact amount.
2. A horizontal line on a grid makes a(n) [term] with a vertical line.
3. You get two coins when you [term] a dime for nickels.
4. There are 4 different coin [term] that make 11¢.
5. The [term] of two dimes is 20¢.
6. If you [term] do something, then you are required to do it.
7. A(n) [term] number of marbles can be divided equally between two girls.

Complete each analogy. Use the best term from Word List B.

8. Greatest is to most as [term] is to least.
9. Sum is to addition as [term] is to subtraction.

Talk Math

Discuss with a partner what you have learned about magic squares. Use the vocabulary terms sum, column, row, and diagonal.

10. How can you describe a magic square?
11. How can you prove that a magic square is really a magic square?
Word Web

Create a word web for the term reflection. Use what you have learned about reflections of magic squares.

Word Definition Map

Create a word definition map for the term intersection.

A What is it?
B What is it like?
C What are some examples?

MAGIC SQUARE Magic squares have been around for at least 3,000 years. The Chinese are the first people known to have made them. Not all magic squares have 3 rows and 3 columns. Benjamin Franklin was a famous American who loved magic squares. When he was a boy, he made one with 8 rows and 8 columns. Then a friend showed him a magic square with 16 rows and 16 columns. In a magic square, the number of columns must be the same as the number of rows. Also, the sum of each row, column, and diagonal must be equal.

Chapter 3 47
What Are My Coins?

**Game Purpose**
To practice finding the value of a group of coins

**Materials**
- A collection of real or play coins: pennies, nickels, dimes, and quarters

**How to Play the Game**

1. Play this game with a partner. Choose about 10 coins. Place them on the table between you. Then toss a coin to decide who plays first. The first player is the Hider. The second player is the Guesser.

2. While the Guesser looks away, the Hider takes some of the coins, finds their value, and hides them.

3. The Guesser asks yes or no questions to figure out which coins are hidden.

   **Examples:**
   - Are any of the coins pennies?
   - Are the coins worth more than 20¢?
   - Do you have more than three different coins?

4. When the Guesser has named the hidden coins and their total value, players switch roles. Put the hidden coins back on the table and play again.
Least to Greatest

**Game Purpose**  
To practice estimating sums and differences

**Materials**  
- Activity Masters 33 and 34: Least to Greatest Cards  
- Stopwatch or clock with a second hand

**How to Play the Game**

1. Cut out the Least to Greatest cards from Activity Masters 33 and 34. Mix up the cards. Put them in a pile face down.

2. Play this game with a partner. One player is the Placer. The other player is the Timer. The Timer times the Placer for 60 seconds with a stopwatch or the second hand on a clock.

3. The Timer says “Go.” The Placer turns over the cards one at a time. The goal is to place as many cards as possible in order from the smallest sum or difference to the largest. The Placer can pass on any card by setting it aside.

4. The Timer says “Stop” at 60 seconds and checks the order of the cards. The Timer tells the Placer if there are any mistakes. The Timer does not say what the mistakes are.

5. The Placer can try to correct the order of the cards. The Placer can even remove cards. When both players agree that the order is correct, the Placer gets 1 point for each card.

**Example:** These four cards are placed correctly.

6. Switch roles. Play until time is called. The player with more points wins the game.
You can start with one magic square and change it to another. Complete the first problem below. Use that result to help you look for a pattern in the other magic squares. Can you predict the sum for each new magic square?

1. Find the sum of this magic square.

<table>
<thead>
<tr>
<th>15</th>
<th>18</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>21</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

For a new magic square, add 2 to each number.

A I predict that the sum of the new magic square will be ___.

B Draw the new magic square. What is the sum?

2. Find the sum of this magic square.

<table>
<thead>
<tr>
<th>17</th>
<th>32</th>
<th>29</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>23</td>
<td>20</td>
<td>35</td>
</tr>
</tbody>
</table>

For a new magic square, subtract 4 from each number.

A I predict that the sum of the new magic square will be ___.

B Draw the new magic square. What is the sum?

3. Find the sum of this magic square.

<table>
<thead>
<tr>
<th>9</th>
<th>2</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>3</td>
</tr>
</tbody>
</table>

For a new magic square, multiply each number by 2.

A I predict that the sum of the new magic square will be ___.

B Draw the new magic square. What is the sum?
Dear Student,

Why is it that 2 dimes and 4 pennies are 24 pennies, but 2 feet and 4 inches are not 24 inches? You will explore questions like this one as you discuss different ways to group objects. These measurement units count things in different ways, so the amounts are written in different ways.

What about other measurement units you know?

How many days in 1 week?
How many days in 2 weeks?

How many minutes in 1 hour?
How many minutes in 3 hours?

Mathematically yours,
The authors of Think Math!
The Grand Canyon in northern Arizona was formed over millions of years as the Colorado River eroded away the land to make a deep gorge. Although the canyon is in a very dry area, many different kinds of wildlife live there.

For these problems, use base-ten blocks where a unit cube represents 1, a rod is 10, and a flat is 100.

1. Which base-ten blocks could you use to show the number of reptiles and amphibians?

2. How many flats are needed to show the number of bird species?

3. How could you use base-ten blocks to help you find the total number of mammals and fish?

4. Find the sum of the fish and bird species.

<table>
<thead>
<tr>
<th>Grand Canyon Wildlife</th>
<th>Animal Life</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mammals</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>Reptiles and</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Amphibians</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fish</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Birds</td>
<td>373</td>
</tr>
</tbody>
</table>
The Grand Canyon area was established as a National Park in 1919. Millions of people visit the park every year. Visitors can hike trails, take mule trips, and camp in family campgrounds.

Write the number being described. Then write the Grand Canyon fact on this page that it represents.

1. My tens digit is 3. I tell a number of miles.
2. I am a number greater than 50 that has a ones digit that is 5 less than my tens digit.
3. I am greater than the number of miles of roads and less than the number of miles of trails.
4. My word name has “two hundred” in it, but I am greater than 300.
5. If you add 200 to me and increase my ones digit by 1, you will get another number in the facts. Name both numbers and facts.

**CHAPTER PROJECT**

On a trip to the Grand Canyon, you buy a postcard for $1.00 to send to your friend. You use only coins for your purchase. You use at least one of each coin (quarters, dimes, nickels, and pennies) to purchase the card.

- Make a table to show what coins you could use to purchase the postcard. Include at least 4 combinations.
- Which of your combinations uses the least number of coins?

<table>
<thead>
<tr>
<th>Name of Campground</th>
<th>Number of Campsites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mather</td>
<td>314</td>
</tr>
<tr>
<td>Desert View</td>
<td>50</td>
</tr>
<tr>
<td>North Rim</td>
<td>83</td>
</tr>
<tr>
<td>Tuweep</td>
<td>12</td>
</tr>
</tbody>
</table>

On the average, the walls of the Grand Canyon rise about 1 mile above the Colorado River.
Ari found 2 dimes and 5 pennies under the couch. Then he found 1 dime and 8 pennies in his pocket.

His mother traded coins with him so he had the same amount in fewer coins, but still had only dimes and pennies. How many dimes and pennies did he have?

Esta had 4 dimes and 3 pennies.

She bought something that cost 2 dimes and 6 pennies. If she has only dimes and pennies and the fewest coins, how much does she have left?
You can use base-ten blocks to represent a number.

**Example A**

<table>
<thead>
<tr>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

5 tens + 3 ones = 53

**Example B**

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

3 hundreds + 2 tens + 7 ones = 327

**Check for Understanding**

Write the number.

1. 

2. 

3. Use pictures, numbers, or words to tell how you would represent 419 using base-ten blocks.
1. Make a list of the numbers that match Clue A.

2. A student noticed that Clue B eliminates 45. What numbers can you cross off the list because they do not fit Clue B?

3. What numbers are still on the list?

4. What numbers can you cross off the list because they do not fit Clue C?

5. What numbers are still on the list?

6. What is the mystery number?
The class looked at the first clue in this puzzle. Someone said there were too many numbers to list. So, the class decided to list the possible units and tens digits, and then cross out the digits that did not fit the clues.

A student wrote this list on the board:

<table>
<thead>
<tr>
<th>t</th>
<th>u</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

1. Why didn’t the student write a 0 in the tens column?

2. What is the mystery number?
Does the order of clues change how you solve a puzzle?

1. To find the mystery number, use the clues in order.

   **Who Am I?**
   - **Clue A:** I have 2 digits.
   - **Clue B:** All my digits are odd.
   - **Clue C:** The product of my digits is 5.
   - **Clue D:** \( t < u \)

2. Now try using the clues in this order. How is your reasoning different?

   **Who Am I?**
   - **Clue A:** I have 2 digits.
   - **Clue B:** The product of my digits is 5.
   - **Clue C:** All my digits are odd.
   - **Clue D:** \( t < u \)
You can use a place-value chart to help you understand each digit in a number.

**Example A**

There were 29,460 people at the candidate's speech.

<table>
<thead>
<tr>
<th>Ten Thousands</th>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

Find the value of the digit 9: 9,000.
Name the number using words: twenty-nine thousand, four hundred sixty.

**Example B**

The candidate won the election by 852,641 votes.

<table>
<thead>
<tr>
<th>Hundred Thousands</th>
<th>Ten Thousands</th>
<th>Thousands</th>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

Find the value of the digit 5: 50,000.
Name the number using words: eight hundred fifty-two thousand, six hundred forty-one.

**Check for Understanding**

Write the value of the blue digit.

1. 9,486
2. 309,421
3. 418,237

Write the number.

4. five thousand, eight hundred forty
5. sixty thousand
6. two hundred thirty-one thousand, seven hundred fifty-six

Chapter 4  59
How many ways can you arrange the digits 4, 5, and 6 to make a three-digit number?

**Strategy:** Make an Organized List

**Read to Understand**

What do you know from reading the problem?
I need to find all the ways to arrange the digits 4, 5, and 6 to make a three-digit number.

**Plan**

How can you solve the problem?
You can make an organized list.

**Solve**

How can you make an organized list?

List the three-digit numbers with a 4 in the hundreds place and 5 or 6 in the tens and ones places.

Then list the numbers with a 5 in the hundreds place and 4 or 6 in the tens and ones places.

Finally, list the numbers with a 6 in the hundreds place and 4 or 5 in the tens and ones places.

The list shows 4, 5, and 6 can be arranged in 6 different ways.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Use the strategy **make an organized list** to solve.

1. What is the two-digit mystery number?
   - A. I am greater than $9 \times 9$.
   - B. I am an odd number.
   - C. My tens digit is 2 more than my ones digit.

2. Simon and Lily used the spinner shown at right. They spun the pointer and recorded their results. Their results were 6, 5, 6, 4, 1, 2, 1, 3, 5, 6, 2, 3, 6, 4, and 2. Which number occurred most often?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Javier and Nina are playing a game. Javier has 8 cards and picks up 5 cards. Nina has 6 cards. How many more cards does Nina need to have the same number as Javier?

4. Janelle spent 2 weeks and 1 day at camp. She spent 1 week and 5 days visiting her grandmother. How many days was Janelle away?

5. Jim hiked the first 3 miles of the trail in 1 hour. If he continues at the same pace, how many miles will he hike in 4 hours?

6. Olga is choosing a writing tool and a paper color for her journal. She can choose a pencil, a pen, a crayon, or a marker. She can choose white or yellow paper. What are all the different combinations of a writing tool and paper Olga can choose?
Choose the best vocabulary term from Word List A for each sentence.

1. Suppose you combine groups of tens and ones. You can __?__ them to find the fewest units.
2. The place between the thousands place and the tens place is the __?__ place.
3. The __?__ in the tens place of 947 is 4.
4. You have three piles of coins. They are 6 nickels, 8 dimes, and 9 pennies. The pile with the __?__ is 6 nickels.
5. To solve a mystery number puzzle, make a list and __?__ possibilities using the clues.
6. When you __?__ 8,925 to the nearest thousand, you get 9,000.

Complete each analogy. Use the best term from Word List B.

7. Cent is to dollar as __?__ is to hundreds.
8. Letter is to word as __?__ is to number.

**Talk Math**

Discuss with a partner what you have learned about place value. Use the vocabulary terms digit, thousands, hundreds, tens, and ones.

9. How can you round a number to the nearest thousands place?
10. How can you use base-ten blocks to represent a four-digit number?
Analysis Chart

Create an analysis chart for the place-value terms *hundreds*, *millions*, *ten thousands*, and *thousands*.

Word Web

Create a word web using the word *round*. Use what you know about the different meanings of *round*.

**What's in a Word?**

**MILLION**  The English word *million* comes from the old Italian word *millione*. It was first used in the 1300s. *Milla* means “thousand.” The suffix “-one” means “great.” So, *millione* means “a great thousand.”

Suppose the word *million* had not been created. We would have to call the millions place the *thousand-thousands place*. Then the ten-millions place would become the *ten-thousand-thousands place*. Number names would be very long and too confusing to use.
How To Play The Game

1. Play this game with a partner. Each player will need Activity Master 35. Decide who will play first.

2. The first player tosses both number cubes.
   • Write the numbers under Toss A and Toss B on Activity Master 35.
   • Use the tossed numbers to make a two-digit number. Write it under Chosen Number in the table.
   • Show your chosen number with base-ten blocks. Combine them with the blocks from your previous total. (There is nothing to combine on your first toss.)
   • Write an addition sentence for the combined base-ten blocks in the last column.

3. Players take turns. The first player to trade 10 flats for the large cube wins!

Trading to 1,000

Game Purpose
To use base-ten blocks to represent sums

Materials
• 2 number cubes labeled 1–6
• Base-ten blocks (units, rods, flats, 1 large cube)
• Activity Master 35: Trading to 1,000
Place Value Game

**Game Purpose**
To practice identifying place-value attributes

**Materials**
- Activity Masters 36–46: Attribute Cards, Sets A–C
- scissors

**How to Play the Game**

1. Play this game with a small group. Cut out the Attribute Cards. There are three sets of cards. Choose the set (or sets) you want to use.
   - Set A cards have the easiest clues.
   - Set B cards have more difficult clues.
   - Set C cards have the most difficult clues.

2. Each player writes 5 four-digit numbers on a sheet of paper. Write neatly and large enough for others to see.

3. Place the Attribute Cards face down. Take turns turning over an Attribute Card and reading it aloud. All players cross out any of their numbers that match that attribute.

4. Play until someone crosses out all 5 numbers. That person wins!

**Example:** A player turns over this card:
Your numbers are 1,409; 7,246; 2,030; 8,925; 5,634.
You can cross out 7,246 and 8,925.

5. Play as many games as you can in the time allowed.
In 1858, units of money in the United States were different from those we use today. There were five units—mill, cent, dime, dollar, and eagle. The chart shows how much each unit was worth and its symbol.

<table>
<thead>
<tr>
<th>United States Money in 1858</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 mills (m.) = 1 cent (c.)</td>
</tr>
<tr>
<td>10 cents (c.) = 1 dime (d.)</td>
</tr>
<tr>
<td>10 dimes (d.) = 1 dollar ($)</td>
</tr>
<tr>
<td>10 dollars ($) = 1 eagle (E)</td>
</tr>
</tbody>
</table>

Use the chart to answer the questions below. They come from a math textbook that was used by students in 1858!

1. How many mills in 2 cents?
2. How many cents in 3 dimes?
3. How many dimes in 4 dollars?
4. How many dollars in 2 eagles?
5. How many dimes in 1 eagle?
6. How many dimes in 3 dollars and 6 dimes?
7. How many cents in 4 dimes and 7 cents?
8. How many dimes are equal to 70 cents?
9. If James earned 12 dollars and his father earned 3 eagles, how many dollars did they earn together?
10. A man has 4 eagles, 4 dollars, and 4 dimes. How many dollars and cents does he have?
Dear Student,

An algorithm is a step-by-step process to solve a problem. You have already learned algorithms to add and subtract large numbers, and you have experience using them. This chapter will give you a closer look at how these algorithms work.

Look at these puzzles:

<table>
<thead>
<tr>
<th>200</th>
<th>50</th>
<th>4</th>
<th>254</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>40</td>
<td>6</td>
<td>746</td>
</tr>
<tr>
<td>900</td>
<td>90</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>600</th>
<th>140</th>
<th>6</th>
<th>746</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>50</td>
<td>4</td>
<td>254</td>
</tr>
<tr>
<td>400</td>
<td>90</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

How are they like the problems shown below? How are they different from the problems below?

\[
\begin{align*}
254 & \quad + \quad 746 \\
\_ & \quad \_ & \quad \_ \\
254 & \quad - \quad 254
\end{align*}
\]

By exploring questions like these, you will become even more skilled at computing, and will learn more about how arithmetic works.

Best wishes for a fun chapter!

Mathematically yours,
The authors of *Think Math!*
All Kinds of Puzzles

Puzzles challenge us to think and use our brains. Crossword puzzles teach us about words. Jigsaw puzzles help us tell different shapes apart. Did we forget to mention that puzzles are fun?

Use the chart to answer the questions.

1. Which is the puzzle with the least number of pieces? Explain how you could represent the number using the fewest base-ten blocks.

2. If the puzzle with the most pieces takes you the longest to assemble, which puzzle would take you the most time to complete?

3. Which puzzle has more pieces, Snowman or Ladybug?

4. Write the number of puzzle pieces in order from least to greatest.

5. Melissa wants to organize her puzzles into those that are about 900 pieces and those that are about 1,000 pieces. Use rounding to tell which puzzles belong in each category.

Melissa likes jigsaw puzzles, especially ones that are unusual shapes. All of Melissa’s shaped puzzles have about 1,000 pieces. The chart shows the exact number of pieces in each of her shape puzzles.

<table>
<thead>
<tr>
<th>Shape Puzzles</th>
<th>Shape</th>
<th>Number of Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bear</td>
<td>899</td>
<td></td>
</tr>
<tr>
<td>Frog</td>
<td>975</td>
<td></td>
</tr>
<tr>
<td>Ladybug</td>
<td>918</td>
<td></td>
</tr>
<tr>
<td>Snowman</td>
<td>981</td>
<td></td>
</tr>
<tr>
<td>Space Shuttle</td>
<td>995</td>
<td></td>
</tr>
<tr>
<td>Statue of Liberty</td>
<td>958</td>
<td></td>
</tr>
</tbody>
</table>
Some puzzles come in books. Melissa has puzzle books and other types of books. She takes the following five books with her on a long trip.

**For 1–4, use the table.**

1. How much longer is the Crossword Puzzle Book than the Number Puzzle Book?
2. If Melissa reads the Funny Poems book and Princess Tale book by the end of her trip, how many pages will she have read?
3. Melissa has read 47 pages of the animal stories book. How many more pages must she read to finish the book?
4. What is a good estimate for the total number of pages in all of the books? Explain.

### Melissa’s Books

<table>
<thead>
<tr>
<th>Title</th>
<th>Number of Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Puzzle Book</td>
<td>32</td>
</tr>
<tr>
<td>Crossword Puzzle Book</td>
<td>80</td>
</tr>
<tr>
<td>Animal Stories</td>
<td>96</td>
</tr>
<tr>
<td>Funny Poems</td>
<td>128</td>
</tr>
<tr>
<td>The Princess Tale</td>
<td>112</td>
</tr>
</tbody>
</table>

**CHAPTER PROJECT**

What kinds of books do you like? Some kinds of books are puzzle books, animal books, fantasy books, joke books, science books, and reference books.

- Use books from your home, school, or library. List 2 books in each of 3 different categories, such as 2 joke books, 2 science books, and 2 adventure books. You can use books that you have read or books that you would like to read.
- Make a poster with the name of each category, the titles of the books in each category, and the number of pages in each book.
- Find the total number of pages for the books in each category.
- Describe how you might find the total number of pages in all 6 books.

**ALMANAC Fact**

Some jigsaw puzzles have as many as 18,000 pieces.
You can use base-ten blocks to help you compare numbers.

**Example** Compare 1,146 and 1,163.

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Use base-ten blocks to show each number. Then compare from left to right.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Look at the thousands. They are the same, so continue to compare.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Look at the hundreds. They are the same, so continue to compare.</td>
</tr>
<tr>
<td>Step 4</td>
<td>Look at the tens. 6 tens is greater than 4 tens. So, 1,163 is the greater number. (You do not need to look at the ones, because the tens are different.)</td>
</tr>
<tr>
<td>Step 5</td>
<td>Use these symbols: &lt; (less than) and &gt; (greater than)</td>
</tr>
</tbody>
</table>

1,146 < 1,163  
1,163 > 1,146

**Check for Understanding**

Compare the numbers. Write < or >.

1

1,392 < 1,460
1. A frog jumped from **47** to **50** on the number line.

How many spaces did the frog jump?

2. Next, the frog jumped from **50** to **80**.

How far was the second jump?

3. Then the frog jumped from **80** to **82**.

How far was the third jump?

4. How far is it to jump all the way from **47** to **82**?

5. Solve **82 − 47 =**

6. Draw a picture showing one or more jumps to go from **66** to **104** on the number line. Find the distance for each jump you make and the total distance for all the jumps.
You can use the number line to help you subtract. The distance between the two numbers is their difference.

Example \(47 - 18 = \) 

**Step 1** Draw the section of the number line that starts with the smaller number and ends with the larger number.

**Step 2** Jump from the smaller number to the larger number. Use landing places that are easy to work with, such as multiples of ten.

**Step 3** Find the total distance jumped.

\[2 + 20 + 7 = 29\] So, \(47 - 18 = 29\).

**Check for Understanding**

Find the difference. Draw the number line on your own paper.

1. \(93 - 55 = \) 
2. \(138 - 119 = \)
Predict the number of base-ten rods you will need to show each sum with fewest blocks.

Write the answer to each question.

3 Will 28 + 45 be in the sixties or the seventies?
4 Will 16 + 78 be in the eighties or the nineties?

Predict the number of base-ten flats you will need to show each sum with fewest blocks.

Write the answer to each question.

7 Will 356 + 482 be in the 700s or the 800s?
8 Will 238 + 319 be in the 500s or the 600s?
Imagine combining the two piles of base-ten blocks and making trades until you have the fewest blocks for the sum.

1. How many flats will be in the sum?
2. How many rods will be in the sum?
3. How many units will be in the sum?
4. Add to check your predictions. 
   \[
   \begin{array}{c}
   348 \\
   + 275
   \end{array}
   \]

Without calculating \[183 + 594\], predict each digit of the sum.

5. the hundreds digit
6. the tens digit
7. the ones digit
8. Add to check your predictions. 
   \[
   \begin{array}{c}
   183 \\
   + 594
   \end{array}
   \]
You can use base-ten block pictures to find a sum. Regroup to find the fewest blocks.

**Step 1**
Look at the hundreds.

\[
\begin{array}{c}
137 \\
+ 385 \\
\hline
522
\end{array}
\]

**Step 2**
See if you have 10 tens you can regroup to make another hundred.

**Step 3**
See if you have 10 ones you can regroup to make another ten.

**Step 4**
Count the remaining blocks. There are 5 hundreds, 2 tens, and 2 ones. So,

\[
\begin{array}{c}
137 \\
+ 385 \\
\hline
522
\end{array}
\]

---

**Check for Understanding**

Find the sum. Draw the base-ten blocks on your own paper.

1. \[
\begin{array}{c}
214 \\
+ 269 \\
\hline
483
\end{array}
\]
2. \[
\begin{array}{c}
452 \\
+ 178 \\
\hline
630
\end{array}
\]
Tuan needed to split his collection of base-ten blocks into two piles. In order to put the blocks he wanted into the first pile, he had to trade some of his original blocks for smaller ones. Show what is left for the other pile.

Tuan’s original collection

Tuan’s first pile

Tuan’s second pile (the difference)

1. How many flats are in the difference?
2. How many rods are in the difference?
3. How many units are in the difference?
4. Subtract to check your predictions.

\[ \begin{array}{c}
623 \\
- 348 \\
\end{array} \]

Without calculating, predict each digit of the difference.

5. the hundreds digit
6. the tens digit
7. the ones digit
8. Subtract to check your predictions.

\[ \begin{array}{c}
777 \\
- 594 \\
\end{array} \]
Cross Number Puzzles are a tool for adding and subtracting multi-digit numbers.

Three-digit numbers are separated into hundreds, tens, and ones, so you can add or subtract each place value.

**Addition Puzzle**

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>500</td>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td>800</td>
<td>100</td>
<td>9</td>
</tr>
</tbody>
</table>

**Subtraction Puzzle**

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>891</td>
<td>80</td>
<td>11</td>
</tr>
<tr>
<td>700</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>80</td>
<td>7</td>
</tr>
</tbody>
</table>

Amounts on either side of a heavy line must be the same.

**Addition Puzzle**

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>500</td>
<td>60</td>
<td>4</td>
</tr>
<tr>
<td>800</td>
<td>100</td>
<td>9</td>
</tr>
</tbody>
</table>

**Subtraction Puzzle**

<table>
<thead>
<tr>
<th>Hundreds</th>
<th>Tens</th>
<th>Ones</th>
</tr>
</thead>
<tbody>
<tr>
<td>800</td>
<td>81</td>
<td>11</td>
</tr>
<tr>
<td>700</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>100</td>
<td>80</td>
<td>7</td>
</tr>
</tbody>
</table>

Use 80 and 11, so 4 can be combined with something (7) to get 11, rather than using 90 and 1 and trying to combine 4 with something to get 1.

**Check for Understanding**

Copy the Cross Number Puzzle on your own paper. Then complete the puzzle.

1

```
400 20 3
100 50 9

```

2

```
500 140 647

```

```
The volunteers made 430 care packages to send overseas. They mailed 249 packages on Monday. Do they have enough packages left to meet their goal of mailing at least 200 packages on Tuesday?

**Strategy:** Solve a Simpler Problem

**Read to Understand**

What do you know from reading the problem?

There were 430 care packages made and 249 packages were mailed on Monday. You need to find out if there are 200 packages left.

**Plan**

How can you solve this problem?

You can solve a simpler problem.

**Solve**

How can you solve a simpler problem?

You do not need to subtract the ones, tens, and hundreds to find the exact difference. You just need to find how many hundreds are left.

\[ 430 \quad \underline{-} \quad 249 \]

Write a subtraction problem and work from left to right to find the number of hundreds in the difference. Look at the tens digits to see if you need to regroup a hundred to subtract the tens. You cannot subtract 4 tens from 3 tens, so you will need to trade 1 hundred for 10 tens. If you subtract 2 hundreds from the 3 hundreds left, you see they will not meet their goal of mailing 200 packages on Tuesday.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Use the strategy solve a simpler problem.

1. It takes Yolanda 1 minute to copy 10 pages. She made 46 copies of one page and 52 copies of another page. Did Yolanda finish making the copies in 10 minutes?

2. Jeremy has $2.00. He wants to buy a cup of yogurt for 89¢ and 2 pieces of fruit for 48¢ each. Does Jeremy have enough money?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. An artist can make 6 clay pots in 2 days. How many clay pots can he make in 8 days?

4. There are 36 birds in a special exhibit at the zoo. There are 8 more females than males. How many birds are male?

5. A road map shows the Baker family must travel 267 miles south and then 156 miles west to get to the campground. How far must they travel?

6. Josh brought home 3 watermelons left at the end of the picnic. There were 14 watermelons eaten at the picnic. Tory took 2 watermelons home. How many watermelons were there at the beginning of the picnic?

7. Marissa is making a picture frame. She glues stones across the top of the frame. She continues the pattern along the bottom. Look at the picture. What color stone will Marissa place next?
Choose the best vocabulary term from Word List A for each sentence.

1. A(n) ____ is a line labeled with evenly spaced numbers.
2. To find a(n) ____ of a sum, add rounded numbers instead of the exact numbers.
3. To find the ____ between two numbers, subtract one number from the other.
4. The number 15 is a ____ of 3.
5. Trade means the same as ____.
6. To find the ____ of two numbers, add the numbers.
7. To ____ a number to the nearest hundred, decide which multiple of 100 the number is closer to.

Complete each analogy using the best term from Word List B.

8. Flat is to 100 as ____ is to 10.
9. Addition is to ____ as subtraction is to difference.

**Talk Math**

Discuss with a partner what you have learned about addition and subtraction. Use the vocabulary terms group and regroup.

10. How can you use flats, rods, and units to find the total for 2 three-digit numbers?
11. How do you know when you need to trade to find a difference?
What's in a Word?

**TRADE** The word *trade* has many different meanings. *Trade* can describe a job. “He is a car mechanic by *trade.*” It can also be used to mean “business.” “She did an excellent *trade* in souvenirs for the fair.” It can be a naming word for an exchange. “He made a good *trade.*” It can be an action word for an exchange. “She and her friend *traded* jackets.” In math, you can *trade* hundreds for tens or tens for ones when subtracting. If you use base-ten blocks, you can *trade* or exchange 1 rod for 10 units.
Ordering Numbers

**Game Purpose**
To practice comparing and ordering four-digit numbers

**Materials**
• 4 number cubes (labeled 1–6)

**How to Play the Game**

1. This is a game for 4 to 6 players. The goal is to score points by making up numbers from a toss of the number cubes.

2. The group tosses all 4 number cubes. Each player uses the numbers tossed to secretly write a four-digit number.

3. Everyone shows their numbers. Work together to put the numbers in order from smallest to largest.

4. This is how you earn points:
   • 2 points if no one else has the number
   • 1 point for the smallest number
   • 1 point for the largest number

**Example:** Number cubes 

<table>
<thead>
<tr>
<th>Player</th>
<th>Number</th>
<th>Points Earned</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carli</td>
<td>5,265</td>
<td>No one else has it: 2 points</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Smallest number: 1 point</td>
<td></td>
</tr>
<tr>
<td>Lamar</td>
<td>5,562</td>
<td>No one else has it: 2 points</td>
<td>2</td>
</tr>
<tr>
<td>Royce</td>
<td>6,552</td>
<td>Largest number: 1 point</td>
<td>1</td>
</tr>
<tr>
<td>Becka</td>
<td>6,552</td>
<td>Largest number: 1 point</td>
<td>1</td>
</tr>
</tbody>
</table>

5. Keep playing until time is called. The player with the most points wins. Ties are possible.
Least to Greatest

Game Purpose
To practice estimating and ordering sums

Materials
• Activity Masters 33 and 49: Least to Greatest Cards
• Stopwatch or a watch with a second hand

How to Play the Game

1. Play this game with a partner. Cut out the cards from Activity Masters 33 and 49. Mix them up. Put them face down in a pile.

2. Choose one player to be the card Placer. The other player will be the Timer.

3. The Timer says, “Go.” The Placer turns over one card at a time and puts it where it belongs in a line from the least sum to the greatest sum. You can pass on a card by setting it aside.

4. The Timer says “Stop” after 60 seconds and checks the order of the cards. The Timer says whether there are mistakes but not what the mistakes are.

5. The Placer may remove cards from the line to correct the order. When the Timer agrees that the order is correct, the Placer gets 1 point for each card.

Example: These four cards are placed correctly.

6. Switch roles. Play until time is called. The player with more points wins!
Here is a math trick that will let you add 3 three-digit numbers in your head very quickly.

Practice this trick on your own. Then try it on friends and family members.

**Step 1** Ask someone to name a three-digit number. Suppose the person says 534. This number is the key to the answer. Write the number.

**Step 2** Ask for a second three-digit number. Suppose the person says 741. Write it below the first one.

**Step 3** Then write the third number. You want the second and third numbers to have a sum of 999.

*Think:* $7 + 2 = 9$, $4 + 5 = 9$, and $1 + 8 = 9$.

So, you write 258.

The addition looks like this:

```
  5 3 4  First number
+ 7 4 1  Second number
+ 2 5 8  Third number
```

**Step 4** Now you can write the sum without adding the columns. Here’s how.

*Think:* $741 + 258 = 999$,

which is 1 less than 1,000.

*Think:* $1,000 + 534$, or 1,534. That is why the first number is the key to the answer. The sum is $1,000 + \text{the first number} - 1$.

And you can do that using mental math!

Practice the trick. Find the third number and the sum for each set of numbers without adding the columns. Then use a calculator to check.

1. 428, 375
2. 856, 602
3. 787, 529
Dear Student,

The number of clouds on the back of this card was found by applying a rule to the number of clouds on the front. What do you think the rule could be?

Some ideas for the rule might be:
• Multiply the number of clouds on the front by 2.
• Add 1 cloud to the amount on the front.
• Add 3 clouds, and then subtract 2 clouds from the clouds on the front.

You cannot be sure of the rule until you see the other cards in the set that follow the same rule. In this chapter, you will be working with sets of cards like these as you think about patterns. Have fun finding a rule for all the cards!

Mathematically yours,
The authors of *Think Math!*
Two girls are making necklaces. Alona uses 3 white beads for every red bead she puts in her necklace. Cara uses 3 more small beads than the number of large beads in her necklace.

For thousands of years, beads have been used for jewelry, decorations, and trade. Beads can be made from shells, gems, glass, and even from seeds.

**FACT-ACTIVITY 1**

Two girls are making necklaces. Alona uses 3 white beads for every red bead she puts in her necklace. Cara uses 3 more small beads than the number of large beads in her necklace.

<table>
<thead>
<tr>
<th>Alona’s Necklace</th>
<th>Cara’s Necklace</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red</strong></td>
<td><strong>White</strong></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

**Use the tables to answer the questions.**

1. What is a rule for finding the number of white beads in Alona’s necklace for a particular number of red beads? How many white beads are needed if there are 4 red beads? 5 red beads?

2. Look at the table for Cara’s Necklace. What is a rule for finding the number of small beads in Cara’s necklace for a particular number of large beads? What are the missing numbers in the table?
Janet is stringing beads to make a necklace. The table below shows the relationship between the number of long purple beads and round yellow beads.

<table>
<thead>
<tr>
<th>Purple</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

Use the table to answer the questions.

1. Janet begins with 2 purple beads and 3 yellow beads. When there are 4 purple beads, how many yellow beads are there?
2. When there are 9 yellow beads, how many purple beads are there?
3. Complete the table.
4. Draw a picture of what Janet’s necklace might look like. Describe the pattern.

CHAPTER PROJECT

Look in magazines or catalogs for floor tiles that have simple geometric shapes. You may find something like the design below.

- Select a tile or draw a design that has a clear number of two or more geometric shapes on it.
- Suppose you have 2, 3, 4, or 5 of the tiles. Write a rule that gives the number of each shape when you know how many tiles you have.
- Make a table to show the relationship between the shapes.

ALMANAC

Fact

The Bead Museum in Washington, D.C., has exhibits showing how beads have been used throughout history and amazing beaded crafts from all over the world. The largest bead in the collection is 6 inches long and weighs 6 pounds.
You can record information from Find a Rule cards onto a graph.

The numbers on the front of the FAR cards refer to the number of stickers. The numbers on the back of the cards refer to the cost of the stickers.

<table>
<thead>
<tr>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10¢</td>
</tr>
<tr>
<td>2</td>
<td>20¢</td>
</tr>
</tbody>
</table>

**Step 1**

Look at the first card to find the first number of stickers. On the graph, find the line for 1 sticker.

**Step 2**

Look at the first card to find the cost of the sticker. On the graph, find the line labeled 10¢.

**Step 3**

Place a point where the two lines intersect.

---

**Check for Understanding**

1. Use the second FAR card at the top of the page. Explain how you would record the information on the graph above.
These FAR cards have two rules.

<table>
<thead>
<tr>
<th>FRONT</th>
<th>BACK</th>
<th>FRONT</th>
<th>BACK</th>
<th>FRONT</th>
<th>BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A a A</td>
<td>Rule I</td>
<td>A a a</td>
<td>Rule II</td>
<td>A a a A</td>
<td>Rule I</td>
</tr>
<tr>
<td>A a a</td>
<td>4</td>
<td>A a a</td>
<td>9</td>
<td>A a a</td>
<td>8</td>
</tr>
<tr>
<td>A a A</td>
<td>Rule I</td>
<td>A a A</td>
<td>Rule II</td>
<td>A a A</td>
<td>14</td>
</tr>
</tbody>
</table>

This table shows the numbers on the backs of cards A, B, and C.

<table>
<thead>
<tr>
<th>Card</th>
<th>Rule I</th>
<th>Rule II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

On your own paper, continue the table for cards D, E, and F. The fronts of those cards are shown below.
Study the figures below. Look for a pattern.

1. How many tiles are in each figure?
2. How many orange tiles are in each figure?
3. How many white tiles are in each figure?
4. How does the total number of tiles change from one figure to the next figure?
5. How does the number of orange tiles change from one figure to the next figure?
6. How does the width of the figure change?
7. How does the length of the figure change?
8. Draw the next figure.
You can use a rule to describe the pattern in a sequence.

**Step 1** Think about how each figure in the sequence is the same.

Each figure has a row with an odd number of tiles across the top and a column of tiles down the middle.

**Step 2** Think about how each figure is different from the previous figure.

Each figure has two more tiles in the row across the top. Each figure has one more tile in the middle column.

**Step 3** State the rule and draw the next figure.

Add two more tiles to the top row. Add one more tile to the middle column.

---

**Check for Understanding**

Draw the next figure following the pattern.

1

2
A part of the Number Line Hotel is shown below. The entire hotel contains the number line from 0 to 99.

Look at the column of numbers above 6. What changes, and what stays the same for the numbers within the column?

What kind of jump would change the ones digit but not the tens digit?

How could you use the Number Line Hotel to help find 11 + 37?

How could you use the Number Line Hotel to help find 25 + 16?

How could you use the Number Line Hotel to help find 28 – 13?

How could you use the Number Line Hotel to help find 32 – 26?
You can add and subtract by using a grid.

<table>
<thead>
<tr>
<th>40</th>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
<th>47</th>
<th>48</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>31</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>35</td>
<td>36</td>
<td>37</td>
<td>38</td>
<td>39</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

You can use an arrow to represent a move of 1 square on the grid.

↑: up  ↓: down  →: right  ←: left

**To Add**

Move up to add tens.
Move to the right to add ones.

1 move up (↑) adds 10.
So, 26 + 10 = 36.
3 moves right (→→→) adds 3.
So, 14 + 3 = 17.

**Add tens and ones by using a combination of moves.**

Start on 13. Move up 3 (↑↑↑).
Move 2 to the right (→→).
You land on 45.
So, 13 + 32 = 45.

**To Subtract**

Move down to subtract tens.
Move to the left to subtract ones.

4 moves down (↓↓↓↓) subtracts 40.
So, 45 − 40 = 5.
1 move left (←) subtracts 1.
So, 14 − 1 = 13.

**Subtract tens and ones by using a combination of moves.**

Start on 37. Move down 2 (↓↓).
Move 3 to the left (←←←).
You land on 14.
So, 37 − 23 = 14.

✓ **Check for Understanding**

Write the landing number. Then write an addition or subtraction sentence to match.

1. 15↑↑→
2. 7↑↑↑→→
3. 43↓←←←
This machine takes a package as input. It outputs two smaller packages that share the contents of the input equally between them. Together, these two smaller packages contain everything the input package contained.

Aki put a package containing 2 quarters, 4 dimes, and 2 pennies into the machine. Use coins to act out what the machine will do.

1. What was in each package that came out of the machine?

2. How much money did the input package contain?

3. How much money did each output package contain?

4. Aki then tried an input package of 6 dimes, 2 nickels, and 4 quarters. What came out of the machine?

5. What did Aki put in the machine if the output was two packages, each containing 2 quarters and 4 pennies?

6. Aki input a package of 18 marbles. What came out of the machine?

7. The machine returns all packages that it cannot share evenly without cutting an object. What might you put in the machine that it would return?
You can write division number sentences to represent sharing situations.

There are 8 markers.

The markers are shared equally between 2 students.

Each student gets 4 markers. So, \(8 \div 2 = 4\).

There are 15 trading cards.

The cards are shared equally among 3 friends.

Each person gets 5 cards. So, \(15 \div 3 = 5\).

Check for Understanding

Write a division sentence for each situation.

1. There are 9 star stickers. They are shared equally among 3 third graders.

2. There are 10 counters. They are shared equally between 2 groups.

3. There are 12 quarters. They are shared equally among 3 brothers.
Leo makes a table to show how many stickers each of his brothers will get if he shares different numbers of stickers equally among them. How many stickers will each brother get if Leo shares 36 stickers?

<table>
<thead>
<tr>
<th>Number of Stickers</th>
<th>12</th>
<th>4</th>
<th>8</th>
<th>28</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Each Brother Gets</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>7</td>
<td>5</td>
</tr>
</tbody>
</table>

**Strategy:** Look for a Pattern

**Read to Understand**

What do you need to find out?

You need to find out how many stickers each brother will get if Leo shares 36 stickers.

**Plan**

How can you solve the problem?

You can look for a pattern.

**Solve**

How can you look for a pattern to solve the problem?

Look for a pattern in the table. The rule is divide by 4; 36 ÷ 4 = 9; So, each brother will get 9 stickers.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Look for a pattern to solve.

1. Robert uses a pattern to stack boxes for a store display. He puts 11 boxes in the first row. He puts 9 boxes in the second row and 7 boxes in the third row. How many rows of boxes will be in the display when Robert is finished, if the top row has only 1 box?

2. Noriko uses a pattern to write the following numbers: 5, 10, 20, 40. What is a rule for Noriko’s pattern?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Jenna is choosing an outfit to wear. She can wear a long-sleeve shirt or a short-sleeve shirt. She can wear a skirt, short pants, or long pants. How many different outfits are possible?

4. Tyrone earned some money doing chores. He put half of what he earned in the bank. Then he paid his sister the $2 he owed her. He has $5 left to spend. How much did Tyrone earn doing chores?

5. There are 6 people in the Ling family. At the mall, each person in the family bought either a pizza for $4 or a hot dog for $3. They spent $22 in all. How many pizzas and hot dogs did the Ling family buy?

6. Eduardo makes snack bags for a class trip. He has 34 pretzels. If he puts 3 pretzels in each bag, how many bags can Eduardo fill?

7. Jacob and Gabe plan to go fishing every week this summer. The table shows how many fish the boys have caught each week so far. If the pattern continues, how many fish will they catch in Week 5?

<table>
<thead>
<tr>
<th>FISH CAUGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Week</strong></td>
</tr>
<tr>
<td><strong>Number of Fish</strong></td>
</tr>
</tbody>
</table>

Chapter 6  97
Choose the best vocabulary term from Word List A for each sentence.

1. \(6 \div 3 = 2\) is a _____.

2. A(n) ____ can be made from two numbers and an operation symbol.

3. The number that is being divided is called the _____.

4. A(n) ____ is a picture of information.

5. In \(45 \div 5 = 9\), the number 5 is the _____.

6. The number on the bottom of a fraction is called the _____.

7. A table can be used to show the ____ for an input.

Complete each analogy. Use the best term from Word List B.

8. Numerator is to denominator as ____ is to whole.

9. Addition is to sum as division is to _____.

Talk Math

Discuss with a partner what you know about rules and patterns. Use the vocabulary terms rule and pattern.

10. You want to write a rule for a table. How do you know which operation to use?

11. How can you find a rule from a graph?
**Word Definition Map**

Create a word definition map for the word *graph*.

A. What is it?

B. What is it like?

C. What are some examples?

**Tree Diagram**

Create a tree diagram using the word *fraction*. Use what you know about the words *numerator, denominator, top number, bottom number, part, and whole*.

---

**TABLE**

A *table* is a piece of furniture with a smooth flat top fixed on legs. Some people use a table as a desk or a workbench. A *table of contents* in a book is a short list of what is in the book and where to find it. In math, a table uses columns and rows to organize and display information like a table of contents. The information can be numbers, but it does not have to be.
Find a Rule

**Game Purpose**
To practice using two-number inputs and outputs to find a rule

**Materials**
- Activity Master 68: Find a Rule

**How to Play the Game**

1. Play this game with a partner. Each player thinks of a rule for two input numbers and keeps it a secret.

2. Your partner names pairs of inputs. Write them in the first column of your table. Then use mental math or paper and pencil along with your rule to find the outputs.

3. When you have filled in the rows of the table, your partner guesses the rule and scores 1 point if correct.

4. Switch roles and continue playing. The winner is the player with more points when time is called.

<table>
<thead>
<tr>
<th>Two Numbers</th>
<th>Rule A</th>
<th>Rule B</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 3</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>10, 9</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>4, 2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>7, 4</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>3, 11</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>8, 8</td>
<td>64</td>
<td></td>
</tr>
</tbody>
</table>
Make a Rule

Game Purpose
To practice finding a rule for a set of numbers

Materials
• Index cards

How to Play the Game

1. Play this game with a partner. Make 2 sets of number cards, each numbered 1 through 12. Mix up all the cards. Place them face down in a stack.

2. Take turns turning over a card from the top of the deck. Both players look for 3 cards on the table that follow a rule.
   • Rules such as “greater than” and “less than” are not allowed.
   • A rule can be used only once. For example, if the rule for a set of cards is “numbers that are even,” that rule cannot be used for another set of cards.

3. The first player to correctly name a rule for 3 cards takes the cards. Keep a record of the rules you use.

4. If neither player can name a rule, the cards remain on the table.

Example: The number cards are:

   Possible rules are:  
   • even numbers
   • multiples of 4
   • one more than an odd number
   • one less than an odd number

5. Play until all the cards in the stack have been turned over and neither player can find a rule for the cards that are left. The winner is the player with more cards.
Put your finger on one corner of Picture A. Can you trace a path over the picture without going back over any line? Try it. A path that works is shown on the right.

Picture A

Pictures like this one are called networks. They have even and odd corners. Corner x is even, because it has an even number of lines meeting at the dot. Corner y is odd, because it has an odd number of lines meeting at the dot.

Trace over each picture. Try not to go back over a line.

Use the table to help you look for a pattern.

<table>
<thead>
<tr>
<th>Picture</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many odd corners?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can you trace over it?</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You can trace over a picture if it has ■ or □ odd corners.
Dear Student,

You have seen fractions in many places: when you need one third of a cup of flour, when it’s half an hour until lunch, and when you buy something with a quarter (one fourth of a dollar). In this chapter, you will not only look at fractions and what they mean, but you will also compare fractions and develop strategies for thinking about them.

An important idea about fractions is they are made by cutting a whole into equal parts. How could you cut this rectangle into halves (2 pieces with the same area)? How could you cut this rectangle into 3 pieces with the same area?

There are many ways to cut a rectangle into halves and thirds, so be creative!

Mathematically yours,
The authors of *Think Math!*
Origami is a Japanese word that means “paper folding.” There are 6 basic folds in origami: the mountain fold, valley fold, diagonal fold, fold and unfold, rotate, and flip over. These basic folds are used to create complex origami designs.

The models on the right show some folds that create fractional parts. Use these models for Problems 1–4.

1. What fractional parts are shown in Model A?
2. What fraction describes 3 of the equal parts in Model B?
3. How can you fold Model C to show fourths? Explore by folding a piece of square paper. Unfold your paper to show your folds. Draw a picture to show your answer.
4. Fold Model C into eighths. Show a fraction that is equivalent to your answer in Problem 2 by coloring some of the folded parts.
Imagine you are making origami designs to sell at the school arts and crafts fair. The table shows the time it takes to make each design and how much each design will cost. 

**Use a clock or coins for help.**

1. Write each time in the table as a fraction of an hour.
2. Write each price in the table as a fraction of a dollar.

### Origami Designs

<table>
<thead>
<tr>
<th>Item</th>
<th>Time (minutes)</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>bookmark</td>
<td>15</td>
<td>25¢</td>
</tr>
<tr>
<td>crane</td>
<td>10</td>
<td>30¢</td>
</tr>
<tr>
<td>coaster</td>
<td>20</td>
<td>50¢</td>
</tr>
<tr>
<td>frog</td>
<td>30</td>
<td>75¢</td>
</tr>
</tbody>
</table>

---

You can make more colorful origami by decorating the paper. Start with 2 pieces of white square paper. Fold each paper into 8 equal parts.

- On the first paper, create an interesting origami square by coloring one of the sections. Repeat the design on a number of sections so that your colored sections cover less than \( \frac{5}{8} \) but more than \( \frac{1}{4} \) of the paper.
- On the second paper, use three different colors on different sections of the square. Only use one color in each section. Write a fraction to show what part of the square each color represents.
- Use the papers you designed and fold each one into an object.

---

**ALMANAC Fact**

The world’s largest origami crane was created in Japan to promote world peace. The crane was 120 feet tall. About 10,000 children from all over the world helped to create drawings on the paper.
Understanding Fractions

A fraction names a part of a whole.

The number below the line tells how many equal-size pieces the whole was cut into. The number above the line tells how many of those pieces you are referring to.

Example What fraction of the rectangle is shaded?

3 ← number of pieces shaded
4 ← number of equal-size pieces the whole was cut into

The size of each piece must be the same. The shape of each piece does NOT have to be the same.

Examples

1/3 is shaded. The shaded part is NOT 1/3.

Check for Understanding

Write yes or no to answer the question.

1. Is 1/2 shaded? 2. Is 2/3 shaded? 3. Is 1/4 shaded?
Equivalent fractions are two or more fractions that name the same amount.

You can use fraction models to help you find equivalent fractions.

**Example** Find fractions equivalent to \( \frac{1}{4} \).

Find the models that match the length of \( \frac{1}{4} \).

\[
\begin{array}{c|c|c}
1 & 1\frac{1}{4} & 1\frac{1}{4} \\
\hline
1\frac{1}{4} & 1\frac{1}{4} & 1\frac{1}{4} \\
\hline
1\frac{1}{4} & 1\frac{1}{4} & 1\frac{1}{4} \\
\hline
1\frac{1}{4} & 1\frac{1}{4} & 1\frac{1}{4} \\
\hline
1\frac{1}{4} & 1\frac{1}{4} & 1\frac{1}{4} \\
\hline
2\frac{1}{8} & 3\frac{1}{12} & \frac{1}{4} \\
\hline
\end{array}
\]

\( \frac{2}{8} \) and \( \frac{3}{12} \) are the same length as \( \frac{1}{4} \), so they are equivalent.

**Check for Understanding**

Use the models above to write an equivalent fraction.

1. \( \frac{1}{3} \)
2. \( \frac{1}{5} \)
3. \( \frac{1}{2} \)
4. \( \frac{5}{6} \)
What are some different ways to describe a half dozen?

1. How many eggs in the picture are cracked?

B. What fraction, other than $\frac{1}{2}$, describes the cracked eggs in the picture?

2. Use a fraction to describe the number of cracked eggs in each group.

3. Use a fraction to describe the number of cracked eggs in each group.

4. What is another fraction that describes a half dozen eggs?

5. In each picture below, what fraction of the eggs are cracked?

Is the same fraction of eggs cracked in each picture?
One egg is \( \frac{1}{12} \) of a dozen. Two eggs are \( \frac{2}{12} \) of a dozen.

1. What part of a dozen is 5 eggs?

Four eggs are \( \frac{4}{12} \) of a dozen. Four eggs are also \( \frac{2}{6} \) of a dozen.

2. Write another fraction that describes 4 eggs as part of a dozen.

3. What part of a dozen is 3 eggs? Write two fractions.

Crystal has \( \frac{2}{3} \) of a dozen eggs, and her friend has \( \frac{3}{4} \) of a dozen eggs.

4. How many eggs does Crystal have?

5. How many eggs does her friend have?

6. Which is more: \( \frac{2}{3} \) or \( \frac{3}{4} \)?
Use the clock to help you answer the questions.

1. How many minutes are in an hour?

2. How many minutes are in a half hour?

3. How many minutes are in a quarter of an hour?

Ron will eat dinner in 1 hour. He plans to read for 20 minutes, do homework for 20 minutes, and play for 20 minutes.

4. What fraction of an hour is 20 minutes?

5. What fraction of an hour is 40 minutes?

6. Anh spends $\frac{3}{4}$ of an hour at karate class and $\frac{2}{3}$ of an hour playing piano.
   Which activity lasts longer?

7. Yori walks his dog for $\frac{1}{2}$ of an hour every day. Then they play together for $\frac{1}{3}$ of an hour.
   Which activity lasts longer?
You can use fraction models to help you compare fractions.

**Example** Compare $\frac{2}{5}$ and $\frac{3}{8}$.

Compare the lengths of the models for each fraction.

\[
\begin{array}{c|c|c}
\frac{1}{2} & \frac{1}{2} & \\
\frac{1}{3} & \frac{1}{3} & \\
\frac{1}{4} & \frac{1}{4} & \\
\frac{1}{5} & \frac{1}{5} & \\
\frac{1}{6} & \frac{1}{6} & \\
\frac{1}{8} & \frac{1}{8} & \\
\frac{1}{10} & \frac{1}{10} & \\
\frac{1}{12} & \frac{1}{12} & \\
\end{array}
\]

$\frac{2}{5}$ is longer than $\frac{3}{8}$, so $\frac{2}{5} > \frac{3}{8}$.

**Check for Understanding**

Compare the fractions using $<$, $>$, or $=$.

1. $\frac{1}{2}$ **•** $\frac{5}{10}$
2. $\frac{3}{12}$ **•** $\frac{3}{8}$
3. $\frac{4}{5}$ **•** $\frac{5}{6}$
4. $\frac{2}{3}$ **•** $\frac{1}{4}$
5. $\frac{1}{6}$ **•** $\frac{1}{3}$
6. $\frac{5}{12}$ **•** $\frac{4}{10}$
Kiki bought a dozen muffins. \( \frac{2}{3} \) of the muffins were blueberry. \( \frac{1}{4} \) of the muffins were cranberry. Did Kiki buy more blueberry or cranberry muffins?

**Strategy:** Make a Model

**Read to Understand**

What do you know from reading the problem?

\( \frac{2}{3} \) of a dozen muffins are blueberry. \( \frac{1}{4} \) of a dozen muffins are cranberry. You need to find out if there are more blueberry or cranberry muffins.

**Plan**

How can you solve this problem?

You can make a model.

**Solve**

How can you make a model?

You can use 12 counters to represent the dozen muffins.

To find the number of blueberry muffins, separate the counters into 3 equal groups. There are 8 counters in two groups, so Kiki bought 8 blueberry muffins.

To find the number of cranberry muffins, separate the counters into 4 equal groups. There are 3 counters in one group, so Kiki bought 3 cranberry muffins.

\( 8 > 3 \), so Kiki bought more blueberry muffins.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Use the strategy make a model.

1. Lupe has some bags of coins. Each bag has 8 coins, and 7 of the 8 coins are pennies. How many pennies does Lupe have in 6 bags?

2. Rex made a square design with 25 tiles. He put a green tile in each corner. He used red tiles to complete the outside border. Then he filled in the center with blue tiles. How many blue tiles did Rex use?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Mr. Ortega is ordering 20 packages of erasers. A package of erasers costs 50¢. If he buys them in bulk, he can get 20 packages for $7.99. How much would he save if he buys in bulk?

4. Carl has 6 library books and borrows 3 more. Mary Beth has 10 library books. If Carl returns 2 books, what must Mary Beth do to have the same amount as Carl?

5. Ms. Holt wrote some fractions. If she continues the pattern, which fraction will she write next?
   
   \[
   \frac{1}{4}, \frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \text{_____?}
   \]

6. There are 30 people having lunch together. They want to share large submarine sandwiches. Each person will have \(\frac{1}{6}\) of a sandwich. How many whole sandwiches should they order?

7. Lester can ride his bike 12 miles in 1 hour. How far can he travel in 6 hours?

8. Trina is going to ride her bike to visit her friends Hank, Marsha, and Annette. How many different ways can she order her visits?
Choose the best vocabulary term from Word List A for each sentence.

1. Two numbers that have the same value are ____.
2. A fraction with 3 in the denominator describes a group divided equally into ____.
3. Fifteen minutes is a ____ hour.
4. A package of twelve items is one ____ items.
5. A fraction with 4 in the denominator describes a group divided equally into ____.
6. When two numbers are compared, the one representing more is ____ the other number.
7. Thirty minutes is a ____ hour.
8. A(n) ____ names the same amount as another fraction.

Complete each analogy using the best term from Word List B.

9. Two is to ____ as ten is to tenths.
10. Minute is to ____ as day is to week.

Talk Math

Discuss with a partner what you have learned about fractions. Use the vocabulary terms fraction, half, and equal.

11. How can you tell what fraction of a grid is shaded?
12. How can you tell whether two fractions have the same value?
13. How can you use what you know about minutes and hours to compare fractions?
Create a Venn diagram for the words *hour* and *minute*. Write activities that you would measure by the hour and by the minute.

Create a word line using the words *fourth*, *half*, and *third*.

**What’s in a Word?**

**HOUR** The words *hour* and *our* sound exactly the same, but they have very different meanings. Using the word *our* says two things. One is that the person speaking is part of a group. The other is that the group owns something.

The word *hour*, however, refers only to time. One *hour* is exactly 60 minutes long.
Fraction Construction Zone

**Game Purpose**
To find equivalent fractions

**Materials**
- Activity Masters 79–81
- Paper bag
- Scissors

**How to Play the Game**

1. This is a game for two players.
   - Both players will use the Fraction Construction Zone gameboard and cards. Cut out 1 row of the Fraction Construction Zone cards, and put them in the paper bag.
   - Each player will need all of the Fraction Pieces. Cut them out.

2. Take turns. Without looking, pick a card from the bag.
   - Use the fraction pieces named on the card. If *free choice* is picked, you may choose any size you want.
   - Name an empty fraction bar on the gameboard. Use as many fraction pieces as you need to make that bar.
   - Write the equivalent fraction. You get 1 point for each fraction piece you used to make the bar.
   - If you cannot make the bar you named, you lose your turn and must take away your fraction pieces.

3. Take turns until all the fraction bars have been made. The player with more points wins.
Marble Mystery

**Game Purpose**
To find fractional parts of sets of objects

**Materials**
- Activity Master 82
- Two-color counters

**How to Play the Game**

1. **This is a game for 2 players. You each will need a gameboard and some counters. Choose who will be the Mystery Maker and who will be the Detective.**

2. **The Mystery Maker secretly sets up Game 1. Decide on the number of black marbles in a bag. Shade that number of marbles in each bag. Record the fractions.**

3. **The Detective asks questions to find the number of black marbles. The questions must be about the total number of marbles. You may NOT ask questions about the marbles in one bag. You may ask a question such as: *Are there more black marbles than white marbles?* You may NOT ask a question such as: *Are there 3 black marbles in a bag?* Use counters to help.**

4. **The Mystery Maker keeps track of the number of questions. The Mystery Maker gets 1 point for every question asked. The Detective gets 2 points for:**
   - finding the total number of black marbles.
   - telling how many black marbles are in each bag.
   - modeling the bags with counters.

5. **Switch roles. Play Game 1 again. The player with more points after two games wins.**
Work with a partner to discover how many different ways you can make one whole using halves, fourths, eighths, and sixteenths.

You will need 6 round paper plates, all the same size. You will also need scissors, a ruler, markers, and a bag.

**Color 4 paper plates each a different color.**
**Then cut up the paper plates this way:**

**A** Cut one plate in half. Label each part $\frac{1}{2}$.

**B** Cut one plate into 4 equal parts. Label each part $\frac{1}{4}$.

**C** Cut one plate into 8 equal parts. Label each part $\frac{1}{8}$.

**D** Cut one plate into 16 equal parts. Label each part $\frac{1}{16}$.

Mix up all the fraction parts and put them in a bag.

**Create a New Whole Plate**

1. Each partner starts with one whole plate. The goal is to exactly cover up your plate with fraction parts.

2. One partner picks a fraction part from the bag.

3. Take turns. If you get a fraction part and you cannot put it on your plate without overlapping, choose another part.

4. Record the fraction parts you used to cover your plate.

5. Start over. Can you cover the plate another way?

**Example:** On her first turn, Cho gets $\frac{1}{4}$.

After 3 turns, Cho has $\frac{1}{4}$, $\frac{1}{8}$, and $\frac{1}{8}$. 
Dear Student,

The way you display information can help you see patterns and draw conclusions. For example, imagine that your class voted on whether to have recess before or after lunch. Here are the ballots:

Which choice got the most votes? It is difficult to tell until you organize the information:

Now it’s easier to see which time the class prefers.

In this chapter, you will use tables and graphs to organize information in different ways to help you solve different problems.

Mathematically yours,
The authors of *Think Math!*
How high can you jump? Can you flip and twist in the air? Skateboarders can perform amazing jumps and tricks with just a board and 4 wheels. There are different lengths of skateboards. The following chart shows the average length of some skateboards.

<table>
<thead>
<tr>
<th>Skateboards</th>
<th>Length (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Board</td>
<td>80</td>
</tr>
<tr>
<td>Long Board: Transport</td>
<td>70</td>
</tr>
<tr>
<td>Long Board: Slalom</td>
<td>60</td>
</tr>
<tr>
<td>Long Board: Downhill</td>
<td>50</td>
</tr>
<tr>
<td>Long Board: Cruiser</td>
<td>40</td>
</tr>
</tbody>
</table>

Use the chart for the problems.

1. How long is the Slalom long board? Explain how you know.
2. How long is the Downhill long board?
3. How much longer is the Cruiser long board than the Standard board?
4. Name two boards whose combined length would be the same as the Cruiser long board.
The popularity of skateboarding has created a demand for more public skate parks. More cities are providing parks for skateboarders to practice their riding tricks.

**Use the map to answer the questions.**

1. At what 2 positions would you find the iron railing?
2. What is located at G6?
3. At what 3 positions would you find the ramp?
4. If the park designers wanted to make the ramp longer, at what position could they add an extension?

**CHAPTER PROJECT**

Suppose you have a skateboard, and you have saved up $100 to spend on additional skateboarding gear. Use newspapers, magazines, and catalogs to find the typical price of each of the following items: pads (knee and elbow, pair of each), wrist guards (pair), helmet, wheels (set of 4).

Make a list of the items and their prices. Then determine all the ways you can spend your money without exceeding $100. Make a chart to help you plan your possible purchases. On your chart, include the total cost of what you can buy and your change from $100.

- Can you buy all four of the items? Explain.
- Can you buy three of the items? Which ones?

**ALMANAC Fact**

Danny Way, a pro skateboarder, performed a stunning jump in the summer of 2005 by jumping over the Great Wall of China from a 9-story “MegaRamp.”
Students at Lincoln Elementary were surveyed about school lunch. They were asked to choose their favorite lunch from these five choices. Here are the results:

<table>
<thead>
<tr>
<th></th>
<th>Hamburger or cheeseburger</th>
<th>33</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Tuna sandwich</td>
<td>24</td>
</tr>
<tr>
<td>C</td>
<td>Chicken tenders</td>
<td>72</td>
</tr>
<tr>
<td>M</td>
<td>Macaroni and cheese</td>
<td>48</td>
</tr>
<tr>
<td>P</td>
<td>Pizza</td>
<td>66</td>
</tr>
</tbody>
</table>

A. On a separate sheet of paper, make a pictograph to show the data. Use a plate symbol (_plate_10) to represent 6 students.

B. How did you represent the results for hamburger or cheeseburger in your pictograph?

Here is another pictograph of the same data, where each _plate_10 represents 10 students. (Each number of students is rounded to the nearest multiple of 10.)

Looking at this pictograph, what is the most popular lunch?
Imagine that you toss two number cubes and find the sum of the results.
(Each number cube is numbered 1 through 6.)

Classify the following events as possible (P) or impossible (I).

1. The sum is 6.
2. The sum is 4.
3. The sum is 1.
4. The sum is 9, and one cube shows 2.
5. The sum is 8, and one cube shows 4.
6. The sum is 10, and neither cube shows 5.
7. The sum is 13.
8. The sum is multiple of 7.

9. Toss two number cubes 30 times and record the sum for each toss.

10. On a separate sheet of paper, make a pictograph of the data from Problem 9 as shown at right.
You can describe the likelihood of an event.

An event is **possible** if it could happen.

**Example:** Spin a number greater than 2 on the spinner shown. The numbers 4, 6, 8, 10, and 12 are greater than 2, so this could happen.

An event is **impossible** if it can never happen.

**Example:** Spin a 1. There are no 1s on the spinner, so this can never happen.

**More likely** than and **less likely** than are used to compare the likelihood of two events.

**Example:** You are **more likely** to spin a 2 than a 6.

**Example:** You are **less likely** to spin an 8 than a 4.

---

**Check for Understanding**

For 1 to 6, use the spinner above.

On a separate piece of paper, write **possible** or **impossible** for each event.

1. Spin an even number.

2. Spin an odd number.

3. Spin a number greater than 12.

On a separate piece of paper, write **more likely** or **less likely**.

4. You are ____ to spin a one-digit number than a two-digit number.

5. You are ____ to spin a number greater than 10 than a number less than 10.

6. You are ____ to spin a 4 than a 6.
You can use a table to list possible outcomes for an experiment.

How many possible outcomes are there if you toss two coins?

There is 1 way to get 2 heads.
There are 2 ways to get 1 heads and 1 tails.
There is 1 way to get 2 tails.
So, there are 4 possible ways the two coins can land.

**POSSIBLE WAYS FOR TWO COINS TO LAND**

<table>
<thead>
<tr>
<th>First Coin</th>
<th>Second Coin</th>
</tr>
</thead>
<tbody>
<tr>
<td>heads</td>
<td>heads</td>
</tr>
<tr>
<td>heads</td>
<td>tails</td>
</tr>
<tr>
<td>tails</td>
<td>heads</td>
</tr>
<tr>
<td>tails</td>
<td>tails</td>
</tr>
</tbody>
</table>

**Check for Understanding**

On a separate piece of paper, complete the table and answer the question.

How many possible outcomes are there if you toss a coin and spin the pointer shown above?
Chapter 8

Lesson 6

EXPLORE

Prices at the Class Store

Erasers and pencils are on sale!

Limit: no more than 3 of each item to a customer.

1. Chani bought 2 pencils and 2 erasers. How much did she spend?

2. If Chani gave the cashier a quarter, how much change did she receive?

3. List all the purchases you could make for 10¢ or less.

4. Miya spent exactly 17¢. What did she buy?
Using a Map Grid

You can name locations on a map grid.

**Activity** Jerome’s house is at the intersection of two streets. Name the location of Jerome’s house.

**Step 1** Trace along the bottom of the grid until you reach the vertical line that crosses Jerome’s house. Look at the label below the graph that gives the street name.

**Step 2** Find the horizontal line that crosses Jerome’s house. Find the label on the side of the grid that shows the name of the other street.

So, Jerome’s house is at the intersection of Avenue D and Third Street.

**Check for Understanding**

**Name the location of each house.**

1. Sue’s house is at the intersection of ____ Street and ____ Avenue.

2. Tom’s house is at the intersection of ____ Street and ____ Avenue.
Lori has two number cubes. Each cube has the numbers 1, 1, 2, 2, 3, and 3. She tosses the cubes and finds the sum. What sums can she toss?

**Strategy:** Make a Table

**Read to Understand**

What do you know from reading the problem?

Lori tosses two number cubes numbered 1, 1, 2, 2, 3, and 3 and finds the sum.

What do you need to find out?

All the possible sums Lori can toss.

**Plan**

How can you solve the problem?

I can make a table.

**Solve**

How can you make a table to solve the problem?

List all the different tosses for each number cube in the table. Record the sums for each toss in the table. Then look for all the possible sums.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?

<table>
<thead>
<tr>
<th>Number Cube 1</th>
<th>Number Cube 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Lori can toss a sum of 2, 3, 4, 5, and 6.
**Problem Solving Practice**

**Make a table to solve.**

1. You have only dimes, nickels, and pennies in your bank. You want to buy a pen for 16¢. What are all the ways you can pay for the pen?

2. Sam would like to buy stickers to decorate his notebook. One sticker costs 12¢. Two stickers cost 24¢, and three stickers cost 36¢. If Sam has a total of 72¢ to spend, how many stickers can he buy?

**Mixed Strategy Practice**

**Use any strategy to solve. Explain.**

3. Annabelle eats 5 servings of vegetables each day. How many servings of vegetables does Annabelle eat in a week?

4. If $\frac{1}{4}$ of a box of crayons is 12 crayons, how many crayons are in the whole box?

5. It takes Manuel 15 minutes to ride his bike to Jake’s house. Manuel and Jake want to play video games together for an hour. What time should Manuel leave his house to play video games with Jake and be back home at 6:00 P.M.?

6. Sasha tossed a coin 15 times. She tossed heads twice as many times as tails. How many times did Sasha toss heads?
Chapter 8

Vocabulary

Choose the best vocabulary term from Word List A for each sentence.

1. The number 8 is a(n) ___, but 3\(\frac{1}{2}\) is not.
2. Walking to the sun is a(n) ___ event.
3. A group of questions used to collect data is called a(n) ___.
4. Going to school on Friday is ___ going to school on Saturday.
5. A(n) ___ shows how to measure bars in a bar graph.
6. The place where two lines cross each other is called an ___.

Complete each analogy. Use the best term from Word List B.

7. Symbol is to pictograph as bar is to ___.
8. Word is to story as ___ is to graph.

Talk Math

Discuss with a partner what you have learned about pictographs and bar graphs. Use the vocabulary terms data, graph, label, and symbol.

9. How can you make a bar graph?
10. How are a pictograph and a bar graph alike? How are they different?
**EXPERIMENT** An experiment is “a trial or a test.” Experiments are done to discover something, test a guess, or try out a new idea. We use the word experiment in everyday life, in science, and in math. School cafeteria workers might do an experiment to see if offering more food choices will affect how many lunches are sold. In a science experiment, a scientist might test how weather affects plant growth. A math experiment could be tossing a coin many times to see how often heads is tossed. For most experiments, the results are recorded. Then conclusions can be made from the data.
Where's My House?

Game Purpose
To practice locating an object on a grid

Materials
• Activity Master 88: Where’s My House?
• Activity Master 89: House Pieces
• Two-color counters

How to Play the Game

1. Play this game with a partner. Each player will need a Where’s My House? gameboard and 1 house piece.
   • Stand an open book or folder between you and your partner so you cannot see each other’s gameboard.
   • Secretly place your house in one square of your gameboard.

2. Decide who will play first.
   • Take turns guessing the location of your partner’s house. Ask whether the house is in a certain square.
   • Your partner says, “yes,” “no,” or “near.” (Near means your guess is one of the eight squares touching the square with the house.)
   • Use two-color counters to mark your guesses. Use one color for “no.” Use the other color for “near.”

3. The winner is the first player to find the other player’s house. Play as many rounds as time allows.
## How to Play the Game

1. Play this game with a partner. Each player will need a Town Street Map and 1 token to use as a car.
   - Stand an open book or folder between you and your partner so you cannot see each other’s map.
   - Secretly place your car on a street or avenue on your map. The car can be at an intersection or between intersections.

2. Decide who will play first.
   - Take turns guessing the location of your partner’s car. Ask whether it is at a certain intersection, between intersections, or anywhere along a certain street.
   - Use two-color counters to mark your partner’s responses to your guesses. Use one color for “no.” Use the other color for “near.”

3. The winner is the first player to find the other player’s car. Play as many rounds as time allows.

---

### Where’s My Car?

#### Game Purpose
To practice naming intersections on a map grid

#### Materials
- Activity Master 90: Town Street Map
- Tokens
- Two-color counters
Ozzie surveyed his classmates. He asked “How many days last week did you ride your bicycle?” Ozzie made a table to show the results.

<table>
<thead>
<tr>
<th>NUMBER OF DAYS LAST WEEK WE RODE OUR BICYCLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Days</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1 or 2</td>
</tr>
<tr>
<td>3 or 4</td>
</tr>
<tr>
<td>5 or 6</td>
</tr>
<tr>
<td>I don’t ride a bicycle.</td>
</tr>
</tbody>
</table>

Make a bar graph or a pictograph from the data in the table. Then use the table or your graph to answer the questions.

1. How many classmates answered the survey question?

2. How many classmates rode their bicycles last week?

3. How many classmates rode more than 2 days?

4. How many classmates who rode their bicycles said they rode fewer than 3 days?
Dear Student,

To multiply larger numbers, such as $27 \times 58$, it helps to know some multiplication facts well. Some facts that might help you solve this problem are shown below.

Do you already know these facts?

In this chapter, you will improve your knowledge of multiplication facts, and begin to see how these facts can help you multiply larger numbers. The games and puzzles will also give you many chances to show what you already know.

Mathematically yours,
The authors of Think Math!

$8 \times 7$

$2 \times 5$

$5 \times 7$

$8 \times 2$
Are you a collector? Some people collect model cars, dolls, or stamps. Others collect more unusual items such as potato chip bags or gum wrappers.

Lauren collects key chains. The table below shows the types of key chains Lauren collects.

| Collections |

| Use the table to answer the questions. |

2. Lauren has 5 of each type of fashion key chain. How many fashion key chains does she have?
3. Lauren has 9 of each type of animal key chain. How many animal key chains does she have in her collection?
4. Find the total number of sports key chains Lauren has if she has 8 of each.
5. Lauren has 2 of each type of vehicle key chain. Does she have more vehicle or more fashion key chains?
6. Lauren also collects key chains of attractions from U.S. states. She has 5 key chains each from 14 different states. Draw an array to help you find $5 \times 14$. Break the array into two smaller arrays. What is the total number of state key chains?

| Lauren's Key Chain Collection |

<table>
<thead>
<tr>
<th>Key Chains</th>
<th>Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals</td>
<td>cats, birds, fish, dogs</td>
</tr>
<tr>
<td>Fashion</td>
<td>shoes, hats, jewelry</td>
</tr>
<tr>
<td>Sports</td>
<td>baseball, football, soccer, basketball, tennis, car racing, golf</td>
</tr>
<tr>
<td>Vehicles</td>
<td>cars, boats, bikes, motorcycles, planes, trains</td>
</tr>
</tbody>
</table>
Sports card collecting started in the 19th century. It became more popular around 1933 when baseball stars such as Babe Ruth and Ty Cobb were featured.

Matt has a collection of 120 sports cards that includes baseball, football, basketball, and soccer cards. Use Matt's collection for 1–3.

1. Matt arranged his cards in an array with 12 rows. How many columns are in his array?

2. In Matt’s display, there are 4 rectangular sections, one for each sport. Break his array into 4 different sections to show one possibility for Matt’s display.

3. Using Matt’s array, how many cards of each sport are in each section? Write a multiplication sentence for each section.

CHAPTER PROJECT

Choose an item you would like to collect. Gather, draw, or find pictures of at least 36 of the items.

Separate the collection into at least 3 different groups, either by color, size, or some other attribute. Arrange some or all of the items or pictures in each group in an array. Lay the groups out on a table.

Draw your array on a poster. Show how multiplication can be used to find the number of items in each group and the total number of items displayed in the collection.

ALMANAC

Fact

A key chain is not just a simple metal key ring attached to your keys. You can find all kinds of fancy key chains from cartoon characters to flash lights and even the world’s smallest calendar.
How many ways can you make the products?

Find at least two ways to write each number below as the product of two numbers (not including 1). Use tiles or counters to help you.

**Example:** \(20 = 5 \times 4\) and \(20 = 2 \times 10\)

<table>
<thead>
<tr>
<th></th>
<th>24</th>
<th>30</th>
<th>45</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>56</td>
<td>36</td>
<td>32</td>
</tr>
<tr>
<td>7</td>
<td>48</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>18</td>
<td>42</td>
<td>54</td>
</tr>
</tbody>
</table>

You may use grid paper or drawings of intersecting lines to help you find the product.

<table>
<thead>
<tr>
<th></th>
<th>5 \times 12</th>
<th>9 \times 8</th>
<th>11 \times 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td></td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>16</td>
<td>7 \times 11</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>19</td>
<td>11 \times 10</td>
<td>12 \times 12</td>
<td>18</td>
</tr>
<tr>
<td>18</td>
<td>6 \times 12</td>
<td>9 \times 7</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>12 \times 12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
You can use models to help you multiply.

**You can use counters.**

**Example** $3 \times 8 = \square$

You can make an array with 3 rows and 8 counters in each row. Then find the total number of counters in your array.

There are 24 counters.
So, $3 \times 8 = 24$.

**You can use square tiles.**

**Example** $6 \times 6 = \square$

You can make an array with 6 rows and 6 tiles in each row. Then find the number of tiles in your array.

There are 36 tiles.
So, $6 \times 6 = 36$.

**You can draw intersecting lines.**

**Example** $8 \times 7 = \square$

You can draw 8 horizontal lines and 7 vertical lines. Then find the number of intersections.

There are 56 intersections.
So, $8 \times 7 = 56$.

**You can use grid paper.**

**Example** $5 \times 12 = \square$

You can shade an array with 5 rows and 12 columns. Then find the number of squares in your array.

There are 60 squares.
So, $5 \times 12 = 60$.

**Check for Understanding**

Find the product. You may use any model you wish.

1. $4 \times 7 = \square$
2. $12 \times 6 = \square$
3. $9 \times 8 = \square$
4. $5 \times 9 = \square$
Use tiles or counters to solve the problem. Draw a picture to represent your solution, and write a number sentence to describe it.

1 Mrs. Kay gave the same number of stickers to each of her 4 grandchildren. She gave away 36 stickers. How many stickers did each child get?

2 After school, a team of 9 students cleaned up the playground. Each student picked up 4 bags of trash. How many bags did the team collect?

3 The Pet Store sells dog treats in packages of 6 treats. The store sold 48 dog treats yesterday. How many packages did they sell?

4 Cindy is playing a card game to test her memory. She neatly lines up 48 cards in 8 rows and places them face down. How many cards are in each row?
You can write multiplication and division fact families for problem situations.

**Example**

Angela displays her collection of quarters in an array.

You can use multiplication and division to describe the array.

**Use multiplication to tell how many quarters in the array.**

Multiply the number of rows by the number of columns, or $4 \times 6 = 24$ quarters

Multiply the number of columns by the number of rows. $6 \times 4 = 24$ quarters

**Use division to tell how many quarters are in each row or column.**

Divide the total by the number of rows. $24 \div 4 = 6$ columns

Divide the total by the number of columns. $24 \div 6 = 4$ rows

The same numbers are used in all the facts. These related multiplication and division number sentences are called a **fact family**.

**Check for Understanding**

Write a fact family for each situation.

1. Suki picked 32 tomatoes. She gave the same number of tomatoes to each of her 4 neighbors.
EXPLORE
Using 10 as a Factor

What pattern can help you multiply by 10?

1. You already know these products.

   | 3 × 10 | 10 × 8 |
   | 4 × 10 | 10 × 7 |
   | 10 × 1 |

   Now try to find these products. Then use a calculator to check your answers.
   10 × 12 10 × 10
   16 × 10 10 × 23
   45 × 10 87 × 10

2. Think about the related number sentences for this sentence . . .

   10 × 36 = 360

   . . . to help you complete the number sentence and write the related number sentences.

   680 = ■ × 68
   ■ = ■ × ■
   ■ = ■ ÷ ■
   10 = ■ ÷ 68

3. What number must you multiply by 10 to get 370? Write the four related number sentences.

4. Find two numbers with a product of 530, and write a number sentence that uses those numbers.
   See if you can find another pair of numbers with a product of 530, and write a multiplication sentence that uses those numbers.
You can use smaller arrays to help you find the number of squares in a larger array.

**Example A** You can draw a line to separate a large array into two smaller arrays.

Write a multiplication sentence to find the number of squares in each small array.

M: \(3 \times 10 = 30\)  \(N: 3 \times 6 = 18\)

Add the number of squares in each small array to find the number of squares in the large array.

\(30 + 18 = 48\)  So, \(3 \times 16 = 48\)

**Example B** You can draw two lines to separate a large array into four smaller arrays.

Write a multiplication sentence to find the number of squares in each small array.

P: \(10 \times 10 = 100\)  \(Q: 10 \times 4 = 40\)
\(R: 3 \times 10 = 30\)  \(S: 3 \times 4 = 12\)

Add the number of squares in each small array to find the number of squares in the large array.

\(100 + 40 + 30 + 12 = 182\)  So, \(13 \times 14 = 182\)

**Check for Understanding**

Find the number of squares in the larger array.

1. \(5 \times 14 = \_\)

2. \(11 \times 15 = \_\)
At the baseball game, Toby spent $6.00 on snacks. He bought a large bag of popcorn and a small bag of peanuts. The bag of popcorn cost 3 times as much as the bag of peanuts. What was the cost of the peanuts? What was the cost of the popcorn?

**Strategy:** Guess and Check

**Read to Understand**

What do you know from reading the problem?

Toby spent $6.00 on a bag of popcorn and a bag of peanuts. The popcorn cost 3 times as much as the peanuts.

**Plan**

How can you solve this problem?

You can use the strategy guess and check.

**Solve**

How can you use this strategy?

Guess the cost of the peanuts, and use this guess to find the cost of the popcorn. Start with an amount less than $6.00, such as $1.00. If peanuts are $1.00, then popcorn is 3 times more, or $3.00: $1.00 + $3.00 = $4.00.

That guess is too low, so adjust the guess. If peanuts are $1.50, then popcorn is $4.50. $1.50 + $4.50 = $6.00. So, that guess is correct.

**Check**

Look back at the problem. Did you answer the questions that were asked? Do the answers make sense?
**Problem Solving Practice**

Use the strategy *guess and check*.

1. The sum of two numbers is 10. Their product is 24. What are the two numbers?

2. There were 125 campers at the cookout. Each camper ordered either a hot dog or a hamburger. There were 25 more hot dog orders than hamburger orders. How many hot dogs were ordered? How many hamburgers were ordered?

**Mixed Strategy Practice**

Use any strategy to solve. Explain.

3. Suppose you start an exercise program by exercising 15 minutes a day. If every week you increase your daily exercise time by 5 minutes, during which week would you be exercising 30 minutes a day?

4. At the birthday party, $\frac{5}{6}$ of the chocolate cake got eaten and $\frac{5}{8}$ of the vanilla cake got eaten. If the cakes were the same size, which cake had the greater amount eaten?

5. Six children went apple picking. Each child picked 17 apples. How many apples did they pick?

6. Vincent is watching his favorite movie. The movie is 138 minutes long. If he stops the movie after 2 hours, how many minutes will Vincent have left to watch?

7. Nona is using toothpicks to make the design shown at right. How many toothpicks will Nona need to make 14 squares in a row?
Choose the best vocabulary term from Word List A for each sentence.

1. Multiplication is ____ because switching the factors does not change the answer.
2. A set of multiplication and division sentences that use the same three numbers is called a(n) ____.
3. The ____ is the answer in a multiplication problem.
4. A(n) ____ is an arrangement of objects in rows and columns.
5. You can ____ rows in two arrays to make a larger array (if the number of columns is the same).

Complete each analogy using the best term from Word List B.

6. Add is to multiply as addend is to ____.
7. Addend is to sum as factor is to ____.

Talk Math

Discuss with a partner what you have learned about multiplication. Use the vocabulary terms factor, product, separate, and combine.

8. How can you write a multiplication and division fact family from an array?
9. How can you use an array to multiply two numbers?
10. How is a Cross Number Puzzle like an array?
Analysis Chart

Create an analysis chart for the terms combine, commutative, fact family, factor, and product.

Concept Map

Create a concept map using the term fact family. Use what you know and what you have learned about addition, subtraction, multiplication, and division.

What’s in a Word?

FACTOR The word factor is often used in everyday life. A factor is something that is important for something to happen. It could also be a part of a process. Good study habits are a factor in school success. Price could be a factor when choosing a new jacket.

In math, the word factor also has to do with making something happen. We say 3 and 4 are factors of 12 because $3 \times 4$ results in 12.
Tic-Tac-Toe Multiplication

**Game Purpose**
To select factors and find products

**Materials**
- Activity Masters 95 to 98: Tic-Tac-Toe Multiplication
- Two-color counters

**How to Play the Game**

1. This is a game for 2 players. You each will need about 20 counters. Decide who will use each color.

2. Place your gameboard (Activity Master 95, 96, 97, or 98) between you. One player faces the numbers in the *Player A* box. The other player faces the numbers in the *Player B* box.
   - Player A chooses a number from his or her box. Player A says the number aloud and places a counter on it.
   - Player B chooses an unused factor from his or her box that can be multiplied with Player A’s factor to make a product on the gameboard. Player B places a counter on the factor and on the product.
   - If Player B cannot make a product, he or she loses a turn. Then Player B must name the next factor for Player A.

3. Take turns choosing factors and placing counters on products on the gameboard.

4. The first player to cover 3 products in a line—across, down, or diagonally—wins.
Caught in the Middle

Game Purpose
To practice identifying factors and products

Materials
• Index cards

How to Play the Game

1. This is a game for 3 players. Make 4 sets of index cards numbered 1 through 12.

2. Mix up the cards. Place them face down in a pile.
   • Each player takes two cards and turns them face up. Take turns saying aloud the product of your numbers. Be sure to notice who has the product with the value between the other two products—the middle value, not the highest or lowest.
   • Take turns naming a different pair of numbers (not including 1) that also make your product. For example, a player who gets 4 and 8 could name 2 and 16, even though 16 is not a card.
   • If you can make your product a different way, place any one of your own cards face down in your “won pile.” If you have the product in the middle, take the rest of the face-up cards for your “won pile.” If there is no middle value because two players have the same product, the player with the different product can take the remaining cards.

3. Play until there are not enough cards for each player to take 2 cards. The player with the most cards in his or her “won pile” wins.
Make a copy of this grid. Then draw arrays for as many of the multiplication facts below as you can. Do not overlap arrays. Make each array a different color. Try to fill as much of the grid as you can. Can you fill the entire grid?

**MULTIPLICATION FACTS**

<table>
<thead>
<tr>
<th>1 × 12</th>
<th>1 × 5</th>
<th>1 × 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 × 10</td>
<td>1 × 6</td>
<td>1 × 3</td>
</tr>
<tr>
<td>3 × 9</td>
<td>2 × 5</td>
<td>2 × 3</td>
</tr>
<tr>
<td>4 × 8</td>
<td>3 × 5</td>
<td>3 × 3</td>
</tr>
<tr>
<td>5 × 7</td>
<td>5 × 5</td>
<td>4 × 3</td>
</tr>
<tr>
<td>6 × 6</td>
<td>4 × 6</td>
<td>6 × 3</td>
</tr>
</tbody>
</table>
Chapter 10

Length, Area, and Volume

Dear Student,

In this chapter, you will be measuring length, area, and volume. These are all measurements of space.

When you use a measuring tape or ruler to measure distance along a straight line or a wiggly path, you are measuring length. When a path loops to make a closed figure like the one shown, you can still measure its length. That length is called the perimeter of the figure. You can also measure something new: the area inside the loop.

Now imagine that you’ve drawn a loop on the top of a block of wood and cut around it with a saw. You can still measure the length of the loop (perimeter of the figure you’ve drawn) and the area inside that figure, but the amount of space this lump of wood takes up depends on its thickness. When you measure that amount of space, you are measuring volume.

You’ll get a chance to measure the length, area, and volume of many things during this chapter!

Mathematically yours,
The authors of Think Math!
Many people keep tropical fish as pets. Tropical fish are colorful, fun to watch, and they don’t need to be taken for a walk!

Fancy Fish

For 1–3, use a ruler to measure the length of each fish to the nearest quarter inch.

1. Goldfish
2. Betta
3. Royal Gramma Basslet
4. Find an object in the classroom that is about 2 1/2 inches long.
5. Write the lengths of the fish and the object you found in order from least to greatest.
Have you ever wondered how many fish can live together in a tank? This actually depends on the type of fish. A Betta is an aggressive fish and is usually kept alone in a 10-gallon tank or bigger. A Betta can live with other fish in the same tank as long as the other fish are peaceful.

For 1–4, you may use cubes to help.

1. Suppose you have a Betta fish, and you put it in a tank that is 2 feet wide and 2 feet long. What is the perimeter of the tank’s bottom?

2. Suppose your tank is 2 feet wide, 2 feet long, and 2 feet tall. Explain how you can find the volume of the tank in cubic feet.

3. Suppose you want to keep a goldfish and a Basslet together with your Betta in a larger tank. The new tank is 4 feet wide, 5 feet long, and 3 feet high. Find the volume of the tank.

Materials: cubes

Design your own large fish tank. Your tank needs to have a volume of 48 cubic feet.

- Use cubes to build 3 different rectangular fish tank designs.
- Find the perimeter of your tank’s bottom.
- Find the area of your tank’s bottom.
- If the bottom of your fish tank has an area of 4 square feet, what is the tallest your tank could be? Explain how you can use cubes to find out.
- Describe how you could find the total area of the glass sides of any of your tanks. Do not include the top.

ALMANAC

Americans own about 50 million pet fish, making fish the third most popular pet after cats and dogs.
You can use a ruler to measure objects to the nearest inch, half inch, and quarter inch.

To the nearest inch, this crayon measures 3 inches.

To the nearest half inch, this crayon measures $2\frac{1}{2}$ inches.

To the nearest quarter inch, this crayon also measures $2\frac{1}{2}$ inches.

To the nearest quarter inch, this crayon measures $2\frac{3}{4}$ inches.

**Check for Understanding**

1. What is the measure of the ribbon to the nearest half inch?

2. What is the measure of the ribbon to the nearest quarter inch?
Each small square on this page measures 1 cm on each of its four sides.

The amount of paper covered by one of these squares—the area covered—is 1 square centimeter or 1 sq cm.

The distance around any figure is its perimeter. Sometimes you can measure perimeter with a ruler, or on graph paper like this. You can use the fact that the sides of the small squares each measure 1 cm.

This figure has an area of 3 sq cm and a perimeter of 8 cm.

Use your graph paper to draw lots of different figures that have an area of 6 sq cm. Find the perimeter of each figure.

Do all the figures have the same perimeter? If not, find as many different perimeters as you can.
Measuring Perimeter and Area

Perimeter (P) is the distance around a figure. Area (A) is the number of square units needed to cover a flat surface.

You can measure the perimeter of a figure in centimeters (cm) and the area of a figure in square centimeters (sq cm).

The perimeter of the figure is 10 cm.

The area of the figure is 4 sq cm.

Two figures with the same area can have different perimeters.

P = 8 cm
A = 4 sq cm

P = 10 cm
A = 4 sq cm

Check for Understanding

1. Which two figures have the same perimeter?

2. Which two figures have the same area?
Imagine that you are an ant wrangler, and you’re making a tiny corral for your herd of ants. You have 16 cm of fencing for the corral.

Use a piece of centimeter graph paper to try some designs. Make the fence follow the lines of the graph paper. Use all 16 cm of fence for each design.

1. Record the area and perimeter of each design.

2. What is the smallest area of the corrals you designed?

3. What is the largest area of the corrals you designed?

4. If you had 18 cm of fencing instead of 16 cm, could you enclose a larger area? What would be the largest possible area?
Lesson 7
Building with Cubes

1. Using units from a set of base-ten blocks, build this box:

2. Use a centimeter ruler to measure your box.
   A. From left to right
   B. From front to back
   C. From top to bottom

3. How many units did you use to build the box?

4. Using rods from a set of base-ten blocks, build this box:

5. Use a centimeter ruler to measure your box.
   A. From left to right
   B. From front to back
   C. From top to bottom

6. Although you actually used rods to build this box, if you built it with units instead, how many units would you need?
Volume is the amount of space a three-dimensional figure takes up. This is 1 cubic unit. It is used to measure volume.

You can find volume by counting the number of cubic units needed to fill an object.

Volume = 9 cubic units

You can find volume by counting the number of cubes in each layer of a three-dimensional figure.

2 layers × 4 cubes in each layer
Volume = 8 cubic units

You can find volume of a rectangular box by multiplying the length, width, and height.

3 cubes × 2 cubes × 4 cubes
Volume = 24 cubic units

✔ Check for Understanding

Write the volume for each figure in cubic units.

1. cubic units

2. cubic units

3. cubic units
Katie drew a rectangular figure with an area of 20 sq cm and a perimeter of 24 cm. What are the length and width of the figure she drew?

**Strategy:** Draw a Picture

**Read to Understand**

What do you know from reading the problem?

The rectangular figure has an area of 20 sq cm and a perimeter of 24 cm.

**Plan**

How can you solve the problem?

You can draw a picture to solve the problem.

**Solve**

How can you draw a picture to solve the problem?

You can draw different rectangles that have an area of 20 sq cm. Then you can find the one that has a perimeter of 24 cm. Find the length and width of this figure.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Draw a picture to solve.

1. Francisco drew a rectangle with a perimeter of 20 cm. The length of the rectangle is 9 cm. What is the area of the rectangle?

2. Celine is setting up for the book fair. She has 28 books to display on a table. If she places the same number of books in each row, how many different ways could she arrange the books?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Erika has 140 pictures in her photo albums. Her first album has 20 more pictures in it than her second album. How many pictures are in each album?

4. Jackie’s karate class begins at 4:45. It takes her 10 minutes to get from home to her class. She spends 20 minutes getting ready for the class. At what time should Jackie begin getting ready for karate?

5. Jared wrote the numbers 3, 6, 8, 11, 13, 16, and 18 on the board. What are the next two numbers in his pattern?

6. Luis is studying for the Spelling Bee. He studied 12 words each night for the last 5 nights. How many words has he studied so far?

7. Nathan is taller than Julio. Emily is shorter than Julio. What is the order of the children from shortest to tallest?

8. Alely used quarters and nickels to pay 80¢ for her snack. She used 2 quarters. How many nickels did she use?
Choose the best vocabulary term from Word List A for each sentence.

1. The middle mark between 0 and 1 inches measures a(n) ___.
2. The dimensions of a box are ___, ___, and ___.
3. The ___ is the distance around something.
4. The ___ of this figure is the number of squares that can cover it.
5. You can use ___ to measure volume.

Complete each analogy. Use the best term from Word List B.

6. Inch is to foot as ___ is to meter.
7. Length is to centimeter as volume is to ___.

Talk Math

Discuss with a partner what you have learned about perimeter, area, and volume. Use the vocabulary terms length, width, and height.

8. How can you measure the perimeter of a sheet of paper?
9. How can you measure the area of a sheet of paper?
10. How can you measure the volume of a box?
Create a Venn diagram for the terms **height, length, width, area, perimeter, volume, square centimeter, cubic centimeter, square inch, and cubic inch**. Call one circle of the Venn diagram “Measurements of a Square.” Call the other circle “Measurements of a Box.”

**Word Definition Map**

Create a word definition map for the term **volume**.

**What's in a Word?**

**RANGE** The word *range* in the song *Home on the Range* means a wide-open area where animals can roam and feed. Another type of *range* is a cooking stove with burners on top and an oven. Both of those meanings of *ranges* are nouns. *Range* can also be a verb. “To range through the park” means “to walk around and explore the park.”

In mathematics, *range* is a noun. It is the difference between the largest number and smallest number in a set of numbers.
Ruler Game

**Game Purpose**
To practice identifying fractional parts of inches

**Materials**
- Activity Master 104: Ruler Game
- Paper clip and pencil
- Crayons or markers

**How to Play the Game**

1. Play this game with a partner. To use the spinner on Activity Master 104, lay a paper clip flat. Put the pencil point through one end of it and onto the dot in the center of the spinner. The paper clip will spin around the pencil point.

2. Spin the spinner. The player who spins the greater fraction goes first. That player will choose a ruler on Activity Master 104.

3. The first player spins the spinner and shades his or her ruler for the fraction of an inch shown by the spin.

4. The other player spins and shades his or her ruler the fraction of an inch shown by the spin.

5. Take turns. On each turn, add the fraction of an inch shown by your spin to your shaded section.

   **Example:** On your first two turns, you spin $\frac{3}{4}$ inch and $\frac{1}{2}$ inch. So, your ruler looks like this:

   ![Ruler Example](image)

6. Play until one player gets to 5 inches or more on the ruler. That player wins.
Perimeter Golf

Game Purpose
To draw figures with a given area and the smallest perimeter possible

Materials
- 2 number cubes, colored pencils or markers
- Activity Master 111: Centimeter Grid Paper

How to Play the Game

1. Play this game with a partner. Each player tosses the number cubes. The player with the larger sum goes first.

2. The first player tosses the 2 number cubes and finds the sum. The player must draw a figure on the grid paper that has an area in square centimeters equal to their sum. The player tries to get the smallest perimeter possible.

3. The player’s score for the “hole” is the perimeter of the figure drawn.

4. Take turns tossing the number cubes and drawing a figure. The player with the lower score after 18 holes of Perimeter Golf is the winner.
You can build models of cubes using smaller cubes.

1. A cube has 6 faces. If you paint the outside of 1 cube blue, all 6 faces will be blue.
   - How many small cubes do you need to build the next larger cube?

2. Suppose you paint the outside of the next larger cube blue and take it apart.
   - How many cubes will have 0 blue faces?
   - How many cubes will have 1 blue face?
   - How many cubes will have 2 blue faces?
   - How many cubes will have 3 blue faces?
   - How many small cubes do you need to build the next larger cube?

3. Suppose you paint the outside of the next larger cube blue and take it apart.
   - How many cubes will have 0 blue faces?
   - How many cubes will have 1 blue face?
   - How many cubes will have 2 blue faces?
   - How many cubes will have 3 blue faces?
Chapter 11

Geometry

Dear Student,

Think of all the kinds of figures you have seen!
Some figures are two-dimensional.

You can find ways in which some of these figures are alike.
• Which figures have only straight sides?
• Which figures have exactly 6 straight sides?
• Which figures have right angles?
Some figures are three-dimensional.

In this chapter, you will learn ways to describe figures using attributes (they tell in which ways figures—and other things—are alike or different). You will also learn the names of some figures and explore characteristics of figures.

Mathematically yours,
The authors of Think Math!
Have you ever visited or seen photos of our nation’s capital, Washington, D.C.? Many buildings there honor past presidents of the United States. The Thomas Jefferson Memorial is a tribute to our third president, Thomas Jefferson, who was also the author of The Declaration of Independence.

Use the picture below. Answer the following questions about the figures outlined in red.

1. Draw each figure outlined in red. Name the figures.
2. Draw a line of symmetry for each figure. Which of the outlined figures has more than one line of symmetry?
3. Which figures have parallel sides?
4. Which figure has two pairs of parallel sides?
5. Which figure has a right angle?
6. Which figures have no right angles?
Visitors to Washington, D.C., can also see the Washington Monument, and the Lincoln Memorial. A modern building houses the National Gallery of Art.

**FACTIVITY 2**

Look for three-dimensional figures in the photos. Write the name of the photo to answer Problems 1 and 2.

1. Which photos have figures that represent pyramids? Describe where the pyramids appear.
2. Which photo shows figures that represent cylinders? Describe where the cylinders appear.
3. How would you describe the three-dimensional figures of the National Gallery of Art building?

**CHAPTER PROJECT**

Think about historical places in your community. Consider the first library, first post office, or the first school. Research a historical landmark. Using blocks or other materials, create a model of the landmark. Observe the structure from different sides. Name the three-dimensional figures in the structure. Describe the two-dimensional figures on each side. In your description, use the terms *faces, edges, vertices, sides,* and *congruent.*
Two sides of a quadrilateral are parallel. Are the other two sides also parallel? Complete Steps 1 through 6 to find out what affects the answer.

Step 1
Tape a straw to a large piece of paper so that it is slanted: not horizontal (like this: — ) or vertical (like this: | ).

Step 2
Tape another straw that is the same length to the paper so that it is parallel to the first straw. (They form lines that never cross and are always the same distance apart.) Leave lots of room between the straws.

Step 3
Use a ruler to draw 2 straight lines that connect the ends of the straws. This makes a closed figure.

Step 4
Tape a straw to a second piece of paper so it is not horizontal or vertical.

Step 5
Tape a straw that is a different length to the paper so it is parallel to the first straw.

Step 6
Create another figure with 4 straight sides by drawing 2 straight lines to connect the ends of the straws.

Compare the two figures you made. Are the sides you drew for each figure parallel?
You can decide if a pair of lines is parallel. Look to see if the two lines will never cross or if they are always the same distance apart.

If I extend the lines will they ever cross? Are the lines always the same distance apart?

The lines will never cross, and they are always the same distance apart. So, the lines are parallel.

If I extend the lines will they ever cross? Are the lines always the same distance apart?

The lines will cross, and they are not always the same distance apart. So, the lines are not parallel.

**Check for Understanding**

Write *parallel* or *not parallel* to describe the pair of lines.

1. 

2. 

3. 

4. Draw a pair of parallel lines. You may use a ruler to help you.

5. Draw a pair of lines that are NOT parallel. You may use a ruler to help you.
**Part 1  What figures can you make from two triangles?**

**A** On a rectangular card, use a ruler to draw a diagonal line from one corner to another like this:

![Diagram of a diagonal line drawn on a rectangular card]

**B** Cut the rectangle along the line you drew. Check to make sure the two triangles are congruent.

**C** See how many different figures you can make by placing these two parts next to each other with two congruent sides matching exactly. Trace each figure you make on a separate piece of paper.

**Part 2  What figures can you make from a trapezoid and a triangle?**

**A** Fold a rectangular card to divide its long sides exactly in half as shown by the dashed line below. Use a ruler to draw a line from the end of the fold to the corner like this:

![Diagram of a fold dividing a rectangular card]

**B** Cut the card along the line you drew. You should have a triangle and a trapezoid.

**C** See how many different figures you can make placing these two parts next to each other with two congruent sides matching exactly. Trace each figure you make on a separate piece of paper.

**NOT OK**
- congruent sides touching, but not matching
- non-congruent sides touching

**OK**
- congruent sides matching

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You can sort figures by different attributes, such as the number of sides, the size of the angles, and the number of pairs of parallel sides.

This triangle has 3 sides and 1 right angle.

This quadrilateral has 4 sides, 1 pair of parallel sides, and no right angles.

This pentagon has 5 sides and 1 line of symmetry.

**Check for Understanding**

List the figures that belong in each group.

1. triangles with no right angles

   \[ A \quad \quad B \quad \quad C \quad \quad D \quad \quad E \]

2. quadrilaterals with at least 1 pair of parallel sides

   \[ G \quad \quad H \quad \quad I \quad \quad J \quad \quad K \quad \quad L \]

3. pentagons with at least 1 line of symmetry

   \[ Q \quad \quad R \quad \quad S \quad \quad T \quad \quad U \]
Which figures from the class Figure Zoo match the clues?

For 1 to 7, list the letters of all the figures that belong. Try standing each figure on different faces to see if there is any way it might fit the clues.

1. All my faces are rectangles. Only two of those rectangles are squares.

2. At least three of my faces are triangles.

3. Two of my faces are parallel and congruent to each other. All my other faces are parallelograms.

4. All my faces are congruent.

5. Two of my faces are parallel and congruent to each other. All my other faces are not parallelograms.

6. All my faces have at least two lines of symmetry.

7. My top and bottom faces are congruent. All my other faces are rectangles.
You can compare three-dimensional figures by describing the faces, edges, and vertices.

**Example A: Pyramid**

- **Step 1**
  Write the names of the two-dimensional figures for the faces and count the number of each kind of face.
  
  Faces:
  1 square and 4 triangles

- **Step 2**
  Count the number of edges and vertices.
  
  Edges: 8  Vertices: 5

**Example B: Prism**

- **Step 1**
  Write the names of the two-dimensional figures for the faces and count the number of each kind of face.
  
  Faces:
  6 rectangles

- **Step 2**
  Count the number of edges and vertices.
  
  Edges: 12  Vertices: 8

**Check for Understanding**

Describe each three-dimensional figure. Identify the faces and the number of edges and vertices.

1

2
Troy sorted some three-dimensional figures into two groups.

Group 1

Group 2

Into which group should Troy place this figure?

**Strategy: Look for a Pattern**

**Read to Understand**

What do you need to find out?

Where Troy should place the next figure

**Plan**

How can you solve the problem?

You can look for a pattern.

**Solve**

How can you look for a pattern to solve the problem?

Look to see how the figures in each group are alike.

The figures in group 1 are prisms. The figures in group 2 are pyramids. The next figure is a prism, so it should be in group 1.

**Check**

Look back at the problem. Did you answer the question that was asked?
Problem Solving Practice

Look for a pattern to solve.

1. Anita wants to find out the date of her friend’s birthday. She knows it is the fifth Saturday in December. She knows that the dates of the first three Saturdays in December are 2, 9, and 16. What is the date of her friend’s birthday?

2. Yoshi is making a pattern. If he continues the pattern in the same way, what will the next figure be?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. The length of one side of a rectangle is 2 centimeters. Another side of the same rectangle is twice as long. What is the perimeter of the rectangle?

4. Courtney saves $0.75 the first week, $1.25 the next week, and $1.75 the third week. If this pattern continues, how much money will she save in the fourth week?

5. The baseball team scored 2 runs in the first inning. After 3 innings, the team scored a total of 6 runs. What are all the ways the team could have scored 6 runs after 3 times at bat?

6. Last month, 4 students received an award for perfect attendance. This month, 3 times as many students received a perfect attendance award. How many more students received an attendance award this month than last month?
Choose the best vocabulary term from Word List A for each sentence.

1. Two lines that form right angles are ____?
   to each other.
2. Three edges of a three-dimensional figure meet at a(n) ____?
3. A(n) ____? is a special type of rectangle.
4. A(n) ____? has three sides.
5. You can fold a pentagon in half in five different ways and have both halves match exactly. This pentagon has five lines of ____?
6. A(n) ____? has two faces that are triangles and three faces that are rectangles.
7. A square corner is a(n) ____?.
8. If two figures match exactly, then they are ____?.
9. A two-dimensional pattern for a cube is called a(n) ____?.

Complete each analogy. Use the best term from Word List B.

10. Triangle is to pyramid as ____? is to prism.
11. Poodle is to dog as rectangle is to ____?.

Talk Math

Discuss with a partner what you have learned about geometry. Use the vocabulary terms side, right angle, parallel, and perpendicular.

12. How does a rectangle compare to a trapezoid?
13. How can you tell when two rectangles are congruent?
Create a degrees of meaning grid for the words pentagon, polygon, quadrilateral, rectangle, square, trapezoid, and triangle.

Use what you know and what you have learned about geometry to create a word line for polygons. Use the number of sides from least to greatest for the sequence.

**RECTANGLE** The word *rectangle* comes from an old Latin word that means “having a right angle.” Today, *rectangle* means any quadrilateral with four right angles. A square is a special type of *rectangle.*
What's My Rule?

**Game Purpose**
To practice identifying the attributes of two-dimensional figures

**Materials**
- Activity Masters
- scissors
  113–114: Sorting Figures

**How To Play The Game**

1. **Play the game with a small group.** Sit around a table or desk. Cut out all the figures.

2. **Take turns being the Rule Maker.** The Rule Maker secretly makes a rule for sorting the figures into two groups. One group of figures will follow the rule. The other group of figures will not.

   **Possible rules:**
   - 3 sides only
   - No right angles
   - Not 4 sides
   - At least 1 right angle

3. **The Rule Maker puts the figures on the table one at a time.** The first figure follows the rule. After that, he or she sorts the figures using the secret rule.

4. **The winner is the first player who correctly names the rule the Rule Maker is using.**

   **Example:** There are 2 groups of figures on the table.

   Can you guess the rule? If you’re the first player to say “No right angles,” you win!

5. **Play again. Keep playing until everyone has had a chance to be the Rule Maker.**
Polygon Bingo

Game Purpose
To practice matching figures with their descriptions

Materials
• Activity Master 119: Bingo Attributes
• Activity Masters 120–123: Polygon Bingo
• Counters, scissors

How To Play The Game

1. Play this game in a small group. Cut out the description cards from Activity Master 119. Place them face down. Each player will need a Polygon Bingo board and 20 counters.

2. Take turns picking a description card and reading it aloud.
   • If a player has a figure on his or her board that matches the description, the player covers it with a counter.
   • There might be more than one figure that matches the description, but you can cover only one figure for each description.

3. If you cover 5 figures in a row, a column, or a diagonal, say “Bingo!” Show your board. Does everyone agree that the winning figures match the descriptions that were read? If yes, you win! If no, keep playing until someone has “Bingo.”

4. Clear the counters off the boards for each new game. Players may wish to trade Bingo boards.
The popular puzzle below is known as a tangram. Trace the puzzle. Then cut along the lines. There will be 7 pieces in all.

Now use the puzzle pieces to make all the squares you can. You know you can make a square using 1 piece, because 1 piece is a small square. You know you can make a square using all 7 pieces, because that is the shape of the puzzle. Can you make a square using 2 pieces? 3 pieces? 4 pieces? 5 pieces? 6 pieces?

Copy and complete this table. Try to make each square. Good luck!

<table>
<thead>
<tr>
<th>Can you make a square with</th>
<th>Yes or No</th>
<th>Draw the square if you can make it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 pieces?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 pieces?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 pieces?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pieces?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 pieces?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Dear Student,

Multiplying larger numbers is easier when you break the numbers into smaller parts. For example, when finding $14 \times 6$, you can think of breaking 14 into 10 and 4.

\[
\begin{array}{ccc}
14 & & \\
10 & & 4 \\
6 & & \\
\end{array}
\]

Then you can multiply each part by 6.

\[14 \times 6 = 10 \times 6 + 4 \times 6\]

Could you break 14 differently to multiply 14 by 6? Could you use the same idea to multiply 27 by 13?

In this chapter, you will be breaking numbers in different ways to make it easier to multiply large numbers.

Mathematically yours,

The authors of *Think Math!*
Use real or play coins to multiply the amount. Then write a multiplication sentence.

1. 4 nickels × 4

2. 2 nickels × 2

3. 3 nickels × 3

4. 2 nickels × 6

5. Make at least two problems using your own combinations of dimes, nickels, and pennies. You do not need to use all three kinds of coins each time.
Each picture of base-ten blocks represents a number. Find that number, solve the multiplication problem, and write the matching number sentence. You may use blocks to help you.

1. \[ \times 4 \]
2. \[ \times 5 \]
3. \[ \times 5 \]
4. \[ \times 4 \]
5. \[ \times 5 \]
6. \[ \times 5 \]
You can find larger products by adding the products of two simpler multiplication problems.

Example Find $13 \times 4$.

**One Way**

Use base-ten blocks.

Step 1 Multiply the tens.

10 $\times$ 4 = 40

Step 2 Multiply the ones.

3 $\times$ 4 = 12

Step 3 Add the two smaller products to find the larger product.

$40 + 12 = 52$ So, $13 \times 4 = 52$.

**Another Way**

Draw intersecting lines.

Step 4 Separate the array into two simpler problems. (Breaking a number apart into a multiple of 10 and leftover ones can make it easier to find a solution.)

10 $\times$ 4 = 40

3 $\times$ 4 = 12

Step 3 Add the two smaller products to find the larger product.

$40 + 12 = 52$ So, $13 \times 4 = 52$.

**Check for Understanding**

Find the product. Use base-ten blocks or draw intersecting lines on your own paper if you wish.

1. $17 \times 3 =$
2. $16 \times 8 =$
Using Rectangles to Represent Arrays

You can think about arrays of intersecting lines to help you multiply by a two-digit number.

Example Find \(18 \times 7\).

You can think about an array with 7 horizontal lines and 18 vertical lines.

You can think about the best way to separate the array, so you have simpler problems to solve.

Then you can use a shortcut to record your solution and find the product.

**Step 1** You can represent the array using a separated rectangle instead of drawing all the lines.

\[
\begin{array}{c}
10 \\
18 \\
7
\end{array}
\]

\[
\begin{array}{c}
8 \\
7
\end{array}
\]

**Step 2** You can record the number of intersections in each section.

\[7 \times 10 = 70\]
\[7 \times 8 = 56\]

**Step 3** You can find the number of intersections in the complete array by adding the amounts in each section.

\[70 + 56 = 126\]

So, \(18 \times 7 = 126\).

✓ Check for Understanding

Draw a diagram to help you find the product.

1. \(19 \times 6 = \) 2. \(27 \times 5 = \)
This array shows \(15 \times 17\). Use straws to separate the array and find the number of dots in the array.
A crate of 96 juice boxes was delivered to the cafeteria. It contained apple, orange, grape, pineapple, cranberry, and tomato juice. If there was an equal number of each type of juice, how many grape juice boxes were delivered?

Solve the problem and write a number sentence to match. Then write the related number sentences. Use tiles, grid paper, or draw a picture to help you. Be prepared to explain your solution.
Hector wants his new friend to guess his age. He tells his friend that he multiplied his age by 5, and then added 8 to the result. His final answer was 83. What is Hector’s age?

\[ \_ \times 5 + 8 = 83 \]

**Strategy:** Work Backward

**Read to Understand**
What do you know from reading the problem?
When Hector multiplies his age by 5 and adds 8, he gets 83.

**Plan**
How can you solve this problem?
You can use the strategy *work backward*.

**Solve**
How can you use this strategy?
You can start with Hector’s final answer of 83. Next, subtract the 8 he added:

\[ 83 - 8 = 75. \]
Then solve \[ 5 \times \_ = 75 \] to find his age.

\[ 5 \times 15 = 75 \]
So, Hector is 15 years old.

**Check**
Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Problem Solving Practice

Use the strategy work backward.

1. Omar paid $14 for 4 sandwiches and 2 drinks. What was the cost of each drink?

   Sandwiches $2.50
   Salads $1.75
   Drinks

2. Yvette sold a fourth of her doll collection at the garage sale. She sold 20 dolls. How many dolls did Yvette have before the garage sale?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. Jorge has 36 strawberries divided equally into 4 containers. How many strawberries are in 2 containers?

4. Leticia used nickels and dimes to pay for a toy that cost $1.00. If she used 2 more nickels than dimes, how many dimes did she use?

5. If a butterfly flaps its wings about 400 times a minute, about how many times will it flap its wings in 3 minutes? How many times in 5 minutes?

6. The Ferris wheel at the amusement park has 20 cars. Each car can hold up to 8 people. What is the largest number of people that can ride the Ferris wheel at one time?

7. The box shown at right is made up of green and blue centimeter cubes. All six sides look the same. How many blue centimeter cubes were used to make the box?
Choose the best vocabulary term from Word List A for each sentence.

1. The direction that goes from top to bottom is ____?
2. A(n) ____? is an operation on a number.
3. A(n) ____? for an array is the line from an upper corner toward the opposite lower corner.
4. The ____? is where two lines cross.
5. The number that results from dividing is the ____?.
6. A rectangular arrangement that shows objects in rows and columns is called a(n) ____?.
7. A number that is multiplied by another number is called a(n) ____?.
8. The ____? is the result of multiplication.

Complete each analogy using the best term from Word List B.

9. Toast is to bread as output is to ____?.
10. Vertical is to column as horizontal is to ____?.

Talk Math

Discuss with a partner what you have learned about multiplication. Use the vocabulary terms factor, product, and sum.

11. How can you separate a number to multiply?
12. How can you use base-ten blocks to multiply two numbers?
13. How can you use shorthand notation instead of an array to multiply?
Create an analysis chart for the terms dividend, divisor, factor, product, quotient, and sum. Use what you know and what you have learned about operations with whole numbers.

Create a word web using the term rule. Include similar words you know and what you have learned about math rules.

Pattern

A pattern can be many things. It can be a design that repeats. You see patterns like that on wallpaper, gift wrap, and clothing. A pattern can also be a model or a guide for making something. A tailor uses that type of pattern, because it shows the shape and size of the pieces of cloth to cut out. A clothing pattern is a sort of “rule” to follow for making a piece of clothing.

In math, patterns also follow a rule. A math pattern can be an ordered set of numbers or figures.
Multiplication Challenge

**Game Purpose**
To multiply with factors to 18

**Materials**
- 3 number cubes
- Activity Master 164: Multiplication Challenge
- Activity Master 165: Multiplication Table: Factors to 18 or a calculator
- Base-ten blocks or counters (optional)

**How To Play The Game**

1. This is a game for 2 players. Each player will need a copy of Activity Master 164 and Activity Master 165. You may use a calculator instead of Activity Master 165.

2. Take turns tossing the 3 number cubes.
   - Find the sum of the 3 numbers you tossed.
   - Record that number on Activity Master 164.
   - Then record the other player’s number.

3. By yourself, multiply the numbers. Record the product.

4. Together, decide what the correct product is. Each player with a correct product gets one point.

5. Repeat steps 2 to 4 until you have completed 5 problems.

6. Check your answers using the multiplication table or a calculator. You might have to adjust your score. The player who has more correct answers wins.
Factor Tic-Tac-Toe

**Game Purpose**
To practice strategies for multiplying with two-digit numbers

**Materials**
- Activity Master 166, 167, 168, or 169: Factor Tic-Tac-Toe gameboards
- Two-color counters
- Calculator

**How To Play The Game**

1. **This is a game for 2 players. Choose your Factor Tic-Tac-Toe gameboard. Decide who will use each color of counter.**

2. **Player 1 chooses a number on the gameboard. Player 2 chooses a different number.**

3. **Each player finds the product of the two numbers. Record your work on a separate sheet of paper.**

4. **Use the calculator to check your answers. If your answer is correct, place a counter over the number you chose to multiply. Both players, only one player, or neither players may be able to place a counter.**

5. **Repeat steps 2 to 4. Take turns being the first player to choose a number. The first player to get 3 counters in a row, column, or diagonal wins.**

6. **Play again. Use the same gameboard, or choose a different one. Play as many games as time allows.**
Use each number in the box one time to complete the problems. Then solve each problem. When you are finished, each problem will make sense. Each answer will be a whole number. *Hint:* Decide which problems can be solved by dividing. Do those first.

![](24 33 6 8 7 7 9 91 85 64 168)

1. A train has □ cars. Each car carries □ passengers. There are between 250 and 300 passengers. How many passengers does the train carry in all?

2. A juice carton holds □ ounces. Each serving of juice is □ ounces. The number of servings is the same as the number of ounces in each serving. How many servings can be made from a full carton?

3. Tammy’s Toy Store sells bags of marbles. There are □ marbles in each bag. There are □ bags in the store. There are between 550 and 650 marbles in the store. How many marbles are in the store?

4. Roberto rode his bicycle □ miles last week. He rode every day except Thursday. He rode the same number of miles each day. The number of miles he rode each day was greater than 20. How many miles did he ride each day?

5. There are □ students in the school band. They march in rows of □ students. How many rows of students are there?

6. The library received □ cartons of books. There are □ books in each carton. If there are fewer than 150 books, how many books are in the cartons?
Chapter 13

Time, Temperature, Weight, and Capacity

Dear Student,

If someone says it’s 80°F outside, do you need a jacket? Or is it hot outside?

Some things can be measured, but not with a ruler. Once you have some experience measuring the temperature, you can tell someone what the temperature is. You will know whether it’s cold, hot, or just right. In this chapter, you will measure different things, using tools such as clocks, thermometers, scales, and measuring cups.

You will use several skills to make sense of all the things you measure, including:

• understanding what you are measuring,
• choosing the right kind of tool to measure,
• using and reading the tool,
• knowing what measurement numbers mean, and
• drawing conclusions from measurements.

Get ready to measure!

Mathematically yours,
The authors of Think Math!
In snowy places in the winter, many children make snowmen. It can snow a lot in Boston, Massachusetts. A typical temperature in Boston in February is 32°F. Fairbanks, Alaska, is even snowier and colder. A typical temperature in Fairbanks in February is -4°F.

**FACT-ACTIVITY 1**

**Use the temperatures to answer the questions.**

1. What temperature does the thermometer for Boston show? What temperature does the Fairbanks thermometer show?
2. Is the Boston temperature on the thermometer higher or lower than Boston’s typical February temperature? How much higher or lower?
3. Is the Fairbanks temperature on the thermometer higher or lower than it’s typical February temperature? How much higher or lower?

**Use the times to answer the questions.**

4. It is morning in Fairbanks. Write the time. What time will it be in 5 hours?
5. It is daytime in Boston. Suppose the temperature in Boston increases 3°F an hour for the next 5 hours. What will the temperature be in 5 hours? What will the time be?
6. A snowman will begin to melt when the temperature is 32°F or above. Will the snowman in Boston begin to melt in the next 5 hours? Explain.
After playing in the snow, children and adults might enjoy hot soup or hot cocoa. Sammy’s mother made 2 gallons of soup for a hungry crowd. However, the soup pot is too big to store in the refrigerator. Help Sammy’s mom figure out how she can refrigerate the soup.

**FACT ACTIVITY 2**

Write yes or no for each choice. If no, tell how many more and what containers are needed.

1. Can the soup be stored in 3 half-gallon jugs?
   - No, Sammy’s mom needs 1 more half-gallon jug.

2. Can the soup be stored in 8 one-quart containers?
   - Yes.

3. Can the soup be stored in 4 one-quart containers and 4 one-pint jars?
   - Yes.

**CHAPTER PROJECT**

Find out how long it takes for a cup of cold water and a cup of tap water to warm to room temperature.

- Fill a 4-ounce plastic cup with water from the tap. Make it colder by refrigerating it for 4 hours.
- When the 4 hours are up, fill a second cup with 4 ounces of tap water.
- Use a thermometer to measure the temperature of each cup of water.
- Measure the temperature every 30 minutes until each cup reaches the air temperature in your room. Record the temperatures and time in a table.
- Make a graph to show your results.
- Analyze the results. Compare the amount of time it took for each cup of water to reach room temperature.

**ALMANAC Fact**

To create a snow sculpture, experts usually begin with a single block of snow about 6 to 15 feet on each side. The winner of the 2006 International Snow Sculpture Competition was a puppy looking in a mirror.
EXPLORE
How Much Time Is Left?

Snaily needs to be home at 5:45 P.M. She is worried that she will be late, so she looks at her watch several times.

1. For each picture of Snaily's watch, write the time and the number of minutes left until 5:45.

<table>
<thead>
<tr>
<th>Time</th>
<th>Minutes Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00 PM</td>
<td>45 minutes</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. How many minutes passed without Snaily looking at her watch . . .
   . . . between times A and B?
   . . . between times B and C?
   . . . between times C and D?

3. Snaily can travel 1 inch in 5 minutes.
   A. How far can she go in 10 minutes?
   B. How far can she go in a half hour?
   C. If Snaily was 10 inches away from home at 4:50 P.M., could she make it home on time? Explain.
You can draw a picture to help you find how far you can travel or how much time it takes.

It takes Matt 10 minutes to walk his dog 1 block. If he continues walking at the same speed, how far can Matt walk his dog in 20 minutes?

Think:

20 minutes − 10 minutes = 10 minutes

In 10 minutes, Matt can walk his dog 1 block.

In the remaining 10 minutes, he can walk his dog another block.

So, Matt can walk his dog 2 blocks in 20 minutes.

You may draw a picture like this to help you.

🔑 Check for Understanding

You may draw a picture to help answer the questions.

1. How long would it take Matt to walk his dog 3 blocks?

2. The park is 2 blocks away from Matt’s house. How long will it take Matt to walk his dog to the park and back?

3. How many blocks can Matt and his dog walk in 1 hour?
EXPLORE
Estimating Weight

How many pounds of books do you have in your classroom?

1. How many books do you have in your desk?

2. About how many books are in your classroom?

3. Find a light book. How much does it weigh?

4. Find a heavy book. How much does it weigh?

5. Find an average book—one that is not very light and not very heavy. How much does it weigh?

6. About how much do you think all the books in your classroom weigh?

   Be ready to explain how you made your estimates.
Comparing Capacities

How many pints are in 1 gallon?

How many cups are in 1 gallon?

You can use a diagram to help you write the same capacity in different ways.

This diagram can help you find how many cups, pints, and quarts are in 1 gallon.

The largest letter, G, is 1 gallon. The gallon is the largest unit of capacity in the diagram. It helps you see that one G (gallon) holds more than one Q (quart).

How many quarts does 1 gallon hold?
Count the quarts.
There are 4 quarts (Q) in 1 gallon (G).
So, 4 quarts = 1 gallon.

You can use the diagram to help you write the same capacity in different ways.

Follow these steps to show the number of cups in 1 quart:

Step 1 Find the Q (quart).
Step 2 Count the number of cups (C) inside the Q (quart).
Step 3 Write the equal capacities.
   4 cups = 1 quart

Different letters in the diagram show different units of capacity. The size of each letter is important.

G = gallon
Q = quart
P = pint
C = cup

Different letters in the diagram show different units of capacity. The size of each letter is important.

G
Q
P
C

Check for Understanding

Use the diagram to help you write the same capacity in different ways.

1. How many pints are in 1 gallon?
2. How many cups are in 1 gallon?
3. How many pints are in 2 quarts?
4. Jill brought 4 quarts of water to the game. Brandon brought 6 pints. Who brought more water? How do you know?
The Art Club had a party. They served 3 pounds of cheese. The guests ate 29 ounces of the cheese. How much cheese was left?

**Strategy:** Act It Out

**Read to Understand**

What do you know from reading the problem?

There were 3 pounds of cheese. The guests ate 29 ounces. You need to find how much cheese was left.

**Plan**

How can you solve this problem?

You can act it out by using objects, such as counters, to represent the number of ounces.

**Solve**

How can you act it out?

To find how many ounces of cheese are left, you need to know how many ounces are in 3 pounds of cheese.

Since there are 16 ounces in 1 pound, you can count out 3 groups of 16 counters. $3 \times 16 = 48$ counters, so 3 pounds = 48 ounces.

Then subtract 29 counters for the number of ounces that were eaten.

$48 - 29 = 19$, so there were 19 ounces of cheese left.

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
Use the strategy act it out.

1. The Art Club made 16 cups of berry punch. The guests drank 96 fl oz of punch. How many ounces of punch were left?

2. At 6:00 P.M. when the snowstorm began, the temperature was 4°F. At 9:00 P.M., it was 12°F colder. What was the temperature at 9:00 P.M.?

Mixed Strategy Practice

Use any strategy to solve. Explain.

3. The Drama Club put on a play for the school. It started at 2:15 P.M. and lasted 1 hour 45 minutes. What time did the play finish?

4. It takes Jenna 6 minutes to walk 3 blocks. Her house is 9 blocks from her school. If she leaves school at 3:00 P.M., what time will Jenna get home?

For 5 and 6, use the table.

5. Which day had the warmest afternoon temperature?

6. How would you describe the trend in the temperatures from Monday to Thursday?
Choose the best vocabulary term from Word List A for each sentence.

1. A customary unit for measuring something that weighs less than a pound is a(n) **?**.

2. Any number that is less than zero is a(n) **?**.

3. **?** is a measure of how hot or cold it is.

4. The amount of time that passes from the start of an activity to the end of that activity is **?**.

5. The amount that a container can hold is called its **?**.

6. A(n) **?** is a customary unit of capacity that is the same as 2 pints.

Complete each analogy using the best term from Word List B.

7. Length is to ruler as temperature is to **?**.

8. Clock is to time as **?** is to weight.

**Talk Math**

Discuss with a partner what you have learned about measurement. Use the vocabulary terms decrease, increase, earlier, and later.

9. How can you find a change in temperature on a thermometer?

10. How can you find elapsed time on an analog clock?
11 Create a degrees of meaning grid for capacity, temperature, time, and weight. Use what you know and what you have learned about measurement.

<table>
<thead>
<tr>
<th>General</th>
<th>Less General</th>
<th>Specific</th>
<th>More Specific</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

12 Create an analysis chart using the words cup, pint, quart, and gallon.

POUND A car might be towed to the pound for parking in the wrong place. A pound is a place where stray animals are taken. In England, a pound is a unit of money. You can pound a nail with a hammer. You can pound your fist on a door. You can eat pound cake, which got its name because the original recipe called for one pound of each ingredient. In math, a pound is a customary unit of weight equal to 16 ounces.
The Freezing Game

Game Purpose
To practice reading temperatures on a thermometer

Materials
• Activity Master 170: The Freezing Game
• 4 counters
• 2 number cubes

How To Play The Game

1. This is a game for 2 players. The goal is to land on 32°F as many times as you can. Use the Freezing Game Activity Master. Choose your color counter. Put 1 counter at the freezing point for water (32°F) to mark the temperature. Put 1 counter in your 0 box to count the times you land at freezing. Toss the number cubes to see who goes first. After that, take turns.

2. Toss both number cubes.
   • Find the sum or difference of the two numbers.
   • Move your temperature counter that many spaces up or down on the thermometer.
   • You must move your counter.

Example: You get these numbers. You may move up or down 7 degrees. You may move up or down 3 degrees.

But if you get these numbers, you must move up or down 6 degrees. You may not use the difference of 0 to stay where you are.

3. Each time you land on 32°F at the end of your turn, move your counting counter to the next box. The first player to land on the freezing point 4 times is the winner.
Time Concentration

**Game Purpose**
To practice telling time

**Materials**
- Activity Master 171: Time Concentration Cards (Deck 1)
- Scissors

**How To Play The Game**

1. This is a game for 2 players. The game is played like any other Concentration game. The object is to match times shown on an analog clock to times written as they would appear on a digital clock.

2. Cut out the *Time Concentration Cards* from Deck 1. Mix up the cards. Place them face down to form a 4-by-6 rectangular array. Decide who will go first. After that, take turns.

3. Turn over two cards.
   - If both cards show the same time (one analog and one digital), it’s a match. Take the cards. You get another turn.
   - If the cards do not match, turn them face down again. Your turn is over.

4. When all the matching pairs have been found, count your cards. The player with more cards is the winner. (There could be a tie.) If there is time, mix up all the cards again, and play another game.
Ms. Clark gave each student in her class a paper bag with marbles hidden inside. Each bag has a different number of marbles. The students made up measurement riddles about the number of marbles in their bags.

**How many marbles does each student have?**

**Solve each riddle to find out.**

1. Drake has as many red marbles as there are quarts in a half gallon. He has as many blue marbles as there are cups in 2 pints. How many marbles does Drake have?

2. Joelle has as many green marbles as there are ounces in a half pound. She has as many red marbles as there are tons in 4,000 pounds. How many marbles does Joelle have?

3. Calvin has as many blue marbles as there are pints in \(2\frac{1}{2}\) quarts. He has as many orange marbles as there are fluid ounces in \(\frac{1}{2}\) cup. How many marbles does Calvin have?

4. Aiko has as many clear marbles as there are quarts in 16 cups. She has as many yellow marbles as there are gallons in 8 quarts. How many marbles does Aiko have?

5. Scott has as many green marbles as there are cups in \(1\frac{1}{2}\) pints. He has as many orange marbles as there are quarts in \(1\frac{1}{2}\) gallons. How many marbles does Scott have?

6. Donette has as many red marbles as there are pints in 2 gallons. She has as many blue marbles as there are cups in 2 quarts. How many marbles does Donette have?

7. Javon has as many green marbles as there are pounds in 48 ounces. He has as many blue marbles as there are ounces in \(1\frac{1}{2}\) pounds. He has as many clear marbles as there are tons in 6,000 pounds. How many marbles does Javon have?
Chapter 14
Addition and Subtraction in Depth

Dear Student,

When we need to solve difficult math problems, we sometimes use related problems that are simpler to solve.

For example, to solve $70,000 + 60,000 = \_\_$, we might use $7 + 6 = \_\_$? How could $7 + 6 = \_\_$ help with $70,000 + 60,000 = \_\_$? Which other problems that involve large numbers could you solve using $7 + 6 = \_\_$?

The idea of place value makes it possible to use $7 + 6 = \_\_$ to complete $70,000 + 60,000 = \_\_$. Can you explain how place value can help you solve problems with larger numbers?

In this chapter, you will learn more ways to solve challenging addition and subtraction problems by using simpler problems. The idea of place value will be at the center of these ways.

So go ahead! Use the tools you have to make “difficult” problems simpler to solve.

Mathematically yours,
The authors of Think Math!
New York City has the largest population of any city in the United States. Five parts, called boroughs, make up New York City. Two of the boroughs are islands. If you visit the city, you can get around by bus, taxi, subway, car, and even by boat!

For 1–4, use the table.

1. What is the place value of the digit 1 in the total number of licensed taxis?
2. Describe the total number of licensed taxis in words.
3. The buses in New York City run 44,550 trips on a daily basis. Write the number of buses and the number of trips in expanded form.
4. The total number of running subway cars is missing from the table. Its thousands digit is 3 times its hundreds digit. Which of the following could be the number of running subway cars: 6,030; 6,200; 620; 2,600?
The subway system has **underground** tracks below street level, **street level** tracks, **embankment** tracks built up on earth or stone, and elevated tracks built on high platforms above street level.

**FACT·ACTIVITY 2**

Just for fun, some people try to ride the entire New York subway system in the shortest time possible. In August, 2006, two college students finished the ride in 24 hours 2 seconds!

**For 1–3, use the table.**

1. How many underground, embankment, and street level stations are there in all?
2. Find the number of elevated stations.
3. New York subway stations are also famous for their interesting art and designs. Mike wants to see the art in each subway station. He rides to 152 stations on the first day and 137 more stations on the second day. How many more stations are left for Mike to see?

<table>
<thead>
<tr>
<th>Type of Stations</th>
<th>Number of Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground</td>
<td>277</td>
</tr>
<tr>
<td>Elevated</td>
<td>?</td>
</tr>
<tr>
<td>Embankment</td>
<td>29</td>
</tr>
<tr>
<td>Street level</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>468</strong></td>
</tr>
</tbody>
</table>

**CHAPTER PROJECT**

Central Park is a must-see attraction when you visit New York. Create a brochure that includes the area of different parts of the park and the distances to the park from other major attractions. Also include:

- a map of the park
- directions to the park
- interesting facts about the park, such as total number of water fountains, benches, ponds, or species of birds.

Write three 2- and 3-digit addition and/or subtraction sentences based on your facts.

**ALMANAC**

There are about 6,375 miles of streets in New York City. There is no street in Manhattan called Main Street.
1 Make up a situation to go with the problem:

\[ 163 + 24 \]

Write each number in expanded form. Find a way to use the expanded form to add the numbers. If it helps, use base-ten blocks or draw a diagram. Be prepared to explain your solution.

2 Ruby added a number to 384 and got a sum with a 6 in the tens place.

\[ \begin{array}{c}
3 & 8 & 4 \\
+ & & & \\
\hline
& & 6
\end{array} \]

Could her sum be correct? Explain.
Using Expanded Form to Add

You can break up numbers to add. Breaking up numbers can help you regroup the place values to find the sum.

**Example** Find the sum.  

\[
\begin{array}{c}
365 \\
+ 289 \\
\hline
654
\end{array}
\]

**Step 1** Break up both addends by writing them in expanded form.

\[
\begin{align*}
365 &= 300 + 60 + 5 \\
289 &= 200 + 80 + 9
\end{align*}
\]

**Step 2** Add each place value.

\[
\begin{align*}
365 &= 300 + 60 + 5 \\
+ 289 &= 200 + 80 + 9 \\
\hline
= 500 + 140 + 14
\end{align*}
\]

**Step 3** Regroup if there is 10 or more in the ones place.

Rewrite 14 using expanded form: 14 = 10 + 4

\[
\begin{align*}
365 &= 300 + 60 + 5 \\
+ 289 &= 200 + 80 + 9 \\
\hline
= 500 + 150 + 4
\end{align*}
\]

**Step 4** Regroup if there is 100 or more in the tens place.

Rewrite 150 using expanded form: 150 = 100 + 50

\[
\begin{align*}
365 &= 300 + 60 + 5 \\
+ 289 &= 200 + 80 + 9 \\
\hline
= 600 + 50 + 4
\end{align*}
\]

**Step 5** Add the sums in each place value to find the total sum.

\[
\begin{array}{c}
365 \\
+ 289 \\
\hline
654
\end{array}
\]

**Check for Understanding**

Find the sum.

1. \(78 + 22\)  
2. \(403 + 168\)  
3. \(655 + 267\)  
4. \(248 + 109\)  
5. \(66 + 36\)  
6. \(782 + 235\)
For Problems 1 and 2, use base-ten blocks or draw a picture to explain your thinking.

1. Which way is most useful for subtracting 172 from 348?

2. Which way is most useful for subtracting 89 from 348?

How would you break up 232 if you were subtracting . . .

3. 11?

4. 96?

5. 113?

6. Make up a situation to go with one of the subtraction problems on this page. Write a number sentence to go with your story.
You can break up numbers to subtract. Then you can regroup, if necessary, to find the difference.

**Example**  Find the difference.  \[ \begin{align*}
755 & \quad 167 \\
\hline
\end{align*} \]

**Step 1** Write each number in expanded form.  \[ \begin{align*}
755 &= 700 + 50 + 5 \\
167 &= 100 + 60 + 7 \\
\end{align*} \]

**Step 2** Subtract the ones.  
So, take 10 from the tens place of the larger number and add it to the ones place.  
The tens place of the larger number changes from 50 to 40, and the 5 ones become 15 ones.  
\[ \begin{align*}
755 &= 700 + 40 + 15 \\
-167 &= 100 + 60 + 7 \\
\hline
80 &= 8 \\
\end{align*} \]

**Step 3** Subtract the tens.  
So, take 100 from the hundreds place of the larger number and add it to the tens place.  
The hundreds place of the larger number changes from 700 to 600, and the tens place changes from 40 to 140.  
\[ \begin{align*}
755 &= 600 + 140 + 15 \\
-167 &= 100 + 60 + 7 \\
\hline
500 &= 80 + 8 \\
\end{align*} \]

**Step 4** Subtract the hundreds. Then add the numbers in each place value to find the difference.  
\[ \begin{align*}
755 &= 600 + 140 + 15 \\
-167 &= 100 + 60 + 7 \\
\hline
500 &= 80 + 8 \\
\end{align*} \]

\[ 588 \]

**Check for Understanding**

Find the difference.  
\[ \begin{align*}
1. \ 426 - 118 = 308 \\
2. \ 356 - 124 = 232 \\
3. \ 176 - 29 = 147 \\
4. \ 142 - 65 = 77 \\
5. \ 521 - 433 = 88 \\
6. \ 257 - 183 = 74 \\
\end{align*} \]
How would you break up these numbers to add and subtract?

\[
\begin{array}{c}
829 \\
+ 164 \\
\hline
993
\end{array}
\]
David wants to know if there are more science books or biography books in the library.

In the science section, there are 48 books on the first shelf, 65 books on the second shelf, and 77 books on the third shelf.

In the biography section, there are 105 books on the first shelf, 52 books on the second shelf, and 68 books on the third shelf.

1. Which section has more books?

2. How many more books are in that section than in the other?

3. Be prepared to discuss how you solved the problem.
Problem Solving Strategy
Solve a Simpler Problem

Shanna owns a garden shop. She spent $53 for each small clay pot and sold each one for $80. She spent $112 for each medium clay pot and sold each one for $145. She spent $137 for each large clay pot and sold each one for $170. If Shanna sold one clay pot of each size on one day, how much money did she make that day?

Strategy: Solve a Simpler Problem

Read to Understand
What do you know from reading the problem?
The amount Shanna paid for each size of clay pot and the sale price of each size of pot.

Plan
How can you solve this problem?
You can use the strategy solve a simpler problem.

Solve
How can you use this strategy to solve the problem?
Find the amount she made on each size of pot by finding the difference between the amount she paid and the sale price for each pot.
Small clay pot: $80 − $53 = $27
Medium clay pot: $145 − $112 = $33
Large clay pot: $170 − $137 = $33
Then find the total amount she made.
$27 + $33 + $33 = $93 So, Shanna made $93.

Check
Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
**Problem Solving Practice**

**Use the strategy solve a simpler problem.**

1. Paul is in charge of counting students as they enter and leave the school carnival. He counted 455 students entering before 1:00 P.M. He counted 126 students leaving at 2:00 P.M. At 3:00 P.M., 56 more students arrived and 14 students departed. At 4:00 P.M., 111 students left and 44 students arrived. How many students were at the carnival at 4:00 P.M.?

2. Carrie mows 14 lawns each week. How many lawns does she mow in 9 weeks?

**Mixed Strategy Practice**

**Use any strategy to solve. Explain.**

3. What is the missing output?

<table>
<thead>
<tr>
<th>Input</th>
<th>5</th>
<th>7</th>
<th>3</th>
<th>9</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>14</td>
<td>16</td>
<td>12</td>
<td>18</td>
<td>□</td>
</tr>
</tbody>
</table>

4. What is the mystery number? The number is greater than 40 but less than 50. The number is odd. When you add the two digits together, you get a sum of 13.

5. Rod has 42 stickers to share evenly with his 6 friends. How many stickers will each person get if Rod shares his stickers with his friends and gives himself the same number of stickers?

6. At 5:00 P.M. when the baseball game started, the temperature was 63°F. By 7:00 P.M., it was 8 degrees cooler. By 9:00 P.M., the temperature had dropped another 16 degrees. What was the temperature at 9:00 P.M.?

7. Brooke arranged her picture frames on her bedroom wall in an array with 8 rows and 3 columns. What other ways could she arrange the same number of pictures if she wants to make an array, but does not want to have all the pictures in one row or one column?

8. Mr. Hood plans to work in his garden 12 hours during the next 3 days. He wants to work for half of the planned time on Friday, half of the time that is left on Saturday, and the remaining time on Sunday. How many hours does Mr. Hood plan to work in his garden on Sunday?
Choose the best vocabulary term from Word List A for each sentence.

1. A number close to an exact amount is a(n) ____.
2. A(n) ____ has more than one digit.
3. When you write a number to its nearest ten or hundred you ____.
4. A number that is added to another in an addition problem is called a(n) ____.
5. A way to write a number to show the value of each digit is called ____.
6. To ____ means to exchange equal amounts when working with a number.
7. The answer in a subtraction problem is called the ____.

Complete each analogy using the best term from Word List B.

8. Compatible numbers are to estimate as addends are to ____.
9. Addition is to subtraction as sum is to ____.

Talk Math

Discuss with a partner what you have learned about addition and subtraction. Use the vocabulary terms expanded form, regroup, standard algorithm, and sum.

10. How can you add two multi-digit numbers?
11. How can you use sums to 10 to add a list of two-digit numbers?
**Word Definition Map**

12 Create a word definition map for the term *estimate*.

**A** What is it?

**B** What is it like?

**C** What are some examples?

---

**Word Web**

13 Create a word web using the term *sum*.

---

**ESTIMATE**

This word is spelled one way, but it can be pronounced two ways. When it is a noun (a naming word), the A in the last syllable has a short sound. It sounds like the I in the middle syllable. “The *estimate* of the sum is 600.” The verb (action word) has a long A sound in the last syllable. It sounds like the word for friend, mate. “*Estimate* the sum of 362 and 231.”
Place Value Game

**Game Purpose**
To practice reading and comparing place values of six-digit numbers

**Materials**
- Activity Masters 177–184: Attribute Cards
- Scissors

**How To Play The Game**

1. This is a game for 3, 4, or 5 players. The goal is to match 5 six-digit numbers that you choose to attributes on the Attribute Cards. The blue cards are the easiest. The green cards are more challenging. As a group, decide which color cards to use. Or you may use all of the cards.

2. Cut out the Attribute Cards. Mix them up. Place them face down in a stack.

3. Write 5 six-digit numbers on a sheet of paper. Write neatly and large enough for the others to see.

4. Take turns. Turn over one attribute card at a time. Read it aloud. Cross out any of your numbers that match the attribute. You may help one another decide which numbers to cross out.

5. The first player to cross out all 5 numbers wins. If there is time, play another game.
Addition Scramble

**Game Purpose**
To practice addition with multi-digit numbers

**Materials**
- Activity Master 187: Addition Scramble Game Page
- Number cards (1–9, four sets)

**How To Play The Game**

1. This is a game for 2 players. The goal is to score fewer points. Use the same game page.

2. Mix up the number cards. Place them face down in a stack.
   - One player takes 3 cards. He or she puts the cards in any order to make a three-digit number.
   - The other player takes 2 cards. He or she makes a two-digit number.
   - Both players record their numbers on the Addition Scramble Game Page.

3. Find the sum of the numbers.

4. The first player’s score is the digit in the tens place. The second player’s score is the digit in the ones place.

5. Trade roles. Keep a running total of your scores. Play until one player reaches 50 points. The other player wins!
Solve these ten number puzzles. Work backward from the starting number to find each number. Each puzzle will involve addition, subtraction, or comparisons. Some puzzles might use two of those or all three. The first puzzle is set up for you.

1. What number is 8 more than 20 more than 5 more than 60?
2. What number is 25 more than 9 more than 32 more than 14 more than 18?
3. What number is 3 less than 2 more than 17 more than 11?
4. What number is 5 less than 4 less than 6 less than 59?
5. What number is 12 more than 1 more than 3 less than 25 more than 6?
6. What number is 10 less than 17 more than 6 more than 2 less than 21?
7. What number is 4 more than 15 less than 19 more than 8 less than 52?
8. What number is 9 less than 23 less than 14 more than 16 more than 73?
9. What number is 27 more than 8 less than 16 less than 10 less than 35?
10. What number is 8 less than 13 less than 24 less than 7 less than 86?

Now make up some number puzzles on your own. Test them out on a partner.

11. Use only addition and at least three comparisons.
12. Use only subtraction and at least three comparisons.
13. Use both addition and subtraction and at least three comparisons.
Dear Student,

In this chapter, you are going to go further with multiplication than you have ever gone before. You are going to look ahead to things you will learn about in fourth grade and beyond.

You will be multiplying and dividing larger numbers, and you will learn to answer questions like these:

Suppose there are 23 students in a class, and each student has read 48 books. How many books has the class read altogether?

Suppose there are 126 days until Dominick’s birthday. How many weeks until his birthday?

We hope you enjoy this look into your mathematical future!

Mathematically yours,
The authors of Think Math!
Butterflies

Would you like to be indoors and have beautiful butterflies circle around you and maybe even land on your hand? You can at an indoor butterfly garden. One such place is Butterfly World in Florida. There, you can see 50 different kinds of butterflies at any one time among the 5,000 that are on display.

**Solve.**

1. Suppose you see 10 each of 9 different kinds of butterflies at Butterfly World. How many butterflies will you see in all?

2. Suppose you see 10 each of 24 different kinds of butterflies at Butterfly World. How many butterflies will you see in all?

3. Butterfly World provides guided tours. Suppose the tour guide gives 50 tours of 20 students each in a year. How many students does the tour guide lead in one year?

4. Adults can arrange to have children’s birthday parties at Butterfly World. The cost is $18 per child with a minimum of 12 children. (That is, there must be at least 11 children.) Suppose it is your party. How many people do you want to have at your party? You may use the model at the right to help you find the total cost for that number of children.
An artist has collected different types of butterflies and put them in display cases. The table below shows the number of different butterflies in a case.

**FACT ACTIVITY 2**

Use the information in the table for 1–3.

1. A museum store buys 25 displays of Birdwing butterflies. Write two related multiplication sentences to show the total number of butterflies in the display. Then write two related division sentences.

2. If the artist had 126 Zebra Swallowtail butterflies, how many cases could he make?

3. The artist has collected 44 Paris Peacock butterflies. How many cases can he make? Does he have any Paris Peacocks left over?

**CHAPTER PROJECT**

In the butterfly life cycle, caterpillars turn into butterflies. Make a caterpillar. You need 5 pompoms, 2 wiggly eyes, 1 pipe cleaner, and 1 clothespin for each caterpillar.

**Directions:** Cut the pipe cleaners into 1-inch-long pieces. Wrap 6 pieces of the pipe cleaner around the clothespin. Glue 5 pompoms together on top of the clothespin. Glue 1 pair of wiggly eyes on the face of the caterpillar.

How many of each material do you need to make 25 caterpillars? How many caterpillars can you make with 1 pack of pompoms? 1 pack of wiggly eyes? 1 pack of pipe cleaners? 1 pack of clothespins? You may use sketches or base-ten blocks to help you.

---

**Butterfly Display Cases**

<table>
<thead>
<tr>
<th>Type of Butterfly</th>
<th>Number of Butterflies per Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birdwing</td>
<td>14</td>
</tr>
<tr>
<td>Paris Peacock</td>
<td>3</td>
</tr>
<tr>
<td>White Dragontail</td>
<td>8</td>
</tr>
<tr>
<td>Zebra Swallowtail</td>
<td>6</td>
</tr>
</tbody>
</table>

**Materials**

<table>
<thead>
<tr>
<th>Materials</th>
<th>Number per Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ to 1-inch craft pompoms</td>
<td>300</td>
</tr>
<tr>
<td>wiggly eyes</td>
<td>152</td>
</tr>
<tr>
<td>12-inch long pipe cleaners</td>
<td>12</td>
</tr>
<tr>
<td>3-inch clothespins</td>
<td>36</td>
</tr>
</tbody>
</table>
You want to make an array to help you find $8 \times 60$, but you do not have hundreds of counters. Think of a way to use dimes as counters so you can do this with fewer than 50 dimes.

1. Draw your array.

2. Complete the number sentence.
   
   $8 \times 60 =$ □

Now use fewer than 50 dimes to make an array that represents $6 \times 80$.

3. Draw your array.

4. Complete the number sentence.
   
   $6 \times 80 =$ □
You can use a diagram and simpler problems to find a product.

**Example** Find $32 \times 24$.

Each product in the diagram (600, 40, 120, and 8) is a partial product.

Think of the partial products as parts of the total product. They can be added together to find the total product.

You can record the partial products in a column to make it easier to add.

Be sure to align the place values (ones, tens, and hundreds) to add.

You can record the partial products in any order.

Use the diagram to find the partial products. Then add the partial products to find the total product.

1. $30 \times 6 = 180$
2. $40 \times 3 = 120$
Nina was solving a multiplication problem using base-ten blocks. This is what she wrote:

What do you think the problem was?
What is the product?

Nina started to solve $243 \times 3$ by making $243$ with dollars $\$1$, dimes $\text{D}$, and pennies $\text{P}$.

How could Nina continue to solve $243 \times 3$?
Trina counted 126 intersections on the 7 streets that run east to west on the map of her town.

1. On a separate piece of paper, draw a map of the town.

How many streets on your map run north to south?

Mario counted 144 intersections on the 9 streets that run north to south on the map of his town.

3. Draw a map of the town on a separate piece of paper.

4. How many streets on your map run east to west?
A Division Puzzle Challenge

Keesha’s teacher gave the class this challenge.

Find a division puzzle for \(144 \div 3\) that splits 144 into two parts.

A The first part must be a multiple of 10.
B Make the second part as small as possible.
C Use only whole numbers.

1 Keesha started with this puzzle.

\[
\begin{array}{c}
3 \\
140 + 4
\end{array}
\]

Why won’t her puzzle meet the challenge?

2 Keesha made this puzzle next.

\[
\begin{array}{c}
30 + 18 \\
90 + 54
\end{array}
\]

Why won’t this puzzle meet the challenge?

3 Find and complete the puzzle that meets the challenge.
Sometimes you cannot divide objects evenly into groups.

**Example** Find $125 \div 4$.

**Step 1** Use base-ten blocks to represent the number you are dividing.

$120 + 5$

$(10 \times 12)$

**Step 2** Make 4 groups. Separate the tens into 4 equal groups by putting the same number of tens into each group.

**Step 3** Separate the ones into your 4 equal groups by putting the same number of ones into each group.

The **quotient** is 31—the number in each of the 4 groups.

You started with 5 ones. You only used 4 ones to make equal groups. So, you have 1 left over.

The **remainder** is 1—the number left over. So, $125 \div 4 = 31 \text{ r} 1$.

**Check for Understanding**

Use the picture to help you find the quotient and the remainder.

1. $109 \div 5 = \underline{\hspace{2cm}}$
2. $368 \div 3 = \underline{\hspace{2cm}}$
Janice’s small dog plays in a rectangular grassy space in her backyard. The play space is 18 feet long and 15 feet wide. What is the area of the play space?

**Strategy:** Draw a Picture

**Read to Understand**

What do you know from reading the problem?
The rectangular play space is 18 feet long and 15 feet wide.

**Plan**

How can you solve this problem?
You can use the strategy _draw a picture_.

**Solve**

How can you use this strategy?
You can draw a picture of the play space. Draw a rectangle and label it with the length and width. Separate the rectangle into 4 parts and solve simpler problems by breaking the numbers into tens and ones. Find the area of each part, and add the 4 products to find the total area.

\[
10 \times 10 = 100, \quad 10 \times 8 = 80, \quad 5 \times 10 = 50, \quad \text{and} \quad 5 \times 8 = 40
\]

\[
100 + 80 + 50 + 40 = 270. \text{ So, the play space is 270 sq ft.}
\]

**Check**

Look back at the problem. Did you answer the question that was asked? Does the answer make sense?
**Problem Solving Practice**

**Use the strategy draw a picture.**

1. Jerry looked at a map of the town he was visiting and saw that the streets form 36 intersections. Some streets run east to west, and the other streets run north to south. How many streets could there be in the town?

2. Elena is decorating her bedroom. Her paint color choices are white, yellow, gray, or brown. She can choose red, green, blue, purple, orange, or pink curtains. How many choices does Elena have if she chooses one paint color and one curtain color?

**Mixed Strategy Practice**

**Use any strategy to solve. Explain.**

3. Shakira has nickels, dimes, and quarters in her pocket. She pulls out 1 quarter. Then she pulls out 2 more coins. What are all the possible amounts of money Shakira could have pulled out of her pocket?

4. Tony and Fran were decorating cupcakes. Tony was faster than Fran. Every time Fran decorated one cupcake, Tony decorated two cupcakes. Together they decorated 48 cupcakes. How many cupcakes did each person decorate?

5. Becky drinks 6 glasses of water each day. She drinks 8 ounces each time she has a glass of water. How many ounces of water does Becky drink in a week?

6. Mr. Yang owns 4 pet stores. He ordered 216 bags of dog food. He wants each store to have the same number of bags of food. How many bags will each store receive?
Choose the best vocabulary term from Word List A for each sentence.

1. A(n) ____ is an arrangement that shows objects in rows and columns.
2. A number that is multiplied by another number to find a product is called a(n) ____.
3. A(n) ____ of a whole number is a product of that number and another whole number.
4. The answer to a division problem is called the ____.
5. A(n) ____ is one of the set of numbers 0, 1, 2, 3, . . ., which continues without end.
6. The amount left over when a number cannot be divided equally is a(n) ____.
7. The ____ is the number to be divided in a division problem.

Complete each analogy using the best term from Word List B.

8. River is to horizontal as tree is to ____.
9. Multiplication is to product as division is to ____.

Talk Math

Discuss with a partner what you have learned about multiplication and division. Use the vocabulary terms factor, multiple, and whole number.

10. How can you use an array to multiply two numbers?
11. How does division relate to multiplication?
Create a Venn diagram for the words and terms related to multiplication and division. Label one circle *Multiplication* and the other circle *Division*.

Create a word definition map for the term *array*.

**A** What is it?

**B** What is it like?

**C** What are some examples?

**PRODUCT** A *product* is a result. In math, a product is the result of multiplying two or more factors. In everyday life, there are other types of *products*. The *product* of a factory might be cars. The *product* of a farm might be corn. The *product* of a writer might be a book. The *product* of a musician might be a song. Each *product* is the result of performing an action.
**Factor Factory**

**Game Purpose**  
To practice multiplying two-digit numbers using arrays

**Materials**  
- 2 Number cubes  
- 2 Colored pencils  
- Centimeter grid paper, tape  
- Calculator

**How to Play the Game**

1. This is a game for 2 players. Tape together 4 sheets of centimeter grid paper to make a 2-by-2 array. Choose your color of pencil.

2. To start, each player tosses one number cube. The two numbers tossed are the length and width of an array. The player who tossed the larger number draws the array on the grid paper and finds the number of squares in the array. That number is his or her score for the round. Remember to keep a record of your scores.

3. Now take turns. Toss one number cube. Decide whether to add that number of rows or columns to the array. Then figure out the new total number of squares. Your partner can use a calculator to check the answer. If it is correct, you get the number of squares that you added to the array as your points for the round.

4. Play until adding a row or column would make one side of the new array greater than 50. There is no score for that round. The game is over.

5. Add all your points. The player with more points wins.

**Example:**

<table>
<thead>
<tr>
<th>Sara's points</th>
<th>Bob's points</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>12</td>
</tr>
<tr>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>
Partial Claim

**Game Purpose**
To practice using partial products to find the product of 2 two-digit numbers

**Materials**
• Number cards (1–9, four sets)  • Calculator

**How to Play the Game**

1. This is a game for 2 players. Mix up the number cards. Place them in a stack face down.

2. Each player takes 2 cards to make a factor. The first number picked is the tens digit. The second number is the ones digit. Multiply the factors using partial products.
   - Take turns. “Claim” (say aloud) and record the partial products of the two factors.
   - Find the sum of your “claimed” partial products.
   - Calculate and record the total product.
   - Check your work with the calculator.

3. Play 6 rounds. Find the sum of your partial products from each round. The player with the higher total wins.

**Here’s a Sample Round**

Suki picks 3 and 6 to form 36. Cal picks 1 and 7 to form 17. Suki and Cal multiply $36 \times 17$.

Suki claims the partial product $10 \times 30 = 300$.
Cal claims $7 \times 30 = 210$. Suki claims $10 \times 6 = 60$. Cal claims $7 \times 6 = 42$.

Suki and Cal record the total product. They check the answer with a calculator.
Somebody erased some of the numbers from Trevor’s math homework. Can you help Trevor find all the missing numbers?

For 1 to 4, find the missing factors.

1. \[482 \times \_ = 1200\]
   \[482 \times \_ = 240\]
   \[482 \times \_ = 6\]
   \[482 \times \_ = 1446\]

2. \[264 \times \_ = 1600\]
   \[264 \times \_ = 480\]
   \[264 \times \_ = 32\]
   \[264 \times \_ = 2112\]

3. \[718 \times \_ = 4200\]
   \[718 \times \_ = 60\]
   \[718 \times \_ = 48\]
   \[718 \times \_ = 4308\]

4. \[963 \times \_ = 4500\]
   \[963 \times \_ = 300\]
   \[963 \times \_ = 15\]
   \[963 \times \_ = 4815\]

For 5 to 8, find the missing partial products.

5. \[39 \times 35 = 1365\]
   \[39 \times 14 = 528\]
   \[39 \times 63 = 2461\]
   \[39 \times 37 = 2662\]

6. \[52 \times \_ = 200\]
   \[52 \times \_ = 120\]
   \[52 \times \_ = 21\]
   \[52 \times \_ = 728\]

7. \[47 \times \_ = 2400\]
   \[47 \times \_ = 180\]
   \[47 \times \_ = 140\]
   \[47 \times \_ = 2961\]

8. \[26 \times \_ = 600\]
   \[26 \times \_ = 180\]
   \[26 \times \_ = 140\]
   \[26 \times \_ = 962\]

For 9 to 12, find all the missing digits.

9. \[\_ \times 57 = 500\]
   \[\_ \times 28 = 70\]
   \[\_ \times 23 = 56\]
   \[\_ \times 3 = 1026\]

10. \[\_ \times 28 = 1764\]

11. \[\_ \times 23 = 2093\]

12. \[\_ \times 3 = 2408\]
Table of Measures ......................................................... 246
All the important measures used in this book are in this table. If you’ve forgotten exactly how many feet are in a mile, this table will help you.

Glossary ................................................................. 247
This glossary will help you speak and write the language of mathematics. Use the glossary to check the definitions of important terms.

Index ....................................................................... 257
Use the index when you want to review a topic. It lists the page numbers where the topic is taught.
### Table of Measures

#### Metric

<table>
<thead>
<tr>
<th><strong>LENGTH</strong></th>
<th><strong>CUSTOMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 decimeter (dm) = 10 centimeters</td>
<td>1 foot (ft) = 12 inches (in.)</td>
</tr>
<tr>
<td>1 meter (m) = 100 centimeters</td>
<td>1 yard (yd) = 3 feet, or 36 inches</td>
</tr>
<tr>
<td>1 meter (m) = 10 decimeters</td>
<td>1 mile (mi) = 1,760 yards, or 5,280 feet</td>
</tr>
<tr>
<td>1 kilometer (km) = 1,000 meters</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CAPACITY</strong></th>
<th><strong>CUSTOMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 liter (L) = 1,000 milliliters (mL)</td>
<td>1 cup (c) = 8 fluid ounces (fl oz)</td>
</tr>
<tr>
<td></td>
<td>1 pint (pt) = 2 cups</td>
</tr>
<tr>
<td></td>
<td>1 quart (qt) = 2 pints</td>
</tr>
<tr>
<td></td>
<td>1 gallon (gal) = 4 quarts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>MASS / WEIGHT</strong></th>
<th><strong>CUSTOMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilogram (kg) = 1,000 grams (g)</td>
<td>1 pound (lb) = 16 ounces (oz)</td>
</tr>
<tr>
<td></td>
<td>1 ton (T) = 2,000 pounds</td>
</tr>
</tbody>
</table>

#### Time

<table>
<thead>
<tr>
<th><strong>LENGTH</strong></th>
<th><strong>CUSTOMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 minute (min) = 60 seconds (sec)</td>
<td>1 year (yr) = 12 months (mo), or</td>
</tr>
<tr>
<td>1 hour (hr) = 60 minutes</td>
<td>about 52 weeks</td>
</tr>
<tr>
<td>1 day = 24 hours</td>
<td>1 year = 365 days</td>
</tr>
<tr>
<td>1 week (wk) = 7 days</td>
<td>1 leap year = 366 days</td>
</tr>
</tbody>
</table>

#### Money

<table>
<thead>
<tr>
<th><strong>LENGTH</strong></th>
<th><strong>CUSTOMARY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 penny = 1 cent (¢)</td>
<td></td>
</tr>
<tr>
<td>1 nickel = 5 cents</td>
<td></td>
</tr>
<tr>
<td>1 dime = 10 cents</td>
<td></td>
</tr>
<tr>
<td>1 quarter = 25 cents</td>
<td></td>
</tr>
<tr>
<td>1 half dollar = 50 cents</td>
<td></td>
</tr>
<tr>
<td>1 dollar ($) = 100 cents</td>
<td></td>
</tr>
</tbody>
</table>

### Symbols

- `<` is less than
- `>` is greater than
- `=` is equal to
- `≠` is not equal to
- °F degrees Fahrenheit
- °C degrees Celsius
- (2,3) ordered pair (x,y)
**Pronunciation Key**

| a | add, map      | f | fit, half     | n | nice, tin     |
| a | ace, rate     | g | go, log       | o | odd, hot      |
| á(r) | care, air    | h | hope, hate    | ñ | ring, song    |
| a | palm, father  | i | it, give      | ó | open, so      |
| b | bat, rub      | j | joy, ledge    | ò | order, jaw    |
| ch | check, catch  | k | cool, take    | òi | oil, boy      |
| d | dog, rod      | l | look, rule    | ou | pout, now     |
| e | end, pet      | m | move, seem    | òo | took, full    |
| è | equal, tree   | p | pit, stop     | òó | pool, food    |

a the schwa, an unstressed vowel representing the sound spelled a in above, e in sicken, i in possible, o in melon, u in circus

Other symbols:
- • separates words into syllables
- † indicates stress on a syllable

---

**Acute Angle**
An angle that has a measure less than a right angle (less than 90°)

*Example:*

\[ \angle \]

**Addend** *add*ˈend*
Any of the numbers that are added

*Example:*

\[ 2 + 3 = 5 \]

**Addition Sentence** *add*ˈiʃən senˈtənz*
A number sentence that uses the operation of addition

**Algorithm** *aˌlif ˈgo-*rithˈəm*
A step-by-step method for solving a problem

**Amount** *aw-mənt*
The total number or quantity

**Area** *ârˈē-ə*
The number of square units needed to cover a flat surface

**Arrangement** *ärˈanj-ər-ənt*
The way in which objects or numbers are grouped

**Array** *ərˈər*
A rectangular arrangement of objects in rows and columns

*Example:*

```
  \( \begin{array}{c}
  \text{column} \\
  \text{row} \\
  \end{array} \)
```

```
3 \times 4 = 12
```

**Associative** *əsəˈsət-ət-iv*
Changing grouping

**Backward** *bakˈwərd*
The direction of a jump on a number line that represents subtraction

**Balance** *bəlˈkans*
A tool used to weigh objects and to compare the weights of objects

**Bar Graph** *bər graf*
A graph that uses bars to show data

*Example:*

```
<table>
<thead>
<tr>
<th>Number of Votes</th>
<th>Tacos</th>
<th>Pizza</th>
<th>Chili</th>
<th>Pasta</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>30</td>
<td>16</td>
<td>14</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>
```

**Base-Ten Blocks** *bās ten blāks*
Blocks that model the base-ten system by representing ones, tens, and hundreds—units, rods of 10 units, flats of 10 rods, respectively

*Example:*
Glossary

**capacity** [kəˈpæsətɪ] The amount a container can hold

**centimeter (cm)** [senˈtɪˌmɛtər] A metric unit that is used to measure length or distance

**cents** [sɛnts] A unit of money equal to one hundredth of a dollar

**column** [kəˈləm] A vertical arrangement of objects

**coordinate** [kəˌɔrdənit] The numbers in an ordered pair

**cost** [kɔst] The amount of money that must be paid to purchase an item

**could** [kəd] May be

**Cross Number Puzzle** [krɔs nʌmˈbər puzəl] A way of modeling addition or subtraction so that the values in each place are computed separately before the final answer is found

**cube** [kjuːb] A solid figure with six congruent square faces

**cubic centimeter** [kjuːbˈsɛntɪˌmɛtər] A unit for measuring volume where the base unit is a cube that is one centimeter in length, width, and height

**cubic unit** [kjuːbˈjuːnit] A cube with a side length of one unit; used to measure volume

**cup (c)** [kʌp] A customary unit used to measure capacity
**data** [dæ'tə] Information from which conclusions can be made

**decrease** [dē'krēs] To make smaller

**denominator** [di'nə'mə'nər] The number in a fraction below the line, which tells how many equal parts there are in the whole or in the group

*Example:* $\frac{3}{4} \rightarrow$ denominator

**diagonal** [di'agənal] A line that connects two opposite corners of a figure

**diagram** [di'əgram] A drawing that can be used to represent a situation

**difference** [dif'ran(t)s] The result of subtraction

*Example:* $6 - 4 = 2$

**digits** [di'jats] One of the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 used in a written representation of a number

**dividend** [di'vənd] The number that is to be divided in a division problem

*Example:* $35 \div 5 = 7$

**division sentence** [di'vei'shan sen'təns] A number sentence that uses the operation of division

*Example:* $21 \div 3 = 7$

**divisor** [di'vəzər] The number that divides the dividend

*Example:* $35 \div 5 = 7$

**dozen** [du'sən] A set of 12

*Example:*

**earlier** [ə'lār] A time that occurs before another time

**east** [ěst] On a compass rose, the direction that horizontally points to the right

**edge** [eji] A line segment formed where two faces meet

*Example:*

**elapsed time** [ə'lapst' tim] The amount of time that passes from the start of an activity to the end of that activity

**eliminate** [ə'limənət] To narrow down

**equal** [i'kwəl] Having the same value

**equal (=)** [i'kwəl] A symbol used to show that two numbers have the same value

*Example:* $384 = 384$

**equally likely as** [i'kwəl li'kli as] Having the same chance of happening

**equivalent** [i'kwəvələnt] Two or more sets that name the same amount

**equivalent fractions** [i'kwəvələnt frak'shənz] Two or more fractions that name the same amount

*Example:*

**estimate** [es'tə'mət] verb: To find about how many or how much

**estimate** [es'tə'mət] noun: A number close to an exact amount

**even** [i'ven] A whole number that has a 0, 2, 4, 6, or 8 in the ones place
exchange [eks·chān] To trade things of equal value

expanded form [ik·spand·id fôrm] A way to write a number by showing the value of each digit
Example: 7,201 = 7,000 + 200 + 1

experiment [ik·sper·mənt] An exploration of a probability question, such as, “What’s the likelihood of getting heads in a coin toss?”

expression [ik·spre·əshən] The part of a number sentence that combines numbers and operation signs, but doesn’t have an equal sign
Example: 5 × 6

fewest [fyōō·əst] Less in number than all other groups

fewest units [fyōō·əst yōō·ənit] The least possible units

flat [flat] The base-ten block that represents 10 rods or 100 units

flip [flip] A movement of a figure to a new position by flipping the figure over a line
Example:

fluid ounce [ouns] A unit of liquid capacity

forward [för·ward] The direction of a jump on a number line that represents addition

fourth [förθ] The term to describe each of four fractional parts
Example:

fourths [förths] When something is divided into four fractional parts

fraction [frak·shan] A number that names part of a whole or part of a group
Example:

gallon (gal) [ga·lən] A customary unit for measuring capacity
Example: 1 gallon = 4 quarts

graph [graf] A way to organize data and information

greater than (>) [grā·tər thən] A symbol used to compare two numbers, with the greater number given first
Example: 6 > 4

greatest [grā·test] More in value than all other values

group [grōop] To put things together
half [haf] One part of something when it is divided into two equal parts
half inch [haf inch] One part of an inch when the inch is divided into two equal parts
halves [havz] When something is divided into two equal fractional parts
Example:

height [hit] The distance from the bottom to the top of something standing upright
horizontal [hôr′ōzon′tal] The direction from left to right
horizontal axis [hôr′ōzon′tal ] The horizontal number line on a coordinate plane
hour (hr) [our] A unit used to measure time; in one hour, the hour hand on a clock moves from one number to the next; 1 hour = 60 minutes
hundreds [hun′drads] The place value that represents 100 through 900

impossible [im′pä′sə′bal] An event that will never happen
increase [in′kres] To make larger
input [in′pūt] The number that is put into an input-output table or algebraic equation
intersecting lines [in′ter′sek′ting linz] Lines that cross
Example:

intersection [in′ter′sek′shən] The place where two streets or lines cross each other

label [lā′bal] A term used in a graph to classify data
later [lā′tər] A time that occurs after another time
least [lést] Less in value than all other values
length [lenkθ] The measure of a side of a figure
less likely than [les lik′əl than] Not as likely to happen than something else
less than (<) [les thən] A symbol used to compare two numbers, with the lesser number given first
Example: 3 < 7
line symmetry [lin si′ma′trē] If one can fold a figure so the two parts match exactly, then the fold line is called a line of symmetry for that figure

magic square [maj′iık skwer] A square array of numbers where every row, column, and diagonal has the same sum
millions [mil′iəns] The place value to the left of hundred thousands
minute (min) [min′it] A unit used to measure short amounts of time; in one minute, the minute hand moves from one mark to the next
more likely than [mər lik′əl than] A greater chance of happening than something else
most [məst] More in number than all other groups
multi-digit number [mul′ti dʒi′it num′bər] A number that has two or more digits
Glossary

**multiple** [mulˈtə-pəl] A number that is the product of a given number and another whole number

*Example:* 

\[
\begin{array}{c}
10 \\
\times 1 \\
\hline
10 \\
\end{array}
\begin{array}{c}
10 \\
\times 2 \\
\hline
20 \\
\end{array}
\begin{array}{c}
10 \\
\times 3 \\
\hline
30 \\
\end{array}
\begin{array}{c}
10 \\
\times 4 \\
\hline
40 \\
\end{array}
\]

\[\rightarrow \text{multiples of 10}\]

**must** [must] Has to be

**negative number** [negə-tiv numə-bar] A number that lies to the left of zero on the number line or below zero on a thermometer

*Example:*

\[
\begin{array}{cccccccc}
\text{8} & \text{7} & \text{6} & \text{5} & \text{4} & \text{3} & \text{2} & \text{1} \\
\text{0} & \text{1} & \text{2} & \text{3} & \text{4} & \text{5} & \text{6} & \text{7} & \text{8} \\
\end{array}
\]

The red numbers are negative numbers.

**negative sign** (−) [negə-tiv sin] A symbol used to show a negative number

**net** [net] A two-dimensional pattern that can be folded to make a three-dimensional figure

*Example:*

\[
\begin{array}{c}
\text{north} \quad \text{south} \quad \text{east} \quad \text{west} \\
\end{array}
\]

**number** [numər] A value composed of one or more digits

**number line** [numər lin] A line with equally spaced tick marks named by numbers

*Example:*

\[
\begin{array}{cccccccc}
0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\end{array}
\]

**number sentence** [numər senˈtəns] A statement that shows the relationship between two or more values

*Example:* 

\[5 + 3 = 8\] is a number sentence.

**numerator** [nəˈmə-ritər] The number in a fraction above the line, which tells how many parts are being counted

*Example:* 

\[
\frac{3}{4} \quad \rightarrow \text{numerator}
\]

**odds** [od] A whole number that has a 1, 3, 5, 7, or 9 in the ones place

**ones** [wuns] The place value that represents the numbers 1 through 9

**operation sign** [əpə-raˈtʃən] A symbol which represents the process that will change one number to another according to a rule

*Example: Operation signs: \(+, -, ÷, \times\)

**ounce** (oz) [ouns] A customary unit for measuring weight

**outcome** [outˈkʌm] A possible result of an experiment

**output** [outˈpūt] The number that is the outcome of an input-output table or an algebraic equation

**package** [pakˈi] To group together

**parallel** [parəˈlel] Lines that never cross, lines that are always the same distance apart

*Example:*

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

**parallelogram** [parəˈleləɡram] A quadrilateral with 2 pairs of parallel sides and 2 pairs of equal sides

*Example:*

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

**part** [pərt] One portion of a whole

*Example: A quarter hour is \(\frac{1}{4}\) of an hour, and an hour has 4 such parts in it.

**partial product** [pərˈshəl prəˈdakt] A part of a final product that is the result of multiplying the ones, tens, hundreds, and so on, separately

*Example:*

\[
\begin{array}{c}
\text{partial product} \\
\frac{3 \times 4}{12} \quad \rightarrow \text{Multiply the ones: } 3 \times 4 = 12 \\
\frac{3 \times 20}{60} \quad \rightarrow \text{Multiply the tens: } 3 \times 20 = 60 \\
\frac{72}{72} \\
\end{array}
\]

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pattern [patˈɔrn] A rule that allows you to predict what is missing or what comes next in a sequence of numbers or objects; casually, the word pattern can be used for the sequence itself
Examples: 2, 4, 6, 8, 10

pentagon [penˈtægən] A polygon with five sides
Example:

perimeter [pərɪˈmərər] The distance around a figure
Example:

perpendicular [pərˈpəŋdɪkələr] Lines that form four equal angles
Example:

pictograph [pɪkˈtəɡræf] A graph that uses pictures to show and compare information
Example:

piece [pɛs] A part of a whole

pint (pt) [pɪnt] A customary unit for measuring capacity
Example: 1 pint = 2 cups

polygon [pəlˈeɡən] A closed plane figure with straight sides that are line segments
Example:

possible [pəˈzəbəl] Something that has a chance of happening

pound (lb) [pound] A customary unit for measuring weight
Example: 1 pound = 16 ounces

predict [prɪˈdɪkt] To make a reasonable guess about what will happen

prediction [prɪˈdɪkʃən] A reasonable guess about what will happen

price [prɪs] The amount of money that a customer will be charged to buy something

prism [prɪzəm] A solid figure that has two congruent, polygon-shaped bases, and other faces that are rectangles
Example:

probability [prəˈbəbilətɪ] The study of random occurrences

product [prəˈdʌkt] The result of multiplication
Example: $3 \times 8 = 24$

purchase [pərˈchʌs] To get by paying money for

pyramid [pɪrˈæmɪd] A solid, pointed figure with a flat base that is a polygon
Example:

quadrilateral [kwəˈdralətər] A polygon with four sides
Example:

quart (qt) [kwɔrt] A customary unit for measuring capacity
Example: 1 quart = 2 pints

quarter [kwɔrtˈər] One fourth of something

quarter after [kwɔrtˈər əfˈɛtər] One fourth of an hour, or 15 minutes, after the hour

quarter inch [kwɔrtˈər ɪŋk] One fourth of an inch

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**quarter past** [kwɔrtˈɔr past] One fourth of an hour, or 15 minutes, after the hour

**quotient** [kwɔˈʃənt] The number, not including the remainder, that results from division

*Example:* $8 \div 4 = 2$

**rod** [rɔd] A base-ten block that represents one row of 10 units

**range** [ræn] The difference between the largest number and the smallest number in a set of data

**rectangle** [rekˈtæŋgəl] A quadrilateral with 2 pairs of parallel sides, 2 pairs of equal sides, and 4 right angles

*Example:*

**rectangular prism** [rekˈtæŋgyəlar prɪzəm] A solid figure with six faces that are all rectangles

*Example:*

**reflection** [rɛflektˈʃən] A transformation that creates a mirror image of an object

*Example:*

**region** [rɪˈdʒən] A section or part of a larger whole

**regroup** [rɛˈgrʊp] To exchange amounts of equal value when working with a number

*Example:* $5 + 8 = 13$ ones or $1$ ten $3$ ones

**remainder** [rɪˈmændər] The amount left over when a number cannot be divided evenly

**right angle** [rɪt angˈɡəl] A special angle that forms a square corner; a right angle measures $90^\circ$

*Example:*

**round** [rʊnd] To replace a number with another number close to the same value

**row** [rɔʊ] A horizontal arrangement of objects

*Example:*

**rule** [rʊl] A procedure for solving a mathematical problem

**scale** [skæl] The numbers on a bar graph that help you read the number each bar shows

**section** [sekˈʃən] A part or piece of a whole

**separate** [sepˈærət] To pull apart

**separation** [sepərəˈʃən] The act of pulling something apart, such as partitioning a whole number into a sum of smaller whole numbers

**shorthand notation** [ʃɔrtˈhaŋd nətˈɑŋkən] Mathematical shorthand used to express numerical computations

**skip-count** [skɪpˈkʌnt] A method of counting where certain numbers are skipped so that each space between the numbers has the same value

**slide** [slɪd] A movement of a figure to a new position without turning or flipping it

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smallest unit [smol′əst yō′nəl] The littlest unit possible
south [souθ] On a compass rose, the direction that vertically points downward
spaces [spās′əs] The parts of a number line that are between the tick marks
spend [spend] The amount of money used to purchase items
square [skwār] A quadrilateral with 2 pairs of parallel sides, 4 equal sides, and 4 right angles
Example:

standard algorithm [stan′dərd al′gərith′əm] A step-by-step procedure for computing that will work for every event within a certain type of number set
subtraction sentence [sub′trak′shən] A number sentence that uses the operation of subtraction
sum [səm] The result of addition
survey [sərvə] A method of gathering information
symbol [sim′bəl] Something that stands for something else, such as a picture symbol in a pictograph
symmetry [sim′ətrē] A figure has symmetry if it can be folded along a line so that the two parts match exactly; one half of the figure looks like the mirror image of the other half

table [ta′bal] A tool used to record data
Example:

<table>
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<th>Number</th>
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<td>2</td>
</tr>
<tr>
<td>Football</td>
<td>1</td>
</tr>
<tr>
<td>Basketball</td>
<td>1</td>
</tr>
</tbody>
</table>

thermometer [θar′məm′ətər] A tool used to measure temperature
thir[ds] [θərds] When something is divided into three equal parts
thousand [θou′zənd] How the thousands place-value is referred to when reading a number out loud
thousands [θou′zənds] The place value that represents 1,000 through 9,000
three-dimensional [thrē də′men′chənəl] A figure that has length, width, and height
times (x) [timz] The operation of multiplication
ton [tən] A customary unit of measuring large weights, equal to 2,000 pounds
total [tō′tal] Another word for sum
trade [trād] To exchange for something of equal value
trapezoid [tra′pezoid] A quadrilateral with one pair of parallel sides
Example:

trend [trend] On a graph, the area where data increase, decrease, or stay the same over time
triangle [tri′ang′əl] A polygon with three sides
Examples:

triangular prism [tri′an′gəl priz′əm] A solid figure that has two parallel faces that are triangles and three faces that are rectangles

turn [tərn] A movement of a figure to a new position by rotating the figure around a point
Example:
ungroup [un'groop'] To take apart amounts of equal value to rename a number
unit [yöo'nit] A base-ten block that represents 1 (small cube)
unpackage [un'pak'ij] To ungroup

value [val'ya] What something is worth
variable [vär'e-o-bal] A symbol or letter that stands for an unknown number
vertex [vûr'teks] The point at which two or more line segments meet in a plane figure or where three or more edges meet in a solid figure
Example:

vertical [vûr'ti-kal] The direction from top to bottom

vertical axis [vûr'ti-ka al ak'sas] The vertical number line on a coordinate plane
Example:

volume [vûl'ya] The amount of space a solid figure takes up

west [west] On a compass rose, the direction that horizontally points to the left
Example:

whole number [hûl num'bar] One of the numbers 0, 1, 2, 3, 4 . . . ; the set of whole numbers goes on without end
width [width] A measurement of a figure from one side to another
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