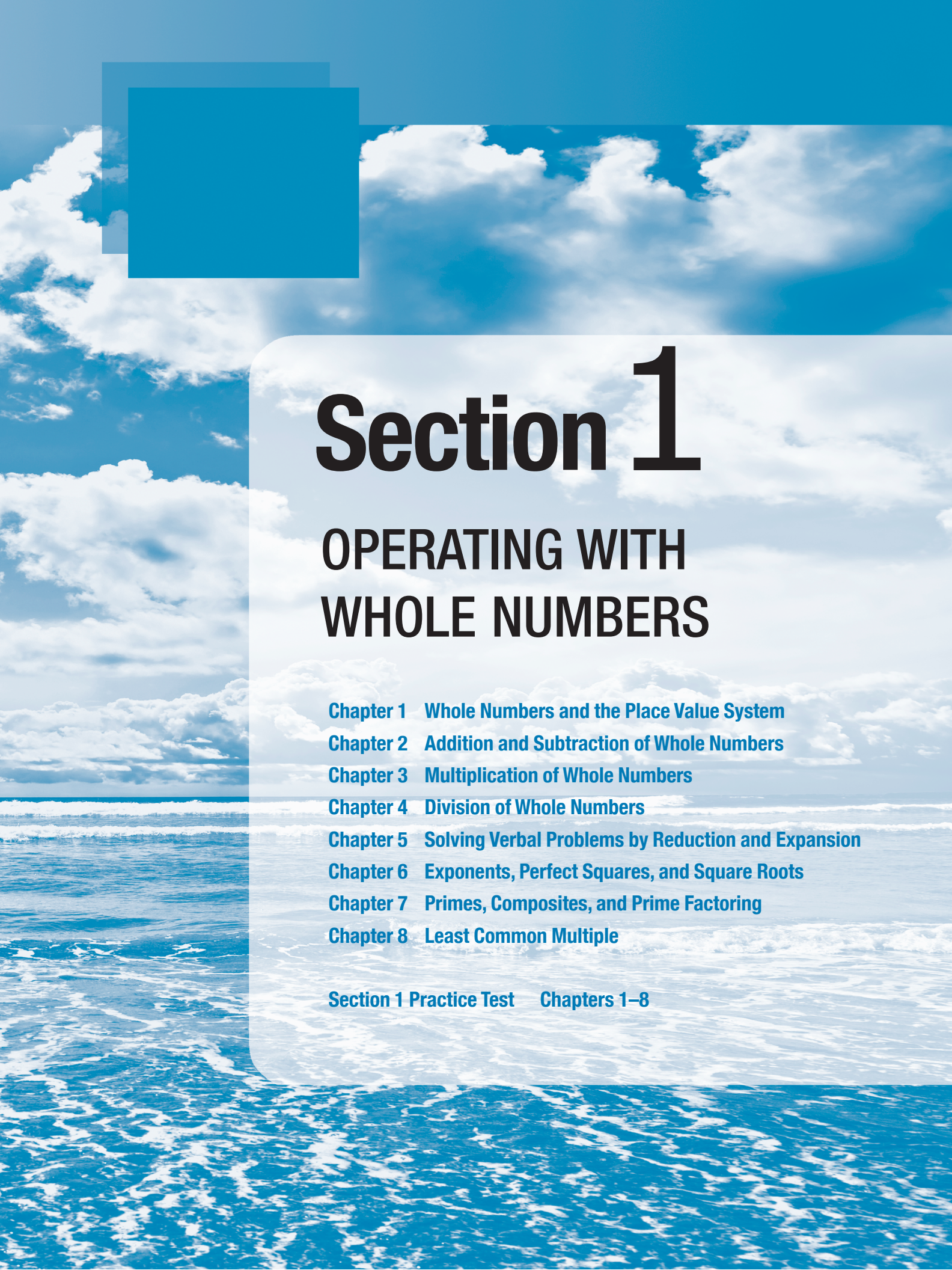






Section 1

OPERATING WITH WHOLE NUMBERS

Chapter 1 Whole Numbers and the Place Value System

Chapter 2 Addition and Subtraction of Whole Numbers

Chapter 3 Multiplication of Whole Numbers

Chapter 4 Division of Whole Numbers

Chapter 5 Solving Verbal Problems by Reduction and Expansion

Chapter 6 Exponents, Perfect Squares, and Square Roots

Chapter 7 Primes, Composites, and Prime Factoring

Chapter 8 Least Common Multiple

Section 1 Practice Test **Chapters 1–8**

1 Whole Numbers and the Place Value System

CHAPTER OBJECTIVES

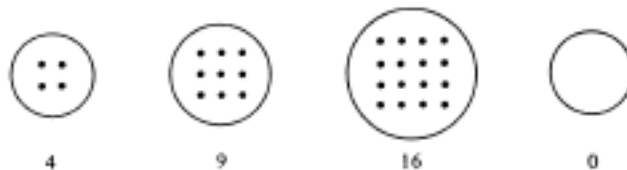
- 1 Show how place value and multiples of ten are used to name whole numbers by writing them in expanded form.
- 2 Read numerals representing whole numbers.
- 3 Write numerals representing whole numbers.
- 4 Round whole numbers to a specified degree of accuracy.



Whole Numbers

Whole numbers may be used to count objects within a collection or to denote an order.

| **Example 1:** Counting objects in a collection



| **Example 2:** Denoting an order

a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z

a is the first letter of the alphabet.

e is the fifth letter of the alphabet.

z is the twenty-sixth letter of the alphabet.

The whole numbers are represented by the following symbols called *numerals*: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, ...

Base Ten System

Because our primitive ancestors counted on their fingers, we have a *base ten* or *decimal* system. The symbol for ten is *10*. It means *one group of ten plus no units*.

	tens	units
10 means	1	0

Basic Digits

Each numeral representing a whole number may be composed of any of the following *basic digits*: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

| **Examples:**

1. 23

2. 456

3. 9,178

4. 631,205,479

Place Value

When the basic digits are placed together to form symbols for whole numbers, each digit has a *place value*. Each place value is a power of ten: units, tens, hundreds, thousands, and so on.

Expanded Form

Each whole number can be written in expanded form, where it is written as a sum in terms of the place values.

| **Example 1:** 23

23 means *2 tens plus 3 units*.

tens	units
2	3

The place value of the digit 2 is *tens*.

The place value of the digit 3 is *units*.

Expanded form: 2 tens + 3 units

Example 2: 456

456 means 4 *hundreds plus 5 tens plus 6 units*.

hundreds	tens	units
4	5	6

The place value of the digit 4 is *hundreds*.

The place value of the digit 5 is *tens*.

The place value of the digit 6 is *units*.

Expanded form: 4 hundreds + 5 tens + 6 units

Example 3: 9,178

9,178 means 9 *thousands plus 1 hundred plus 7 tens plus 8 units*.

thousands	hundreds	tens	units
9	1	7	8

The place value of the digit 9 is *thousands*.

The place value of the digit 1 is *hundreds*.

The place value of the digit 7 is *tens*.

The place value of the digit 8 is *units*.

Expanded form: 9 thousands + 1 hundred + 7 tens + 8 units

Example 4: 631,205,479

This numeral means

	hundred millions	ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	units
6	3	1	2	0	5	4	7	9	

Place Value Chart

Memorize this chart.

trillions	hundred billions	ten billions	billions	hundred millions	ten millions	millions	hundred thousands	ten thousands	thousands	hundreds	tens	units

Each place is ten times the one to its immediate right.



Study Exercise One

- 8,975 means eight _____ plus _____ hundreds plus seven _____ plus _____ units.
- Use the chart, if necessary, to determine the place value of each digit in the following numeral: 2,308,471,659,624
- Write a numeral having 2 in the tens' place, 8 in the thousands' place, 3 in the units' place, 0 in the hundreds' place, 7 in the ten thousands' place, 2 in the millions' place, and 9 in the hundred thousands' place.
- Write each of these whole numbers in expanded form.

(a) 49
(b) 6,325
(c) 12,907

Reading Numerals Representing Whole Numbers

hundreds	6	hundred millions
tens	1	ten millions
units	5	millions
hundreds	4	hundred thousands
tens	8	ten thousands
units	9	thousands
hundreds	2	hundreds
tens	3	tens
units	7	units

Six hundred fifteen million, four hundred eighty-nine thousand, two hundred thirty-seven.

In summary, to read a numeral representing a whole number, follow these steps:



Step (1) Separate the numeral into groups of three going from right to left.

Step (2) Read each of the resulting three-digit numerals, being sure to attach the correct labels.

Using Commas

Commas are used to separate billions, millions, thousands, and units.

615,489,237								
millions			thousands			units		
6	1	5	4	8	9	2	3	7
hundreds	tens	units	hundreds	tens	units	hundreds	tens	units

Six hundred fifteen million, four hundred eighty-nine thousand, two hundred thirty-seven

Note: Two-digit numerals are hyphenated, such as eighty-nine and thirty-seven.

More Examples

1. 121,648

thousands			units		
1	2	1	6	4	8

One hundred twenty-one thousand, six hundred forty-eight

2. 37,502

thousands			units		
	3	7	5	0	2

Thirty-seven thousand, five hundred two

3. 6,025,201,310,007

trillions			billions			millions			thousands			units		
		6	0	2	5	2	0	1	3	1	0	0	0	7

Six trillion, twenty-five billion, two hundred one million, three hundred ten thousand, seven



Study Exercise Two

Write in words the names for the following numerals:

1. 512

2. 1,602

3. 35,011

4. 615,901,002

5. 2,007,500,400

6. 9,245,063,106,002

Writing Numerals Representing Whole Numbers

Remember commas are used to separate thousands from units.

Example 1: Two thousand, three hundred forty-five

thousands			units		
		2	3	4	5
			2	3	4 5

Example 2: Five hundred twenty-six thousand, one hundred sixty-three

thousands			units		
5	2	6	1	6	3
5	2	6	1	6	3

Example 3: Thirty-one million, four hundred eighty-two thousand, nine hundred twenty-eight

millions			thousands			units				
	3	1	4	8	2	9	2	8		
	3	1	,	4	8	2	,	9	2	8

Example 4: Three hundred million

millions			thousands			units		
3	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0

Example 5: Nine billion, four million, six hundred five thousand, fourteen

billions		millions			thousands			units		
	9	0	0	4	6	0	5	0	1	4
9	0	0	4	6	0	5	0	1	4	



Study Exercise Three

A. Use the ten basic digits to write numerals for the following whole numbers:

1. Three hundred four
2. Four thousand, nine hundred eleven
3. Forty thousand, six hundred two
4. Eight hundred fifty-five thousand, one
5. Twenty-five million
6. Thirty-two million, one thousand, nine hundred ten
7. Three billion, four hundred twelve million, six hundred twenty-two thousand, three hundred ninety-five
8. Twelve trillion, eighty-nine billion, four-hundred twenty-six million, one hundred five thousand, two hundred fifty-one

Rounding Whole Numbers

When great accuracy is not required, whole numbers may be rounded to a given place value by replacing certain digits with zeros.

Example 1: Rounding 4,681 to the nearest hundred, we have 4,700.

Example 2: Rounding 4,621 to the nearest hundred, we have 4,600.



Procedure for Rounding

Step (1) Locate the place value to which you are rounding and draw a box around this digit.

Step (2) Examine the digit which is to the immediate right of the box.

- a. If this digit is 5, 6, 7, 8, or 9, then *increase the digit in the box by one, and replace all digits to the right with zeros.* (If the digit in the box is nine, it can be raised one by writing a zero and increasing the digit on its left by one.)
- b. If this digit is 0, 1, 2, 3, or 4, then *leave the digit in the box as is and replace all digits to the right with zeros.*

Examples:

1. Round 63,295 to the nearest hundred

Step (1): 63, 2 95

Step (2): 63, 3 0 0

2. Round 398 to the nearest ten

Step (1): 3 9 8

Step (2): 4 0 0

3. Round 67,973 to the nearest hundred

Step (1): 67, 9 73*Step (2):* 68, 000

4. Round 63,235 to the nearest hundred

Step (1): 63, 2 35*Step (2):* 63, 200

5. Round 2,586,913 to the nearest hundred thousand

Step (1): 2, 5 86,913*Step (2):* 2, 600, 000

6. Round 5,214,692 to the nearest million

Step (1): 5, 214,692*Step (2):* 5, 000, 000

Study Exercise Four

- A. Round each of the following whole numbers to the indicated place value:

1. 628 to the nearest ten

2. 628 to the nearest hundred

3. 628 to the nearest thousand

4. 3,864,950 to the nearest million

5. 3,864,950 to the nearest ten thousand

6. 3,864,950 to the nearest hundred

- B. In the following paragraph, round all whole numbers to the nearest hundred thousand

7. The assets of Valley Savings and Loan are \$75,672,452 for the current fiscal year. Last year the assets were \$61,971,412. The increase in assets has been \$13,701,040.



REVIEW EXERCISES

- A. Give the place value for each digit in the following numerals:

1. 6,201

2. 5,906,871,234

- B. Write in words the name for each of the following numerals:

3. 16

4. 496

5. 3,002

6. 46,950

7. 100,000

8. 3,000,000,000

9. 3,000,000

10. 9,070,021,004

11. 2,673,332

- C. Write the numeral for each of the following whole numbers:

12. Twenty-two

13. Five hundred two

14. Sixteen thousand, nine hundred twelve

15. Fifty thousand, four hundred

16. Twenty million

17. Three trillion, eighty-five million

18. Two hundred sixty-five million, four hundred twenty-one thousand, two hundred eighty-one

- D. Round off 4,619,745 to the nearest:

19. Million

20. Hundred thousand

21. Thousand

22. Hundred

23. Ten

E. Fill in the blanks:

24. 21,034 means two _____ plus _____ thousand plus _____ hundreds plus three _____ plus _____ units.

F. Write each of these numerals in expanded form:

25. 86

26. 309

27. 5,160

28. 29,468

29. 5,000

30. 98,061



Solutions to Review Exercises

1. Digit

Place Value

2. Digit

Place Value

6

Thousands

5

Billions

2

Hundreds

9

Hundred millions

0

Tens

0

Ten millions

1

Units

6

Millions

8

Hundred thousands

7

Ten thousands

1

Thousand

2

Hundreds

3

Tens

4

Units

3. Sixteen

4. Four hundred ninety-six

5. Three thousand, two

6. Forty-six thousand, nine hundred fifty

7. One hundred thousand

8. Three billion

9. Three million

10. Nine billion, seventy million, twenty-one thousand, four

11. Two million, six hundred seventy-three thousand, three hundred thirty-two

12. 22

13. 502

14. 16,912

15. 50,400

16. 20,000,000

17. 3,000,085,000,000

18. 265,421,281

19. 5,000,000

20. 4,600,000

21. 4,620,000

22. 4,619,700

23. 4,619,750

24. 21,034 means two ten thousands plus one thousand plus zero hundreds plus three tens plus four units.

25. 8 tens + 6 units

26. 3 hundreds + 0 tens + 9 units

27. 5 thousands + 1 hundred + 6 tens + 0 units

28. 2 ten thousands + 9 thousands + 4 hundreds + 6 tens + 8 units

29. 5 thousands + 0 hundreds + 0 tens + 0 units

30. 9 ten thousands + 8 thousands + 0 hundreds + 6 tens + 1 unit

**SUPPLEMENTARY PROBLEMS**

- A.** Give the place value for each digit that is underlined:
1. 3 0, 2 0 8
 2. 5 6 3, 4 2 1
 3. 5, 0 6 3, 1 4 2
 4. 2 0, 5 6 0
- B.** Write each of these numerals in expanded form:
5. 93
 6. 2,041
 7. 12,832
 8. 460,215
- C.** Write, in words, names for the following numerals:
9. 56
 10. 506
 11. 5,006
 12. 20,316
 13. 200,316
 14. 4,953,629
 15. 95,000,000
 16. 9,500,000,000
 17. 2,673,498,212
 18. 302,000,104
 19. 635,902,040
 20. 7,654,503
- D.** Write numerals for the following whole numbers:
21. Three thousand, four hundred twenty-nine
 22. Thirty thousand, four hundred twenty-nine
 23. Eight hundred fifty-six million, two hundred fifteen thousand, one hundred forty-one
 24. Three billion, four million, two thousand, five
 25. Thirteen million
 26. One billion
 27. Five hundred thousand
 28. Two million, one hundred forty-one thousand, six hundred thirty-one
 29. One hundred thousand, six hundred two
- E.** Round off the whole number 7,936,429 to the nearest:
30. Million
 31. Hundred thousand
 32. Ten thousand
 33. Thousand
 34. Hundred
 35. Ten
- F.** Round each whole number in the following paragraphs to the nearest million:
36. The 1960 census showed that the United States population was 179,323,175 people. The 1970 census showed there were 204,821,693 people. This represents an increase of 25,498,518 people.
 37. A corporation showed yearly receipts of \$67,692,456. Its yearly expenditures were \$35,449,991. This gives a gross profit of \$32,242,465.
 38. In 1980, the United States had a wheat reserve of 248,650,000 bushels. In 1975, the wheat reserve had declined to 212,470,000 bushels. This represents a decrease in the wheat reserve of 36,180,000 bushels.
- G.** When writing a check, the amount must be filled in both as a numeral and in words. For these imaginary checks write in the amount in words. (Real checks also have a decimal portion which will be studied later.)

39.

James Smart Anaheim, CA	<u>Aug. 15</u> 20 <u>11</u>	286
Pay to the order of <u>Computers Limited</u> \$ <u>6,072</u>		
_____ Dollars		
2 nd National Bank of Anaheim	<u>James Smart</u>	

40.

JANE GORDON FARMVILLE, IA	<u>May 6</u> 20 <u>11</u>	803
Pay to the order of <u>Farmville Hardware</u> \$ <u>13,680</u>		
_____ DOLLARS		
Iowa National Bank	<u>Jane Gordon</u>	

41.

Ramon Montoya Silver City, TX	<u>Sept. 2</u> 20 <u>11</u>	511
Pay to the order of <u>Western Saddle Co.</u> \$ <u>896</u>		
_____ Dollars		
 SILVER CITY savings and loan	<u>Ramon Montoya</u>	



Solutions to Study Exercises

Study Exercise One ■ ■ ■

1. 8,975 means eight thousands plus nine hundreds plus seven tens plus five units.
2.

Digit	Place Value
2	Trillions
3	Hundred billions
0	Ten billions
8	Billions
4	Hundred millions
7	Ten millions
1	Millions
6	Hundred thousands
5	Ten thousands
9	Thousands
6	Hundreds
2	Tens
4	Units
3. 2,978,023
4. (a) 4 tens + 9 units
 (b) 6 thousands + 3 hundreds + 2 tens + 5 units
 (c) 1 ten thousand + 2 thousands + 9 hundreds + 0 tens + 7 units

Study Exercise Two ■ ■ ■

- A.
 1. Five hundred twelve
 2. One thousand, six hundred two
 3. Thirty-five thousand, eleven
 4. Six hundred fifteen million, nine hundred one thousand, two
 5. Two billion, seven million, five hundred thousand, four hundred
 6. Nine trillion, two hundred forty-five billion, sixty-three million, one hundred six thousand, two

Study Exercise Three ■ ■ ■

- | | | | |
|---------------|---------------|------------------|-----------------------|
| A. 1. 304 | 2. 4,911 | 3. 40,602 | 4. 855,001 |
| 5. 25,000,000 | 6. 32,001,910 | 7. 3,412,622,395 | 8. 12,089,426,105,251 |

Study Exercise Four ■ ■ ■

- A. 1. *Step (1):* 6 $\boxed{2}$ 8
Step (2): 6 3 0
3. *Step (1):* $\boxed{0}$ 6 2 8
Step (2): 1 0 0 0
5. *Step (1):* 3,8 $\boxed{6}$ 4,950
Step (2): 3,8 6 0,000
- B. 7. \$75,700,000; \$62,000,000; \$13,700,000
2. *Step (1):* $\boxed{6}$ 28
Step (2): 6 00
4. *Step (1):* $\boxed{3}$,864,950
Step (2): 4, 000,000
6. *Step (1):* 3,864, $\boxed{9}$ 50
Step (2): 3,865, 0 00