


SECTION

1.2

Addition of Whole Numbers

OBJECTIVE A

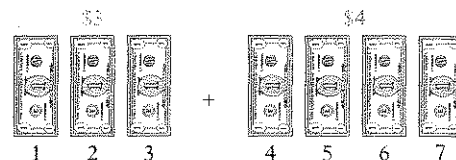
To add whole numbers **Addition** is the process of finding the total of two or more numbers. **Take Note**

The numbers being added are called **addends**. The result is the **sum**.

By counting, we see that the total of \$3 and \$4 is \$7.

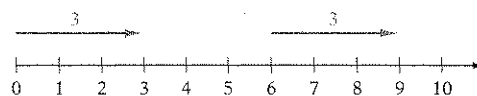
$$\$3 + \$4 = \$7$$

Addend **Addend** **Sum**



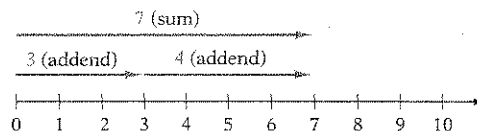
Addition can be illustrated on the number line by using arrows to represent the addends. The size, or magnitude, of a number can be represented on the number line by an arrow.

The number 3 can be represented anywhere on the number line by an arrow that is 3 units in length.

 **Point of Interest**

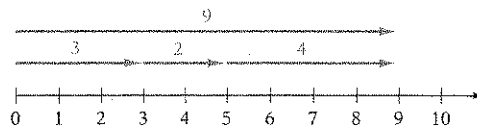
The first use of the plus sign appeared in 1489 in *Mercantile Arithmetic*. It was used to indicate a surplus, not as the symbol for addition. That use did not appear until about 1515.

To add on the number line, place the arrows representing the addends head to tail, with the first arrow starting at zero. The sum is represented by an arrow starting at zero and stopping at the tip of the last arrow.



$$3 + 4 = 7$$

More than two numbers can be added on the number line.



$$3 + 2 + 4 = 9$$

Some special properties of addition that are used frequently are given below.

Addition Property of Zero

Zero added to a number does not change the number.

$$4 + 0 = 4$$

$$0 + 7 = 7$$

Commutative Property of Addition

Two numbers can be added in either order; the sum will be the same.

$$4 + 8 = 8 + 4$$

$$12 = 12$$

 **Take Note**

This is the same addition problem shown on the number line above.

Associative Property of Addition

Grouping the addition in any order gives the same result. The parentheses are grouping symbols and have the meaning "Do the operations inside the parentheses first."

$$\underbrace{(3 + 2)}_5 + 4 = 3 + \underbrace{(2 + 4)}_6$$

$$5 + 4 = 3 + 6$$

$$9 = 9$$

The number line is not useful for adding large numbers. The basic addition facts for adding one digit to one digit should be memorized. Addition of larger numbers requires the repeated use of the basic addition facts.

To add large numbers, begin by arranging the numbers vertically, keeping the digits of the same place value in the same column.

HOW TO 1Add: $321 + 6472$

	THOUSANDS	HUNDREDS	TENS	ONES
	3	2	1	
+ 6	4	7	2	
	6	7	9	3

* Add the digits in each column.

There are several words or phrases in English that indicate the operation of addition. Here are some examples:

added to	3 added to 5	$5 + 3$
more than	7 more than 5	$5 + 7$
the sum of	the sum of 3 and 9	$3 + 9$
increased by	4 increased by 6	$4 + 6$
the total of	the total of 8 and 3	$8 + 3$
plus	5 plus 10	$5 + 10$


Integrating Technology

Most scientific calculators use *algebraic logic*: the add ($+$), subtract ($-$),

multiply (\times), and divide

(\div) keys perform the indicated operation on the number in the display and the next number keyed in. For instance, for the example at the right, enter 24 $+$ 71 $=$. The display reads 95.

HOW TO 2

What is the sum of 24 and 71?

$$\begin{array}{r} 24 \\ + 71 \\ \hline 95 \end{array}$$

* The phrase *the sum of* means to add.

The sum of 24 and 71 is 95.

When the sum of the digits in a column exceeds 9, the addition will involve **carrying**.

HOW TO 3Add: $487 + 369$

	HUNDREDS	TENS	ONES
	4	8	7
+ 3	6	9	
	7	6	6

* Add the ones column.
 $7 + 9 = 16$ (1 ten + 6 ones).
 Write the 6 in the ones column and carry the 1 ten to the tens column.

	1	1	4	8	7
			3	6	9
	5	6			

* Add the tens column.
 $1 + 8 + 6 = 15$ (1 hundred + 5 tens).
 Write the 5 in the tens column and carry the 1 hundred to the hundreds column.

	1	1	4	8	7
			3	6	9
	8	5			

* Add the hundreds column.
 $1 + 4 + 3 = 8$ (8 hundreds).
 Write the 8 in the hundreds column.

EXAMPLE 1

Find the total of 17, 103, and 8.

Solution

$$\begin{array}{r} 17 \\ 103 \\ + 8 \\ \hline 128 \end{array}$$

• $7 + 3 + 8 = 18$

Write the 8 in the ones column. Carry the 1 to the tens column.

YOU TRY IT 1

What is 347 increased by 12,453?

Your solution**EXAMPLE 2**Add: $89 + 36 + 98$ **Solution**

$$\begin{array}{r} 89 \\ 36 \\ + 98 \\ \hline 223 \end{array}$$

• $9 + 6 + 8 = 23$

Write the 3 in the ones column. Carry the 2 to the tens column.

YOU TRY IT 2Add: $95 + 88 + 67$ **Your solution****EXAMPLE 3**Add: $41,395$
 $4,327$
 $497,625$
 $+ 32,991$ **Solution**

$$\begin{array}{r} 11221 \\ 41,395 \\ 4,327 \\ 497,625 \\ + 32,991 \\ \hline 576,338 \end{array}$$

YOU TRY IT 3Add: 392
 $4,079$
 $89,035$
 $+ 4,992$ **Your solution**

Solutions on p. S1

**Integrating Technology**

This example illustrates that estimation is important when one is using a calculator.

ESTIMATION**Estimation and Calculators**

At some places in the text, you will be asked to use your calculator. Effective use of a calculator requires that you estimate the answer to the problem. This helps ensure that you have entered the numbers correctly and pressed the correct keys.

For example, if you use your calculator to find $22,347 + 5896$ and the answer in the calculator's display is 131,757,912, you should realize that you have entered some part of the calculation incorrectly. In this case, you pressed \times instead of $+$. By estimating the answer to a problem, you can help ensure the accuracy of your calculations. We have a special symbol for **approximately equal to** (\approx).

For example, to estimate the answer to $22,347 + 5896$, round each number to the same place value. In this case, we will round to the nearest thousand. Then add.

$$\begin{array}{r} 22,347 \approx 22,000 \\ + 5,896 \approx + 6,000 \\ \hline 28,000 \end{array}$$

The sum $22,347 + 5896$ is approximately 28,000. Knowing this, you would know that 131,757,912 is much too large and is therefore incorrect.

To estimate the sum of two numbers, first round each whole number to the same place value and then add. Compare this answer with the calculator's answer.

OBJECTIVE B**To solve application problems**

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To solve an application problem, first read the problem carefully. The **strategy** involves identifying the quantity to be found and planning the steps that are necessary to find that quantity. The **solution of an application problem** involves performing each operation stated in the strategy and writing the answer.

HOW TO 4

The table below displays the Wal-Mart store count and square footage in the United States as reported in the Wal-Mart 2008 Annual Report.

	Discount Stores	Supercenters	Sam's Clubs	Neighborhood Markets
<i>Number of Units</i>	941	2523	593	134
<i>Square footage (in millions)</i>	105	457	78	5



Find the total number of Wal-Mart discount stores and Supercenters in the United States.

Strategy To find the total number of Wal-Mart discount stores and Supercenters in the United States, read the table to find the number of each type of store in the United States. Then add the numbers.

Solution

$$\begin{array}{r} 941 \\ + 2523 \\ \hline 3464 \end{array}$$

Wal-Mart has a total of 3464 discount stores and Supercenters in the United States.

EXAMPLE 4

Use the table above to find the total number of Sam's Clubs and neighborhood markets that Wal-Mart has in the United States.

Strategy

To determine the total number of Sam's Clubs and neighborhood markets, read the table to find the number of Sam's Clubs and the number of neighborhood markets. Then add the two numbers.

Solution

$$\begin{array}{r} 593 \\ + 134 \\ \hline 727 \end{array}$$

Wal-Mart has a total of 727 Sam's Clubs and neighborhood markets.

YOU TRY IT!

Use the table above to determine the total square footage of Wal-Mart stores in the United States.

Your strategy**Your solution**

1.2 EXERCISES

OBJECTIVE A To add whole numbers

For Exercises 1 to 32, add.

$$\begin{array}{r} 1. \quad 17 \\ + 11 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 25 \\ + 63 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 83 \\ + 42 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 63 \\ + 94 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 77 \\ + 25 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 63 \\ + 49 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 56 \\ + 98 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 86 \\ + 68 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 658 \\ + 831 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 842 \\ + 936 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 735 \\ + 93 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 189 \\ + 50 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 859 \\ + 725 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 637 \\ + 829 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 470 \\ + 749 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 427 \\ + 690 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 36,925 \\ + 65,392 \\ \hline \end{array}$$

$$\begin{array}{r} 18. \quad 56,772 \\ + 51,239 \\ \hline \end{array}$$

$$\begin{array}{r} 19. \quad 50,873 \\ + 28,453 \\ \hline \end{array}$$

$$\begin{array}{r} 20. \quad 34,872 \\ + 46,079 \\ \hline \end{array}$$

$$\begin{array}{r} 21. \quad 878 \\ 737 \\ + 189 \\ \hline \end{array}$$

$$\begin{array}{r} 22. \quad 768 \\ 461 \\ + 669 \\ \hline \end{array}$$

$$\begin{array}{r} 23. \quad 319 \\ 348 \\ + 912 \\ \hline \end{array}$$

$$\begin{array}{r} 24. \quad 292 \\ 579 \\ + 315 \\ \hline \end{array}$$

$$\begin{array}{r} 25. \quad 9409 \\ 3253 \\ + 7078 \\ \hline \end{array}$$

$$\begin{array}{r} 26. \quad 8188 \\ 8020 \\ + 7104 \\ \hline \end{array}$$

$$\begin{array}{r} 27. \quad 2038 \\ 2243 \\ + 3139 \\ \hline \end{array}$$

$$\begin{array}{r} 28. \quad 4252 \\ 6882 \\ + 5235 \\ \hline \end{array}$$

$$\begin{array}{r} 29. \quad 67,428 \\ 32,171 \\ + 20,971 \\ \hline \end{array}$$

$$\begin{array}{r} 30. \quad 52,801 \\ 11,664 \\ + 89,638 \\ \hline \end{array}$$

$$\begin{array}{r} 31. \quad 76,290 \\ 43,761 \\ + 87,402 \\ \hline \end{array}$$

$$\begin{array}{r} 32. \quad 43,901 \\ 98,301 \\ + 67,943 \\ \hline \end{array}$$

For Exercises 33 to 40, add.

33. $20,958 + 3218 + 42$

34. $80,973 + 5168 + 29$

35. $392 + 37 + 10,924 + 621$

36. $694 + 62 + 70,129 + 217$

37. $294 + 1029 + 7935 + 65$

38. $692 + 2107 + 3196 + 92$

39. $97 + 7234 + 69,532 + 276$

40. $87 + 1698 + 27,317 + 727$

41. What is 9874 plus 4509?

42. What is 7988 plus 5678?

43. What is 3487 increased by 5986?

44. What is 99,567 increased by 126,863?

45. What is 23,569 more than 9678?

46. What is 7894 more than 45,872?

47. What is 479 added to 4579?


48. What is 23,902 added to 23,885?

49. Find the total of 659, 55, and 1278.

50. Find the total of 4561, 56, and 2309.

51. Find the sum of 34, 329, 8, and 67,892.

52. Find the sum of 45, 1289, 7, and 32,876.


 For Exercises 53 to 56, use a calculator to add. Then round the numbers to the nearest hundred, and use estimation to determine whether the sum is reasonable.

53. $1234 + 9780 + 6740$

54. $919 + 3642 + 8796$

55. $241 + 569 + 390 + 1672$

56. $107 + 984 + 1035 + 2904$

 For Exercises 57 to 60, use a calculator to add. Then round the numbers to the nearest thousand, and use estimation to determine whether the sum is reasonable.

$$\begin{array}{r} 57. \quad 32,461 \\ \quad 9,844 \\ + 59,407 \\ \hline \end{array}$$

$$\begin{array}{r} 58. \quad 29,036 \\ \quad 22,904 \\ + 7,903 \\ \hline \end{array}$$

$$\begin{array}{r} 59. \quad 25,432 \\ \quad 62,941 \\ + 70,390 \\ \hline \end{array}$$

$$\begin{array}{r} 60. \quad 66,541 \\ \quad 29,365 \\ + 98,742 \\ \hline \end{array}$$



For Exercises 61 to 64, use a calculator to add. Then round the numbers to the nearest ten-thousand, and use estimation to determine whether the sum is reasonable.

$$\begin{array}{r} 61. \quad 67,421 \\ \quad 82,984 \\ \quad 66,361 \\ \quad 10,792 \\ \quad + 34,037 \\ \hline \end{array}$$

$$\begin{array}{r} 62. \quad 21,896 \\ \quad 4,235 \\ \quad 62,544 \\ \quad 21,892 \\ \quad + 1,334 \\ \hline \end{array}$$

$$\begin{array}{r} 63. \quad 281,421 \\ \quad 9,874 \\ \quad 34,394 \\ \quad 526,398 \\ \quad + 94,631 \\ \hline \end{array}$$

$$\begin{array}{r} 64. \quad 542,698 \\ \quad 97,327 \\ \quad 7,235 \\ \quad 73,667 \\ \quad + 173,201 \\ \hline \end{array}$$



65. Which property of addition (see page 8) allows you to use either arrangement shown at the right to find the sum of 691 and 452?

$$\begin{array}{r} 691 \\ + 452 \\ \hline \end{array} \quad \begin{array}{r} 452 \\ + 691 \\ \hline \end{array}$$

OBJECTIVE B To solve application problems



66. Use the table of Wal-Mart data on page 11. What does the sum $105 + 457$ represent?



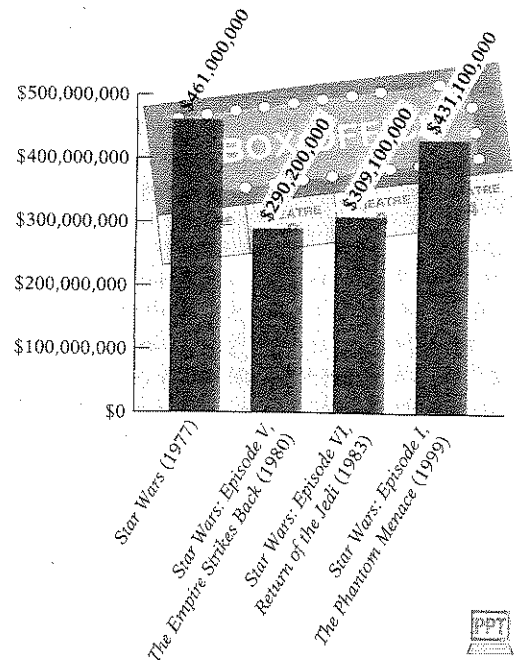
67. **Demographics** In a recent year, according to the U.S. Department of Health and Human Services, there were 110,670 twin births in this country, 6919 triplet births, 627 quadruplet deliveries, and 79 quintuplet and other higher-order multiple births. Find the total number of multiple births during the year.



68. **Demographics** The Census Bureau estimates that the U.S. population will grow by 296 million people from 2000 to 2100. Given that the U.S. population in 2000 was 281 million, find the Census Bureau's estimate of the U.S. population in 2100.



The Film Industry The graph at the right shows the domestic box-office income from the first four *Star Wars* movies. Use this information for Exercises 69 to 71.



69. Estimate the total income from the first four *Star Wars* movies.

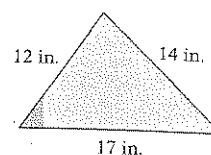
70. Find the total income from the first four *Star Wars* movies.

71. a. Find the total income from the two movies with the lowest box-office incomes.
 b. Does the total income from the two movies with the lowest box-office incomes exceed the income from the 1977 *Star Wars* production?

Source: www.worldwideboxoffice.com



72. **Geometry** The perimeter of a triangle is the sum of the lengths of the three sides of the triangle. Find the perimeter of a triangle that has sides that measure 12 inches, 14 inches, and 17 inches.



73. **Travel** The odometer on a moving van reads 68,692. The driver plans to drive 515 miles the first day, 492 miles the second day, and 278 miles the third day.
- How many miles will be driven during the three days?
 - What will the odometer reading be at the end of the trip?

74. **Internet** Thirty-one million U.S. households do not have Internet access. Eighty-three million U.S. households do have Internet access. How many households are there in the United States? (Source: U.S. Bureau of the Census)

75. **Trail** Although 685 miles of the Northern Forest Canoe Trail can be paddled, there are another 55 miles of land over which a canoe must be carried. Find the total length of the Northern Forest Canoe Trail. (Source: *Yankee*, May/June 2007)



Image courtesy of Northern Forest Canoe Trail/www.northernforestcanoe.com

Northern Forest
Canoe Trail

76. **Energy** In a recent year, the United States produced 5,102,000 barrels of crude oil per day and imported 10,118,000 barrels of crude oil per day. Find the total number of barrels of crude oil produced and imported per day in the United States. (Source: Energy Information Administration)

Applying the Concepts

77. If you roll two ordinary six-sided dice and add the two numbers that appear on top, how many different sums are possible?



78. If you add two *different* whole numbers, is the sum always greater than either one of the numbers? If not, give an example.

79. If you add two whole numbers, is the sum always greater than either one of the numbers? If not, give an example. (Compare this with the previous exercise.)

80. Make up a word problem for which the answer is the sum of 34 and 28.

81. Call a number "lucky" if it ends in a 7. How many lucky numbers are less than 100?