

14th Edition

# Business MATHEMATICS

Gary Clendenen  
Stanley A. Salzman





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# Whole Numbers and Decimals

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## CHAPTER CONTENTS

- 1.1 Whole Numbers
- 1.2 Application Problems
- 1.3 Decimal Numbers
- 1.4 Addition and Subtraction of Decimals
- 1.5 Multiplication and Division of Decimals



## CASE IN POINT

**JESSICA FERNANDEZ** worked part time for Subway when taking classes at a local community college, but she is now a manager who oversees 18 employees. She looks for employees who have a

good work ethic, are honest and friendly, and can work with numbers. She uses numbers daily to schedule employees, compute sales, figure sales taxes, complete the payroll, and order inventory.







**Quick TIP //**

These steps are used to round numbers throughout this book.

**Rounding Whole Numbers**

- Step 1** Locate the **place** to which the number is to be rounded. Draw a line under that place.
- Step 2** If the first digit to the *right* of the underlined place is **5 or more**, **increase** the digit in the place to which you are rounding by 1.  
If the digit is **4 or less**, **do not change**.
- Step 3** **Change** all digits to the right of the underlined digit to zeros.

**Rounding Whole Numbers** **EXAMPLE 2 //** Round each number as indicated.

- (a) 579 to the nearest ten  
 (b) 34,127 to the nearest thousand  
 (c) 475,871 to the nearest ten thousand  
 (d) 79,625 to the nearest thousand

**SOLUTION //**

- (a) **Step 1** Locate the tens place and underline.

579  
 ↑  
 Round to this place.

**Step 2** The first digit to the right of the underlined digit is 9, which is greater than 5. Therefore, increase the digit in the tens place from 7 to 8.

**Step 3** Change all digits to the right of the tens place to zero. In other words, change the 9 in the ones place to a zero.

**579 rounded to the nearest ten is 580.**

- (b) **Step 1** Locate the thousands place and underline. 34,127

**Step 2** Since the digit to the right of the thousands place is 1 (less than 5), do not change the 4 in the thousands place.

**Step 3** Change all digits to the right of the thousands place to zeros.

**34,127 rounded to the nearest thousand is 34,000**

- (c) **Step 1** Locate the ten thousands place and underline. 475,871

**Step 2** Since the digit to the right of the ten thousands place is 5, which falls in the category of 5 or more, increase the 7 to an 8.

**Step 3** Change all digits to the right of the tens thousands place to zeros: **480,000**

- (d) **Step 1** Locate the thousands place and underline. 79,625

**Step 2** The number to the right of the underlined number 9 above is 5, which falls in the 5 or more category. Thus, increase the 9 by 1 to 10. Place a 0 in the thousands place and carry 1 to the ten thousands place changing the 7 to an 8.

**Step 3** Change all digits to the right of the thousands place to zeros: **80,000**

**Quick TIP //**

When rounding a number, look **ONLY** at the first digit to the right of the digit being rounded.

**QUICK CHECK 2**

Round each number.

- (a) 653,781 to the nearest ten thousand      (b) 6,578,321 to the nearest million  
 (c) 499,100 to the nearest thousand      (d) 499,100 to the nearest hundred thousand

We will now review four basic **operations** with whole numbers: **addition**, **subtraction**, **multiplication**, and **division**.

**OBJECTIVE 3** Add whole numbers. In **addition**, the numbers being added are **addends**, and the answer is the **sum**, or **total**, or **amount**.

$$\begin{array}{r} 8 \text{ addend} \\ + 9 \text{ addend} \\ \hline 17 \text{ sum (answer)} \end{array}$$

Add numbers by arranging them in a column with units above units, tens above tens, hundreds above hundreds, thousands above thousands, and so on. Use the decimal point as a reference for arranging the numbers. If a number does not include a decimal point, the decimal point is assumed to be at the far right. For example,  $85 = 85.$  and  $527 = 527.$



**Adding with Checking** **EXAMPLE 3** // To find total sales over the weekend at her Subway store, manager Jessica Fernandez needed to add the following amounts.

**Quick TIP** //

To minimize errors, check your work. You do not want to make a mistake and hand it to your boss.

**CASE IN POINT** //

<p style="color: blue;">First, add down the columns</p>	$  \begin{array}{r}  \$4028 \\  \$738 \\  63 \\  125 \\  2617 \\  + 485 \\  \hline  \$4028  \end{array}  $	<p style="color: red;">Then, check by adding up.</p>
---	--	--

Adding from the top down results in an answer of \$4028. Check for accuracy by adding again—this time from the bottom up. If the answers are the same, the sum is probably correct. If the answers are different, there is an error in either adding down or adding up, and the problem should be reworked. Both answers agree in this example, so the sum is correct.

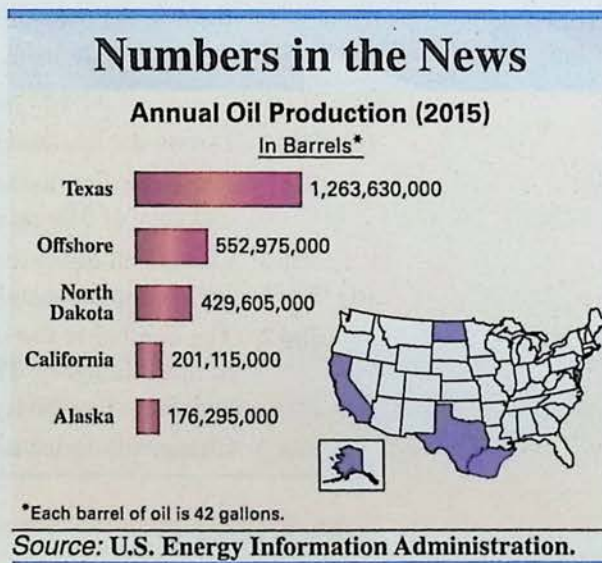
**QUICK CHECK 3** //

Find the total of the following expenses:  $\$2805 + \$871 + \$28 + \$169 + \$1196$

**OBJECTIVE 4** Round numbers to estimate an answer. Answers can be quickly estimated using **front-end rounding**. This requires the first number to be rounded and all the following digits to be changed to zero. Only one nonzero digit remains.

**Using Front-End Rounding to Estimate an Answer**

**EXAMPLE 4** // The graphic shows the top oil producing areas in the U.S. Notice that a lot of oil is produced offshore in the Gulf of Mexico. Apply front-end rounding to estimate total oil production from these areas.



**SOLUTION** //

**Quick TIP** //

In front-end rounding, only one nonzero digit (first digit) remains. All digits to the right are zeros.

	Actual		Front-End Rounded
Texas	1,263,630,000	→	1,000,000,000
Offshore	552,975,000	→	600,000,000
North Dakota	429,605,000	→	400,000,000
California	201,115,000	→	200,000,000
Alaska	176,295,000	→	200,000,000
Estimated Total			2,400,000,000 barrels of oil

This rough estimate shows that total U.S. oil production was about 2.4 billion barrels in 2015. It is a rough estimate because some states that produce oil are not included in the list and we have used front-end rounding. For a more precise number, you need to get the data from all oil-producing areas and add.



**QUICK CHECK 4**

Use front-end rounding to estimate the total of the following numbers.

621,150; 38,400; 9682; 27,451; 435,620

**OBJECTIVE 5 Subtract whole numbers.** A subtraction problem is set up much like an addition problem. The top number is the **minuend**, the number being subtracted is the **subtrahend**, and the answer is the **difference**.

$$\begin{array}{r} 23 \text{ minuend} \\ - 7 \text{ subtrahend} \\ \hline 16 \text{ difference} \end{array}$$

Subtract one number from another by placing the subtrahend directly under the minuend with columns aligned. Begin the subtraction from the right-most column. When a digit in the subtrahend is *larger* than the corresponding digit in the minuend, **borrow** as shown in the next example.

**Subtracting with Borrowing**

**EXAMPLE 5**

Subtract 2894 Subway drink cups from 3783 Subway drink cups in inventory. First, write the problem as follows.



**CASE IN POINT**

$$\begin{array}{r} 3783 \\ -2894 \\ \hline \end{array}$$

In the ones (units) column, subtract 4 from 3 by borrowing a 1 from the tens column in the minuend to get 1 ten + 3, or 13, in the units column with 7 now in the tens column. Then subtract 4 from 13 for a result of 9. Complete the subtraction as follows.

$$\begin{array}{r} 2 \quad 16 \quad 17 \quad 13 \\ 3 \quad 7 \quad 8 \quad 3 \\ -2 \quad 8 \quad 9 \quad 4 \\ \hline 8 \quad 8 \quad 9 \quad \text{drink cups} \end{array}$$

In this example, the tens are borrowed from the hundreds column, and the hundreds are borrowed from the thousands column.

**QUICK CHECK 5**

Subtract 7832 customers from 9511 customers.

Check the answer to a subtraction problem by adding the answer (difference) to the subtrahend. The result should equal the minuend.

**Subtracting with Checking**

**EXAMPLE 6**

Subtract 1635 from 5383 and check the answer.

**Quick TIP**

Do not change the order of the numbers when subtracting. For example,  $(9 - 5)$  is not the same thing as  $(5 - 9)$ .

	<b>Problem</b>		<b>Check</b>	
Problem (subtract down) ↓	$\begin{array}{r} 5383 \text{ minuend} \\ - 1635 \text{ subtrahend} \\ \hline 3748 \text{ difference} \end{array}$		$\begin{array}{r} 5383 \\ + 1635 \\ \hline 3748 \end{array}$	↑ This result should equal the minuend. Check (add up)

**QUICK CHECK 6**

Subtract 2374 from 4165, and check the answer.

**OBJECTIVE 6 Multiply whole numbers.** Multiplication is actually a quick method of addition. For example,  $3 \times 4$  means to add three fours:  $4 + 4 + 4 = 12$ . However, it is not practical to use addition for large numbers such as  $103 \times 92$ , which would require you to add 92 to itself 103 times. Instead, find this result with multiplication. The multiplication of 103 by 92 can be written in any of the following ways:

$$103 \times 92 = 103 \cdot 92 = 103 \cdot 92 = (103)(92)$$

It is okay to change the order when adding two numbers, e.g.,  $3 + 5 = 5 + 3$ . It is also okay to change the order when multiplying two numbers, so  $103 \times 92 = 92 \times 103$ .



The number being multiplied is the **multiplicand**, the number doing the multiplying is the **multiplier**, and the answer is the **product**.

$$\begin{array}{r} 3 \text{ multiplicand} \\ \times 4 \text{ multiplier} \\ \hline 12 \text{ product} \end{array}$$

When the multiplier contains more than one digit, **partial products** must be used, as in the next example, which shows the product of 25 and 34.

### Multiplying Whole Numbers

#### EXAMPLE 7

Multiply  $25 \times 34$  by first multiplying 25 by the 4 in the ones place as shown in Step 1. Then multiply 25 by 3 in the tens place as shown in Step 2, before adding to find the answer in Step 3.



Problem	Step 1	Step 2	Step 3	
$\begin{array}{r} 25 \\ \times 34 \\ \hline \end{array}$	$\begin{array}{r} 25 \\ \times 34 \\ \hline 100 \end{array}$	$\begin{array}{r} 25 \\ \times 34 \\ \hline 100 \\ 75 \end{array}$	$\begin{array}{r} 25 \\ \times 34 \\ \hline 100 \\ + 75 \\ \hline 850 \end{array}$	multiplicand multiplier partial product ( $25 \times 4$ ) partial product ( $25 \times 3$ ) product

Step 1 Multiply 25 by 4 and write 100 aligning ones places.

Step 2 Multiply 25 by 3 and write 75 one position to the left since 3 is in the tens place. The 5 in 75 will be in the ten's place.

Step 3 Add the two partial products to get the answer.

#### QUICK CHECK 7

Multiply 18 telemarketers by 36 phone calls per telemarketer per hour to estimate the number of calls made in one hour.

**OBJECTIVE 7** Multiply by omitting zeros. If the multiplier or multiplicand end in zero, first omit any zeros at the right of the numbers and then replace omitted zeros at the right of the final answer. For example, find the product of 240 and 13 as follows.

$$\begin{array}{r} 240 \\ \times 13 \\ \hline 72 \\ 24 \\ \hline 3120 \end{array}$$

Omit the zero in the calculation.

Replace the omitted zero at the right of 312 for a final answer (product) of 3120.

### Multiplying, Omitting Zeros

#### EXAMPLE 8

In the following multiplication problems, omit zeros in the calculation and then replace omitted zeros to obtain the product.

(a)  $\begin{array}{r} 150 \\ \times 70 \\ \hline \end{array}$   $\begin{array}{r} 15 \\ \times 7 \\ \hline 105 \end{array}$

omit zeros

attach 2 zeros

answer

10,500

(b)  $\begin{array}{r} 300 \\ \times 90 \\ \hline \end{array}$   $\begin{array}{r} 3 \\ \times 9 \\ \hline 27 \end{array}$

omit zeros

attach 3 zeros

answer

27,000

#### QUICK CHECK 8

Multiply 400 by 50. Omit zeros in the calculation and replace them in the product.

#### Quick TIP

A shortcut for multiplying by 10, 100, 1000, and so on is to just attach the number of zeros to the number being multiplied. For example,

$$\begin{array}{l} 33 \times 10 = 33 \text{ and } 1 \text{ zero} = 330 \\ 56 \times 100 = 56 \text{ and } 2 \text{ zeros} = 5600 \\ 732 \times 1000 = 732 \text{ and } 3 \text{ zeros} = 732,000 \end{array}$$







If a divisor contains zeros at the far right, first drop the zeros in the divisor and then move the decimal point in the dividend the same number of places to the left as there were zeros dropped from the divisor.

$$\begin{array}{ccc} 900 \overline{)108,000} & \text{becomes} & 9 \overline{)1080} \\ \text{Drop 2 zeros.} \uparrow & & \uparrow \text{Move decimal point 2 places left.} \end{array}$$

**Dropping Zeros to Divide** **EXAMPLE 11** To divide 108,000 by 900, first drop two zeros from each number. Then divide.

$$\begin{array}{r} 120 \\ 9 \overline{)1080} \\ \underline{9} \phantom{0} \\ 18 \phantom{0} \\ \underline{18} \\ 00 \\ \underline{00} \end{array}$$

Check Answer

$$\begin{array}{r} 120 \\ \times 9 \\ \hline 1080 \end{array} \text{ so the division is correct}$$

**Quick TIP**

After dropping zeros and dividing, do not add trailing zeros back to the answer.

You must change 9 back to 900 and multiply by 120 to get the original dividend of 108,000.

Therefore,  $108,000 \div 900 = 120$ .

**QUICK CHECK 11**

First drop zeros, and then divide  $19,200 \div 300$ .

**Checking Division Problems with Remainders** **EXAMPLE 12** In a division problem, check the answer by multiplying the quotient (answer) and the divisor. Then add any remainder. If the result is not the same as the dividend, an error exists and the problem should be reworked. Check the following division problems.

(a) 
$$\begin{array}{r} 37 \text{ R}3 \\ 716 \overline{)26,495} \\ \underline{2148} \phantom{0} \\ 5015 \\ \underline{5012} \\ 3 \text{ remainder} \end{array}$$

(b) 
$$\begin{array}{r} 85 \text{ R}6 \\ 418 \overline{)35,536} \\ \underline{3344} \phantom{0} \\ 2096 \\ \underline{2090} \\ 6 \text{ remainder} \end{array}$$

**SOLUTION**

(a) 
$$\begin{array}{r} 716 \\ \times 37 \\ \hline 5012 \\ 2148 \phantom{0} \\ \hline 26,492 \\ + 3 \text{ add remainder} \\ \hline 26,495 \text{ correct} \end{array}$$

(b) 
$$\begin{array}{r} 418 \\ \times 85 \\ \hline 2090 \\ 3344 \phantom{0} \\ \hline 35,530 \\ + 6 \text{ add remainder} \\ \hline 35,536 \text{ correct} \end{array}$$

**Quick TIP**

Be sure to add the remainder to the product when checking a division problem with a remainder.

**QUICK CHECK 12**

Divide 9897 by 215. Check the answer by multiplying the quotient (answer) by the divisor.

## 1.1 Exercises // MyLab Math

The shaded sections below contain solutions to help you get a **QUICK START** on the various types of exercises.

Write the following numbers in words. (See Example 1.)

1. 7040 seven thousand, forty

2. 5310 five thousand, three hundred ten



3. 37,901 \_\_\_\_\_  
 4. 725,069 \_\_\_\_\_  
 5. 4,650,015 \_\_\_\_\_  
 6. 3,765,041,000 \_\_\_\_\_

Round each of the following numbers first to the nearest ten, then to the nearest hundred, and finally to the nearest thousand. Go back to the **original number** each time before rounding to the next position. (See Example 2.)

	Nearest Ten	Nearest Hundred	Nearest Thousand
7. 2065	<u>2070</u>	<u>2100</u>	<u>2000</u>
8. 8385	<u>8390</u>	<u>8400</u>	<u>8000</u>
9. 46,231	_____	_____	_____
10. 55,175	_____	_____	_____
11. 106,054	_____	_____	_____
12. 359,874	_____	_____	_____

13. Explain the three steps needed to round a number when the digit to the right of the place to which you are rounding is 5 or more. (See Objective 2.)

14. Explain the three steps needed to round a number when the digit to the right of the place to which you are rounding is 4 or less. (See Objective 2.)

Add each of the following. Check your answers. (See Example 3.)

- |   |  |   |   |
|---|--|---|---|
| 15. $\begin{array}{r} 75 \\ 63 \\ 45 \\ + 27 \\ \hline 210 \end{array}$   | 16. $\begin{array}{r} 57 \\ 26 \\ 43 \\ + 18 \\ \hline \end{array}$        | 17. $\begin{array}{r} 875 \\ 364 \\ 171 \\ + 776 \\ \hline \end{array}$     | 18. $\begin{array}{r} 135 \\ 594 \\ 415 \\ + 276 \\ \hline \end{array}$     |
| 19. $\begin{array}{r} 750 \\ 91 \\ 8 \\ 540 \\ + 7 \\ \hline \end{array}$ | 20. $\begin{array}{r} 371 \\ 45 \\ 839 \\ 3 \\ + 47 \\ \hline \end{array}$ | 21. $\begin{array}{r} 311,479 \\ 77,631 \\ + 594,383 \\ \hline \end{array}$ | 22. $\begin{array}{r} 803,526 \\ 759,991 \\ + 36,024 \\ \hline \end{array}$ |

Subtract each of the following. Check your answers. (See Examples 5 and 6.)

- |   |  |   |   |
|---|--|---|---|
| 23. $\begin{array}{r} 896 \\ - 228 \\ \hline \end{array}$       | 24. $\begin{array}{r} 757 \\ - 286 \\ \hline \end{array}$        | 25. $\begin{array}{r} 3715 \\ - 838 \\ \hline \end{array}$          | 26. $\begin{array}{r} 6215 \\ - 767 \\ \hline \end{array}$          |
| 27. $\begin{array}{r} 65,198 \\ - 43,652 \\ \hline \end{array}$ | 28. $\begin{array}{r} 445,193 \\ - 62,785 \\ \hline \end{array}$ | 29. $\begin{array}{r} 7,025,389 \\ - 936,490 \\ \hline \end{array}$ | 30. $\begin{array}{r} 9,807,943 \\ - 959,489 \\ \hline \end{array}$ |



Solve the following problems. To serve as a check, the vertical and horizontal totals must be the same in the lower right-hand corner.

31. **PRODUCT PURCHASES** The following table shows monthly purchases at a Best Buy by product line for each of the first six months of the year. Complete the totals by adding horizontally and vertically.



Product	Jan.	Feb.	Mar.	Apr.	May	June	Totals
Software	\$49,802	\$36,911	\$47,851	\$54,732	\$29,852	\$74,119	\$293,267
Computers	\$86,154	\$72,908	\$31,552	\$74,944	\$85,532	\$36,705	
Printers	\$59,854	\$85,119	\$87,914	\$45,812	\$56,314	\$91,856	
Smart phones	\$73,951	\$72,564	\$39,615	\$71,099	\$72,918	\$42,953	
Totals							

32. **DEPARTMENT SALES** The following table shows Jameson's Fashion expenses by department for the last six months of the year. Complete the totals by adding horizontally and vertically.

Department	July	Aug.	Sept.	Oct.	Nov.	Dec.	Totals
Office	\$29,806	\$31,712	\$40,909	\$32,514	\$18,902	\$23,514	
Production	\$92,143	\$86,599	\$97,194	\$72,815	\$89,500	\$63,754	
Sales	\$31,802	\$39,515	\$58,192	\$32,544	\$41,920	\$48,732	
Warehouse	\$15,746	\$12,986	\$32,325	\$41,983	\$39,814	\$20,605	
Totals							

Multiply each of the following. (See Example 7.)

$$\begin{array}{r} 33. \quad 218 \\ \times 43 \\ \hline 654 \\ 872 \\ \hline 9374 \end{array}$$

$$34. \quad \begin{array}{r} 672 \\ \times 56 \\ \hline \end{array}$$

$$35. \quad \begin{array}{r} 1896 \\ \times 62 \\ \hline \end{array}$$

$$36. \quad \begin{array}{r} 7318 \\ \times 38 \\ \hline \end{array}$$

$$37. \quad \begin{array}{r} 6452 \\ \times 263 \\ \hline \end{array}$$

$$38. \quad \begin{array}{r} 7143 \\ \times 295 \\ \hline \end{array}$$

$$39. \quad \begin{array}{r} 1109 \\ \times 7311 \\ \hline \end{array}$$

$$40. \quad \begin{array}{r} 9503 \\ \times 3411 \\ \hline \end{array}$$

Estimate answers using front-end rounding. Then find the exact answers. (See Example 4.)

41. Estimate		Exact
8000	← rounds	8215
60	← to	56
700	←	729
+ 4000	←	+ 3605
<u>12,760</u>	←	<u>12,605</u>

42. Estimate		Exact
	←	2685
	←	73
	←	592
+	←	+ 7183

43. Estimate		Exact
	←	783
-	←	- 238

44. Estimate		Exact
	←	942
-	←	- 286

45. Estimate		Exact
	←	638
×	←	× 47

46. Estimate		Exact
	←	864
×	←	× 74



Multiply, omitting zeros in the calculation and then replacing them at the right of the product to obtain the final answer. (See Example 8.)

$$\begin{array}{r} 47. \quad 370 \\ \times 180 \\ \hline 37 \\ \times 18 \\ \hline 666 \quad \swarrow \text{2 zeros} \\ 66,600 \end{array}$$

$$48. \quad \begin{array}{r} 520 \\ \times 400 \\ \hline \end{array}$$

$$49. \quad \begin{array}{r} 3760 \\ \times 6000 \\ \hline \end{array}$$

$$50. \quad \begin{array}{r} 7200 \\ \times 1300 \\ \hline \end{array}$$

Divide each of the following. (See Examples 9 and 10.)

$$51. \quad \begin{array}{r} 1241 \text{ R1} \\ 4 \overline{)4965} \\ \underline{4} \phantom{00} \\ 09 \phantom{0} \\ \underline{8} \phantom{0} \\ 16 \phantom{0} \\ \underline{16} \phantom{0} \\ 05 \phantom{0} \\ \underline{4} \phantom{0} \\ 1 \phantom{0} \end{array}$$

$$52. \quad 7 \overline{)13,214}$$

$$53. \quad 43 \overline{)19,715}$$

$$54. \quad 93 \overline{)81,452}$$

55. Explain why checking the answer is a very important step in solving math problems.

56. In your personal and business life, when is it most important to check your math calculations? Why?

Divide each of the following, dropping zeros from the divisor. (See Examples 10 and 11.)

$$57. \quad 180 \overline{)429,350}$$

$$58. \quad 320 \overline{)360,990}$$

$$59. \quad 1300 \overline{)75,800}$$

$$60. \quad 1600 \overline{)253,100}$$

$$\begin{array}{r} 2385 \text{ R5} \\ 18 \overline{)42,935} \\ \underline{36} \phantom{00} \\ 69 \phantom{0} \\ \underline{54} \phantom{0} \\ 153 \phantom{0} \\ \underline{144} \phantom{0} \\ 95 \phantom{0} \\ \underline{90} \phantom{0} \\ 5 \phantom{0} \end{array}$$

Rewrite the following numbers in words. (See Example 1.)

61. **MOTOR VEHICLE ACCIDENTS** According to the NHTSA, the number of people injured in accidents in 2015 was 2,443,000.

62. **WOMEN IN BUSINESS** A.G. Edwards reports that there are 8,534,350 businesses owned by women in the United States.

63. **PARACHUTE JUMPS** There are 3,200,000 parachute jumps in the United States each year according to the History Channel.

64. **GROSS NATIONAL PRODUCT** The market value of goods and services created in the U.S. increased last quarter to \$18,036,650,000,000.






Rewrite the numbers from the following sentences using digits. (See Example 1.)

65. **JELL-O SALES** The average number of boxes of Jell-O gelatin sold every day is eight hundred fifty-four thousand, seven hundred ninety-five. 65. 854,795
66. **CRAYON SALES** The Binney & Smith Company makes about two billion Crayola Crayons each year. 66. \_\_\_\_\_
67. **SALVATION ARMY** Last year, the Salvation Army served over fifty-six million, three hundred twelve thousand, seven hundred meals to hungry men, women, and children. 67. \_\_\_\_\_
68. **HURRICANE KATRINA** At a New Orleans pumping station, one of the pumps designed by Alexander Baldwin Wood pumped six hundred forty-eight million gallons of flood water (7500 gallons per second) in one day. 68. \_\_\_\_\_

Solve the following application problems.

69. **HERSHEY MINI CHIPS** A student estimated that there are approximately 5000 Mini Chips semisweet chocolate chips in 1 pound. How many chips are in 40 pounds? 69. 200,000 chips
- $5 \times 4 = 20$     4 zeros  
↙  
200,000

70. **HERSHEY KISSES** Each day over 61,000,000 Hershey Kisses are produced. Estimate the number produced in 30 days. 70. \_\_\_\_\_
- 

71. **CAMPUS VENDING MACHINES** On a normal weekday, the vending machines at American River College dispense 900 sodas, 400 candy bars, 500 snack items, and 200 cups of coffee. If it takes Jim Wilson four hours to restock the vending machines, how many items does he restock each hour? 71. \_\_\_\_\_
72. **iPAD SALES** The numbers of iPads sold weekly in one city were 1801, 927, 2088, 580, and 1049. Find the average number sold per week. 72. \_\_\_\_\_

**WHITE WATER RAFTING** American River Raft Rentals lists the following daily raft rental fees. Notice that there is an additional \$3 launch fee payable to the park system for each raft rented. Use this information to solve Exercises 73 and 74.

American River Raft Rentals		
Size	Rental Fee	Launch Fee
4 persons	\$70	\$3
6 persons	\$95	\$3
10 persons	\$165	\$3
12 persons	\$180	\$3



73. On a recent Sunday, the following rafts were rented: 6 4-person rafts, 15 6-person rafts, 10 10-person rafts, and 5 12-person rafts. Find the total receipts, including the \$3-per-raft launch fee. 73. \_\_\_\_\_



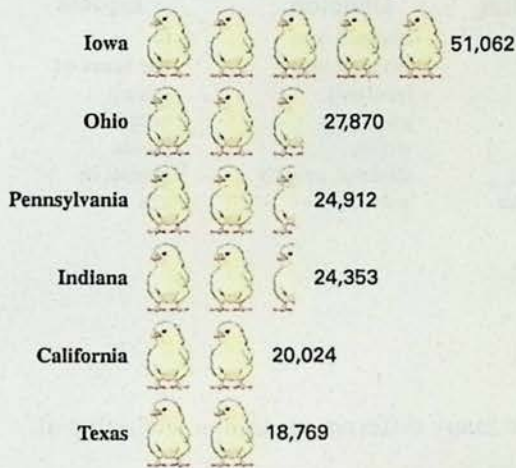
74. During the July 4th weekend, the following rafts were rented: 38 4-person rafts, 73 6-person rafts, 58 10-person rafts, and 46 12-person rafts. Find the total receipts including the \$3-per-raft launch fee.

74. \_\_\_\_\_

**EGG PRODUCTION** The following pictograph shows the states with the largest number of egg-laying chickens. Use this information to answer Exercises 75–78.

### Numbers in the News

**Top Egg-Laying States in 2016**  
(thousands of chickens)



Source: National Agricultural Statistics Service.

75. Find the number of egg-laying chickens in the top four states.  
 $51,062 + 27,870 + 24,912 + 24,353 = 128,197$  thousand or 128,197,000
75. 128,197 thousand or 128,197,000

76. Use front-end rounding to estimate the total number of egg-laying chickens from all states shown.
76. \_\_\_\_\_

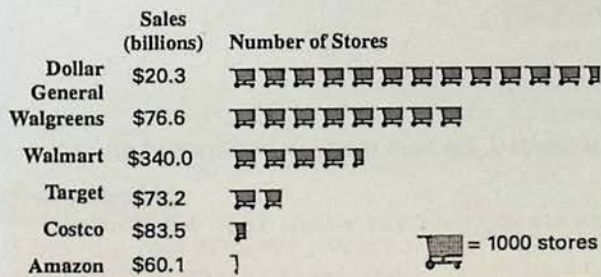
77. How many more egg-laying chickens are there in Iowa than in Texas?
77. \_\_\_\_\_

78. How many more egg-laying chickens are there in Iowa and Ohio combined compared to California and Texas combined?
78. \_\_\_\_\_

**RETAIL GIANTS** The following pictograph shows annual sales and the number of stores for several large retailers. Use it to answer the questions that follow.

### Numbers in the News

**Giant Retailers**  
Annual Sales and Number of Stores (2016)



Source: National Retail Federation.

79. Estimate the number of Dollar General stores.  
 $12.5 \times 1000 = 12,500$  stores
79. 12,500 stores

80. Estimate the number of Walmart stores.
80. \_\_\_\_\_

81. Which company has the fewest retail stores and how many does it have?
81. \_\_\_\_\_

82. Find the difference in annual sales between Walmart and Target.
82. \_\_\_\_\_

83. Does Costco or Target have more sales and if so how much more?
83. \_\_\_\_\_

84. How many more retail stores does Dollar General have than Walgreens?
84. \_\_\_\_\_

### QUICK CHECK ANSWERS

- |   |                               |
|---|-------------------------------|
| 1. Twenty trillion, seven hundred fifty billion, three hundred sixty-one million, one hundred nineteen thousand, four hundred fifty | 6. 1791                       |
| 2. (a) 650,000, (b) 7,000,000, (c) 499,000 (d) 500,000  | 7. 648 phone calls            |
| 3. \$5069   | 8. 20 attach 3 zeros = 20,000 |
| 4. 1,080,000  | 9. \$417                      |
| 5. 1679 customers   | 10. 3 R4                      |
|   | 11. 64                        |
|   | 12. 46 R7                     |



## 1.2 Application Problems

### OBJECTIVES

- 1 Find indicator words in application problems.
- 2 Learn the four steps for solving application problems.
- 3 Learn to estimate answers.
- 4 Solve application problems.

**CASE IN POINT** // When Jessica Fernandez became a manager at a Subway store, she brushed up on her math skills so she could train her employees.

Math has many applications in business. You need to read very carefully and critically to solve problems.

**OBJECTIVE 1** Find indicator words in application problems. Sometimes there is an **indicator word** or phrase in an application problem that gives you an indication of which math operation to use. Here are some of these words.

Addition	Subtraction	Multiplication	Division	Equals
plus	less	product	divided by	is
more	subtract	double	divided into	the same as
more than	subtracted from	triple	quotient	equals
added to	difference	times	goes into	equal to
increased by	less than	of	divide	yields
sum	fewer	twice	divided equally	results in
total	decreased by	twice as much	per	are
sum of	loss of			
increase of	minus			
gain of	take away			
	reduced by			

The word *and* is not listed above since it can have many different meanings, including all the following:

1. sum of 3 **and** 4,
2. product of 6 **and** 8,
3. seventeen **and** one-half, or
4. six **and** seven tenths.

**OBJECTIVE 2** Learn the four steps for solving application problems. When working problems, try to take your time and relax as if you were at the gym or a pool. Believe it or not, you are training your brain when working problems. It is okay if you do NOT know how to solve a problem when first reading it.

### Solving Application Problems

- Step 1 Read the problem carefully, twice if needed. Be sure that you understand what is being asked.
- Step 2 Identify facts and look to see if there are any indicator words. Then work out a plan to solve the problem.
- Step 3 Estimate a *reasonable answer* using rounding.
- Step 4 Solve the problem. Does the answer make sense? If not, work it again.

**OBJECTIVE 3** Learn to estimate answers. Each of the steps in solving an application problem is important, but special emphasis should be placed on step 3, estimating a reasonable answer. Many times an answer just *does not fit* the problem.

What is a *reasonable answer*? Read the problem and estimate the approximate size of the answer. Should the answer be part of a dollar, a few dollars, hundreds, thousands, or even millions of dollars? For example, if a problem asks for the retail price of a shirt, would an answer of \$20 be reasonable? \$1000? \$.65? \$65?

Always make an estimate of a reasonable answer. Always look at the answer and decide if it is reasonable. Doing this will help you become a better problem solver.





## Using Word Indicators to Help Solve a Problem

## EXAMPLE 1

Total sales at a neighborhood yard sale were \$3584. The money was divided equally among the boys soccer club, the girls soccer club, the boys softball team, and the girls softball team. How much did each group receive?

## SOLUTION

Sales of \$3584 are to be *divided equally* among the four groups. Estimate the answer by first rounding \$3584 to the nearest hundred (\$3600); then divide by 4.

$$\$3600 \div 4 = \$900 \quad \text{estimate of amount to each group}$$

Divide to find the exact answer.

$$\begin{array}{r} \$896 \\ 4 \overline{)3584} \\ \underline{32} \phantom{00} \\ 38 \phantom{00} \\ \underline{36} \phantom{00} \\ 24 \phantom{00} \\ \underline{24} \phantom{00} \\ 0 \end{array}$$

## Check Work

$$\begin{array}{r} \$896 \\ \times 4 \\ \hline \$3584 \end{array} \quad \text{The answer is correct.}$$

Each group will get \$896.

## QUICK CHECK 1

A budget surplus of \$13,280 is divided evenly among four branch libraries. How much did each receive?

**OBJECTIVE 4** Solve application problems. To improve your accuracy, use the four steps and estimate answers when solving application problems.

## Solving an Application Problem

## EXAMPLE 2

The daily sales figures at a busy Subway were \$2358 on Monday, \$3056 on Tuesday, \$2515 on Wednesday, \$1875 on Thursday, \$3978 on Friday, \$3219 on Saturday, and \$3008 on Sunday. Find the total sales for the week.

## SOLUTION

## CASE IN POINT

The phrase *total sales* indicates that you need to add daily sales to get the weekly total. Since the sales are about \$3000 every day for a week of 7 days, a reasonable estimate would be around \$21,000 ( $7 \times \$3000 = \$21,000$ ). Find the actual answer by adding the sales for each of the 7 days.

## Quick TIP

Checking your work reduces errors. It is very important to check your work before presenting it to your boss!

	<u>\$20,009</u>	Check
	\$2358	
	\$3056	
	\$2515	
	\$1875	
	\$3978	
	\$3219	
	+ \$3008	
Add.	\$20,009	\$20,009 sales for the week

The estimate of \$21,000 is close enough to actual sales of \$20,009 to be reasonable. If you do not think your answer is reasonable, work the problem again to be sure.

## QUICK CHECK 2

The numbers of visitors to a war veterans' memorial during one week are 5318, 2865, 4786, 1898, 3899, 2343, and 7221. First estimate the total attendance for the week. Then calculate exactly.



**Solving an Application Problem**

**EXAMPLE 3**

Many experts believe that some countries already have a water shortage, while others will be facing water shortages soon. The chart below shows an estimate of freshwater resources per person, by country.



Droughts result in critical water shortages in India. Experts predict it will be even worse in 10 to 20 years.

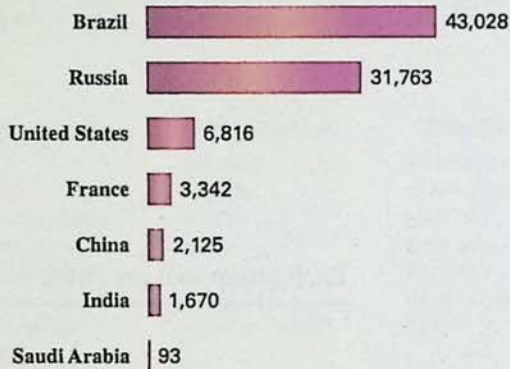


- (a) Find the difference in the water resources per person between China and India.
- (b) Use division to compare water per person in the United States to that in India.

**Numbers in the News**

**Who Has Water?**

(cubic meters per person per year)



**DATA: CIA.** The CIA maintains information on water resources by country because extreme droughts could cause mass migrations and result in political instability.

- (c) The indicator word *difference* suggests a subtraction problem.

$$\begin{array}{r}
 2125 \text{ China} \\
 - 1670 \text{ India} \\
 \hline
 455 \text{ cubic meters per person per year}
 \end{array}$$

- (d)  $6816 \div 1670 = 4.08$  (rounded), or about 4 times as much water per person in the United States as in India.

The bar chart says nothing about the distribution of water within a country or whether that water is clean enough to drink. India does not have much water, and what water there is is heavily polluted.

**QUICK CHECK 3**

Find the difference in the water resources per person between Brazil and Saudi Arabia.

**Solving a Two-Step Problem**

**EXAMPLE 4**

In May, the landlord of an apartment building received \$940 from each of eight tenants. After paying \$2730 in expenses, how much money did the landlord have left?

**SOLUTION**

First, find the total rent before subtracting expenses. Since the rent is about \$900 and there are eight tenants, a *reasonable estimate* would be around \$7200 ( $\$900 \times 8 = \$7200$ ).

$$\begin{array}{r}
 \$940 \\
 \times 8 \\
 \hline
 \$7520 \quad \text{total monthly rent is reasonable}
 \end{array}$$

Now subtract the expenses from the monthly income.

$$\begin{array}{r}
 \$7520 \\
 - 2730 \\
 \hline
 \$4790 \quad \text{after expenses}
 \end{array}$$

**QUICK CHECK 4**

A homeowner's association collected \$385 from each of 62 homeowners. If the association paid \$18,280 in expenses, how much remained?



**Solving Application Problems** **EXAMPLE 5** Use the data below that was taken from company websites to answer each question.

Subway	Calories	Total Fat (g)
Carved Turkey with Bacon	570	26
Oven Roasted Chicken	320	5
Classic Tuna	480	25

McDonalds	Calories	Total Fat (g)
Big Mac	540	28
Quarter Pounder with Cheese	530	27
Southwest Grilled Chicken Salad	350	12



- (a) How many fewer calories and grams of fat are in an Oven Roasted Chicken sandwich from Subway than in a Big Mac?
- (b) How many fewer calories and grams of fat are in a Southwest Grilled Chicken Salad from McDonalds than in a Carved Turkey with Bacon sandwich from Subway?

**SOLUTION**

- (a) The word “fewer” suggests that subtraction should be used to answer the question.

$$\begin{array}{r} 540 \text{ calories} \\ -320 \text{ calories} \\ \hline 220 \text{ fewer calories} \end{array} \qquad \begin{array}{r} 28 \text{ grams of fat} \\ -5 \text{ grams of fat} \\ \hline 23 \text{ fewer grams of fat} \end{array}$$

- (b) Again, fewer indicates subtraction.

$$\begin{array}{r} 570 \text{ calories} \\ -350 \text{ calories} \\ \hline 220 \text{ calories} \end{array} \qquad \begin{array}{r} 26 \text{ grams of fat} \\ -12 \text{ grams of fat} \\ \hline 14 \text{ grams of fat} \end{array}$$

**QUICK CHECK 5**

Find the total number of calories and grams of fat for a person eating both a Big Mac and a Southwest Grilled Chicken Salad.

## 1.2 Exercises // MyLab Math

The shaded sections below contain solutions to help you get a **QUICK START** on the various types of exercises.

Solve the following application problems.

- 1. SUBWAY SANDWICHES** Last week, Subway sold 602 Veggie Delite sandwiches, 935 ham sandwiches, 1328 turkey breast sandwiches, 757 roast beef sandwiches, and 1586 Subway Club sandwiches. Find the total number of sandwiches sold.

$$602 + 935 + 1328 + 757 + 1586 = 5208 \text{ sandwiches}$$



1. 5208 sandwiches

- 2. COMPETITIVE CYCLIST TRAINING** During a week of training, Rob Andrews rode his road bicycle 80 miles on Monday, 75 miles on Tuesday, 135 miles on Wednesday, 40 miles on Thursday, and 52 miles on Friday. How many miles did he ride?

$$\text{Total miles traveled} = 80 + 75 + 135 + 40 + 52 = 382 \text{ miles}$$

2. 382 miles

- 3. MILES DRIVEN** The Federal Highway Commission estimates that the total number of miles driven increased from about 1 trillion miles in 1970 to a little over 3 trillion miles this year. Estimate the increase.

3. \_\_\_\_\_



4. **CARBON DIOXIDE** The amount of carbon dioxide in the atmosphere has increased from 328 parts per million in 1970 to 405 parts per million today. Find the increase.



4. \_\_\_\_\_

5. **CAR EMISSIONS** A typical passenger vehicle emits about 4.7 metric tons of carbon dioxide per year. Assuming there are 253 million cars and trucks in the U.S., estimate the total emitted weight of carbon dioxide per year in the U.S.

5. \_\_\_\_\_

For fun, this is about the weight of 175,000,000 elephants emitted every year.

6. **TOTAL WORLD WAR II VETERANS** According to the Department of Veterans Affairs, there are about 850,000 U.S. World War II veterans alive today. If only 1 in 19 is still alive, estimate the total number who were World War II veterans.



6. \_\_\_\_\_

7. **FISHING BOAT** A fishing boat weighs 8375 pounds. If its 762-pound engine is removed and replaced with a 976-pound engine, find the weight of the boat after the engine change.

7. \_\_\_\_\_

8. **COLLEGE TEXTBOOKS** Tatum Palmer needs to buy three textbooks this semester and shops first at her college bookstore. The cost of new books are: \$195, \$180, and \$205. The cost of used books are: \$85, \$62, and \$92. Find the savings if she buys all three books used.

8. \_\_\_\_\_

9. **NOTEBOOK** The price of a mini notebook was lowered from \$499 to \$435. Find the decrease in price.



9. \_\_\_\_\_

10. **WEIGHING FREIGHT** A truck weighs 9250 pounds when empty. After being loaded with firewood, the truck weighs 21,375 pounds. What is the weight of the firewood?

10. \_\_\_\_\_

11. **LAND AREA** There are 43,560 square feet in 1 acre. How many square feet are there in 140 acres?

11. \_\_\_\_\_

12. **CHECK PROCESSING** One bank processes about 3000 checks every day. Find the number of checks processed in a year. (Use a 365-day year.)

12. \_\_\_\_\_

13. **HOTEL ROOM COSTS** In a recent study of hotel casinos, the cost per night at Harrah's Reno was \$75, while the cost at Harrah's Lake Tahoe was \$225 per night. Find the amount saved on a seven-night stay at Harrah's Reno instead of staying at Harrah's Lake Tahoe.

13. \_\_\_\_\_

14. **LUXURY HOTELS** A luxury hotel room at the Ritz-Carlton in Los Angeles costs \$645 per night, while a nearby room at a Motel 6 costs \$74 per night. What amount will be saved in a four-night stay at Motel 6 instead of staying at the Ritz-Carlton?

14. \_\_\_\_\_

15. **PHYSICALLY IMPAIRED** The Enabling Supply House purchased 6 wheelchairs at \$1256 each and 15 speech compression disc players at \$895 each. Find the total cost.

15. \_\_\_\_\_



- C// 16. KITCHEN EQUIPMENT** Find the total cost if Subway buys 32 baking ovens at \$1538 each and 28 warming ovens at \$887 each.
- 17. YOUTH SOCCER** A youth soccer association raised \$7588 through fund-raising projects. There were expenses of \$838 that had to be paid first, and the remaining money was divided evenly among the 18 teams. How much did each team receive?
- 18. YARD MAINTENANCE** Doug Smith hires a crew of three men to mow yards. His total costs of wages, taxes, expenses, and the costs of equipment and truck is about \$98 per hour. He charges an average of \$60 per yard and his crew can mow and edge two yards per hour. Find his profit for a week in which his crews worked 35 hours.
- 19. THEATER RENOVATION** A theater owner is remodeling to provide enough seating for 1250 people. The main floor has 30 rows of 25 seats in each row. If the balcony has 25 rows, how many seats must be in each row of the balcony to satisfy the owner's seating requirements?
- 20. CALL CENTER** Beverly Stratton was hired to manage a call center for a market research firm that makes calls asking about consumer preferences. She anticipates about 82 outgoing calls per hour, 40 hours per week, 5 days a week, 50 weeks a year. Estimate the total number of calls per year. Also estimate the minimum number of call center operators needed if each can make about 17,000 calls a year. Round up to the next larger whole number.

16. \_\_\_\_\_

17. \_\_\_\_\_

18. \_\_\_\_\_

19. \_\_\_\_\_

20. \_\_\_\_\_

#### QUICK CHECK ANSWERS

- |  |                                  |
|--|----------------------------------|
| 1. \$3320                                  | 4. \$5590                        |
| 2. 28,000; 28,330 visitors                 | 5. 890 calories; 40 grams of fat |
| 3. 42,935 cubic meters per person per year |                                  |

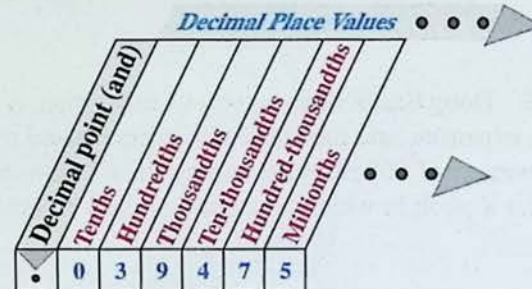


## 1.3 Decimal Numbers

## OBJECTIVES

- 1 Read and write decimal numbers.
- 2 Round decimal numbers.

**OBJECTIVE 1** Read and write decimal numbers. A **decimal number** is any number written with a decimal point, such as 6.8, 5.375, or \$7.50. Decimals, like fractions, can be used to represent parts of a whole. **Section 1.1** discussed how to read the digits to the *left* of the decimal point (whole numbers). Now we will see how to read the digits to the right of the decimal point, which always end in “th” or “ths.”



Read the decimal number .039475 as “39475 millionths,” where millionths comes from the fact that the last digit of this number falls in the millionths place. Write this number using words as follows.

**thirty-nine thousand, four hundred seventy-five millionths**

When reading a number with digits both to the left and the right of the decimal place, use the word *and* to show the location of the decimal point. Here are some examples.

9.7	nine <b>and</b> seven tenths
11.59	eleven <b>and</b> fifty-nine hundredths
1045.658	one thousand, forty-five <b>and</b> six hundred fifty-eight thousandths
5,600,000.0072	five million, six hundred thousand <b>and</b> seventy-two ten thousandths

**Quick TIP**

Do not use commas to the right of a decimal place.

**Reading Decimal Numbers** **EXAMPLE 1** Write the following decimals in words.

- (a) 19.08      (b) .097      (c) 7648.9713      (d) 3,068,001.7

**SOLUTION**

- (a) nineteen **and** eight hundredths  
 (b) ninety-seven thousandths  
 (c) seven thousand, six hundred forty-eight **and** nine thousand, seven hundred thirteen ten-thousandths  
 (d) three million, sixty-eight thousand, one **and** seven tenths

**Quick TIP**

Use the word “*and*” only to separate the whole number from the fractional (decimal) part.

**QUICK CHECK 1**

Write (a) 0.068 and (b) 4,370.15 in words.

**OBJECTIVE 2** Round decimal numbers. It is important to be able to round decimals. For example, Walgreens sells two candy bars for \$.79, but you want to buy only one candy bar. The price of one bar is  $$.79 \div 2$ , which is \$.395, but you cannot pay part of a cent. So the store rounds the price up to \$.40 for one bar. The steps to round decimal numbers are the same as those used to round whole numbers.

**Rounding Decimals**

- Step 1** Find the **place** to which the number is to be rounded. Draw a vertical line after that place to show that you are cutting off the rest of the digits.
- Step 2** Look at only the first digit to the right of your cut-off line. If the first digit is **5 or more**, **increase** the digit in the place to which you are rounding by 1. Otherwise, do not change the digit in the place to which you are rounding.
- Step 3** **Drop** all digits to the right of the place to which you have rounded.



To round 97.3892 to the nearest tenth, first draw a vertical line to the right of the 3 in the tenths place. The digit to the right of the vertical line is 5 or more, so round the 3 in the tenths position up to 4 and drop all digits to the right.

$$\begin{array}{r} \text{digit to the right of tenths place} \\ \downarrow \\ 97.3|892 \\ \uparrow \\ \text{tenths place} \end{array}$$

97.3892 rounded to the nearest tenth is 97.4.

**Rounding Decimal Numbers** **EXAMPLE 2** Round each as indicated.

(a) 87.562 to the nearest tenth

(b) 3678.5928 to the nearest hundredth

**SOLUTION**

(a) Step 1 Locate the tenths place and put a vertical line immediately to the right.

$$\begin{array}{r} 87.5|62 \\ \uparrow \\ \text{tenths place} \end{array}$$

Step 2 The number to the right of the line is 6, which is in the category of 5 or more. Therefore, round the 5 in the tenths place up to 6.

Step 3 Drop all digits to the right of the tenths place.

**87.562 rounded to the nearest tenth is 87.6.**

(b) Step 1 Locate the hundredths place and put a vertical line to the right.

$$3678.59|28$$

Step 2 The number to the right of the line is 2, or less than 5. Therefore, leave the 9 as it is in the hundredths place.

Step 3 Drop all digits to the right of the hundredths place.

**3678.5928 rounded to the nearest hundredth is 3678.59.**

Rounding 3678.5928 to the nearest tenth would result in 3678.6, and rounding it to the nearest whole number would result in 3679.

**QUICK CHECK 2**

Round 72.8479 to the nearest thousandth.

**Rounding the Same Decimal Number to Different Places** **EXAMPLE 3** Round 24.918 to the nearest (a) hundredth, (b) tenth, and (c) whole number.

**SOLUTION**

(a) 24.918 rounded to the nearest hundredth is 24.92.

(b) 24.918 rounded to the nearest tenth is 24.9.

(c) 24.918 rounded to the nearest whole number is 25.

**Quick TIP**

Always refer back to the original number when rounding.

**QUICK CHECK 3**

Round 518.4464 to the nearest (a) thousandth, (b) hundredth, and (c) tenth.

## 1.3 Exercises // MyLab Math

The shaded sections below contain solutions to help you get a **QUICK START** on the various types of exercises.

Write the following decimals in words. (See Example 1.)

1. .38 thirty-eight hundredths

2. .91 ninety-one hundredths

3. 5.61 five and sixty-one hundredths



4. 6.53 \_\_\_\_\_
5. 7.408 \_\_\_\_\_
6. 1.254 \_\_\_\_\_
7. 37.593 \_\_\_\_\_
8. 20.903 \_\_\_\_\_
9. 4.0062 \_\_\_\_\_
10. 9.0201 \_\_\_\_\_
11. "My answer is right, but the decimal point is in the wrong place." Can this statement ever be correct? Explain. (See Objective 1.)
12. Explain the difference between thousands and thousandths.

Write the following decimals, using numbers.

13. four hundred thirty-eight and four tenths 438.4
14. six hundred five and seven tenths 605.7
15. ninety-seven and sixty-two hundredths \_\_\_\_\_
16. seventy-one and thirty-three hundredths \_\_\_\_\_
17. one and five hundred seventy-three ten-thousandths \_\_\_\_\_
18. nine and three hundred eight ten-thousandths \_\_\_\_\_
19. three and five thousand eight hundred twenty-seven ten-thousandths \_\_\_\_\_
20. two thousand seventy-four ten-thousandths \_\_\_\_\_

**GROCERY SHOPPING** Alan Zagorin is grocery shopping. The store will round the amount he pays for each item to the nearest cent. Write the rounded amounts. (See Examples 2–4.)

- |   |  |
|---|--|
| <p>21. Apple pies are two for \$11.99. So one pie is \$5.995. Zagorin pays _____.</p> <p>23. Muffin mix is three packages for \$1.75. So one package is \$.58333. Zagorin pays _____.</p> <p>25. Barbeque sauce is three bottles for \$11.98. So one bottle is \$3.993. Zagorin pays _____.</p> | <p>22. Four 12-packs of soda cost \$69.94 or \$17.485 per 12-pack. Zagorin pays _____.</p> <p>24. Small candy bars are six for \$3.94. So one bar is \$.65666. Zagorin pays _____.</p> <p>26. Tony's Pizzas are five for \$37.46. So one pizza is \$7.492. Zagorin pays _____.</p> |
|---|--|



Round each of the decimals to the nearest tenth, the nearest hundredth, and the nearest thousandth. Remember to use the original number each time before rounding. (See Examples 2–4.)

	Nearest Tenth	Nearest Hundredth	Nearest Thousandth
27. 3.5218	<u>3.5</u>	<u>3.52</u>	<u>3.522</u>
28. 4.836	<u>4.8</u>	<u>4.84</u>	<u>4.836</u>
29. 2.54836	_____	_____	_____
30. 7.44652	_____	_____	_____
31. 27.32451	_____	_____	_____
32. 89.53796	_____	_____	_____



Nearest Tenth      Nearest Hundredth      Nearest Thousandth

- |              |       |       |       |
|--------------|-------|-------|-------|
| 33. 36.47249 | _____ | _____ | _____ |
| 34. 58.95651 | _____ | _____ | _____ |
| 35. .0562    | _____ | _____ | _____ |
| 36. .0789    | _____ | _____ | _____ |

Round each of the dollar amounts to the nearest cent.

- |                           |                             |                        |
|---------------------------|-----------------------------|------------------------|
| 37. \$5.056 <b>\$5.06</b> | 38. \$16.519 <b>\$16.52</b> | 39. \$32.493 _____     |
| 40. \$375.003 _____       | 41. \$382.005 _____         | 42. \$12,802.965 _____ |
| 43. \$42.137 _____        | 44. \$.846 _____            | 45. \$.0015 _____      |
| 46. \$.008 _____          | 47. \$1.5002 _____          | 48. \$7.6009 _____     |
| 49. \$1.995 _____         | 50. \$28.994 _____          | 51. \$752.798 _____    |

Round each of the dollar amounts to the nearest dollar (nearest whole number).

- |                       |                         |                       |
|-----------------------|-------------------------|-----------------------|
| 52. \$8.58 <b>\$9</b> | 53. \$26.49 <b>\$26</b> | 54. \$.57 _____       |
| 55. \$.49 _____       | 56. \$299.76 _____      | 57. \$12,836.38 _____ |
| 58. \$268.72 _____    | 59. \$395.18 _____      | 60. \$666.66 _____    |
| 61. \$4699.62 _____   | 62. \$11,285.13 _____   | 63. \$378.59 _____    |
| 64. \$233.86 _____    | 65. \$722.38 _____      | 66. \$8263.47 _____   |

67. Explain what happens when you round \$.499 to the nearest dollar. (See Objective 2.)

68. Review Exercise 67. How else could you round \$.499 to obtain a result that is more helpful? What kind of guideline does this suggest about rounding to the nearest dollar?

#### QUICK CHECK ANSWERS

- |   |  |
|---|--|
| <p>1. (a) sixty-eight thousandths, (b) four thousand, three hundred seventy and fifteen hundredths</p> <p>2. 72.848</p> | <p>3. (a) 518.446<br/>(b) 518.45<br/>(c) 518.4</p> |
|---|--|



## 1.4 Addition and Subtraction of Decimals

## OBJECTIVES

- 1 Add decimals.
- 2 Estimate answers.
- 3 Subtract decimals.

**CASE IN POINT** // As manager of a Subway, Jessica Fernandez is responsible for making bank deposits. These banking activities require the ability to accurately add and subtract decimal numbers.

**OBJECTIVE 1** Add decimals. To add, write the numbers so that the decimal points are aligned, which causes the place values to be aligned. As with adding whole numbers, add decimal numbers in columns, beginning on the right and moving to the left.

You may wish to add **trailing zeros** to the right of the decimal point so that each number being added has the same number of digits to the right of the decimal point. This does not change the number and can make it easier to keep track of things.

$$45.93 = 45.930 = 45.9300$$

two trailing zeros added

↑

one trailing zero added

**Adding Decimal Numbers** **EXAMPLE 1** // Add  $45.93 + 14.017 + 96.5432$ .

**SOLUTION** //

First, align place values by lining up the decimal points.

$$\begin{array}{r} 45.93 \\ 14.017 \\ \underline{96.5432} \end{array}$$

decimals aligned

Although not required, you can add trailing zeros if you wish so that each number has the same number of digits to the right of the decimal point. Then, add from right to left.

$$\begin{array}{r} 11 \quad 1 \\ 45.9300 \\ 14.0170 \\ \underline{96.5432} \\ 156.4902 \end{array}$$

trailing zeros added

**QUICK CHECK 1**

Add 3.8, 14.604, 5.76, and 27.152.

**OBJECTIVE 2** Estimate answers. Check that the numbers in Example 1 were correctly added by estimating the answer. Apply front-end rounding to the numbers as follows.

Problem	→	Estimate
45.93	→	50
14.017	→	10
+ 96.5432	→	+ 100
<u>156.4902</u>		<u>160</u>

The answer is relatively close to the actual value found of 156.4902 giving confidence that the original decimal numbers were added correctly.

Another option is to round each of the numbers to the nearest whole number and then compare as follows.

Problem	→	Estimate
45.93	→	46
14.017	→	14
+ 96.5432	→	+ 97
<u>156.4902</u>		<u>157</u>

The sum of 156.4902 is very close to the estimate of 157, so it appears the addition was done correctly.







4. Estimate Problem

$$\begin{array}{r} 12.79 \\ 2.15 \\ 16.28 \\ 4.39 \\ + 7.61 \\ \hline \end{array}$$

5. Estimate Problem

$$\begin{array}{r} 2156.38 \\ 5.26 \\ 2.791 \\ + 6.983 \\ \hline \end{array}$$

6. Estimate Problem

$$\begin{array}{r} 1889.76 \\ 21.42 \\ 19.35 \\ + 8.1 \\ \hline \end{array}$$

7. Estimate Problem

$$\begin{array}{r} 6133.78 \\ 506.124 \\ 18.63 \\ + 7.527 \\ \hline \end{array}$$

8. Estimate Problem

$$\begin{array}{r} 743.1 \\ 3817.65 \\ 2.908 \\ 4123.76 \\ + 21.98 \\ \hline \end{array}$$

9. Estimate Problem

$$\begin{array}{r} 1798.419 \\ 68.32 \\ 512.807 \\ 643.9 \\ + 428. \\ \hline \end{array}$$

Place each of the following numbers in a column and then add. (See Example 1.)

10.  $45.631 + 15.8 + 7.234 + 19.63 = 88.295$

11.  $12.15 + 6.83 + 61.75 + 19.218 + 73.325 = 173.273$

12.  $197.4 + 83.72 + 17.43 + 25.63 + 1.4 =$


13.  $27.653 + 18.7142 + 9.7496 + 3.21 =$

14.  $73.618 + 19.18 + 371.82 + 355.125 =$

15. It is a good idea to estimate an answer before actually solving a problem. Why is this true? (See Objective 2.)

16. Explain why placing zeros after any digits to the right of the decimal point does not change the value of a number. (See Objective 1.)

Solve the following application problems.

-  17. **SUBWAY SALES** During a very busy week, daily sales at the Subway managed by Jessica Fernandez were \$1815.79, \$2367.34, \$1976.22, \$2155.81, \$1698.14, \$2885.26, and \$2239.63. Find the total weekly sales.

17. \_\_\_\_\_

18. **RESTAURANT TIPS** Becky Waterton wants to know what her total tips were for the three days she worked as a waitress at a Spanish tapas restaurant. Her tips for Thursday, Friday, and Saturday were \$85.25, \$114.60, and \$129.40. Find the total.



18. \_\_\_\_\_

19. **BEEF/TURKEY COST** At one store, the cost of T-bone steak is \$12.99 per pound, while the cost of turkey is \$1.89 per pound. How much more per pound is the price of T-bone steak than turkey?

19. \_\_\_\_\_

20. **ALIMONY** The average alimony paid to divorced spouses in one area is \$1238.73 per month. However, the court ordered James Tuxon to pay his ex-spouse \$1530 per month. Find the amount he is paying above the average.

20. \_\_\_\_\_



First use front-end rounding to estimate the answer and then subtract. (See Example 3.)

<b>21. Estimate</b>	<b>Problem</b>	<b>22. Estimate</b>	<b>Problem</b>	<b>23. Estimate</b>	<b>Problem</b>
20	19.74	40	35.86		51.215
<u>- 7</u>	<u>- 6.58</u>	<u>- 8</u>	<u>- 7.91</u>		<u>- 19.708</u>
13	13.16	32	27.95		

<b>24. Estimate</b>	<b>Problem</b>	<b>25. Estimate</b>	<b>Problem</b>	<b>26. Estimate</b>	<b>Problem</b>
	27.613		325.053		3974.61
	<u>- 18.942</u>		<u>- 85.019</u>		<u>- 892.59</u>

<b>27. Estimate</b>	<b>Problem</b>	<b>28. Estimate</b>	<b>Problem</b>	<b>29. Estimate</b>	<b>Problem</b>
	7.8		27.8		5
	<u>- 2.952</u>		<u>- 13.582</u>		<u>- 1.9802</u>

**C// CHECKING-ACCOUNT RECORDS** Jessica Fernandez, manager of Subway, had a bank balance of \$5382.12 on March 1. During March, she deposited \$60,375.82 received from sales, \$3280.18 received as credits from suppliers, and \$75.53 as a county tax refund. She paid out \$27,282.75 to suppliers, \$4280.83 for rent and utilities, and \$12,252.23 for salaries and miscellaneous. Find each of the following.

30. How much did Fernandez deposit in March? 30. \_\_\_\_\_  
 $\$60,375.82$  (sales) +  $\$3280.18$  (credits) +  $\$75.53$  (refund) =  $\$63,731.53$
31. How much did she pay out? 31. \_\_\_\_\_
32. What was her final balance at the end of March? 32. \_\_\_\_\_

#### QUICK CHECK ANSWERS

1. 51.316  
 2. \$5400; \$5570.69  
 3. 25; 21.632





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