MATH 6

Third Edition

Teacher's Edition

bju press
Greenville, South Carolina

1 ADD & SUBTRACT

ONE MAN AGAINST THE FLAMES

Chicago, Illinois **October 9, 1871**

During the summer of 1871, only about 2½ inches of rain fell on the city of Chicago. Called by one historian a "bonfire waiting to be lit," the city was built almost entirely of wood. Miles of pine-block streets and wooden sidewalks were flanked by office buildings and storefronts. Most homes and barns were wooden, and many industrial buildings were filled with flammable materials such as lumber, coal, and paint. The drought had caused small fires throughout the city that summer. On October 8, exhausted firefighters had just finished fighting a blaze on Chicago's West Side. Many of the fire crew had been hospitalized for burns or smoke inhalation, and several fire engines were broken.

That evening while the firefighters slept, flames broke out in the O'Leary barn on Chicago's Southwest Side. The exact cause of the blaze is unknown. Some people claim it started when a cow kicked over a lantern; others say that the hired man dropped his pipe.

Chicago in Flames, lithograph by Currier & Ives

At any rate, the wind spread the fire quickly, consuming two entire blocks by the time firefighters arrived. Soon the flames were completely out of control. Leaping from house to house, the fire burned its way through the South Side of Chicago, jumped the river, and began to destroy the North Side.

Various efforts were made to stop the fire. One story is told about the successful attempt of a brave citizen on the North Side. When he saw the blaze coming, he immediately went to work removing all the dry leaves, picket fences, and board sidewalks that were near his house, as well as all the boards from his front porch steps. He covered his roof with wet blankets and rugs. As the blaze approached, he kept the roof soaked with water by running between his house and well with a bucket. When the well ran dry, he used cider from his cellar. At last the fire began to die down. His home was still safe.

When rain finally extinguished the fire two days later, Chicago was in ruins. It took several years to rebuild the city. Today throughout the United States, National Fire Prevention Week is observed each year during the week of October 9 to commemorate the Great Fire and to emphasize fire safety. People who practice fire prevention and plan for the possibility of a fire can be compared to the prudent man in Proverbs 27:12 who "foreseeth the evil, and hideth himself." What are some things you can do to help prevent fires and to keep yourself and others safe in the event of a fire?

Contributions poured into Chicago after the fire, giving the city $50 million to spend on rebuilding within a year.

The fire resulted in stricter fire codes and better construction of buildings.

The time immediately following the fire is called the Great Rebuilding of 1871–73.

The first paid fire department in the American colonies was founded in Boston in 1679.

The protective clothing that firemen wear and the equipment that they carry weigh an average of 50–75 pounds.

Some modern pump trucks can dispense more than 1,500 gallons of water per minute.

Add & Subtract

Lesson	Topic	Lesson Objectives
1	**Whole Number Place Value**	• Demonstrate an understanding of place value • Express numbers in standard form, word form, expanded form, and expanded form with multiplication • Identify the value of the digits in a number • Compare numbers using , , or = • Round numbers to the place of greatest value or to a given place
2	**Add Whole Numbers**	• Apply addition strategies for mental math • Add whole numbers • Estimate the sum by rounding or using front-end estimation • Solve addition word problems
3	**Subtract Whole Numbers**	• Apply the Zero Principle of Subtraction • Subtract whole numbers • Estimate the difference by rounding or using front-end estimation • Solve subtraction word problems • Check a subtraction problem, using addition
4	**Decimal Place Value**	• Demonstrate an understanding of decimal place value • Express decimals in standard form, word form, fraction form, expanded form, and expanded form with multiplication • Identify the value of the digits in a number • Compare and order decimals • Round decimals to the place of greatest value or to a given place
5	**Add & Subtract Decimals**	• Apply addition properties to decimals: Commutative Property, Identity Property, and Associative Property • Add and subtract decimals • Estimate sums and differences • Check a subtraction problem, using addition
6	**Solving Problems**	• Demonstrate an understanding of the inverse relationship between addition and subtraction • Use a part-whole model to solve addition and subtraction word problems • Write an equation for a word problem • Solve multi-step word problems
7	**Positive & Negative Numbers**	• Compare and order positive and negative numbers • Identify the number that is 1 more or 1 less • Plot positive and negative numbers on a number line • Add positive and negative numbers using a number line
8	**Roman Numerals**	• Read and write Roman numerals • Complete a sequence of Roman numerals
9	**Patterns**	• Use logic to identify number patterns • Use a pattern to solve a problem
10	**Chapter 1 Review**	• Review
11	**Chapter 1 Test Grade 5 Review**	• Add, subtract, multiply, and divide whole numbers • Solve equations with variables • Determine the perimeter and the area of polygons • Add decimals • Identify the mathematical expression for a word phrase • Identify the fraction represented by a picture or a number line • Measure to the nearest inch or half inch • Identify the standard form of a whole number or a decimal written in expanded form

Chapter Materials

Teaching Visuals (Teacher's Toolkit CD):
- Chart 1: Roman Numerals

Teacher Manipulatives Packet:
- Place Value Pocket Chart Kit
- Decimal Place Value Pocket Chart Kit
- Place Value Kit
- Money Kit
- Number Line
- Thermometer and Red Strip
- Roman Numeral Clock

Student Manipulatives Packet:
- Decimal Place Value Pocket Chart Kit
- Money Kit (optional)
- Number Line

Instructional Aids (Teacher's Toolkit CD):
- Decimal Number Lines (page IA1)
- Part-Whole Models (page IA2)
- Problem-Solving Plan (page IA3)
- Positive & Negative Number Line (page IA4)
- Roman Numerals (page IA5)
- Roman Numeral Sequences (page IA6) for each student
- Number Patterns (page IA7)
- Patterns (page IA8)
- Patterns (page IA8) for each student
- Cumulative Review Answer Sheet (page IA9) for each student

Christian Worldview Shaping (Teacher's Toolkit CD):
- Pages 1–3

Other Teaching Aids:
- An apple
- A small sharp knife
- A Bible
- An overhead calculator
- A calculator for each student (optional)

Math 6 Tests and Answer Key

Optional (Teacher's Toolkit CD):
- Fact Review pages
- Application pages
- Calculator Activities

As you prepare the lessons, you will want to refer to the corresponding Instructional Aids pages located on the Teacher's Toolkit CD. If a page is not specified for the student's or teacher's use in the Chapter Materials list above, you should prepare the page for display.

The Charts and some of the visuals from the Math 4–6 Teacher Manipulatives Packet are located in the Teaching Visuals section of the Teacher's Toolkit CD. Copies of the visuals may be prepared by home educators or by classroom teachers for individual or classroom (group) use.

A Little Extra Help

Use the following to provide "a little extra help" for the student that is experiencing difficulty with the concepts taught in Chapter 1.

Line up columns—To help the student keep the place value columns aligned, allow him to use graph paper or to turn his notebook paper sideways so that the lines form columns.

Round to the place of greatest value—Write 350 for display and ask the student to tell the number of tens that are in 350. *35 tens* Underline the 35 in 350. Ask the student to identify the hundreds that 350 comes between *300 and 400* and the number of tens that are in each hundred *30 tens and 40 tens*. Write the student's answers as shown below, underlining the 30 in 300 and the 40 in 400. Explain to the student that he needs to focus only on the first 2 digits of the number to round the number to the place of greatest value. Ask him to tell whether 35 tens rounds up to 40 tens or down to 30 tens and instruct him to explain why. *Up to 40 tens; elicit that since 35 tens is halfway between 30 tens and 40 tens, 35 tens rounds up to 40 tens.* Follow a similar procedure for 3,500 and 35,000.

400	*40 tens*	*4,000*	*40 hundreds*	*40,000*	*40 thousands*
350	*35 tens*	3,500	*35 hundreds*	35,000	*35 thousands*
300	*30 tens*	*3,000*	*30 hundreds*	*30,000*	*30 thousands*

Math Notebook

A math notebook with a divider for each section is recommended for the student to use throughout the school year. The student should have at least four sections in his notebook:

- Paper for recording examples and activities during the daily Math lessons
- Instructional Aids pages completed during the daily Math lessons
- A Journal section containing paper for completing problems indicated by the ✎ symbol on the Student Text pages
- Paper for completing Student Text pages

Math Facts

Throughout this chapter, review addition and subtraction facts using Fact Review pages or a Fact Fun activity on the Teacher's Toolkit CD, or you may use flashcards.

Daily Review

The exercises in the Daily Review section, pages 401–67, of the Student Text provide a systematic review of skills and concepts taught or practiced in fifth grade or in an earlier chapter of sixth grade. The Daily Review assignment listed at the beginning of the lesson does not need to be included as part of the scheduled math lesson and may be completed at any time independently. The answer key for the Daily Review exercises is in this Teacher's Edition and on the Teacher's Toolkit CD.

Solutions

Most answers for the Student Text lesson pages appear in the answer overprint on the reduced pages in each lesson of this Teacher's Edition. Answers that do not fit on the reduced pages are provided in the Solutions section of this Teacher's Edition as well as on the Teacher's Toolkit CD. The CD Solutions section also includes the long-division process, partial-products multiplication, and optional drawings used for solving problems on Student Text pages.

Lesson 1 **Student Text** pp. 2–5
Daily Review p. 402a

Objectives
- Demonstrate an understanding of place value
- Express numbers in standard form, word form, expanded form, and expanded form with multiplication
- Identify the value of the digits in a number
- Compare numbers using <, >, or =
- Round numbers to the place of greatest value or to a given place

Teacher Materials
- Place Value Pocket Chart Kit

Notes
The Application pages, located on the Teacher's Toolkit CD, provide individualized activities for the student. Preview the pages and select pages that are appropriate for use with Chapter 1. Also preview the Fact Review pages and the Calculator Activities located on the Teacher's Toolkit CD.

Visuals and manipulatives aid in the understanding of math concepts. In preparation for this course, you may choose to review math concepts taught throughout Math 6 by accessing virtual manipulatives online. An Internet search will provide you with a variety of choices for review using manipulatives.

Introduce the Lesson

Guide the students in reading aloud the story and facts on pages 2–3 of the Student Text (pages xxxii, 1 of this Teacher's Edition).

Teach for Understanding

Demonstrate an understanding of place value

1. Explain that our number system is a base ten system. Numbers are formed using 10 digits (0–9), and place values are based on powers of 10. Each place has a value that is 10 times greater than the place to its right and $\frac{1}{10}$ of the value of the place to its left.
2. Display the Place Value Pocket Chart. Point out that commas separate the periods on the chart.
   - ➤ What periods are shown on this place value chart? *Millions, Thousands, Ones*
   - ➤ What pattern of places is in each period? *Hundreds, Tens, Ones*
3. Insert a 7 in the Tens place of the chart.
   - ➤ What is the value of the 7? *70*

   Move the 7 to the Hundreds place.
   - ➤ What is the value of the 7 now? *700*
   - ➤ How much greater is the value of 7 when it is in the Hundreds place than when it is in the Tens place? *10 times greater*

   Move the 7 to the Ones place.
   - ➤ What is the value of the 7 now? *7*
   - ➤ What part of the value of 7 in the Tens place is the value of 7 when it is in the Ones place? How do you know? *$\frac{1}{10}$; 7 is $\frac{1}{10}$ of 70*
4. Repeat the procedure using three adjacent places on the chart. Emphasize that each place has a value 10 times greater than the place to its right and a value $\frac{1}{10}$ of the place to its left.
5. Write a 12-digit whole number for display.
   - ➤ What period is to the left of the Millions period? *Billions*

   Choose a student to read the number aloud. Remind the students that you say the period name at the end of each period, except for the Ones period, and that you do not use the word *and* between places or periods.
   - ➤ How can you change this number so that there is 1,000 more? *Change the digit in the One Thousands place to the next greater digit.*

   (*Note:* If the digit is 9, you will need to rename 10 One Thousands as 1 Ten Thousand and 0 One Thousands.)

   Choose a student to change the 12-digit number and to read aloud the new number.

   Select another student to add 100,000 to the original number and to read aloud the new number.
6. Follow a similar procedure to add 1 to or subtract 1 from various places in the original number.

Express numbers in different forms

1. Write 503,017,246 for display and choose a student to read the number aloud. Explain that the *standard form* is the most common form used to write a number, but numbers can also be written in other forms. The *word form* is written with words; the period name is written at the end of each period followed by a comma, except for the Ones period.
   - ➤ How could you write the number in the Millions period in word form? *five hundred three million* Thousands period? *seventeen thousand* Ones period? *two hundred forty-six* Write the word form as it is given.
2. Explain that writing a number in *expanded form* is a way to decompose or break down a number by showing the value of each digit. Elicit the expanded form for 503,017,246. *500,000,000 + 3,000,000 + 10,000 + 7,000 + 200 + 40 + 6*

   (*Note:* Zero may be written as a placeholder.)
3. Explain that 503,017,246 can also be written in *expanded form with multiplication.* The value of each place is multiplied by the corresponding digit.
   - ➤ What mathematical phrase can you write for the value of 5 in the Hundred Millions place? *(5 × 100,000,000)*

   Write the phrase for display and elicit the phrase for the value of each digit in the remaining places. *+ (3 × 1,000,000) + (1 × 10,000) + (7 × 1,000) + (2 × 100) + (4 × 10) + (6 × 1)*
4. Instruct the students to write these numbers on paper in all four forms.

   34,056,230,800 9,720,480,056 34,500,872

Compare numbers

- ➤ How can you compare whole numbers that have differing numbers of digits? *The number with more digits is greater.* with the same number of digits? *Elicit that you can begin with the place of greatest value and compare the digits in each place until the digits in a place have different values; the digit with the greater value indicates the greater number.*

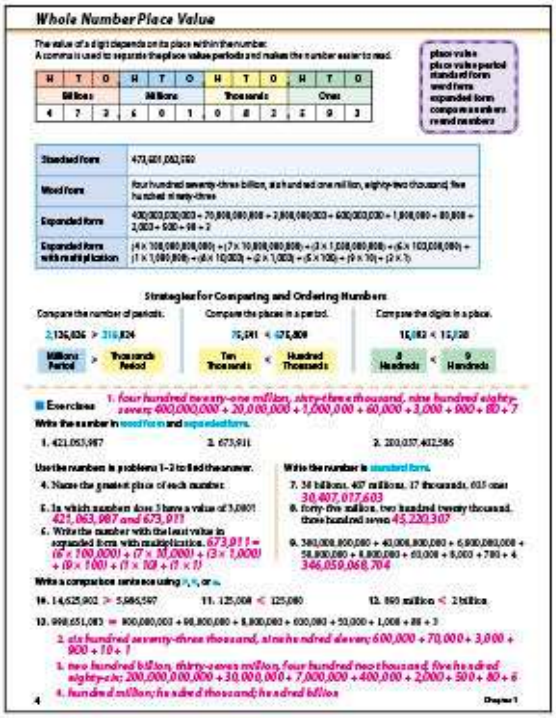
1. Guide the students in completing these number sentences; use strategies such as rewriting a number in standard form or comparing corresponding places when the number is written in word form or expanded form.

   84,769,320 ▢ 84,768,320

   103,278,600 ▢ 99,846,759

   20,040,570 ▢ 20,000,000 + 400,000 + 500 + 70

   twelve billion, fifty-three million, twenty-nine ▢ 12,053,029



Whole Number Place Value

The value of a digit depends on its place within the number.
A comma is used to separate the place value periods and makes the number easier to read.

H	T	O	H	T	O	H	T	O	H	T	O
Billions			Millions			Thousands			Ones		
4	7	3	6	0	1	0	8	2	2	9	3

place value
place value period
standard form
word form
expanded form
compare numbers
round numbers

Standard form	473,601,082,950
Word form	four hundred seventy-three billion, six hundred one million, eighty-two thousand, five hundred ninety-three
Expanded form	400,000,000,000 + 70,000,000,000 + 3,000,000,000 + 600,000,000 + 1,000,000 + 80,000 + 2,000 + 900 + 50 + 3
Expanded form with multiplication	(4 × 100,000,000,000) + (7 × 10,000,000,000) + (3 × 1,000,000,000) + (6 × 100,000,000) + (1 × 1,000,000) + (8 × 10,000) + (2 × 1,000) + (9 × 100) + (5 × 10) + (3 × 1)

Strategies for Comparing and Ordering Numbers

Compare the number of periods. 2,126,826 > 316,824 (Millions Period > Thousands Period)

Compare the places in a period. 75,591 < 675,809 (Ten Thousands < Hundred Thousands)

Compare the digits in a place. 8,182 < 9,128 (8 Hundreds < 9 Hundreds)

Exercises

1. four hundred twenty-one million, sixty-three thousand, nine hundred eighty-seven; 400,000,000 + 20,000,000 + 1,000,000 + 60,000 + 3,000 + 900 + 80 + 7

Write the number in word form and expanded form.

1. 421,063,987
2. 673,911
3. 203,037,402,586

Use the numbers in problems 1–3 to find the answer.

4. Name the greatest place of each number.
5. In which number does 3 have a value of 3,000? 421,063,987 and 673,911
6. Write the number with the least value in expanded form with multiplication. 673,911 = (6 × 100,000) + (7 × 10,000) + (3 × 1,000) + (9 × 100) + (1 × 10) + (1 × 1)

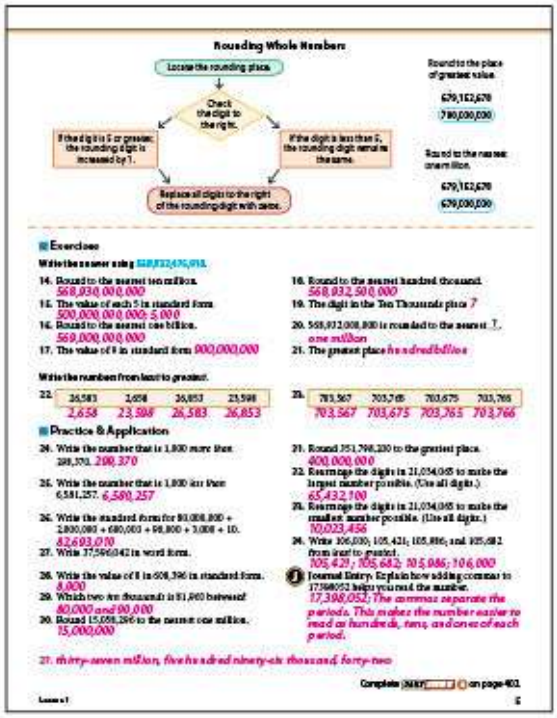
Write the number in standard form.

7. 30 billion, 407 millions, 17 thousands, 603 ones 30,407,017,603
8. forty-five million, two hundred twenty thousand, three hundred seven 45,220,307
9. 340,000,000,000 + 40,000,000,000 + 6,000,000,000 + 50,000,000 + 8,000,000 + 60,000 + 9,000 + 700 + 4 346,059,068,704

Write a comparison sentence using >, <, or =.

10. 14,625,902 > 5,686,597
11. 125,000 < 125,080
12. 990 million < 2 billion
13. 998,651,083 = 900,000,000 + 90,000,000 + 8,000,000 + 600,000 + 50,000 + 1,000 + 80 + 3
14. six hundred seventy-three thousand, nine hundred eleven; 600,000 + 70,000 + 3,000 + 900 + 10 + 1
15. two hundred billion, thirty-seven million, four hundred two thousand, five hundred eighty-six; 200,000,000,000 + 30,000,000 + 7,000,000 + 400,000 + 2,000 + 500 + 80 + 6
16. hundred million; hundred thousand; hundred billion

4 Chapter 1



Rounding Whole Numbers

Locate the rounding place.

Check the digit to the right.

If the digit is 5 or greater, the rounding digit is increased by 1.

If the digit is less than 5, the rounding digit remains the same.

Replace all digits to the right of the rounding digit with zeros.

Round to the place of greatest value.
679,152,670
780,000,000

Round to the nearest one million.
679,152,670
679,000,000

Exercises

Write the answer using 568,832,476,913.

14. Round to the nearest ten million. 568,830,000,000
15. The value of each 5 in standard form 500,000,000,000; 5,000
16. Round to the nearest one billion. 569,000,000,000
17. The value of 9 in standard form 900,000,000
18. Round to the nearest hundred thousand. 568,832,500,000
19. The digit in the Ten Thousands place 7
20. 568,832,000,000 is rounded to the nearest 1. one million
21. The greatest place five hundred billion

Write the numbers from least to greatest.

22. 26,583; 2,658; 26,853; 23,598 — 2,658; 23,598; 26,583; 26,853
23. 703,567; 703,765; 703,675; 703,766 — 703,567; 703,675; 703,765; 703,766

Practice & Application

24. Write the number that is 1,000 more than 289,370. 290,370
25. Write the number that is 1,000 less than 6,581,257. 6,580,257
26. Write the standard form for 80,000,000 + 2,000,000 + 600,000 + 90,000 + 3,000 + 10. 82,693,010
27. Write 37,596,042 in word form.
28. Write the value of 8 in 608,396 in standard form. 8,000
29. Which two are thousands in 81,000 between? 80,000 and 90,000
30. Round 15,098,396 to the nearest one million. 15,000,000
31. Round 351,398,230 to the greatest place. 400,000,000
32. Rearrange the digits in 21,034,065 to make the largest number possible. (Use all digits.) 65,432,100
33. Rearrange the digits in 21,034,065 to make the smallest number possible. (Use all digits.) 10,023,456
34. Write 106,030; 105,421; 105,896; and 105,682 from least to greatest. 105,421; 105,682; 105,896; 106,000
35. Journal Entry. Explain how adding commas to 37,598,052 helps you read the number. 37,598,052; The commas separate the periods. This makes the number easier to read as hundreds, tens, and ones of each period.
37. thirty-seven million, five hundred ninety-six thousand, forty-two

Complete ... on page 403.

Lesson 1 5

2. Write *a* __ *b* for display. Explain that the variables *a* and *b* represent 2 values to be compared. Assign the following values to *a* and *b* and guide the students in comparing them. Select students to explain the answers.

   a is a 7-digit whole number; *b* is a 9-digit whole number
   a . b; *one millions are less than hundred millions*

   a = 367,000,000; *b* = 365,000,000 a . b

   a = 2,000,000 + 6,000; *b* = 2,000,000 + 60,000 a . b

Round numbers

1. Write 354,829 for display. Explain that you want to round 354,829 to the place of greatest value. Choose a student to underline the digit in the place of greatest value. *3*

➤ **Which hundred thousands is 354,829 between?** *300,000 and 400,000* Write the two rounding possibilities above and below 354,829.

2. Draw a number line with a mark close to each end and at the halfway point. Label the left mark 300,000 and the right mark 400,000.

➤ **What number is halfway between 300,000 and 400,000? Why?** *350,000; 50,000 is half of 100,000, so 350,000 is halfway between 300,000 and 400,000.*

Label the halfway point 350,000. Choose a student to draw and label a point at the approximate location of 354,829.

➤ **Which hundred thousand does 354,829 round to? Why?** *400,000; 354,829 . 350,000*

3. Follow a similar procedure to round these numbers to the given place.

   354,829 rounded to the nearest ten thousand *between 350,000 and 360,000; rounds to 350,000*

   1,465,309 rounded to the nearest one thousand *between 1,465,000 and 1,466,000; rounds to 1,465,000*

   378,720,526,482 rounded to the nearest ten billion *between 370,000,000,000 and 380,000,000,000; rounds to 380,000,000,000*

➤ **How does the value of the digit to the right of the rounding place help you to round a number?** *Elicit that if the digit to the right of the rounding place is 5 or more, you round up, increasing the rounding place by 1; if the digit is less than 5, you round down, leaving the rounding place unchanged. Replace digits to the right of the rounding place with zeros.*

Student Text pp. 4–5

Throughout Math 6, use the information given on the Student Text pages to review the concepts taught in the lesson and allow the students to complete a few practice problems with you, if needed, before they complete the remaining problems independently.

For your convenience, a printable version of the Daily Reviews are included on the Teacher's Toolkit CD. We have included room on these pages for students to show their work, so the order and numbering may differ from the Student Text. An answer key for these pages is also available on the CD.

Lesson 2 **Student Text** pp. 6–7
Daily Review p. 402b

Objectives
- Apply addition strategies for mental math
- Add whole numbers
- Estimate the sum by rounding or using front-end estimation
- Solve addition word problems

Teacher Materials
- Place Value Kit

Teach for Understanding

Apply addition strategies for mental math

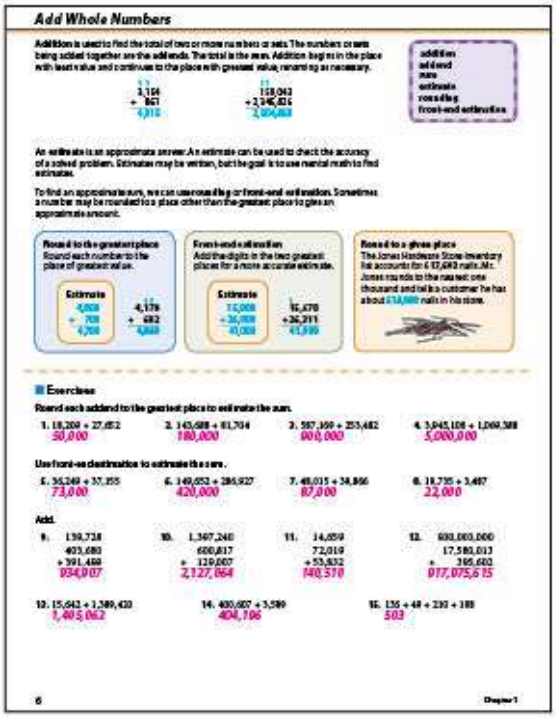
1. Write 3 + 7 = 10 and 7 + 3 = 10 for display.
➤ **What other addition facts do you know that equal 10?** *0 + 10; 10 + 0; 1 + 9; 9 + 1; 2 + 8; 8 + 2; 4 + 6; 6 + 4; 5 + 5*
2. Write 23 + 7 = ___ and 3 + 47 = ___ for display.
Choose students to complete the equations, using mental math, and to explain how they calculated the answers. *30; 50*
Remind the students that using addition facts to make tens can help them to easily add mentally.
3. Write 23 + 84 = ___ and 56 + 57 = ___ for display.
➤ **How does knowing the "ten" facts help you to solve problems like these mentally?** *Accept any reasonable answers, but elicit that you can easily add the tens to make 10 tens or 100 and then add the sum of the ones to 100.*
Select students to complete the equations and explain how they calculated the answers mentally. *Think 2 tens + 8 tens = 100, 100 + (3 + 4) = 107; think 5 tens + 5 tens = 100, 100 + (6 + 7) = 113.*
4. Explain that when adding mentally it is often easier to add from left to right, adding the value of each place and making adjustments for any renaming as you add. Guide the students in solving these problems from left to right, mentally adding each place and making adjustments for any renaming.
4,276 + 372 = ___ *Think 4,000 + (200 + 300) = 4,500; 4,500 + (70 + 70) = 4,640; 4,640 + (6 + 2) = 4,648.*
790,234 + 4,823 + 587 = ___ *Think 790,000 + 4,000 = 794,000; 794,000 + (200 + 800 + 500) = 795,500; 795,500 + (30 + 20 + 80) = 795,630; 795,630 + (4 + 3 + 7) = 795,644.*
5. Point out that *compensation*, subtracting an amount from one addend and adding the same amount to another addend to make the other addend a ten, can help in adding more quickly. Guide the students in mentally solving these problems using compensation.
45 + 13,005 = ___ *Think (45 − 5) + (13,005 + 5) = 50 + 13,000 = 13,050.*
634 + 76 = ___ *Think (634 + 4) + (76 − 4) = 630 + 80 = 710 or (634 + 6) + (76 − 6) = 640 + 70 = 710.*
6. Direct the students to choose any strategy to solve these equations using mental math. Point out that there is not a right or wrong strategy.
9,034 + 72 = ___ *9,106*
851 + 249 = ___ *1,100*
376,000 + 19 + 4,001 = ___ *380,020*

Estimate sums; add 4-digit numbers

During a 2-day karate tournament, 1,465 tickets were sold on the first day and 2,780 tickets were sold on the second day. How many tickets were sold for the tournament? *4,245 tickets*

➤ **What equation can you write to solve this word problem?** *1,465 + 2,780 = ___*
1. Write 1,465 + 2,780 = *t* for display. Remind the students that the variable *t* represents the unknown number of tickets that were sold. Point out that any letter can be used as a variable. (*Note:* Whenever a variable has been used in a lesson, encourage the students to use a variable when giving an equation to solve other word problems.)
➤ **Why would it be helpful to estimate the sum?** *Elicit to find an approximate answer or to determine whether your exact answer is reasonable.*
➤ **How would you estimate the number of tickets sold for the tournament?** *Round the addends to the place of greatest value, the nearest one thousand.*
➤ **Approximately how many tickets were sold? How do you know?** *4,000; elicit that 1,465 rounds down to 1,000 and 2,780 rounds up to 3,000, resulting in an estimated sum of 4,000.*
Explain that when both addends are rounded up your estimate will be greater than your exact answer, and when both addends are rounded down your estimate will be less than your exact answer. For this estimate, the first addend was rounded down by 400–500, and the second addend was rounded up by 200–300. Since you rounded the first addend down approximately 200 more than you rounded the second addend up, your exact answer should be approximately 200 more than your estimated answer. Elicit the adjusted estimate. *4,200*
2. Explain that an adjusted, or closer, estimate can also be found by rounding to a lesser place. Guide the students in estimating the number of tickets sold by rounding to the nearest hundred. *4,300*
➤ **Will the actual answer be greater or less than this estimate? Why?** *Less; we rounded up both addends.*
3. Write 1,465 + 2,780 = ___ in vertical form. Display the addends using ones, tens, hundreds, and one thousands from the Place Value Kit.
Choose a student to combine the ones. Discuss whether renaming is needed.
4. Follow a similar procedure to add the remaining places. Emphasize the renaming of the tens and hundreds.
➤ **How many tickets were sold for the tournament?** *4,245 tickets* **Is this answer reasonable?** *yes* Complete the equation.
5. Write these problems for display. Direct the students to estimate the sums before solving the problems on paper.

		723
1,208	3,047	1,649
+ 964	+ 1,275	+ 2,378
2,172	*4,322*	*4,750*
(2,000)	*(4,000)*	*(4,700)*



Add Whole Numbers

Addition is used to find the total of two or more numbers or sets. The numbers or sets being added together are the addends. The total is the sum. Addition begins in the place with least value and continues to the place with greatest value, renaming as necessary.

addition
addend
sum
estimate
rounding
front-end estimation

An estimate is an approximate answer. An estimate can be used to check the accuracy of a solved problem. Estimates may be written, but the goal is to use mental math to find estimates.

To find an approximate sum, we can use rounding or front-end estimation. Sometimes a number may be rounded to a place other than the greatest place to give an approximate amount.

Round to the greatest place
Round each number to the place of greatest value.

Front-end estimation
Add the digits in the two greatest places for a more accurate estimate.

Round to a given place
The Jones Hardware Store inventory has accounts for 617,683 nails. Mr. Jones rounds to the nearest one thousand and tells a customer he has about 618,000 nails in his store.

Exercises

Round each addend to the greatest place to estimate the sum.

1. 18,209 + 27,652 — 50,000
2. 143,688 + 81,704 — 180,000
3. 597,199 + 253,482 — 900,000
4. 3,945,108 + 1,069,388 — 5,000,000

Use front-end estimation to estimate the sum.

5. 36,249 + 37,355 — 73,000
6. 149,052 + 286,927 — 420,000
7. 48,015 + 34,866 — 87,000
8. 19,735 + 3,487 — 22,000

Add.

9. 139,728 + 403,680 + 391,469 = 934,877
10. 1,367,248 + 600,817 + 129,007 = 2,127,864
11. 14,659 + 72,019 + 53,832 = 140,510
12. 600,000,000 + 17,580,013 + 395,602 = 977,975,615

13. 15,642 + 1,389,420 = 1,405,062
14. 400,607 + 3,589 = 404,196
15. 135 + 48 + 230 + 189 = 503

6 Chapter 1

Use the map to find the answer.

16. Mr. Johnson flew from his hometown of Los Angeles on a business trip. He flew to Chicago and then from Chicago to New York City. What was the total distance of his flight? 2,054 + 802 = 2,856 mi
17. Mr. Brown was meeting Mr. Johnson in New York City. How far did Mr. Brown fly if he flew from Seattle to Chicago and then from Chicago to New York City? 2,013 + 802 = 2,815 mi
18. Estimate the number of miles flown by Mr. Johnson and Mr. Brown. 3,000 + 3,000 = 6,000 mi
19. Find the number of miles Mr. Johnson flew while making a round trip (flying to the meeting and then flying home). 2,856 + 2,856 = 5,712 mi

Practice & Application

20. Add commas to 20043170. 20,043,170
21. Write the name of the greatest place in the number for problem 20. Ten Millions place
22. Write 10,366,670,502 in expanded form.
23. Write six hundred forty-nine thousand, five hundred seventeen in standard form. 649,517
24. Write the value of 8 in 18,325,644 in word form. eight million
25. Write two facts with a sum of 12 using different addends for each fact. Answers may vary. 5 + 7 = 12; 8 + 4 = 12
26. Find the sum of 94, 87, 57, and 39. 257
27. Find the sum of 903,871 and 89,532. 993,403
28. Write the number that is 1,000 more than 329,990. 330,990
29. Write a number sentence using the greater than symbol to compare the numbers 280,998 and 329,992. 300,000 > 300,000
30. Write 2,291,620; 2,291,206; 2,921,260; and 2,291,026 from greatest to least. 2,921,260; 2,291,620; 2,291,206; 2,291,026
31. Round 1,364,250 to the nearest hundred thousand. 1,400,000
32. Round 7,521,024,308 to the greatest place. 8,000,000,000
33. Write the next eight numbers for the count by 6 pattern: 6, 12, 18, 24. 30, 36, 42, 48, 54, 60, 66, 72
34. Journal Entry. Estimate the sum of 158,341 and 211,977 by rounding to the greatest place. 200,000 + 200,000 = 400,000
35. Journal Entry. Estimate the sum of 158,341 and 211,977 by front-end estimation. 150,000 + 210,000 = 360,000
36. Journal Entry. Explain why using front-end estimation for the addends 158,341 and 211,977 gives a more accurate estimate than rounding to the greatest place. Find the sum. Rounding to the place of greatest value gives an overestimate of about 30,000. Front-end estimation gives an underestimate of about 10,000. 158,341 + 211,977 = 370,318

37. 10,000,000,000 + 8,000,000,000 + 300,000,000 + 90,000,000 + 6,000,000 + 400,000 + 70,000 + 500 + 2

Complete on page 403.

Lesson 2 7

6. Explain that another way to estimate is called *front-end estimation*. As the name implies, you add the values in the greatest place. Closer estimates can be made by adding the values in the first two greatest places.

		321
3,874	4,075	2,167
+ 529	+ 3,786	+ 4,950
4,403	7,861	7,438
(3,000; 4,300)	(7,000; 7,700)	(6,000; 7,300)

Add large numbers

For a circus at the city arena, 9,345 tickets were sold for the Friday performance and 23,560 tickets were sold for the two performances on Saturday. What was the total number of tickets sold for Friday and Saturday? *32,905 tickets*

➤ **What equation can you write to solve this word problem?** *9,345 + 23,560 = t or 23,560 + 9,345 = t*

1. Write both equations for display.

➤ **Rounding to the place of greatest value, approximately how many tickets were sold? How do you know?** *29,000; 9,000 + 20,000 = 29,000*

➤ **Rounding to the nearest one thousand, approximately how many tickets were sold? How do you know?** *33,000; 9,000 + 24,000 = 33,000*

2. Write the problem vertically. Review renaming as you demonstrate solving the problem. *32,905 tickets*

➤ **Why can you use an estimate to check an answer?** *The estimate helps you to determine whether the answer is reasonable or makes sense.*

➤ **Is 32,905 tickets a reasonable answer? Why?** *Elicit that the sum is reasonable because it is within a few thousand of the estimate and even closer to the adjusted estimate.*

3. Remind the students that addition and subtraction are *inverse operations*. Elicit that addition is the mathematical process of combining parts to make a total, or whole, and subtraction is the mathematical process of separating the total into parts.

➤ **What 2 subtraction equations can you write using the same 3 numbers in the addition problem?** *32,905 − 9,345 = 23,560 and 32,905 − 23,560 = 9,345*

4. Write these problems for display. Direct the students to solve the problems on paper.

		45,703
3,271,208	203,531,047	731,649
+ 704,685	+ 16,275,873	+ 12,478
3,975,893	219,806,920	789,830

Student Text pp. 6–7

(*Note: Assessment* available on Teacher's Toolkit CD.)