

SAXON MATH™

Stephen
Hake



SAXON MATH™

Intermediate 4

Student Edition

Stephen Hake

SAXON™

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– *Stephen Hake*

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ABOUT THE AUTHOR

Stephen Hake has authored six books in the **Saxon Math** series. He writes from 17 years of classroom experience as a teacher in grades 5 through 12 and as a math specialist in El Monte, California. As a math coach, his students won honors and recognition in local, regional, and statewide competitions.

Stephen has been writing math curriculum since 1975 and for Saxon since 1985. He has also authored several math contests including Los Angeles County's first Math Field Day contest. Stephen contributed to the 1999 National Academy of Science publication on the Nature and Teaching of Algebra in the Middle Grades.

Stephen is a member of the National Council of Teachers of Mathematics and the California Mathematics Council. He earned his BA from United States International University and his MA from Chapman College.

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2	• Missing Addends	14	NO, A, PS, CM, C, R
3	• Sequences • Digits	18	NO, A, PS, CM, R
4	• Place Value Activity Comparing Money Amounts	24	NO, PS, CM, C, R
5	• Ordinal Numbers • Months of the Year	29	NO, PS, CM, R
6	• Review of Subtraction	35	NO, PS, RP, R
7	• Writing Numbers Through 999	39	NO, PS, CM, C
8	• Adding Money Activity Adding Money Amounts	45	NO, PS, C, R
9	• Adding with Regrouping	50	NO, PS, CM, RP, R
10	• Even and Odd Numbers	55	NO, PS, CM, R
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13	<ul style="list-style-type: none"> • Adding Three-Digit Numbers Activity Adding Money 	77	NO, PS, CM, C
14	<ul style="list-style-type: none"> • Subtracting Two-Digit and Three-Digit Numbers • Missing Two-Digit Addends 	82	NO, PS, RP, C
15	<ul style="list-style-type: none"> • Subtracting Two-Digit Numbers with Regrouping Activity Subtracting Money 	88	NO, PS, CM, C
16	<ul style="list-style-type: none"> • Expanded Form • More on Missing Numbers in Subtraction 	94	NO, A, PS, RP, C
17	<ul style="list-style-type: none"> • Adding Columns of Numbers with Regrouping 	99	NO, PS, RP, C
18	<ul style="list-style-type: none"> • Temperature Activity Measuring Temperature 	104	M, PS, CM, C
19	<ul style="list-style-type: none"> • Elapsed Time Problems Activity Finding Elapsed Time 	110	M, PS, CM, C, R
20	<ul style="list-style-type: none"> • Rounding 	116	NO, PS, C, R
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Lesson		Page	Strands Focus
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22	<ul style="list-style-type: none"> • Naming Fractions • Adding Dollars and Cents Activity Counting Money	133	NO, PS, CM, C, R
23	<ul style="list-style-type: none"> • Lines, Segments, Rays, and Angles Activity Real-World Segments and Angles	140	G, CM, C, R
24	<ul style="list-style-type: none"> • Inverse Operations 	147	NO, A, PS, C, R
25	<ul style="list-style-type: none"> • Subtraction Word Problems 	152	A, PS, CM, RP
26	<ul style="list-style-type: none"> • Drawing Pictures of Fractions 	158	NO, CM, RP, R
27	<ul style="list-style-type: none"> • Multiplication as Repeated Addition • More Elapsed Time Problems Activity Finding Time	162	NO, M, PS, C, R
28	<ul style="list-style-type: none"> • Multiplication Table 	168	NO, CM, C, R
29	<ul style="list-style-type: none"> • Multiplication Facts: 0s, 1s, 2s, 5s 	175	NO, PS, CM, C
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34	• Writing Numbers Through Hundred Millions	212	NO, CM, C, R
35	• Naming Mixed Numbers and Money	218	NO, PS, CM, C, R
36	• Fractions of a Dollar	226	NO, CM, C, R
37	• Reading Fractions and Mixed Numbers from a Number Line	233	NO, CM, C, R
38	• Multiplication Facts (Memory Group)	238	NO, PS, CM, C, R
39	• Reading an Inch Scale to the Nearest Fourth Activity Make a Ruler and Measure	243	M, CM, C, R
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42	<ul style="list-style-type: none"> Rounding Numbers to Estimate 	269	NO, PS, C, R
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48	<ul style="list-style-type: none"> Multiplying Two-Digit Numbers, Part 2 	307	NO, PS, C, R
49	<ul style="list-style-type: none"> Word Problems About Equal Groups, Part 1 	312	NO, A, PS, C
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54	<ul style="list-style-type: none"> • The Calendar • Rounding Numbers to the Nearest Thousand 	344	NO, M, RP, R
55	<ul style="list-style-type: none"> • Prime and Composite Numbers Activity Using Arrays to Find Factors	351	NO, RP, R
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57	<ul style="list-style-type: none"> • Rate Word Problems 	364	NO, A, PS, CM
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68	<ul style="list-style-type: none"> • Division with Two-Digit Answers and a Remainder 	435	NO, PS, R
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83	<ul style="list-style-type: none"> Sales Tax 	532	A, PS, CM, C
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102	<ul style="list-style-type: none"> • Tenths and Hundredths on a Number Line Activity Measuring Objects with a Meterstick	648	NO, CM, R
103	<ul style="list-style-type: none"> • Fractions Equal to 1 and Fractions Equal to $\frac{1}{2}$ 	654	NO, M, PS, RP, R
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107	<ul style="list-style-type: none"> • Adding and Subtracting Fractions with Common Denominators 	675	NO, PS, RP, R
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109	<ul style="list-style-type: none"> • Equivalent Fractions 	687	NO, CM, RP, R
110	<ul style="list-style-type: none"> • Dividing by Multiples of 10 	694	NO, PS, CM, R
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114	<ul style="list-style-type: none"> Simplifying Fraction Answers 	720	NO, PS, RP
115	<ul style="list-style-type: none"> Renaming Fractions 	725	NO, PS, CM, C
116	<ul style="list-style-type: none"> Common Denominators 	729	NO, PS, C
117	<ul style="list-style-type: none"> Rounding Whole Numbers Through Hundred Millions 	735	NO, PS, CM, C
118	<ul style="list-style-type: none"> Dividing by Two-Digit Numbers 	741	NO, PS, CM, RP
119	<ul style="list-style-type: none"> Adding and Subtracting Fractions with Different Denominators 	746	NO, PS, CM
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LETTER FROM THE AUTHOR



Dear Student,

We study mathematics because it plays a very important role in our lives. Our school schedule, our trip to the store, the preparation of our meals, and many of the games we play involve mathematics. The word problems in this book are often drawn from everyday experiences.

When you become an adult, mathematics will become even more important. In fact, your future may depend on the mathematics you are learning now. This book will help you to learn mathematics and to learn it well. As you complete each lesson, you will see that similar problems are presented again and again. ***Solving each problem day after day is the secret to success.***

Your book includes daily lessons and investigations. Each lesson has three parts.

1. The first part is a Power Up that includes practice of basic facts and mental math. These exercises improve your speed, accuracy, and ability to do math *in your head*. The Power Up also includes a problem-solving exercise to help you learn the strategies for solving complicated problems.
2. The second part of the lesson is the New Concept. This section introduces a new mathematical concept and presents examples that use the concept. The Lesson Practice provides a chance for you to solve problems using the new concept. The problems are lettered a, b, c, and so on.
3. The final part of the lesson is the Written Practice. This section reviews previously taught concepts and prepares you for concepts that will be taught in later lessons. Solving these problems will help you practice your skills and remember concepts you have learned.

Investigations are variations of the daily lesson. The investigations in this book often involve activities that fill an entire class period. Investigations contain their own set of questions but do not include Lesson Practice or Written Practice.

Remember to solve every problem in each Lesson Practice, Written Practice, and Investigation. Do your best work, and you will experience success and true learning that will stay with you and serve you well in the future.

A handwritten signature in black ink that reads "Stephen D. Walsh". The signature is written in a cursive style.

Temple City, California

HOW TO USE YOUR TEXTBOOK

Saxon Math Intermediate 4 is unlike any math book you have used! It doesn't have colorful photos to distract you from learning. The Saxon approach lets you see the beauty and structure within math itself. You will understand more mathematics, become more confident in doing math, and will be well prepared when you take high school math classes.

Power Yourself Up

Start off each lesson by practicing your basic skills and concepts, mental math, and problem solving. Make your math brain stronger by exercising it every day. Soon you'll know these facts by memory!

Learn Something New!

Each day brings you a new concept, but you'll only have to learn a small part of it now. You'll be building on this concept throughout the year so that you understand and remember it by test time.

LESSON
69

• Millimeters

Power Up

facts

Power Up I

count aloud

Count down by threes from 60 to 3.

mental math

- Number Sense:** $12 \times 2 \times 10$
- Number Sense:** $20 \times 20 \times 20$
- Number Sense:** $56 + 9 + 120$
- Fractional Parts:** What is $\frac{1}{2}$ of \$60?
- Measurement:** Six feet is 72 inches. How many inches tall is a person whose height is 5 feet 11 inches?
- Measurement:** The airplane is 5500 feet above the ground. Is that height greater than or less than 1 mile?
- Estimation:** Xavier can read about 30 pages in one hour. If Kevin must read 58 pages, about how long will it take him? (Round your answer to the nearest hour.)
- Calculation:** 6^2 , -18 , $\div 9$, $\times 50$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. The parking lot charged \$1.50 for the first hour and 75¢ for each additional hour. Harold parked the car in the lot from 11:00 a.m. to 3 p.m. How much money did he have to pay? Explain how you found your answer.

New Concept

This line segment is one centimeter long:



If we divide a centimeter into ten equal lengths, each equal length is **1 millimeter** long. A dime is about 1 millimeter thick.



← 1 millimeter thick



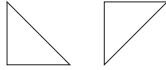
Activity

Material needed:

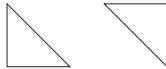
- Lesson Activity 31

Formulate For this activity, you will develop a plan to predict the movement of a triangle to determine **congruence**.

- Cut out the two right triangles from **Lesson Activity 31**, or use triangle manipulatives.
- Predict** Place the two triangles in the positions shown below. Plan a way to move one triangle using a translation and a rotation to show that the triangles are congruent. Remember that one triangle must be on top of the other in the final position. Write your conclusion. Include direction and degrees in your answer.



- Predict** Place the two triangles in the positions shown below. Plan a way to move one triangle to show that the triangles are congruent. Remember that one triangle must be on top of the other in the final position. Write your conclusion. Include direction and degrees in your answer.



Lesson Practice

- Conclude** Can a right triangle have two right angles? Why or why not?
- What is the name for a triangle that has at least two sides equal in length?
- Model** Use a color tile to model a translation, reflection, and rotation.

Get Active!

Dig into math with a hands-on activity. Explore a math concept with your friends as you work together and use manipulatives to see new connections in mathematics.

Check It Out!

The Lesson Practice lets you check to see if you understand today's new concept.

Exercise Your Mind!

When you work the Written Practice exercises, you will review both today's new concept and also math you learned in earlier lessons. Each exercise will be on a different concept — you never know what you're going to get! It's like a mystery game — unpredictable and challenging.

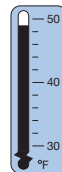
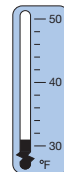
As you review concepts from earlier in the book, you'll be asked to use higher-order thinking skills to show what you know and why the math works.

The mixed set of Written Practice is just like the mixed format of your state test. You'll be practicing for the "big" test every day!

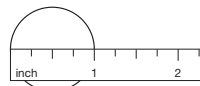
Written Practice

Distributed and Integrated

- One hundred fifty feet equals how many yards?
(ms.2)
- Tammy gave the clerk \$6 to pay for a book. She received 64¢ in change. Tax was 38¢. What was the price of the book?
(ss)
- DaJuan is 2 years older than Rebecca. Rebecca is twice as old as Dillon. DaJuan is 12 years old. How old is Dillon? (*Hint: First find Rebecca's age.*)
(s4)
- Write each decimal as a mixed number:
(s4)
 - 3.295
 - 32.9
 - 3.09
- Represent** Three fourths of the 84 contestants guessed incorrectly. How many contestants guessed incorrectly? Draw a picture to illustrate the problem.
(ms.5, ss)
 - What percent of the contestants guessed incorrectly?
- These thermometers show the average daily minimum and maximum temperatures in North Little Rock, Arkansas, during the month of January. What is the range of the temperatures?
(rs, ss)



- What is the diameter of this circle?
 - What is the radius of this circle?



HOW TO USE YOUR TEXTBOOK

Become an Investigator!

Dive into math concepts and explore the depths of math connections in the Investigations.

Continue to develop your mathematical thinking through applications, activities, and extensions.

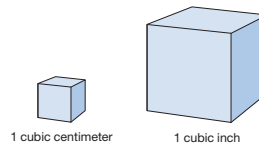
INVESTIGATION

11

Focus on

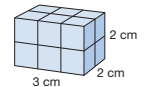
• Volume

Shapes such as cubes, pyramids, and cones take up space. The amount of space a shape occupies is called its **volume**. We measure volume with **cubic units** like cubic centimeters, cubic inches, cubic feet, and cubic meters.



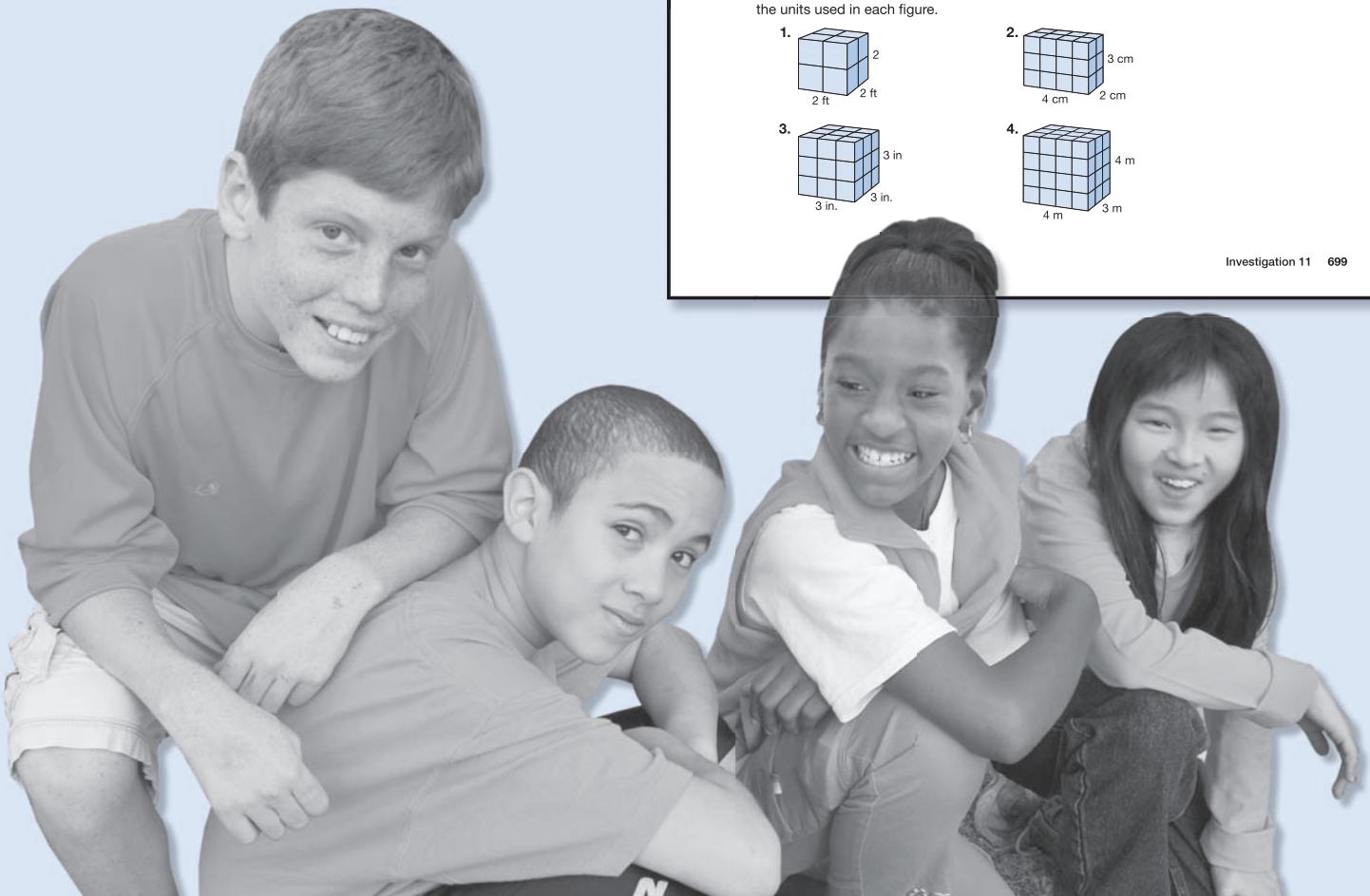
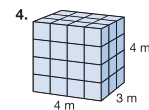
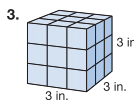
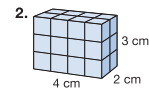
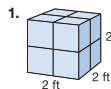
The model of the cube we constructed in Lesson 99 has a volume of one cubic inch.

Here is a model of a rectangular solid built with cubes that each have a volume of 1 cubic centimeter. To find the volume of the rectangular solid, we can count the number of cubic centimeters used to build it.



One way to count the small cubes is to count the cubes in one layer and then multiply that number by the number of layers. There are six cubes on the top layer, and there are two layers. The volume of the rectangular solid is 12 cubic centimeters.

Count cubes to find the volume of each rectangular solid below. Notice the units used in each figure.





Focus on

• Problem Solving

We study mathematics to learn how to use tools that help us solve problems. We face mathematical problems in our daily lives. We can become powerful problem solvers by using the tools we store in our minds. In this book we will practice solving problems every day.

This lesson has three parts:

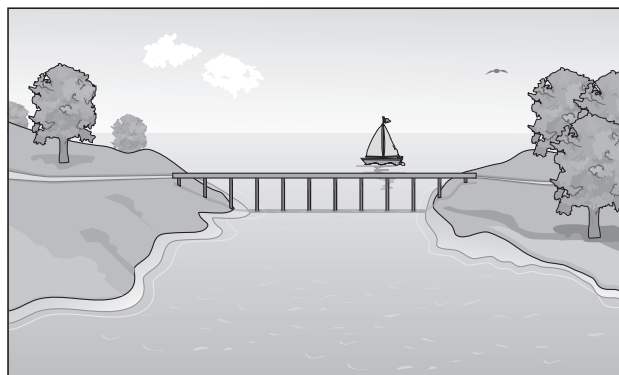
Problem-Solving Process The four steps we follow when solving problems.

Problem-Solving Strategies Some strategies that can help us solve problems.

Writing and Problem Solving Describing how we solved a problem.

Four-Step Problem-Solving Process

Solving a problem is like arriving at a new location, so the process of solving a problem is similar to the process of taking a trip. Suppose we are on the mainland and want to reach a nearby island.



Step	Problem-Solving Process	Taking a Trip
1	Understand Know where you are and where you want to go.	We are on the mainland and want to go to the island.
2	Plan Plan your route.	We might use the bridge, the boat, or swim.
3	Solve Follow the plan.	Take the journey to the island.
4	Check Check that you have reached the right place.	Verify that we have reached our new location.

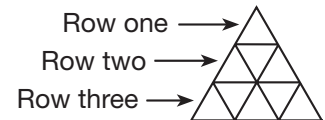
When we solve a problem, it helps to ask ourselves some questions along the way.

Step	Follow the Process	Ask Yourself Questions
1	Understand	What information am I given? What am I asked to find or do?
2	Plan	How can I use the given information to solve the problem? What strategy can I use to solve the problem?
3	Solve	Am I following the plan? Is my math correct?
4	Check	Does my solution answer the question that was asked? Is my answer reasonable?

Below we show how we follow these steps to solve a word problem.

Example 1

Ricardo arranged nine small congruent triangles in rows to make one large triangle.



If Ricardo extended the triangle to 5 rows, how many small triangles will there be in row four and row five?

Step 1: Understand the problem. Ricardo used nine small congruent triangles. He placed the small triangles so that row one has 1 triangle, row two has 3 triangles, and row three has 5 triangles.

We are asked to find the number of small triangles in row four and row five if the large triangle is extended to 5 rows.

Step 2: Make a plan. The first row has one triangle, the second row has three triangles, and the third row has five triangles. We see that there is a pattern. We can make a table and continue the pattern to extend the large triangle to five rows.

Step 3: Solve the problem. We follow our plan by making a table that shows the number of triangles used in each row if the large triangle is extended to 5 rows.

Row	one	two	three	four	five
Number of Triangles	1	3	5	7	9

\swarrow \searrow \swarrow \searrow
 +2 +2 +2 +2

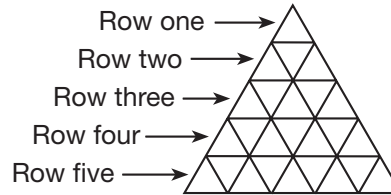
We see that the number of small triangles in each row increases by 2 when a new row is added.

$$5 + 2 = 7 \qquad 7 + 2 = 9$$

This means row four has **7 triangles** and row five has **9 triangles**.

Step 4: Check the answer. We look back at the problem to see if we have used the correct information and have answered the question. We made a table to show the number of small triangles that were in each row. We found a pattern and extended the triangle to 5 rows. We know that row four has 7 small triangles and that row five has 9 small triangles.

We can check our answer by drawing a diagram and counting the number of triangles in each row.



Our answer is reasonable and correct.

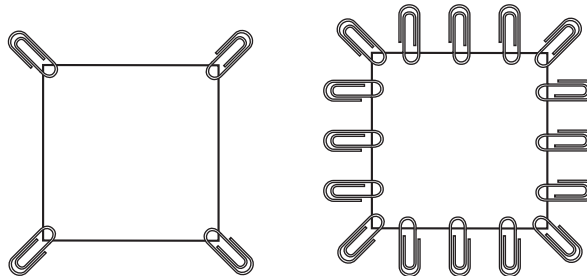
Example 2

Mr. Jones built a fence around his square-shaped garden. He put 5 fence posts on each side of the garden, including one post in each corner. How many fence posts did Mr. Jones use?

Step 1: Understand the problem. Mr. Jones built a square fence around his garden. He put 5 fence posts on each side of the garden. There is one fence post in each corner.

Step 2: Make a plan. We can make a model of the fence using paper clips to represent each fence post.

Step 3: Solve the problem. We follow our plan by creating a model. First we will show one fence post in each corner.



We know each side has five fence posts. We see that each side of our model already has two fence posts. We add three fence posts to each side to show five posts per side.

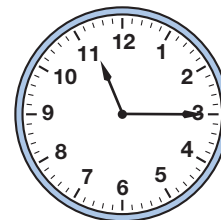
Each side of the fence now has five posts, including the one in each corner. We find that Mr. Jones used **16 fence posts** to build the fence.

Step 4: Check the answer. We look back at the problem to see if we used the correct information and answered the question. We know that our answer is reasonable because each side of the square has 5 posts, including the one in each corner. We also see that there are four corner posts and 3 posts on each of the four sides. Mr. Jones used 16 posts to build the fence.

1. List in order the four steps of the problem-solving process.
2. What two questions do we answer to understand a problem?

Refer to the following problem to answer questions **3–8**.

Katie left her house at the time shown on the clock. She arrived at Monica's house 15 minutes later. Then they spent 30 minutes eating lunch. What time did they finish lunch?



3. **Connect** What information are we given?
4. **Verify** What are you asked to find?
5. Which step of the four-step problem-solving process did you complete when you answered questions 3 and 4?
6. Describe your plan for solving the problem.
7. **Explain** Solve the problem by following your plan. Show your work. Write your solution to the problem in a way someone else will understand.
8. Check your work and your answer. Look back to the problem. Be sure you use the information correctly. Be sure you found what you were asked to find. Is your answer reasonable?

Problem-Solving Strategies

As we consider how to solve a problem, we choose one or more strategies that seem to be helpful. Referring to the picture at the beginning of this lesson, we might choose to swim, to take the boat, or to cross the bridge to travel from the mainland to the island. Other strategies might not be as effective for the illustrated problem. For example, choosing to walk or bike across the water are strategies that are not reasonable for this situation.

When solving mathematical problems we also select strategies that are appropriate for the problem. **Problem-solving strategies** are types of plans we can use to solve problems. Listed below are ten strategies we will practice in this book. You may refer to these descriptions as you solve problems throughout the year.

Act it out or make a model. Moving objects or people can help us visualize the problem and lead us to the solution.

Use logical reasoning. All problems require reasoning, but for some problems we use given information to eliminate choices so that we can close in on the solution. Usually a chart, diagram, or picture can be used to organize the given information and to make the solution more apparent.

Draw a picture or diagram. Sketching a picture or a diagram can help us understand and solve problems, especially problems about graphs or maps or shapes.

Write a number sentence or equation. We can solve many word problems by fitting the given numbers into equations or number sentences and then finding the unknown numbers.

Make it simpler. We can make some complicated problems easier by using smaller numbers or fewer items. Solving the simpler problem might help us see a pattern or method that can help us solve the complex problem.

Find/Extend a pattern. Identifying a pattern that helps you to predict what will come next as the pattern continues might lead to the solution.

Make an organized list. Making a list can help us organize our thinking about a problem.

Guess and check. Guessing the answer and trying the guess in the problem might start a process that leads to the answer. If the guess is not correct, use the information from the guess to make a better guess. Continue to improve your guesses until you find the answer.

Make or use a table, chart, or graph. Arranging information in a table, chart, or graph can help us organize and keep track of data. This might reveal patterns or relationships that can help us solve the problem.

Work backwards. Finding a route through a maze is often easier by beginning at the end and tracing a path back to the start. Likewise, some problems are easier to solve by working back from information that is given toward the end of the problem to information that is unknown near the beginning of the problem.

9. Name some strategies used in this lesson.

The chart below shows where each strategy is first introduced in this textbook.

Strategy	Lesson
Act It Out or Make a Model	1
Use Logical Reasoning	13
Draw a Picture or Diagram	9
Write a Number Sentence or Equation	28
Make It Simpler	20
Find/Extend a Pattern	8
Make an Organized List	46
Guess and Check	15
Make or Use a Table, Chart, or Graph	3
Work Backwards	57

Writing and Problem Solving

Sometimes, a problem will ask us to explain our thinking. This helps us measure our understanding of math and it is easy to do.

- Explain how you solved the problem.
- Explain how you know your answer is correct.
- Explain why your answer is reasonable.

For these situations, we can describe the way we followed our plan.

This is a description of the way we solved Example 1.

We made a table and continued a pattern to extend the large triangle to five rows. We found that row four had 7 small triangles and row five had 9 small triangles.

10. Write a description of how we solved the problem in Example 2.

Other times, we will be asked to write a problem for a given equation. Be sure to include the correct numbers and operations to represent the equation.

11. Write a word problem for $9 + 5 = 14$.

• Review of Addition

Power Up

factsPower Up A¹**count aloud**

Count by twos from 2 to 20.

mental mathAdd ten to a number in **a–f**.

a. **Number Sense:** $20 + 10$

b. **Number Sense:** $34 + 10$

c. **Number Sense:** $10 + 53$

d. **Number Sense:** $5 + 10$

e. **Number Sense:** $25 + 10$

f. **Number Sense:** $10 + 8$

g. What number is one less than 36?

problem solving

Six students are planning to ride the roller coaster at the amusement park. Three students can sit in each row of the roller coaster. How many rows will six students fill?

Focus Strategy: Act It Out

Understand We are told that six students will ride the roller coaster. Three students can sit in each row. We are asked to find the number of rows six students will fill.

Plan Six student volunteers can *act out* the situation in the problem.

Solve Your teacher will call six students to the front of the classroom and line them up in rows of three. Three students will fill one row of the roller coaster, and three more students will fill a second row of the roller coaster. Since there are no students left over, we know that six students will fill **two rows** of the roller coaster.

¹ For instructions on how to use the Power Up activities, please consult the preface.

Check We know our answer is reasonable because by acting out the problem, we see that six students divide into two equal groups of three. Each group of three students fills one row.

How many rows would six students fill if only two students can sit in each row?

New Concept

Reading Math

We can write an addition number sentence both horizontally and vertically. Write an addition number sentence in horizontal form. Write an addition number sentence in vertical form.

Addition is the combining of two groups into one group. For example, when we count the dots on the top faces of a pair of dot cubes, we are adding.

$$\begin{array}{ccccccc}
 \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \bullet \\ \hline \end{array} & + & \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \\ \hline \end{array} & = & \begin{array}{|c|c|} \hline \bullet \bullet & \bullet \bullet \\ \bullet \bullet & \bullet \bullet \\ \hline \end{array} \\
 4 & + & 3 & = & 7 \\
 \text{four} & \text{plus} & \text{three} & \text{equals} & \text{seven}
 \end{array}$$

The numbers that are added are called **addends**. The answer is called the **sum**. The addition $4 + 3 = 7$ is a **number sentence**. A number sentence is a complete sentence that uses numbers and symbols instead of words. Here we show two ways to add 4 and 3:

$$\begin{array}{r}
 4 \text{ addend} \\
 + 3 \text{ addend} \\
 \hline
 7 \text{ sum}
 \end{array}
 \qquad
 \begin{array}{r}
 3 \text{ addend} \\
 + 4 \text{ addend} \\
 \hline
 7 \text{ sum}
 \end{array}$$

Notice that if the order of the addends is changed, the sum remains the same. This is true for any two numbers and is called the **Commutative Property of Addition**. **When we add two numbers, either number may be first.**

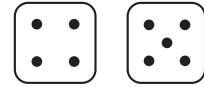
$$\begin{array}{ccc}
 4 + 3 = 7 & & 3 + 4 = 7 \\
 \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \bullet \\ \hline \end{array} & \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \\ \hline \end{array} & \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \\ \hline \end{array} & \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \bullet \\ \hline \end{array}
 \end{array}$$

When we add zero to a number, the number is not changed. This property of addition is called the **Identity Property of Addition**. If we start with a number and add zero, the sum is identical to the starting number.

$$4 + 0 = 4 \qquad 9 + 0 = 9 \qquad 0 + 7 = 7$$

Example 1

Write a number sentence for this picture:



A number sentence for the picture is $4 + 5 = 9$. The number sentence $5 + 4 = 9$ is also correct.

When adding three numbers, the numbers may be added in any order. Here we show six ways to add 4, 3, and 5. Each way the answer is 12.

$$\begin{array}{r} 4 \\ 3 \\ + 5 \\ \hline 12 \end{array} \quad \begin{array}{r} 4 \\ 5 \\ + 3 \\ \hline 12 \end{array} \quad \begin{array}{r} 3 \\ 4 \\ + 5 \\ \hline 12 \end{array} \quad \begin{array}{r} 3 \\ 5 \\ + 4 \\ \hline 12 \end{array} \quad \begin{array}{r} 5 \\ 4 \\ + 3 \\ \hline 12 \end{array} \quad \begin{array}{r} 5 \\ 3 \\ + 4 \\ \hline 12 \end{array}$$

Example 2

Show six ways to add 1, 2, and 3.

We can form two number sentences that begin with the addend 1.

$$1 + 2 + 3 = 6 \quad 1 + 3 + 2 = 6$$

We can form two number sentences that begin with the addend 2.

$$2 + 1 + 3 = 6 \quad 2 + 3 + 1 = 6$$

We can form two number sentences that begin with the addend 3.

$$3 + 1 + 2 = 6 \quad 3 + 2 + 1 = 6$$

Many word problems tell a story. Some stories are about **putting things together**. Read this story:

*D'Jon had 5 marbles. He bought 7 more marbles.
Then D'Jon had 12 marbles.*

Reading Math

We translate the problem using an addition formula.

D'Jon had:
5 marbles

He bought some
more: 7 marbles

Total: 12 marbles

There is a plot to this story. D'Jon had **some** marbles. Then he bought **some more** marbles. When he put the marbles together, he found the **total** number of marbles. Problems with a "**some and some more**" plot can be expressed with an addition **formula**. A formula is a method for solving a certain type of problem. Below is a formula for solving problems with a "some and some more" plot:

Formula	Problem
Some	5 marbles
+ Some more	+ 7 marbles
<hr/> Total	<hr/> 12 marbles

Here we show the formula written horizontally:

Formula: Some + Some more = Total

Problem: 5 marbles + 7 marbles = 12 marbles

A story can become a word problem if one or more of the numbers is missing. Here are three word problems:

*D'Jon had 5 marbles. He bought 7 more marbles.
Then how many marbles did D'Jon have?*

*D'Jon had 5 marbles. He bought some more marbles.
Then D'Jon had 12 marbles. How many marbles did
D'Jon buy?*

*D'Jon had some marbles. He bought 7 more marbles.
Then D'Jon had 12 marbles. How many marbles did
D'Jon have before he bought the 7 marbles?*

To solve a word problem, we can follow the four-step problem-solving process.

Step 1: Read and translate the problem.

Step 2: Make a plan to solve the problem.

Step 3: Follow the plan and solve the problem.

Step 4: Check your answer for reasonableness.

A plan that can help us solve word problems is to *write a number sentence*. We write the numbers we know into a formula.

Example 3

Matias saw 8 ducks. Then he saw 7 more ducks. How many ducks did Matias see in all?

This problem has a “some and some more” plot. We write the numbers we know into the formula.

Formula: Some + Some more = Total

Problem: 8 ducks + 7 ducks = Total

We may shorten the number sentence to $8 + 7 = t$.

We find the total by adding 8 and 7.

Matias saw **15 ducks** in all.

One way to check the answer is to see if it correctly completes the problem.

*Matias saw 8 ducks. Then he saw 7 more ducks. Matias saw
15 ducks in all.*

Math Symbols

Any uppercase or lowercase letter may be used to represent a number. For example, we can use T or t to represent a total.

Example 4

Samantha saw 5 trees in the east field, 3 trees in the west field, and 4 trees in the north field. How many trees did Samantha see in all?

In this story there are three addends.

Formula	Problem
Some	5 trees
Some more	3 trees
<u>+ Some more</u>	<u>+ 4 trees</u>
Total	Total

Using addition, we find that Samantha saw **12 trees** in all.

We check the answer to see if it is reasonable.

There are three addends: 5 trees, 3 trees, and 4 trees. When we put all the trees together, we add $5 + 3 + 4$. The number of trees is **12**.

Some of the problems in this book will have an addend missing. When one addend is missing and the sum is given, the problem is to find the missing addend. What is the missing addend in this number sentence?

$$\begin{array}{ccccccc} \boxed{\begin{array}{c} \bullet \\ \bullet \end{array}} & + & \boxed{} & = & \boxed{\begin{array}{c} \bullet \\ \bullet \end{array}} \boxed{\begin{array}{c} \bullet \\ \bullet \\ \bullet \end{array}} \\ 2 & + & ? & = & 7 \\ \text{two} & \text{plus} & ? & \text{equals} & \text{seven} \end{array}$$

Since we know that $2 + 5 = 7$, the missing addend is 5. A letter can be used to represent a missing number, as we see in the example below.

Example 5

Find each missing addend:

a.
$$\begin{array}{r} 4 \\ + n \\ \hline 7 \end{array}$$

b. $b + 6 = 10$

- The letter n stands for a missing addend. Since $4 + 3 = 7$, the letter n stands for the number **3** in this number sentence.
- In this problem, the letter b is used to stand for the missing addend. Since $4 + 6 = 10$, the letter b stands for the number **4**.

Lesson Practice

Add:

a. $5 + 6$

b. $6 + 5$

c. $8 + 0$

d. $4 + 8 + 6$

e. $4 + 5 + 6$

f. D'Anya ran 5 laps in the morning. She ran 8 laps in the afternoon. How many laps did she run in all? Write a number sentence for this problem.

g. **Formulate** Write two number sentences for this picture to show the Commutative Property.



h. **List** Show six ways to add 1, 3, and 5.

Find each missing addend:

i. $7 + n = 10$

j. $a + 8 = 12$

k. **Connect** Copy these two patterns on a piece of paper. In each of the six boxes, write either “addend” or “sum.”

$$\boxed{} + \boxed{} = \boxed{} \quad \begin{array}{r} \boxed{} \\ + \boxed{} \\ \hline \boxed{} \end{array}$$

Written Practice

Distributed and Integrated

Formulate Write a number sentence for problems **1** and **2**. Then solve each problem.

- *1. There were 5 students in the first row and 7 students in the second row. How many students were in the first two rows?
- *2. Ling had 6 coins in her left pocket and 3 coins in her right pocket. How many coins did Ling have in both pockets?

Find each sum or missing addend:

3. $9 + 4$

4. $8 + 2$

*5.
$$\begin{array}{r} 4 \\ + n \\ \hline 9 \end{array}$$

*6.
$$\begin{array}{r} w \\ + 5 \\ \hline 8 \end{array}$$

*7.
$$\begin{array}{r} 6 \\ + p \\ \hline 8 \end{array}$$

*8.
$$\begin{array}{r} q \\ + 8 \\ \hline 8 \end{array}$$

Beginning in this lesson, we star the exercises that cover challenging or recently presented content. We encourage students to work first on the starred exercises with which they might want help, saving the easier exercises for last.

9. $3 + 4 + 5$

10. $4 + 4 + 4$

11. $6 + r = 10$

12. $x + 5 = 6$

13.
$$\begin{array}{r} 5 \\ 5 \\ + 5 \\ \hline \end{array}$$

14.
$$\begin{array}{r} 8 \\ 0 \\ + 7 \\ \hline \end{array}$$

15.
$$\begin{array}{r} 6 \\ 5 \\ + 4 \\ \hline \end{array}$$

16.
$$\begin{array}{r} 9 \\ 9 \\ + 9 \\ \hline \end{array}$$

17.
$$\begin{array}{r} m \\ + 9 \\ \hline 10 \end{array}$$

18.
$$\begin{array}{r} 9 \\ + f \\ \hline 12 \end{array}$$

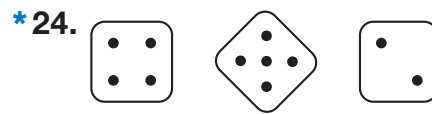
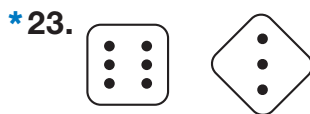
19.
$$\begin{array}{r} z \\ + 5 \\ \hline 10 \end{array}$$

20.
$$\begin{array}{r} 0 \\ + n \\ \hline 3 \end{array}$$

21. $3 + 2 + 5 + 4 + 6$

22. $2 + 2 + 2 + 2 + 2 + 2 + 2$

Represent Write a number sentence for each picture:



*25. **List** Show six ways to add 2, 3, and 4.

*26. **Multiple Choice** Sometimes a missing number is shown by a shape instead of a letter. Choose the correct number for \triangle in the following number sentence:

$$\triangle + 3 = 10$$

A 3

B 7


C 10

D 13

*27. **Represent** Draw a dot cube picture to show $5 + 6$.

*28. **Connect** Write a horizontal number sentence that has a sum of 17.

*29. **Connect** Write a vertical number sentence that has a sum of 15.

*30.  **Formulate** Write and solve an addition word problem using the numbers 10 and 8.

• Missing Addends

Power Up

facts

Power Up A

count aloud

Count by fives from 5 to 50.

mental math

For a–f, add ten to a number.

- Number Sense:** $40 + 10$
- Number Sense:** $26 + 10$
- Number Sense:** $39 + 10$
- Number Sense:** $7 + 10$
- Number Sense:** $10 + 9$
- Number Sense:** $10 + 63$
- What number is one less than 49?

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Maria, Sh'Meika, and Kimber are on a picnic. They want to draw sketches of the clouds in the sky. Sharon brought 15 sheets of paper and 6 pencils to share with the other two girls. How many sheets of paper and how many pencils can each girl have if they share equally?

New Concept

Thinking Skill

Discuss

What is another way you can find the number of the third roll?

Represent

Derek rolled a dot cube three times. The picture below shows the number of dots on the top face of the cube for each of the first two rolls.



First roll



Second roll

The total number of dots on all three rolls was 12.

Math Language

An **equation** is a number sentence that uses the symbol = to show that two quantities are equal. Here are two examples:

$$\begin{aligned}5 + 2 &= 7 \\ 6 + n &= 8\end{aligned}$$


These are not equations:

$$\begin{aligned}5 + 2 \\ 4 > 6\end{aligned}$$

Let's draw a picture to show the number of dots on the top face of the cube for Derek's third roll.

We will write a number sentence, or an *equation*, for this problem. The first two numbers are 5 and 3. We do not know the number of the third roll, so we will use a letter. We know that the total is 12.

$$5 + 3 + t = 12$$

To find the missing addend, we first add 5 and 3, which makes 8. Then we think, "Eight plus what number equals twelve?" Since 8 plus 4 equals 12, the third roll was .

Example



Visit www.SaxonMath.com/Int4Activities for a calculator activity.

Find each missing addend:

a.
$$\begin{array}{r} 6 \\ n \\ + 5 \\ \hline 17 \end{array}$$

b. $4 + 3 + 2 + b + 6 = 20$

- a. We add 6 and 5, which makes 11. We think, "Eleven plus what number equals seventeen?" Since 11 plus 6 equals 17, the missing addend is **6**.
- b. First we add 4, 3, 2, and 6, which equals 15. Since 15 plus 5 is 20, the missing addend is **5**.

Lesson Practice

Find each missing addend:

a. $8 + a + 2 = 17$

b. $b + 6 + 5 = 12$

c. $4 + c + 2 + 3 + 5 = 20$

Written Practice

Distributed and Integrated

Formulate Write a number sentence for problems **1** and **2**. Then solve each problem.

- ¹* **1.** Jordan's rabbit, Hoppy, ate 5 carrots in the morning and 6 carrots in the afternoon. How many carrots did Hoppy eat in all?

¹ The italicized numbers within parentheses underneath each problem number are called *lesson reference numbers*. These numbers refer to the lesson(s) in which the major concept of that particular problem is introduced. If additional assistance is needed, refer to the discussion, examples, or practice problems of that lesson.

- *2. Five friends rode their bikes from the school to the lake. They rode ⁽¹⁾ 7 miles and then rested. They still had 4 miles to go. How many miles was it from the school to the lake?

Find each sum or missing addend:

3. $9 + n = 13$
⁽¹⁾

4. $7 + 8$
⁽¹⁾

5. $\begin{array}{r} p \\ + 6 \\ \hline 13 \end{array}$
⁽¹⁾

*6. $\begin{array}{r} 5 \\ 2 \\ + w \\ \hline 12 \end{array}$
⁽²⁾

7. $\begin{array}{r} 4 \\ 8 \\ + 5 \\ \hline \end{array}$
⁽¹⁾

8. $\begin{array}{r} 9 \\ 3 \\ + 7 \\ \hline \end{array}$
⁽¹⁾

*9. $\begin{array}{r} 8 \\ b \\ + 3 \\ \hline 16 \end{array}$
⁽²⁾

10. $\begin{array}{r} 9 \\ 7 \\ + 3 \\ \hline \end{array}$
⁽¹⁾

11. $\begin{array}{r} 2 \\ 9 \\ + 6 \\ \hline \end{array}$
⁽¹⁾

12. $\begin{array}{r} 3 \\ 8 \\ + 2 \\ \hline \end{array}$
⁽¹⁾

13. $\begin{array}{r} 9 \\ 5 \\ + 3 \\ \hline \end{array}$
⁽¹⁾

14. $\begin{array}{r} 2 \\ m \\ + 4 \\ \hline 9 \end{array}$
⁽²⁾

15. $\begin{array}{r} 5 \\ 3 \\ + q \\ \hline 9 \end{array}$
⁽²⁾

16. $\begin{array}{r} 2 \\ 3 \\ + r \\ \hline 7 \end{array}$
⁽²⁾

17. $\begin{array}{r} 5 \\ 3 \\ + t \\ \hline 10 \end{array}$
⁽²⁾

18. $\begin{array}{r} 8 \\ 4 \\ + 6 \\ \hline \end{array}$
⁽¹⁾

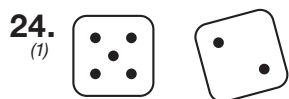
19. $\begin{array}{r} 2 \\ x \\ + 7 \\ \hline 11 \end{array}$
⁽²⁾

20. $\begin{array}{r} 5 \\ 2 \\ + 6 \\ \hline \end{array}$
⁽¹⁾

*21. $5 + 5 + 6 + 4 + x = 23$
⁽²⁾

- *22. **List** Show six ways to add 4, 5, and 6.
⁽¹⁾

Represent Write a number sentence for each picture:



25. **Verify** What is the name of the answer when we add?

(1)

*26. **Multiple Choice** Which number is \square in the following number sentence?

(1)

$$6 + \square = 10$$

A 4

B 6

C 10

D 16

*27. **Represent** Draw a picture to show $6 + 3 + 5$.

(2)

*28. **Connect** Write a horizontal number sentence that has a sum of 20.

(1)

29. **Connect** Write a vertical number sentence that has a sum of 24.

(1)

*30. **Formulate** Write and solve an addition word problem using the numbers 7, 3, and 10.

(1)

Early Finishers

Real-World Connection

There were 35 pictures at the art exhibit. The pictures were made using oils, pastels, or watercolors. Thirteen of the pictures were made using watercolors. An equal number of pictures were made using oils as were made using pastels. How many pictures were made using pastels? Explain how you found the answer.

- Sequences
- Digits

Power Up

facts

Power Up A

count aloud

Count by twos from 2 to 40.

mental math

Number Sense: Add ten, twenty, or thirty to a number in **a–f**.

$$\begin{array}{r} \text{a.} \quad 20 \\ + 20 \\ \hline \end{array}$$

$$\begin{array}{r} \text{b.} \quad 23 \\ + 20 \\ \hline \end{array}$$

$$\begin{array}{r} \text{c.} \quad 43 \\ + 10 \\ \hline \end{array}$$

$$\begin{array}{r} \text{d.} \quad 24 \\ + 30 \\ \hline \end{array}$$

$$\begin{array}{r} \text{e.} \quad 50 \\ + 30 \\ \hline \end{array}$$

$$\begin{array}{r} \text{f.} \quad 10 \\ + 65 \\ \hline \end{array}$$

g. What number is one less than 28?

problem solving

Kazi has nine coins to put in his left and right pockets. Find the ways Kazi could place the coins in his left and right pockets.

Focus Strategy: Make a Table

Understand We are told that Kazi has nine coins that he can put in his left and right pockets. We are asked to find the ways Kazi could place the coins in his left and right pockets.

If Kazi puts all nine coins in his left pocket, he would have zero coins for his right pocket. This means “9 left, 0 right” is a possibility.

If Kazi moves one coin from the left pocket to his right pocket, eight coins would remain in his left pocket ($9 - 1 = 8$). This possibility would be “8 left, 1 right.” We begin to see that there are multiple ways Kazi can put the coins into his left and right pockets.

Plan We can *make a table* to organize the ways Kazi could place the coins.

Solve We make a table with one column labeled “left” and the other labeled “right.” We start by writing the combinations we have already found. Then we fill in new rows until we finish the table.

Notice that the sum of the numbers in each row is 9. Also notice that there are ten rows, which means there are ten different ways Tom could put the coins into his left and right pockets.

Check We know our answer is reasonable because Kazi can put from 0 to 9 coins in one pocket and the rest in the other pocket, which is ten ways. We made a table to help us find all the ways.

Number of Coins	
Left	Right
9	0
8	1
7	2
6	3
5	4
4	5
3	6
2	7
1	8
0	9

What is another problem-solving strategy that we could use to solve the problem?

New Concepts

Sequences

Reading Math

The three dots written after a sequence such as 1, 2, 3, 4, 5, ... mean that the sequence continues without end even though the numbers are not written.

Counting is a math skill we learn early in life. Counting by ones we say, “one, two, three, four, five, ...”

1, 2, 3, 4, 5, ...

These numbers are called **counting numbers**. The counting numbers continue without end. We may also count by numbers other than one.

Counting by twos: 2, 4, 6, 8, 10, ...

Counting by fives: 5, 10, 15, 20, 25, ...

These are examples of counting patterns. A counting pattern is a **sequence**. A counting sequence may count up or count down. We can study a counting sequence to discover a rule for the sequence. Then we can find more numbers in the sequence.

Example 1

Find the rule and the next three numbers of this counting sequence:

10, 20, 30, 40, _____, _____, _____, ...

The rule is **count up by tens**. Counting this way, we find that the next three numbers are **50, 60, and 70**.

Example 2

Find the rule of this counting sequence. Then find the missing number in the sequence.

30, 27, 24, 21, _____, 15, ...

The rule is **count down by threes**. If we count down three from 21, we find that the missing number in the sequence is **18**. We see that 15 is three less than 18, which follows the rule.

Digits

To write numbers, we use **digits**. **Digits are the numerals 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9**. The number 356 has three digits, and the last digit is 6. The number 67,896,094 has eight digits, and the last digit is 4.

Example 3

The number 64,000 has how many digits?

The number 64,000 has **five digits**.

Example 4

What is the last digit of 2001?

The last digit of 2001 is **1**.

Example 5

Model How many different three-digit numbers can you write using the digits 1, 2, and 3? Each digit may be used only once in every number you write.

We can act out the problem by writing each digit on a separate slip of paper. Then we vary the arrangement of the slips until all of the possibilities have been discovered. We can avoid repeating arrangements by writing the smallest number first and then writing the rest of the numbers in counting order until we write the largest number.

123, 132, 213, 231, 312, 321

We find we can make **six different numbers**.

Lesson Practice

Generalize Write the rule and the next three numbers of each counting sequence:

a. 10, 9, 8, 7, _____, _____, _____, ...

b. 3, 6, 9, 12, _____, _____, _____, ...

Connect Find the missing number in each counting sequence:

- c. 80, 70, _____, 50, ... d. 8, _____, 16, 20, 24, ...

How many digits are in each number?

- e. 18 f. 5280 g. 8,403,227,189

What is the last digit of each number?

- h. 19 i. 5281 j. 8,403,190

- k. How many different three-digit numbers can you write using the digits 7, 8, and 9? Each digit may be used only once in every number you write. List the numbers in counting order.

Written Practice

Distributed and Integrated

Formulate Write a number sentence for problems **1** and **2**. Then solve each problem.

- *1. Diana has 5 dollars, Sumaya has 6 dollars, and Britt has 7 dollars.
(1) Altogether, how much money do the three girls have?
- *2. On Taye's favorite CD there are 9 songs. On his second-favorite CD there are 8 songs. Altogether, how many songs are on Taye's two favorite CDs?
- *3. How many digits are in each number?
(3) a. 593 b. 180 c. 186,527,394
- *4. What is the last digit of each number?
(3) a. 3427 b. 460 c. 437,269

Find each missing addend:

5. $5 + m + 4 = 12$
(2)

*6. $8 + 2 + w = 16$
(2)

Conclude Write the next number in each counting sequence:

- *7. 10, 20, 30, _____, ...
(3)
- *8. 22, 21, 20, _____, ...
(3)
- *9. 40, 35, 30, 25, _____, ...
(3)
- *10. 70, 80, 90, _____, ...
(3)

Generalize Write the rule and the next three numbers of each counting sequence:

*11. 6, 12, 18, _____, _____, _____, ...
(3)

12. 3, 6, 9, _____, _____, _____, ...
(3)

13. 4, 8, 12, _____, _____, _____, ...
(3)

*14. 45, 36, 27, _____, _____, _____, ...
(3)

Connect Find the missing number in each counting sequence:

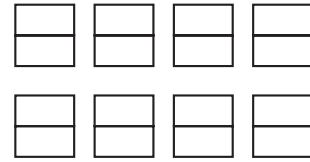
*15. 8, 12, _____, 20, ...
(3)

*16. 12, 18, _____, 30, ...
(3)

17. 30, 25, _____, 15, ...
(3)

18. 6, 9, _____, 15, ...
(3)

19. How many small rectangles are shown? Count by twos.
(3)



20. How many Xs are shown? Count by fours.
(3)



*21. **Represent** Write a number sentence for the picture below.
(1)



22.
$$\begin{array}{r} 4 \\ 8 \\ 7 \\ + 5 \\ \hline \end{array}$$

23.
$$\begin{array}{r} 9 \\ 5 \\ 7 \\ + 8 \\ \hline \end{array}$$

24.
$$\begin{array}{r} 8 \\ 4 \\ 7 \\ + 2 \\ \hline \end{array}$$

25.
$$\begin{array}{r} 2 \\ 9 \\ 7 \\ + 5 \\ \hline \end{array}$$


*26. **Multiple Choice** If $\triangle = 3$ and $\square = 4$, then $\triangle + \square$ equals which of the following?
(1)

A 3

B 4

C 5

D 7

- * 27. ⁽³⁾ How many different arrangements of three letters can you write using the letters a, b, and c? The different arrangements you write do not need to form words.
- * 28. **Connect** ⁽¹⁾ Write a horizontal number sentence that has a sum of 9.
- * 29. **Connect** ⁽¹⁾ Write a vertical number sentence that has a sum of 11.
- * 30.  **Formulate** ⁽¹⁾ Write and solve an addition word problem that has a sum of 12.

Early Finishers

Real-World Connection

Ivan noticed that the first three house numbers on the right side of a street were 2305, 2315, and 2325.

- What pattern do you see in this list of numbers?
- If this pattern continues, what will the next three house numbers be?
- The houses on the left side of the street have corresponding numbers that end in 0. What are the house numbers for the first 6 houses on the left side of the street?
- What pattern is used for the house numbers on the left side of the street?

• Place Value

Power Up

facts

Power Up A

count aloud

Count by fives from 5 to 100.

mental math

Add ten, twenty, or thirty to a number in **a–f**.

a. **Number Sense:** $66 + 10$

b. **Number Sense:** $29 + 20$

c. **Number Sense:** $10 + 76$

d. **Number Sense:** $38 + 30$

e. **Number Sense:** $20 + 6$

f. **Number Sense:** $40 + 30$

g. Add 10 to 77 and then subtract 1. What is the final answer?

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Lorelei has a total of nine coins in her left and right pockets. She has some coins (at least two) in each pocket. Make a table that shows the possible number of coins in each pocket.

New Concept

Model To learn **place value**, we will use money manipulatives and pictures to show different amounts of money. We will use \$100 bills, \$10 bills, and \$1 bills.

Example 1

Write the amount of money that is shown in the picture below.



Since there are 2 hundreds, 4 tens, and 3 ones, the amount of money shown is **\$243**.

Example 2

Model Use money manipulatives or draw a diagram to show \$324 using \$100 bills, \$10 bills, and \$1 bills.

To show \$324, we use 3 hundreds, 2 tens, and 4 ones.

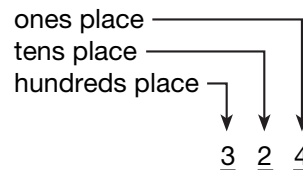


3 hundreds

2 tens

4 ones

The value of each place is determined by its position. Three-digit numbers like 324 occupy three different places.



Math Language

We can use money to show place value because our number system and our money system are both base-ten systems.

Thinking Skill

Connect

What does the zero in \$203 represent? What does the zero in \$230 represent?

Activity

Comparing Money Amounts

Materials needed:

- money manipulatives from **Lesson Activities 2, 3, and 4**

Model Use money manipulatives to show both \$203 and \$230. Write the amount that is the greater amount of money.

Example 3

The digit 7 is in what place in 753?

The 7 is in the third place from the right, which shows the number of hundreds. This means the 7 is in the **hundreds place**.

Lesson Practice

- a. **Model** Use money manipulatives or draw a diagram to show \$231 using \$100 bills, \$10 bills, and \$1 bills.
- b. **Model** Use money manipulatives or draw a diagram to show \$213. Which is less, \$231 or \$213?

The digit 6 is in what place in each of these numbers?

- c. 16 d. 65 e. 623
- f. Use three digits to write a number equal to 5 hundreds, 2 tens, and 3 ones.

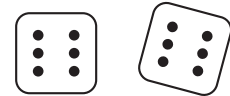
Written Practice

Distributed and Integrated

1. When Roho looked at the group of color tiles, he saw 3 red, 4 blue,
(1) 5 green, and 1 yellow. How many color tiles were there in all? Write the number sentence to find the answer.

- *2. **Represent** Write a number sentence for this picture:

(1)



3. How many cents are in 4 nickels? Count by fives.

(3)



Find each sum or missing addend:

4.
$$\begin{array}{r} 4 \\ + n \\ \hline 12 \end{array}$$

(1)

5.
$$\begin{array}{r} 4 \\ 5 \\ + 3 \\ \hline \end{array}$$

(1)

6.
$$\begin{array}{r} 13 \\ + y \\ \hline 19 \end{array}$$

(1)

7.
$$\begin{array}{r} 7 \\ + s \\ \hline 14 \end{array}$$

(1)

*8. $4 + n + 5 = 12$

(2)

9. $n + 2 + 3 = 8$

(2)

Generalize Write the rule and the next three numbers of each counting sequence:

* 10. 9, 12, 15, _____, _____, _____, ...
(3)

* 11. 30, 24, 18, _____, _____, _____, ...
(3)

* 12. 12, 16, 20, _____, _____, _____, ...
(3)

* 13. 35, 28, 21, _____, _____, _____, ...
(3)

14. How many digits are in each number?
(3)

a. 37,432

b. 5,934,286

c. 453,000

* 15. What is the last digit of each number?
(3)

a. 734

b. 347

c. 473

* 16. **Represent** Draw a diagram to show \$342 in \$100 bills, \$10 bills, and \$1 bills.
(4)

17. How much money does this picture show?
(4)



Connect Find the missing number in each counting sequence:

18. 24, _____, 36, 42, ...
(3)

* 19. 36, 32, _____, 24, ...
(3)

* 20. How many ears do 10 rabbits have? Count by twos.
(3)


* 21. The digit 6 is in what place in 365?
(4)

* 22. **Represent** Write a number sentence for this picture:
(1)



23. Find the missing addend:
(2)

$$2 + 5 + 3 + 2 + 3 + 1 + n = 20$$

-  **24. Explain** How do you find the missing addend in problem 23?
(2)
25. Show six ways to add 6, 7, and 8.
(1)
- 26. Multiple Choice** In the number 123, which digit shows the number of hundreds?
(4)
A 1 B 2 C 3 D 4
- 27. Predict** What is the tenth number in the counting sequence below?
(3)
1, 2, 3, 4, 5, ...
- 28.** How many different three-digit numbers can you write using the digits 2, 5, and 8? Each digit may be used only once in every number you write. List the numbers in counting order.
(3)
- 29. Connect** Write a number sentence that has addends of 6 and 7.
(1)
- 30. Formulate** Write and solve an addition word problem using the numbers 2, 3, and 5.
(1)

Early Finishers
Real-World Connection

Andres was asked to solve this riddle:

What number am I? I have three digits. There is a 4 in the tens place, a 7 in the ones place, and a 6 in the hundreds place.

Andres said the answer was 467. Did Andres give the correct answer? Use money manipulatives to explain your answer.

- Ordinal Numbers
- Months of the Year

Power Up

facts

Power Up A

count aloud

Count by fours from 4 to 40.

mental math

Number Sense: Add a number ending in zero to another number in **a–e**.

$$\begin{array}{r} \text{a. } 24 \\ + 60 \\ \hline \end{array}$$

$$\begin{array}{r} \text{b. } 36 \\ + 10 \\ \hline \end{array}$$

$$\begin{array}{r} \text{c. } 50 \\ + 42 \\ \hline \end{array}$$

$$\begin{array}{r} \text{d. } 33 \\ + 30 \\ \hline \end{array}$$

$$\begin{array}{r} \text{e. } 40 \\ + 50 \\ \hline \end{array}$$

- f. Add 10 to 44 and then subtract 1. What is the final answer?
- g. Add 10 to 73 and then subtract 1. What is the final answer?

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Farica has a total of nine coins in her left and right pockets. She has some coins (at least two) in each pocket. She has more coins in her right pocket than in her left pocket. Make a table that shows the possible number of coins in each pocket.

New Concepts

Ordinal Numbers

If we want to count the number of children in a line, we say, “one, two, three, four, . . .” These numbers tell us how many children we have counted. To describe a child’s position in a line, we use words like *first*, *second*, *third*, and *fourth*. Numbers that tell position or order are called **ordinal numbers**.

Example 1

Math Language

Ordinal numbers tell which one.

Which one is Pedro? *He is the fourth person.*

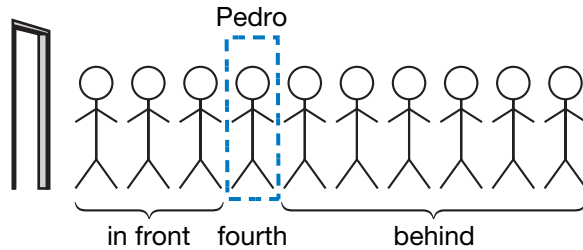
Cardinal numbers tell how many.

How many people are in front of Pedro? *There are 3 people in front of Pedro.*

There are ten children in the lunch line. Pedro is fourth in line.

- How many children are in front of Pedro?
- How many children are behind him?

A diagram may help us understand the problem. We draw and label a diagram using the information given to us.



- Since Pedro is fourth in line, we see that there are **three children** in front of him.
- The rest of the children are behind Pedro. From the diagram, we see that there are **six children** behind him.

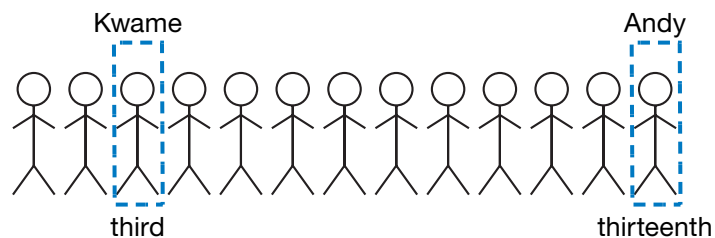
Ordinal numbers can be abbreviated. The abbreviation consists of a counting number and the letters *st*, *nd*, *rd*, or *th*. Here we show some abbreviations:

first 1st	sixth..... 6th	eleventh..... 11th
second..... 2nd	seventh... 7th	twelfth..... 12th
third 3rd	eighth 8th	thirteenth 13th
fourth 4th	ninth 9th	twentieth..... 20th
fifth 5th	tenth 10th	twenty-first .. 21st

Example 2

Andy is 13th in line. Kwame is 3rd in line. How many students are between Kwame and Andy?

We begin by drawing a diagram.



From the diagram we see that there are **nine students** between Kwame and Andy.

Months of the Year

We use ordinal numbers to describe the months of the year and the days of each month. The table below lists the twelve months of the year in order. A common year is 365 days long. A leap year is 366 days long. The extra day in a leap year is added to February every four years.

Math Language

Thirty days have September, April, June, and November. All the rest have 31, except February, which has 28.

Month	Order	Days
January	first	31
February	second	28 or 29
March	third	31
April	fourth	30
May	fifth	31
June	sixth	30
July	seventh	31
August	eighth	31
September	ninth	30
October	tenth	31
November	eleventh	30
December	twelfth	31

When writing dates, we can use numbers to represent the month, day, and year. For example, if Adolfo was born on the twenty-sixth day of February in 1998, then he could write his birth date this way:

2/26/98

The form for this date is “**month/day/year.**” The 2 stands for the second month, which is February, and the 26 stands for the twenty-sixth day of the month.

Example 3

J’Nae wrote her birth date as 7/8/99.

- In what month was J’Nae born?
- In what year was she born?
 - In the United States, we usually write the number of the month first. The first number J’Nae wrote was 7. She was born in the seventh month, which is **July**.
 - We often abbreviate years by using only the last two digits of the year. We assume that J’Nae was born in **1999**.

Example 4

Mr. Chitsey's driver's license expired on 4/29/06. Write that date using the name of the month and all four digits of the year.

The fourth month is April, and "06" represents the year 2006.

Mr. Chitsey's license expired on **April 29, 2006**.

Lesson Practice

- Jayne was third in line, and Zahina was eighth in line. How many people were between them? Draw a picture to show the people in the line.
- Write your birth date in month/day/year form.
- In month/day/year form, write the date that Independence Day will next be celebrated.

Written Practice*Distributed and Integrated*

- * 1. **Formulate** At the grocery store there were 5 people in the first line, 6 people in the second line, and 4 people in the third line. Altogether, how many people were in the three lines? Write a number sentence to find the answer.

Find each missing addend:

$$\begin{array}{r} 2. \quad 2 \\ \quad 6 \\ + x \\ \hline 15 \end{array}$$

$$\begin{array}{r} 3. \quad 1 \\ \quad y \\ + 7 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 4. \quad 3 \\ \quad z \\ + 5 \\ \hline 12 \end{array}$$

$$\begin{array}{r} 5. \quad 1 \\ \quad n \\ + 6 \\ \hline 13 \end{array}$$

$$\begin{array}{r} 6. \quad 2 \\ \quad 5 \\ + w \\ \hline 10 \end{array}$$

$$\begin{array}{r} 7. \quad 2 \\ \quad + a \\ \hline 7 \end{array}$$

$$\begin{array}{r} 8. \quad r \\ \quad + 5 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 9. \quad 3 \\ \quad + t \\ \hline 5 \end{array}$$

- * 10. Tadeo was born on 8/15/93. Write Tadeo's birth date using the name of the month and all four digits of the year.


Conclude Write the rule and the next three numbers of each counting sequence:

11. 12, 15, 18, _____, _____, _____, ...

12. 16, 20, 24, _____, _____, _____, ...
(3)

* 13. 28, 35, 42, _____, _____, _____, ...
(3)

* 14. Find the missing number: 30, _____, 42, 48
(3)

* 15.  **Explain** How did you find the missing number in problem 14?
(3)

* 16. **Represent** Draw a diagram to show \$432 in \$100 bills, \$10 bills, and \$1 bills.
(4)

* 17. **Represent** Write a number sentence for the picture below.
(1)



18. The digit 8 is in what place in 845?
(4)

* 19. **Represent** Use three digits to write the number that equals 2 hundreds plus 3 tens plus 5 ones.
(4)

* 20. **Predict** If the pattern is continued, what will be the next circled number?
(3)

1, 2, (3), 4, 5, (6), 7, 8, (9), 10, ...

21. Seven boys each have two pets. How many pets do the boys have?
(3) Count by twos.

$$\begin{array}{r} 22. \quad 5 \\ (1) \quad 8 \\ \quad 4 \\ \quad 7 \\ \quad 4 \\ \hline + 3 \end{array}$$

$$\begin{array}{r} 23. \quad 5 \\ (1) \quad 7 \\ \quad 3 \\ \quad 8 \\ \quad 4 \\ \hline + 2 \end{array}$$

$$\begin{array}{r} 24. \quad 9 \\ (1) \quad 7 \\ \quad 6 \\ \quad 5 \\ \quad 4 \\ \hline + 2 \end{array}$$

$$\begin{array}{r} 25. \quad 8 \\ (1) \quad 7 \\ \quad 3 \\ \quad 5 \\ \quad 4 \\ \hline + 9 \end{array}$$

* 26. **Multiple Choice** Jenny was third in line. Jessica was seventh in line. How many people were between Jenny and Jessica?
(5)

A 3

B 4

C 5

D 6

27. **Predict** What is the tenth number in this counting sequence?

(3)

2, 4, 6, 8, 10, ...

- *28. How many different arrangements of three letters can you write using the letters r, s, and t? The different arrangements you write do not need to form words.

(3)

- *29. **Connect** Write a number sentence that has addends of 5 and 4.

(1)

- *30. **Formulate** Write and solve an addition word problem using the numbers 1, 9, and 10.

(1)

Early Finishers

Real-World Connection

During the fourth month of every year, Stone Mountain Park near Atlanta, Georgia, hosts Feria Latina, one of the largest Hispanic cultural events in the state. What is the name of the month in which Feria Latina is held? If Amy and Carlos attend the festival next year on the 21st of the month, how would you write that date in month/date/year form?

• Review of Subtraction

Power Up

facts

Power Up A

count aloud

Count by threes from 3 to 30.

mental math

Number Sense: Nine is one less than ten. When adding 9 to a number, we may mentally add 10 and then think of the number that is one less than the sum. For $23 + 9$ we may think, “ $23 + 10$ is 33, and one less than 33 is 32.”

a.
$$\begin{array}{r} 33 \\ + 10 \\ \hline \end{array}$$

b.
$$\begin{array}{r} 33 \\ + 9 \\ \hline \end{array}$$

c.
$$\begin{array}{r} 46 \\ + 10 \\ \hline \end{array}$$

d.
$$\begin{array}{r} 46 \\ + 9 \\ \hline \end{array}$$

e.
$$\begin{array}{r} 65 \\ + 10 \\ \hline \end{array}$$

f.
$$\begin{array}{r} 65 \\ + 9 \\ \hline \end{array}$$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. At the arcade, Bao won 8 prize tickets and Sergio won 4 prize tickets. They decide to share the tickets equally. How many tickets should Bao give Sergio so that they have an equal number of prize tickets? How many tickets will each boy have? Explain how you arrived at your answer.

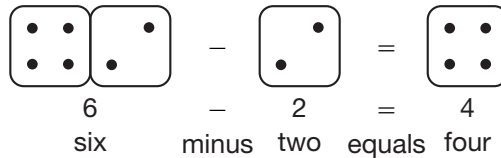
New Concept

Remember that when we add, we combine two groups into one group.

$$\begin{array}{c} \begin{array}{|c|} \hline \bullet \bullet \\ \bullet \bullet \\ \hline \end{array} \\ 4 \\ \text{four} \end{array} + \begin{array}{c} \begin{array}{|c|} \hline \bullet \\ \bullet \\ \hline \end{array} \\ 2 \\ \text{two} \end{array} = \begin{array}{c} \begin{array}{|c|c|} \hline \bullet \bullet & \bullet \\ \bullet \bullet & \bullet \\ \hline \end{array} \\ 6 \\ \text{six} \end{array}$$

plus equals

When we **subtract**, we separate one group into two groups. To take away two from six, we subtract.



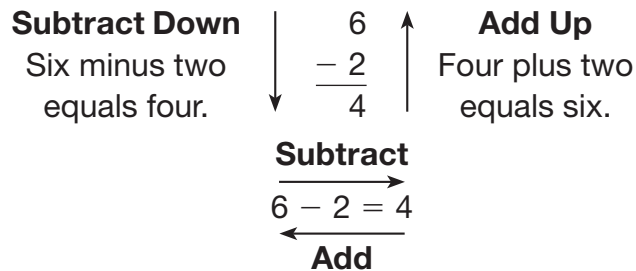
When we subtract one number from another number, the answer is called the **difference**. If we subtract two from six, the difference is four.

$$\begin{array}{r} 6 \\ - 2 \\ \hline 4 \end{array} \text{ difference}$$

Here we write “two subtracted from six” horizontally:

$$6 - 2 = 4$$

We can check a subtraction answer by adding the difference to the number subtracted. This is like doing the problem “in reverse.” The sum of the addition should equal the starting number.



Math Language

An **expression** is a number, a letter, or a combination of numbers and letters. Expressions usually contain one or more operation symbols.

$$3 \quad a \quad 4n \quad 6 + t$$

An **equation** is a number sentence that states that two expressions are equal. An equation always includes an equal sign.

$$3 + 5 = 8$$

< >
expressions

The order of numbers matters in subtraction. The expression $6 - 2$ means “take two from six.” This is not the same as $2 - 6$, which means “take six from two.”

Discuss Since addition and subtraction are opposite operations, we can use addition to check subtraction and use subtraction to check addition. When operations are opposite, one operation undoes the other. How could we use subtraction to check the addition $6 + 8 = 14$?

A **fact family** is a group of three numbers that can be arranged to form four facts. The three numbers 2, 4, and 6 form an addition and subtraction fact family.

$$\begin{array}{r} 2 \\ + 4 \\ \hline 6 \end{array} \quad \begin{array}{r} 4 \\ + 2 \\ \hline 6 \end{array} \quad \begin{array}{r} 6 \\ - 2 \\ \hline 4 \end{array} \quad \begin{array}{r} 6 \\ - 4 \\ \hline 2 \end{array}$$

Recognizing addition and subtraction fact families can help us learn the facts.

Example

The numbers 3, 5, and 8 form an addition and subtraction fact family. Write two addition facts and two subtraction facts using these three numbers.

$$\begin{array}{r} 3 \\ + 5 \\ \hline 8 \end{array} \quad \begin{array}{r} 5 \\ + 3 \\ \hline 8 \end{array} \quad \begin{array}{r} 8 \\ - 3 \\ \hline 5 \end{array} \quad \begin{array}{r} 8 \\ - 5 \\ \hline 3 \end{array}$$

Connect We can write a fact family using three numbers because addition and subtraction are related operations. How would you write a fact family for 9, 9, and 18?

Lesson Practice

Subtract. Then check your answers by adding.

a. $\begin{array}{r} 14 \\ - 8 \\ \hline \end{array}$ b. $\begin{array}{r} 9 \\ - 3 \\ \hline \end{array}$ c. $\begin{array}{r} 15 \\ - 7 \\ \hline \end{array}$ d. $\begin{array}{r} 11 \\ - 4 \\ \hline \end{array}$ e. $\begin{array}{r} 12 \\ - 5 \\ \hline \end{array}$

f. **Connect** The numbers 5, 6, and 11 form a fact family. Write two addition facts and two subtraction facts using these three numbers.

g. **Explain** How can you check a subtraction answer? Give an example.

Written Practice

Distributed and Integrated

*1. $\begin{array}{r} 14 \\ (6) - 5 \\ \hline \end{array}$

*2. $\begin{array}{r} 15 \\ (6) - 8 \\ \hline \end{array}$

3. $\begin{array}{r} 9 \\ (6) - 4 \\ \hline \end{array}$

4. $\begin{array}{r} 11 \\ (6) - 7 \\ \hline \end{array}$

5. $\begin{array}{r} 12 \\ (6) - 8 \\ \hline \end{array}$

6. $\begin{array}{r} 11 \\ (6) - 6 \\ \hline \end{array}$

7. $\begin{array}{r} 15 \\ (6) - 7 \\ \hline \end{array}$

8. $\begin{array}{r} 9 \\ (6) - 6 \\ \hline \end{array}$

9. $\begin{array}{r} 13 \\ (6) - 5 \\ \hline \end{array}$

10. $\begin{array}{r} 12 \\ (6) - 6 \\ \hline \end{array}$

11. $\begin{array}{r} 8 \\ (1) + n \\ \hline 17 \end{array}$

12. $\begin{array}{r} a \\ (1) + 8 \\ \hline 14 \end{array}$

13. $\begin{array}{l} 3 + w = 11 \\ (1) \end{array}$

14. $\begin{array}{l} 1 + 4 + m = 13 \\ (2) \end{array}$

*15. **Connect** The numbers 4, 6, and 10 form a fact family. Write two addition facts and two subtraction facts using these three numbers.

Generalize Write the rule and the next three numbers of each counting sequence:

* 16. 16, 18, 20, _____, _____, _____, ...
(3)

* 17. 21, 28, 35, _____, _____, _____, ...
(3)

* 18. 20, 24, 28, _____, _____, _____, ...
(3)

* 19. How many days are in the tenth month of the year?
(5)

20. **Represent** Draw a diagram to show \$326.
(4)

21. The digit 6 is in what place in 456?
(4)

Find each missing addend:

22. $2 + n + 4 = 13$
(2)

23. $a + 3 + 5 = 16$
(2)

* 24. What is the name for the answer when we subtract?
(6)

* 25. **List** Show six ways to add 3, 4, and 5.
(1)

* 26. **Multiple Choice** The ages of the children in Tyrese's family are 7 and 9. The ages of the children in Mary's family are 3, 5, and 9. Which number sentence shows how many children are in both families?

A $3 + 7 = 10$

B $7 + 9 = 16$


C $2 + 3 = 5$

D $3 + 5 + 9 = 17$

27. How many different three-digit numbers can you write using the digits 6, 3, and 9? Each digit may be used only once in every number you write. List the numbers in counting order.
(3)

* 28. Write a horizontal number sentence that has a sum of 23.
(1)

* 29. Write a horizontal number sentence that has a difference of 9.
(6)

* 30.  **Formulate** Write and solve an addition word problem using the numbers 6, 5, and 11.
(1)

• Writing Numbers Through 999

Power Up

facts

Power Up A

count aloud

Count by tens from 10 to 200.

mental mathAdd one less than ten to a number in **a–c**.

a. **Number Sense:** $28 + 9$

b. **Number Sense:** $44 + 9$

c. **Number Sense:** $87 + 9$

d. **Review:** $63 + 20$

e. **Review:** $46 + 50$

f. **Review:** $38 + 30$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. Steve has 5 pencils. Perry has 3 pencils. Chad has only 1 pencil. How can one boy give one other boy some pencils so that they each have the same number of pencils? Explain your answer.

New Concept

Whole numbers are the counting numbers and the number zero.

0, 1, 2, 3, 4, 5, ...

Reading Math

The names of two-digit numbers greater than twenty that do not end in zero are written with a hyphen.

Examples:
twenty-three
fifty-one
eighty-seven

To write the names of whole numbers through 999 (nine hundred ninety-nine), we need to know the following words and how to put them together:

0....zero	10....ten	20....twenty
1....one	11....eleven	30....thirty
2....two	12....twelve	40....forty
3....three	13....thirteen	50....fifty
4....four	14....fourteen	60....sixty
5....five	15....fifteen	70....seventy
6....six	16....sixteen	80....eighty
7....seven	17....seventeen	90....ninety
8....eight	18....eighteen	100....one hundred
9....nine	19....nineteen	

You may refer to this chart when you are asked to write the names of numbers in the problem sets.

Example 1

Use words to write the number 44.

We use a hyphen and write “**forty-four.**” Notice that “forty” is spelled without a “u.”

To write three-digit numbers, we first write the number of hundreds and then we write the rest of the number. **We do not use the word *and* when writing whole numbers.**

Example 2

Use words to write the number 313.

First we write the number of hundreds. Then we write the rest of the number to get **three hundred thirteen.** (We do not write “three hundred *and* thirteen.”)

Example 3

Use words to write the number 705.

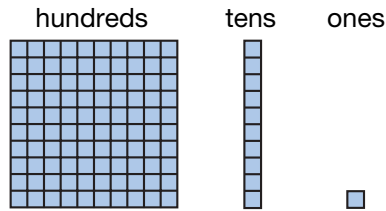
First we write the number of hundreds. Then we write the rest of the number to get **seven hundred five.**

Example 4

Use digits to write the number six hundred eight.

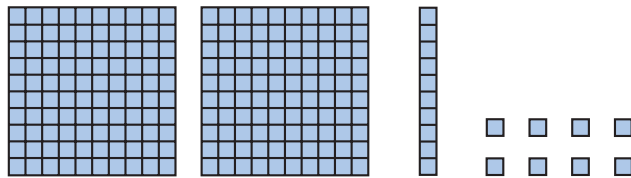
Six hundred eight means “six hundreds plus eight ones.” There are no tens, so we write a zero in the tens place and get **608.**

In Lesson 4 we used \$100 bills, \$10 bills, and \$1 bills to demonstrate place value. Here we show another model for place value. Small squares represent ones. The long, ten-square rectangles represent tens. The large, hundred-square blocks represent hundreds.



Example 5

Use words to write the number shown by this model:



Two hundreds, one ten, and eight ones is 218, which we write as **two hundred eighteen**.

Example 6

Which of these two numbers is greater: 546 or 564?

We compare whole numbers by considering the place value of the digits. Both numbers have the same digits, so the position of the digits determines which number is greater.



Both numbers have 5 hundreds. However, 564 has 6 tens while 546 has only 4 tens. This means **564 is greater**, and 546 is less no matter what digit is in the ones place.

Example 7

Arrange these numbers in order from least to greatest:

36 254 105 90

Arranging whole numbers vertically with last digits aligned also aligns other digits with the same place value.

36

254

105

90

Looking at the hundreds place, we see that 254 is the greatest number listed and 105 is the next greatest. By comparing the tens place of the two-digit numbers, we see that 36 is less than 90. We write the numbers in order:

36, 90, 105, 254

Lesson Practice

Represent Use words to write each number:

a. 0

b. 81

c. 99

d. 515

e. 444

f. 909

Represent Use digits to write each number:

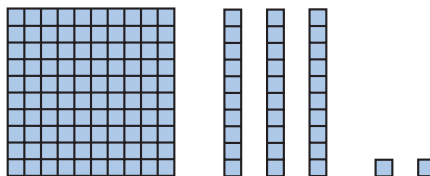
g. nineteen

h. ninety-one

i. five hundred twenty-four

j. eight hundred sixty

k. Use words to write the number shown by this model:



l. **Compare** Which of these two numbers is less: 381 or 359?

m. Write these numbers in order from least to greatest:

154 205 61 180

Written Practice

Distributed and Integrated

Formulate Write and solve equations for problems 1 and 2.

- *1. Anita has 8 dollars. She needs 6 dollars more to buy the radio. How much does the radio cost?

- *2. Peyton poured 8 ounces of water into a pitcher containing 8 ounces of lemon juice. How many ounces of liquid were in the mixture?

Find the missing addend:

3. $5 + n + 2 = 11$
(2)

4. $2 + 6 + n = 15$
(2)

Subtract. Check by adding.

*5. $\begin{array}{r} 13 \\ - 5 \\ \hline \end{array}$
(6)

6. $\begin{array}{r} 16 \\ - 8 \\ \hline \end{array}$
(6)

7. $\begin{array}{r} 13 \\ - 7 \\ \hline \end{array}$
(6)

8. $\begin{array}{r} 12 \\ - 8 \\ \hline \end{array}$
(6)

Represent Use digits to write each number:

- *9. two hundred fourteen
(7)

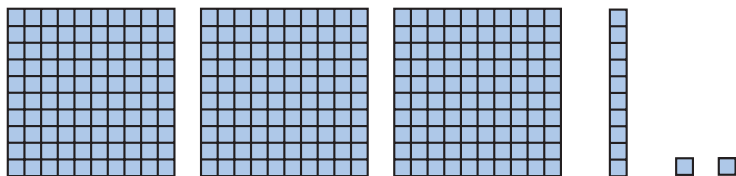
- *10. five hundred thirty-two
(7)

Represent Use words to write each number:

- *11. 301
(7)

- *12. 320
(7)

- *13. **Represent** Use words to write the number shown by this model:
(7)



14. **Represent** Write a number sentence for this picture:
(1)



Generalize Write the rule and the next three numbers of each counting sequence:

15. 12, 18, 24, _____, _____, _____, ...
(3)

- *16. 15, 18, 21, _____, _____, _____, ...
(3)

Connect Find the missing number in each counting sequence:

- *17. 35, 42, _____, 56, ...
(3)

- *18. 40, _____, 56, 64, ...
(3)

19. **Connect** How much money is shown by this picture?

(4)



*20. **Connect** The numbers 7, 8, and 15 form a fact family. Write two addition facts and two subtraction facts using these three numbers.

(6)

*21. **Explain** Brad was twelfth in line. His sister was sixth in line. How many people were between Brad and his sister? Explain how you can use the four-step problem-solving process to solve this problem.

(5)

22. Which month is five months after October?

(5)

23. Six nickels equals how many cents? Count by fives.

(3)

24. $4 + 7 + 8 + 5 + 4$

(1)

25. $2 + 3 + 5 + 8 + 5$

(1)

26. $5 + 8 + 6 + 4 + 3 + 7 + 2$

(1)

*27. **Multiple Choice** Which addition equation is related to $12 - 5 = 7$?

(6)

A $7 + 5 = 12$

B $12 + 5 = 17$

C $12 + 7 = 19$

D $12 - 7 = 5$

*28. How many different three-digit numbers can you write using the digits 4, 1, and 6? Each digit may be used only once in every number you write. List the numbers in order from least to greatest.

(3)

*29. Compare 126 and 162. Which number is less?

(7)

*30. The table shows the lengths of three rivers in North America.

(7)

List the rivers in order from longest to shortest.

The Lengths of Rivers
(in miles)

River	Length
Alabama	729
Green	730
Kuskokwim	724

• Adding Money

Power Up

facts

Power Up B

count aloud

Count by fives from 5 to 100.

mental math

Add one less than ten to a number in problems **a–c**.

a. **Number Sense:** $56 + 9$

b. **Number Sense:** $63 + 9$

c. **Number Sense:** $48 + 9$

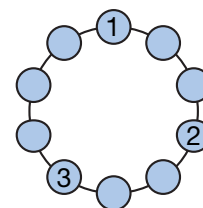
d. **Review:** $74 + 20$

e. **Review:** $60 + 30$

f. **Review:** $49 + 40$

problem solving

Copy this design of ten circles on a piece of paper. In each circle, write a number from 1 to 10 that continues the pattern of “1, skip, skip, 2, skip, skip, 3,”



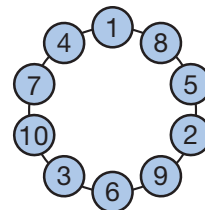
Focus Strategy: Extend a Pattern

Understand We are asked to copy the design of ten circles and to write a number in each circle. Three circles in the design are already filled with numbers. We are asked to continue the pattern of “1, skip, skip, 2, skip, skip, 3,”

Plan We will draw the design on our paper and *extend the pattern*.

Solve Copy the design of ten circles on your paper and write “1” in the top circle, as shown. Moving down and to the right (clockwise), skip two circles (skip, skip) and then write “2” in the next circle.

Then skip two more circles and write “3” in the next circle. Then skip two more circles and write “4.” Continue skipping two circles and then writing the next counting number. Your completed design should look like the picture at right.



Check We completed the task by extending the pattern of “1, skip, skip, 2, skip, skip, 3, ...” in the circle design until we filled all ten circles. We know our answer is reasonable because the pattern is still valid if we start at the end and work forward.

New Concept

Money manipulatives can be used to model or act out the addition of money amounts.

Sakura had \$24. Then she was given \$15 on her birthday. How much money does Sakura now have?

We can use  and  to add \$15 to \$24.

Sakura had \$24.



2



4

She was given \$15.

+



1



5

Now she has ...



3



9

The total is 3 tens and 9 ones, which is \$39.

We can also add \$24 and \$15 with pencil and paper. When we use pencil and paper, we first add the digits in the ones place. Then we add the digits in the tens place. (Remember to include the dollar sign in the answer.)

$$\begin{array}{r}
 \text{Add ones.} \quad \swarrow \searrow \\
 \text{Add tens.} \quad \swarrow \searrow \\
 \begin{array}{r}
 \$24 \\
 + \$15 \\
 \hline
 \$39
 \end{array}
 \end{array}$$

Thinking Skill

Verify

Explain why 3 tens + 9 ones equals 39.

Example

Sh'Tania had \$32. She earned \$7 babysitting. Then how much money did Sh'Tania have?

We add \$32 and \$7. To add with pencil and paper, we write the numbers so that the digits in the ones place are lined up.

$$\begin{array}{r} \$32 \\ + \$ 7 \\ \hline \$39 \end{array}$$

After babysitting Sh'Tania had \$39.

Activity

Adding Money Amounts

Materials needed:

- money manipulatives from Lesson 4 (from **Lesson Activities 1, 2, and 3**)

Use money manipulatives to act out these word problems:

1. Nelson paid \$36 to enter the amusement park and spent \$22 on food and souvenirs. Altogether, how much money did Nelson spend at the amusement park?
2. The plumber charged \$63 for parts and \$225 for labor. Altogether, how much did the plumber charge?

Lesson Practice

Add:

- | | | |
|------------------|------------------|------------------|
| a. $\$53 + \6 | b. $\$14 + \75 | c. $\$36 + \42 |
| d. $\$27 + \51 | e. $\$15 + \21 | f. $\$32 + \6 |

Written Practice

Distributed and Integrated

Represent In problems 1 and 2, use digits to write each number.

- *1. three hundred forty-three
(7)
- *2. three hundred seven
(7)
- *3. Use words to write the number 592.
(7)

Find each missing addend:

$$\begin{array}{r} 4. \quad 2 \\ (2) \quad 4 \\ + n \\ \hline 12 \end{array}$$

$$\begin{array}{r} 5. \quad 1 \\ (2) \quad r \\ + 6 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 6. \quad 1 \\ (2) \quad t \\ + 7 \\ \hline 14 \end{array}$$

$$\begin{array}{r} 7. \quad 2 \\ (2) \quad 6 \\ + n \\ \hline 13 \end{array}$$

$$\begin{array}{r} *8. \quad \$25 \\ (8) \quad + \$14 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad \$85 \\ (8) \quad + \$14 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad \$22 \\ (8) \quad + \$ 6 \\ \hline \end{array}$$

$$\begin{array}{r} *11. \quad \$40 \\ (8) \quad + \$38 \\ \hline \end{array}$$

$$\begin{array}{r} *12. \quad 13 \\ (6) \quad - 9 \\ \hline \end{array}$$

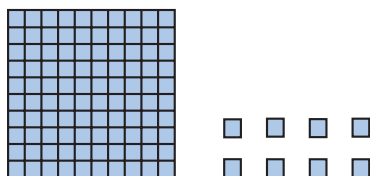
$$\begin{array}{r} 13. \quad 17 \\ (6) \quad - 5 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 17 \\ (6) \quad - 8 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 14 \\ (6) \quad - 6 \\ \hline \end{array}$$

- *16. **Formulate** D'Jeran has \$23. Beckie has \$42. Together, D'Jeran and Beckie have how much money? Write an equation to solve this problem.

- *17. **Represent** Use words to write the number shown by this model:



- *18. Salma was born on the fifth day of August in 1994. Write her birth date in month/day/year form.

Generalize Write the rule and the next three numbers of each counting sequence:

- *19. 12, 15, 18, _____, _____, _____, ...

- *20. 28, 35, 42, _____, _____, _____, ...

$$\begin{array}{r} 21. \quad 5 \\ (1) \quad 8 \\ \quad 7 \\ \quad 6 \\ \quad 4 \\ + 3 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 9 \\ (1) \quad 7 \\ \quad 6 \\ \quad 4 \\ \quad 8 \\ + 7 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 2 \\ (1) \quad 5 \\ \quad 7 \\ \quad 3 \\ \quad 5 \\ + 4 \\ \hline \end{array}$$

*24. **List** Show six ways to add 5, 6, and 7.
(1)

*25. **Connect** Write two addition facts and two subtraction facts using 7, 8, and 15.
(6)

*26. **Multiple Choice** If $7 + \diamond = 15$, then which of the following is *not* true?
(6)

A $\diamond - 7 = 15$

B $15 - 7 = \diamond$

C $15 - \diamond = 7$

D $\diamond + 7 = 15$

*27. How many different three-digit numbers can you write using the digits 7, 6, and 5? Each digit may be used only once in every number you write. List the numbers in order from least to greatest.
(3, 7)

28. Compare 630 and 603. Which is greater?
(7)

*29. The table shows the number of skyscrapers in three cities.
(7)

Write the names of the cities in order from the least number of skyscrapers to the greatest number of skyscrapers.

Skyscrapers

City	Number
Boston	16
Hong Kong	30
Singapore	14

*30. **Formulate** Write and solve an addition word problem that has a sum of 16.
(1)

Early Finishers

Real-World Connection

Mel works at the Cumberland Island National Seashore. He began the day with \$13 in the cash register. A family of four visiting the seashore gives Mel \$4 each for their entrance fees. What is the total amount Mel collects from the family? How much money is in the cash register now?

• Adding with Regrouping

Power Up

facts

Power Up B

count aloud

Count by threes from 3 to 30.

mental math

Number Sense: Nineteen is one less than 20. When adding 19 to a number, we may mentally add 20 and then think of the number that is one less than the sum.

$$\begin{array}{r} \text{a.} \quad 36 \\ + 20 \\ \hline \end{array}$$

$$\begin{array}{r} \text{b.} \quad 36 \\ + 19 \\ \hline \end{array}$$

$$\begin{array}{r} \text{c.} \quad 47 \\ + 20 \\ \hline \end{array}$$

$$\begin{array}{r} \text{d.} \quad 47 \\ + 19 \\ \hline \end{array}$$

$$\begin{array}{r} \text{e.} \quad 24 \\ + 20 \\ \hline \end{array}$$

$$\begin{array}{r} \text{f.} \quad 24 \\ + 19 \\ \hline \end{array}$$

problem solving

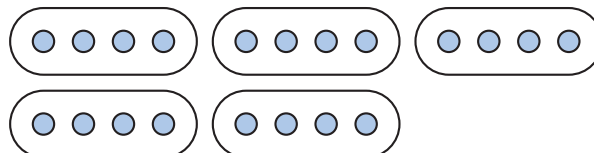
Twenty students are going on a field trip. Each car can hold 4 students. How many cars are needed for all the students?

Focus Strategy: Draw a Picture

Understand We are told that 20 students are going on a field trip. We are also told that each car can hold 4 students. We are asked to find the number of students each car can hold.

Plan We could act out this problem, but we can find the answer more quickly if we *draw a picture*. We could draw dots or other symbols to stand for the 20 students and then circle groups of 4 students.

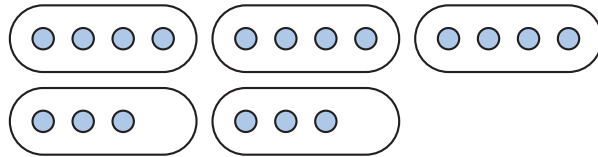
Solve We draw 20 dots on our paper to show 20 students. Then we circle groups of 4 dots. Each circle with 4 dots inside it stands for one car.



We drew 5 circles, which means that **5 cars** are needed for the field trip. Remember, each dot stands for one student, and each circle stands for one car.

Check We know our answer is reasonable because drawing a picture helped us to see how the students divide evenly into 5 equal groups of 4 students each.

We might wonder how many cars would be needed for a different number of students, such as 18. For 18 students, we can erase two dots in the picture, but we see that five cars (represented by the circles) are still needed to carry all 18 students.



New Concept

When we add, we sometimes have to regroup because we cannot have a number larger than 10 as the sum of any place value.

Example 1

Karyn had \$39. She earned \$14 more by raking leaves. How much money does Karyn have altogether?

Model We may use \$10 bills and \$1 bills to add \$14 to \$39.

Karyn had \$39.



3



9

She earned \$14.

+



1



4

Altogether she has ...



4



13

Since there are more than ten \$1 bills in the right-hand column, we exchange ten of the \$1 bills for one \$10 bill.



5



3

Now we have 5 tens and 3 ones, which equals **\$53**.

Thinking Skill

Verify

Why is 4 tens + 13 ones equal to 5 tens + 3 ones?

Thinking Skill

Discuss

How do we know when to regroup?

We use a similar method when we add numbers with pencil and paper. To add 14 to 39, we add the digits in the ones place and get 13.

$$\begin{array}{r} \text{Add ones.} \downarrow \\ 39 \\ + 14 \\ \hline \textcircled{13} \leftarrow 1 \text{ ten and 3 ones} \end{array}$$

Thirteen ones is the same as 1 ten and 3 ones. We write the 3 in the ones place and add the 1 ten to the other tens. We show this by writing a 1 either above the column of tens or below it. Then we add the tens.

$$\begin{array}{r} \text{Add ones.} \quad \text{Add ones.} \\ \text{Add tens.} \quad \text{Add tens.} \\ 1 \text{ above} \rightarrow 1 \quad \quad \quad 39 \\ \quad 39 \quad \quad \quad + 14 \\ + 14 \quad \quad \quad \text{1 below} \rightarrow 1 \\ \hline 53 \quad \quad \quad 53 \end{array}$$

Example 2

**One of the largest carrots ever grown weighed 18 pounds.
One of the largest zucchinis ever grown weighed 64 pounds.
Together, how many pounds did those two vegetables weigh?**

We combine the weights of the two vegetables by adding:

$$\begin{array}{r} 18 \\ + 64 \\ \hline 82 \end{array}$$

Together the vegetables weighed **82 pounds**.

Lesson Practice

Model Demonstrate each problem using money manipulatives. Then add using pencil and paper.

a. $\begin{array}{r} \$36 \\ + \$29 \\ \hline \end{array}$

b. $\begin{array}{r} \$47 \\ + \$8 \\ \hline \end{array}$

c. $\begin{array}{r} \$57 \\ + \$13 \\ \hline \end{array}$

Use pencil and paper to add:

d. $68 + 24$

e. $\$59 + \8

f. $46 + 25$

Represent In problems 1 and 2, use digits to write each number:

*1. six hundred thirteen
(7)

*2. nine hundred one
(7)

3. Use words to write 941.
(7)

Find each missing addend for problems 4–7.

$$\begin{array}{r} 4. \quad 2 \\ (2) \quad 4 \\ + f \\ \hline 11 \end{array}$$

$$\begin{array}{r} 5. \quad 5 \\ (2) \quad g \\ + 2 \\ \hline 13 \end{array}$$

$$\begin{array}{r} 6. \quad h \\ (2) \quad 4 \\ + 7 \\ \hline 15 \end{array}$$

$$\begin{array}{r} 7. \quad 2 \\ (2) \quad 7 \\ + n \\ \hline 16 \end{array}$$

$$\begin{array}{r} *8. \quad 33 \\ (9) \quad + 8 \\ \hline \end{array}$$

$$\begin{array}{r} *9. \quad \$47 \\ (9) \quad + \$18 \\ \hline \end{array}$$

$$\begin{array}{r} *10. \quad 27 \\ (9) \quad + 69 \\ \hline \end{array}$$

$$\begin{array}{r} *11. \quad \$49 \\ (9) \quad + \$25 \\ \hline \end{array}$$

$$\begin{array}{r} *12. \quad 17 \\ (6) \quad - 8 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 12 \\ (6) \quad - 6 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 9 \\ (6) \quad - 7 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 13 \\ (6) \quad - 6 \\ \hline \end{array}$$

16. What is the name for the answer when we add?
(1)

17. What is the name for the answer when we subtract?
(6)

*18. Which month is two months after the twelfth month?
(5)

Generalize Write the rule and the next three numbers of each counting sequence:

*19. 30, 36, 42, _____, _____, _____, ...
(3)

*20. 28, 35, 42, _____, _____, _____, ...
(3)

21. Which digit is in the hundreds place in 843?
(4)

$$22. \quad 28 + 6 \\ (9)$$

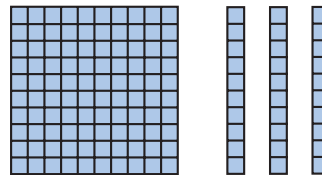
$$*23. \quad \$47 + \$28 \\ (9)$$

$$24. \quad 35 + 27 \\ (9)$$

- *25. **Formulate** (1, 9) Mio bought pants for \$28 and a shirt for \$17. Altogether, how much did the pants and shirt cost? Write an equation for this problem.

- *26. **Multiple Choice** (7) What number is shown by this model?

- A 31
B 13
C 103
D 130



- *27. (3) How many different arrangements of three letters can you write using the letters l, m, and n? Each letter may be used only once, and the different arrangements you write do not need to form words.


28. (7) Compare 89 and 98. Which is less?

- *29. (7) The table shows the maximum speed that some animals can run for a short distance.

Write the names of the animals in order from the fastest to the slowest.

Speeds of Animals

Animal	Speed (miles per hour)
White-tailed deer	30
Mule deer	35
Reindeer	32

- *30. (1)  **Formulate** Write and solve an addition word problem that has a sum of 7.

Early Finishers

Real-World Connection

Terri's basketball team has played four games this season. In the first game, the team scored 26 points. If the team scored 14 points in the first half, how many points did the team score in the second half?

In the first four games of the season, Terri's team scored 26, 34, 35, and 29 points. What is the total number of points the team has scored this season?

• Even and Odd Numbers

Power Up

multiples

Power Up K

A hundred number chart lists the whole numbers from 1 to 100. On your hundred number chart, shade the numbers we say when we count by 2s. What do we call these numbers? What are the last digits of these numbers?

count aloud

Count by fours from 4 to 40.

mental math

- Number Sense:** $28 + 9$
- Number Sense:** $36 + 19$
- Number Sense:** $43 + 9$
- Number Sense:** $25 + 19$
- Number Sense:** $56 + 9$
- Number Sense:** $45 + 19$

problem solving

Choose an appropriate problem-solving strategy to solve this problem. In his backyard garden, Randall planted three rows of carrots. He planted eight carrots in each row. Altogether, how many carrots did Randall plant? Explain how you arrived at your answer.

New Concept

The numbers we say when we start with 2 and then count up by twos are **even numbers**. Notice that every even number ends in either 2, 4, 6, 8, or 0.

2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, ...

The list of even numbers goes on and on. We do not begin with zero when we count by twos. However, the number 0 is an even number.

Example 1

Thinking Skill

Generalize

Think about any two even numbers. Will the sum of two even numbers always be an even number, or will the sum of two even numbers always be an odd number? Use examples to support your answer.

Which one of these numbers is an even number?

463 285 456

We can tell whether a number is even by looking at the last digit. **A number is an even number if the last digit is even.** The last digits of these numbers are 3, 5, and 6. Of these, the only even digit is 6, so the even number is **456**.

If a whole number is not an even number, then it is an **odd number**. We can make a list of odd numbers by beginning with the number 1. Then we add two to get the next odd number, add two more to get the next odd number, and so on. The sequence of odd numbers is

1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, ...

Example 2

Use the digits 2, 7, and 6 to write a three-digit odd number greater than 500. Use each digit only once.

Since 2 and 6 are even, the number must end in 7. To be greater than 500, the first digit must be 6. The answer is **627**.

Example 3

Model How many different three-digit numbers can you write using the digits 0, 1, and 2? Each digit may be used only once, and the digit 0 may not be used in the hundreds place. List the numbers from least to greatest, and label the numbers you write as even or odd.

We list the numbers and identify each number as even or odd.

Four numbers are possible:

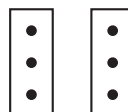
102 even

120 even

201 odd

210 even

An even number of objects can be separated into two equal groups. Six is an even number. Here we show six dots separated into two equal groups:

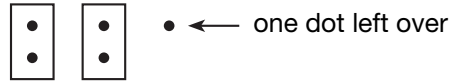


Thinking Skill

Generalize

Will the sum of any two odd numbers be an odd number or an even number? Explain how you know.

If we try to separate an odd number of objects into two equal groups, there will be one extra object. Five is an odd number. One dot is left over because five dots will not separate into two equal groups.



Example 4

The same number of boys and girls were in the classroom. Which of the following numbers could be the total number of students in the classroom?

25 26 27

An even number of students can be divided into two equal groups. Since there are an equal number of boys and girls, there must be an even number of students in the classroom. The only even number listed is **26**.

Lesson Practice

Classify Write “even” or “odd” for each number:

- a. 563
- b. 328
- c. 99
- d. 0
- e. Use the digits 3, 4, and 6 to write an even number greater than 500. Use each digit only once.
- f. **Explain** How can you tell whether a number is even?
- g. How many different three-digit numbers can you write using the digits 4, 0, and 5? Each digit may be used only once, and the digit 0 may not be used in the hundreds place. List the numbers in order and label each number as even or odd.

Written Practice

Distributed and Integrated

Represent In problems 1 and 2, use digits to write each number.

*1. five hundred forty-two
(7)

*2. six hundred nineteen
(7)

*3. The numbers 4, 7, and 11 form a fact family. Write two addition facts and two subtraction facts using those three numbers.
(6)

Represent In problems 4 and 5, use words to write each number.

*4. $\begin{array}{r} 903 \\ (7) \end{array}$

*5. $\begin{array}{r} 746 \\ (7) \end{array}$

*6. Which three-digit odd number greater than 600 has the digits 4, 6, and 7?
(10)

Find each missing addend in problems 7–10.

7. $\begin{array}{r} 4 \\ (2) \quad n \\ + 3 \\ \hline 14 \end{array}$

8. $\begin{array}{r} p \\ (2) \quad 4 \\ + 2 \\ \hline 13 \end{array}$

9. $\begin{array}{r} 5 \\ (2) \quad q \\ + 7 \\ \hline 14 \end{array}$

10. $\begin{array}{r} r \\ (2) \quad 3 \\ + 2 \\ \hline 11 \end{array}$

11. $\begin{array}{r} 15 \\ (6) \quad - 7 \\ \hline \end{array}$

12. $\begin{array}{r} 14 \\ (6) \quad - 7 \\ \hline \end{array}$

13. $\begin{array}{r} 17 \\ (6) \quad - 8 \\ \hline \end{array}$

14. $\begin{array}{r} 11 \\ (6) \quad - 6 \\ \hline \end{array}$

*15. $\begin{array}{r} \$25 \\ (9) \quad + \$38 \\ \hline \end{array}$

16. $\begin{array}{r} \$19 \\ (9) \quad + \$34 \\ \hline \end{array}$

*17. $\begin{array}{r} 42 \\ (9) \quad + 8 \\ \hline \end{array}$

18. $\begin{array}{r} 17 \\ (9) \quad + 49 \\ \hline \end{array}$

*19. **Generalize** Write the rule and the next three numbers of this counting sequence:
(3)

18, 21, 24, _____, _____, _____, ...

*20. **Predict** What is the eighth number in this counting sequence?
(3, 5)

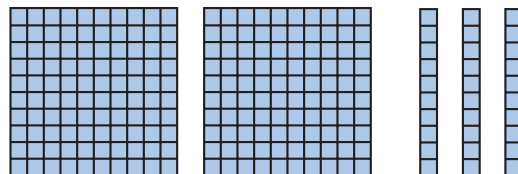
6, 12, 18, 24, ...


*21. **Formulate** If Jabari has \$6 in a piggy bank, \$12 in his wallet, and \$20 in his drawer, how much money does Jabari have in all three places? Write an equation for this problem.
(1, 8)

22. $2 + 3 + 5 + 7 + 8 + 4 + 5$
(1)

*23. Write today's date in month/day/year form.
(5)

*24. **Represent** Use words to write the number shown by this model:
(7)



- *25. What number is the largest two-digit even number?
(10)
- *26. **Multiple Choice** If $\triangle + 4 = 12$, then which of these is *not* true?
(6)
- A** $4 + \triangle = 12$ **B** $12 - \triangle = 4$
C $12 + 4 = \triangle$ **D** $12 - 4 = \triangle$
- *27. List in order from least to greatest all the three-digit numbers you can write using the digits 8, 3, and 0 in each number. The digit 0 may not be used in the hundreds place.
(10)
- *28. Write “odd” or “even” for each number:
(10)
- a.** 73 **b.** 54 **c.** 330 **d.** 209
- *29. **Connect** Write a horizontal subtraction number sentence.
(6)
- *30.  **Formulate** Write and solve an addition word problem. Then explain why your answer is reasonable.
(1)

Early Finishers
Real-World Connection

Janine noticed that the top lockers at school were odd numbers and the bottom locker numbers were even. Below is a list of the first five numbers on the bottom lockers:

300 302 304 306 308

- a.** Are these numbers even or odd? How do you know?
- b.** If this pattern continues, what will the next bottom locker number be?

Focus on

• Number Lines

When we “draw a line” with a pencil, we are actually drawing a **line segment**. A line segment is part of a line.

Line segment

A **line** continues in opposite directions without end. To illustrate a line, we draw an arrowhead at each end of a line segment. The arrowheads show that the line continues.

Line

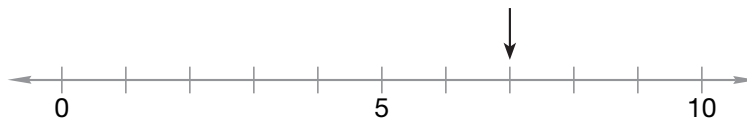
To make a **number line**, we begin by drawing a line. Next, we put **tick marks** on the line, keeping an equal distance between the marks.



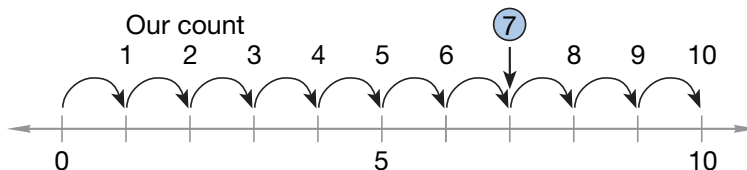
Then we label the marks with numbers. On some number lines every mark is labeled. On other number lines only some of the marks are labeled. The labels on a number line tell us how far the marks are from zero.

Example 1

To what number is the arrow pointing?



If we count by ones from zero, we see that our count matches the numbers labeled on the number line. We know that the distance from one tick mark to the next is 1.

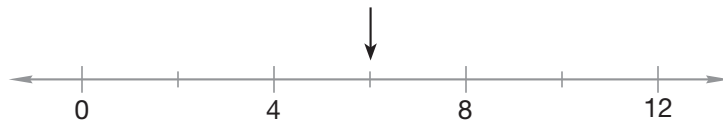


We find that the arrow points to the number 7.

On some number lines the distance from one tick mark to the next is not 1. We may need to count by twos, by fives, by tens, or by some other number to find the distance between tick marks.

Example 2

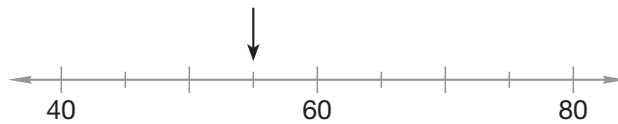
To what number is the arrow pointing?



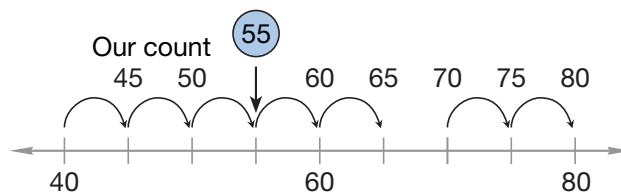
If we count by ones from tick mark to tick mark, our count does not match the numbers labeled on the number line. We try counting by twos and find that our count does match the number line. The distance from one tick mark to the next tick mark on this number line is 2. The arrow points to a mark that is one mark to the right of 4 and one mark to the left of 8. The number that is two more than 4 and two less than 8 is **6**.

Example 3

To what number is the arrow pointing?



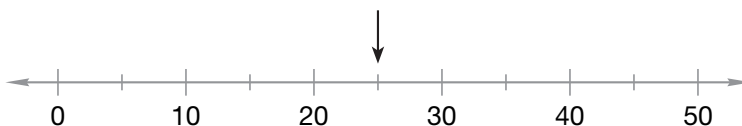
Zero is not shown on this number line, so we will start our count at 40. Counting by ones does not fit the pattern. Neither does counting by twos. Counting by fives does fit the pattern.



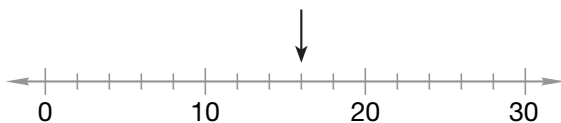
We find that the arrow points to the number **55**.

To what number is each arrow pointing in problems **1** and **2**?

1.



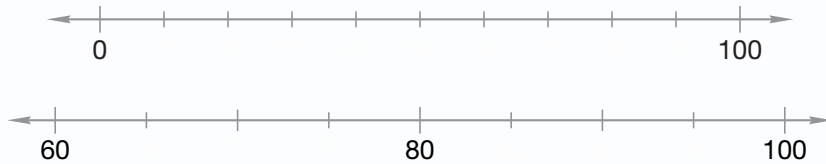
2.



Activity

Drawing Number Lines

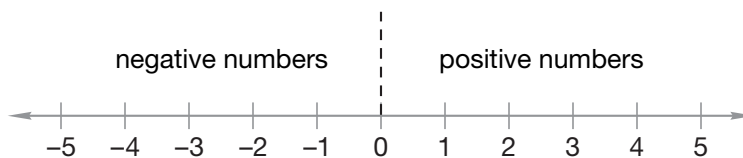
- a. Carefully copy the two number lines below onto your paper. Then write the number represented by each tick mark below the tick marks on your paper.



- b. Draw a number line from 0 to 10 labeling 0 and 10. Then draw tick marks for 2, 4, 6, and 8, but do not label the tick marks.

See below.

Numbers greater than zero are called **positive numbers**. A number line may also show numbers less than zero. Numbers less than zero are called **negative numbers**. Zero is neither positive nor negative. To write a negative number using digits, we place a negative sign (minus sign) to the left of the digit.



Example 4

- a. Use words to write -10 .
- b. Use digits to write negative twelve.
- a. negative ten
- b. -12

We use negative numbers to describe very cold temperatures. For example, on a cold winter day, the temperature in Lansing, Michigan, might be “five degrees below zero”, which would be written as -5 degrees.

Negative numbers are also used in other ways. One way is to show a debt. For example, if Tom has \$3 and needs to pay Richard \$5, he can pay Richard \$3, but Tom will still owe Richard \$2. We can write $-\$2$ to describe how much debt Tom has.

Example 5

At noon the temperature was 4 degrees. By nightfall the temperature had decreased 7 degrees. What was the temperature at nightfall?

We can use a number line to solve this problem. We start at 4 and count down 7.



The temperature at nightfall was **-3 degrees.**

Example 6

Write the next four numbers in each counting sequence:

a. ..., 10, 8, 6, 4, _____, _____, _____, _____, ...

b. ..., 9, 7, 5, 3, _____, _____, _____, _____, ...

Even and odd numbers may be negative or positive.

a. This is a sequence of even numbers. We count down by twos and write the next four even numbers. Notice that zero is even.

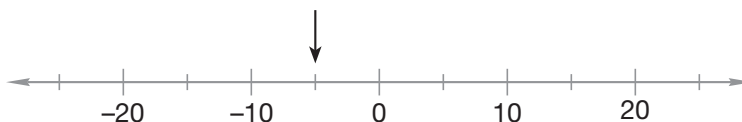
..., 10, 8, 6, 4, 2, 0, -2, -4, ...

b. This is a sequence of odd numbers. We count down by twos and write the next four odd numbers.

..., 9, 7, 5, 3, 1, -1, -3, -5, ...

Example 7

To what number is the arrow pointing?



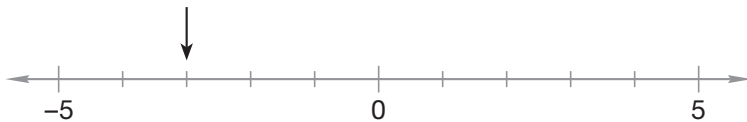
Counting by fives fits the pattern. The arrow points to a number that is five less than zero, which is **-5 .**

3. **Represent** At 3 p.m. the temperature was 2 degrees. At 5 p.m. the temperature was 6 degrees colder. What was the temperature at 5 p.m.?

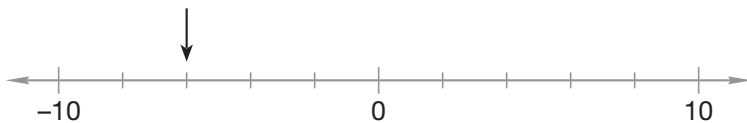
4. **Represent** Amy had \$2, but she needed to pay Molly \$5. Amy paid Molly \$2 and owes her the rest. What negative number describes how much debt Amy has?
5. Write the number that is fifteen less than zero
- using digits.
 - using words.
6. **Conclude** Write the next four numbers in this counting sequence:
 ..., 20, 15, 10, 5, _____, _____, _____, _____, ...

To what number is each arrow pointing in problems 7 and 8?

7.



8.



A number line can help us **compare** two numbers. When we compare two numbers, we decide whether one of the numbers is **greater than**, **equal to**, or **less than** the other number.

To show the comparison for two numbers that are not equal, we may use the greater than/less than symbols:

$$> \quad <$$

The **comparison symbol** points to the smaller number. We read from left to right. If the pointed end comes first, we say “is less than.”

$$3 < 4 \quad \text{“Three is less than four.”}$$


If the open end comes first, we say “is greater than.”

$$4 > 3 \quad \text{“Four is greater than three.”}$$

A number line is usually drawn so that the numbers become greater as we move to the right. When comparing two numbers, we might think about their positions on the number line. To compare 2 and -3 , for example, we see that 2 is to the right of -3 . This means that 2 is greater than -3 .



$$2 > -3$$

 **Generalize** As we move to the right on a number line, the numbers become greater in value. What related statement can we say about moving to the left on a number line?

Example 8**Compare:** $2 \bigcirc -2$

The numbers 2 and -2 are not equal. On a number line we see that 2 is greater than -2 .



We replace the circle with the proper comparison symbol:

$$2 > -2$$

Connect Is -2 greater than zero or less than zero? Explain why.

Example 9

- a. Use words to write the comparison $5 > -10$.
 - b. Use digits and a comparison sign to write “negative three is less than negative two.”
- a. Five is greater than negative ten.
 - b. $-3 < -2$

Compare:

9. $-3 \bigcirc 1$

10. $3 \bigcirc 2$

11. $2 + 3 \bigcirc 3 + 2$

12. $-4 \bigcirc -5$

13. **Represent** Use words to write the comparison $-1 < 0$.

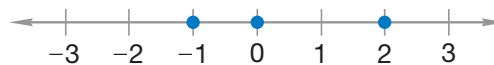
14. **Represent** Use digits and a comparison symbol to write “negative two is greater than negative three.”

Example 10

Arrange these numbers in order from least to greatest:

$$2, -1, 0$$

Numbers appear on a number line in order, so using a number line can help us write numbers in order.



We see the numbers arranged from least to greatest are $-1, 0, 2$.

Arrange the numbers from least to greatest:

15. $0, -2, -3$

16. $10, -1, 0$



One common attribute was used to group the following numbers:

245 27 -61 149

These numbers do not belong in the group:

44 -38 720 150

Explain why the numbers were sorted into these two groups.
Then write a negative number that belongs in the first group, and explain why your number belongs.