Addition and Subtraction of Whole Numbers: Addition of Whole Numbers*

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Abstract

This module is from Fundamentals of Mathematics by Denny Burzynski and Wade Ellis, Jr. This module discusses how to add whole numbers. By the end of this module, students should be able to understand the addition process, add whole numbers, and use the calculator to add one whole number to another.

1 Section Overview

- Addition
- Addition Visualized on the Number Line
- The Addition Process
- Addition Involving Carrying
- Calculators

2 Addition

Suppose we have two collections of objects that we combine together to form a third collection. For example,



We are combining a collection of four objects with a collection of three objects to obtain a collection of seven objects.

Addition

The process of combining two or more objects (real or intuitive) to form a third, the total, is called **addition**. In addition, the numbers being added are called **addends** or **terms**, and the total is called the **sum**.

The **plus symbol** (+) is used to indicate addition, and the **equal symbol** (=) is used to represent the word "equal." For example, 4 + 3 = 7 means "four added to three equals seven."

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3 Addition Visualized on the Number Line

Addition is easily visualized on the number line. Let's visualize the addition of 4 and 3 using the number line.

To find 4+3,

- 1. Start at 0.
- 2. Move to the right 4 units. We are now located at 4.
- 3. From 4, move to the right 3 units. We are now located at 7.

Thus, 4 + 3 = 7.



4 The Addition Process

We'll study the process of addition by considering the sum of 25 and 43.

$$\frac{2 \text{ tens } + 5 \text{ ones}}{4 \text{ tens } + 3 \text{ ones}}$$
means

25 + 43

We write this as 68.

We can suggest the following procedure for adding whole numbers using this example.

Example 1: The Process of Adding Whole Numbers

To add whole numbers,

The process:

1. Write the numbers vertically, placing corresponding positions in the same column.

25 + 43

- 2. Add the digits in each column. Start at the right (in the ones position) and move to the left, placing the sum at the bottom.
 - $\frac{25}{\pm 43}$ $\frac{68}{5}$

CAUTION: Confusion and incorrect sums can occur when the numbers are *not aligned* in columns properly. Avoid writing such additions as

25 +43 25 +43

4.1 Sample Set A

Example 2

Add 276 and	103.
276	6 + 3 = 9
+103	7 + 0 = 7
379	2 + 1 = 3

Example 3

Add 1459 and 130 $\begin{array}{r} 9+0=9 \\ 1459 \\ \underline{+130} \\ 1589 \end{array} \begin{array}{c} 9+130 \\ 4+1=5 \\ 1+0=1 \end{array}$

In each of these examples, each individual sum does not exceed 9. We will examine individual sums that exceed 9 in the next section.

4.2 Practice Set A

Perform each addition. Show the expanded form in problems 1 and 2.

Exercise 1	(Solution on p. 17.)
Add 63 and 25.	
Exercise 2 Add 4,026 and 1,501.	(Solution on p. 17.)
Exercise 3 Add 231,045 and 36,121.	(Solution on p. 17.)

5 Addition Involving Carrying

It often happens in addition that the sum of the digits in a column will exceed 9. This happens when we add 18 and 34. We show this in expanded form as follows.

This sum exceeds 9.

$$18 = 1 \text{ ten} + 8 \text{ ones} \qquad 12 \text{ ones}$$

$$+34 = 3 \text{ tens} + 4 \text{ ones}$$

$$4 \text{ tens} + 12 \text{ ones} = 4 \text{ tens} + 1 \text{ ten} + 2 \text{ ones}$$

$$= 5 \text{ tens} + 2 \text{ ones}$$

$$= 52$$

Notice that when we add the 8 ones to the 4 ones we get 12 ones. We then convert the 12 ones to 1 ten and 2 ones. In vertical addition, we show this conversion by **carrying** the ten to the tens column. We write a 1 at the top of the tens column to indicate the carry. This same example is shown in a shorter form as follows: $\frac{1}{1}$

18 <u>+34</u>

52 8 + 4 = 12 Write 2, carry 1 ten to the top of the next column to the left.

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5.1 Sample Set B

Perform the following additions. Use the process of carrying when needed.

Example 4	
Add 1875 and 358.	
1975	
1075	
$\frac{+ 300}{2233}$	
5+8=13	Write 3. carry 1 ten.
1 + 7 + 5 = 13	Write 3. carry 1 hundred.
1 + 8 + 3 = 12	Write 2, carry 1 thousand.
1 + 1 = 2	, ,
The sum is 2233 .	
Example 5	
Add 89,208 and 4,946.	
11 1	
89,208	
+ 4,940	
94,104	
8 + 6 = 14	Write 4, carry 1 ten.
1 + 0 + 4 = 5	Write the 5 (nothing to carry).
2 + 9 = 11	Write 1, carry one thousand.
1 + 9 + 4 = 14	Write 4, carry one ten thousand.
1 + 8 = 9	
The sum is $94,154$.	
Example 6	
Add 38 and 95. 11	
38	
+ 95	
133	
8 + 5 = 13	Write 3, carry 1 ten.
1 + 3 + 9 = 13	Write 3, carry 1 hundred.
1 + 0 = 1	

As you proceed with the addition, it is a good idea to keep in mind what is actually happening.

38	means		3	tens		+	8 ones
+95		-	+ 9	tens		+	5 ones
		-	12	tens		+1	3 ones
		=	12	tens	+ 1 ten	+	3 ones
		=	13	tens		+	3 ones
		= 1 hundred -	+ 3	tens		+	3 ones
		= 133					

The sum is 133.

Example 7

Find the sum 2648, 1359, and 861.

$ \begin{array}{r} 111 \\ 2648 \\ 1359 \\ + 861 \\ \overline{4868} \end{array} $	
8 + 9 + 1 = 18	Write 8, carry 1 ten.
1 + 4 + 5 + 6 = 16	Write 6, carry 1 hundred.
1 + 6 + 3 + 8 = 18	Write 8, carry 1 thousand.
1 + 2 + 1 = 4	
The sum is 4,868.	

Numbers other than 1 can be carried as illustrated in Example 8.

Example 8

Find the sum of the following numbers.

	0
132 1	
878016	
9905	
38951	
+ 56817	
983689	
6 + 5 + 1 + 7 = 19	Write 9, carry the 1.
1 + 1 + 0 + 5 + 1 = 8	Write 8.
0 + 9 + 9 + 8 = 26	Write 6, carry the 2.
2 + 8 + 9 + 8 + 6 = 33	Write 3, carry the 3.
3 + 7 + 3 + 5 = 18	Write 8, carry the 1.
1 + 8 = 9	Write 9.
The sum is 983,689.	

Example 9

The number of students enrolled at Riemann College in the years 1984, 1985, 1986, and 1987 was 10,406, 9,289, 10,108, and 11,412, respectively. What was the total number of students enrolled at Riemann College in the years 1985, 1986, and 1987?

We can determine the total number of students enrolled by adding 9,289, 10,108, and 11,412, the number of students enrolled in the years 1985, 1986, and 1987.

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 $\begin{array}{r}1 & 11 \\
9,289 \\
10,108 \\
\underline{+11,412} \\
30,809
\end{array}$

The total number of students enrolled at Riemann College in the years 1985, 1986, and 1987 was 30,809.

5.2 Practice Set B

Perform each addition. For the next three problems, show the expanded form.

Exercise 4 Add 58 and 29.	(Solution on p. 17.)
Exercise 5 Add 476 and 85.	(Solution on p. 17.)
Exercise 6 Add 27 and 88.	(Solution on p. 17.)
Exercise 7 Add 67,898 and 85,627.	(Solution on p. 17.)
For the next three problems, find the sums.	
Exercise 8	(Solution on p. 17.)
57	
26	
84	
Exercise 9	(Solution on p. 18.)
847	
825	
796	
Exercise 10	(Solution on p. 18.)
16,945	
8,472	
387,721	
21,059	
629	

6 Calculators

Calculators provide a very simple and quick way to find sums of whole numbers. For the two problems in Sample Set C, assume the use of a calculator that does not require the use of an ENTER key (such as many Hewlett-Packard calculators).

6.1 Sample Set C

Use a calculator to find each sum.

Example 10

34 + 21		Display Reads
Type	34	34
\mathbf{Press}	+	34
Type	21	21
Press	=	55

Table 1

The sum is 55.

Example 11

106 + 8	85 + 322 + 406	Display Reads	
Type	106	106	The calculator keeps a running subtotal
Press	+	106	
Type	85	85	
Press	=	191	$\leftarrow 106 + 85$
Type	322	322	
Press	+	513	$\leftarrow 191 + 322$
Type	406	406	
Press	=	919	$\leftarrow 513 + 406$

Table 2

The sum is 919.

6.2 Practice Set C

Use a calculator to find the following sums.

Exercise 11 62 + 81 + 12	(Solution on p. 18.)
Exercise 12 9,261+8,543+884+1,062	(Solution on p. 18.)
Exercise 13 10,221 + 9,016 + 11,445	(Solution on p. 18.)

7 Exercises

For the following problems, perform the additions. If you can, check each sum with a calculator.

Exercise 14 14+5	(Solution on p. 1	18.)
Exercise 15 12+7		
Exercise 16 46 + 2	(Solution on p. 1	18.)
Exercise 17 83 + 16		
Exercise 18 77 + 21	(Solution on p. 1	18.)
Exercise 19 321		
+ 42		
Exercise 20	(Solution on p. 2	18.)
916		
+ 62		
Exercise 21		
104		
+561		
Exercise 22	(Solution on p. 1	18.)
102		
± 105 Evercise 23		
552 + 237		
Exercise 24 8,521 + 4,256	(Solution on p. 1	18.)
Exercise 25		
16,408		
$\frac{+ 3,101}{- 3,22}$		
Exercise 26	(Solution on p. 1	18.)
10,010		
$\frac{+42,223}{\text{Exoreiso } 27}$		
616,702+101,161		
Exercise 28	(Solution on p. 2	18.)
43, 156, 219 + 2, 013, 520		
Exercise 29		
Exercise 30	(Solution on p	18.)
25+8	(coractor on p.)	

Exercise 31 84

(Solution	on	1

+ 7	
Exercise 32	(Solution on p. 18.)
75	
+ 6	
Exercise 33 36 + 48	
Exercise 34 74 + 17	(Solution on p. 18.)
Exercise 35 486 + 58	
Exercise 36 743 + 66	(Solution on p. 18.)
Exercise 37 381 + 88	
Exercise 38	(Solution on p. 18.)
+175	
Exercise 39 931	
<u>+853</u>	
Exercise 40 1,428+893	(Solution on p. 18.)
Exercise 41 12,898 + 11,925	
Exercise 42	(Solution on p. 18.)
631,464	
+509,740	
Exercise 43 805,996	
+ 98,516	
Exercise 44	(Solution on p. 18.)
38,428,106	
+522,936,005	
Exercise 45 $5,288,423,100+16,934,785,995$	
Exercise 46 98,876,678,521,402 + 843,425,685,685,658	(Solution on p. 18.)
Exercise 47	

41 + 61 + 85 + 62

Exercise 48 21 + 85 + 104 + 9 + 15	(Solution on p. 18
Exercise 49	
116	
27	
110	
110	
+ 8	
Exercise 50	(Solution on p. 18
75,206	
4,152	
$\pm 16,007$	
Exercise 51	
8,226	
143	
92,015	
8	
487, 553	
5,218	
Exercise 52	(Solution on p. 18
50,006	
1,005	
100,300	
20,008	
1,000,009	
800, 800	
Exercise 53	
616	
42,018	
1,687	
225	
8,623,418	
12,506,508	
19	
2,121	
105 643	

Exercise 54	(Solution on p. 19.
1,468	
2,183	
Exercise 55	
928,725	
15,685	
Exercise 56	(Solution on p. 19.
82,006	
3,019,528	
Exercise 57	
18,621	
5,059	
Exercise 58	(Solution on p. 19
92	
_ <u>48</u>	
Exercise 59	
16	
_ 37	
Exercise 60	(Solution on p. 19
21	
16	
Exercise 61	
11,172	
22,749	
12,248	
Exercise 62	(Solution on p. 19
240	
280	
210	
_310	
Exercise 63	
9,573	
101,279	
122,581	

Exercise 64	(Solution on p. 19.)
62	

Exercise 65	
+ m	
113	
Exercise 66	(Solution on p. 19.)
432	
+ m	
451	
Exercise 67	
803	
+ m	
830	
Exercise 68	(Solution on p. 19.)
1,893	
+ m	
1,981	
Exercise 69	

The number of nursing and related care facilities in the United States in 1971 was 22,004. In 1978, the number was 18,722. What was the total number of facilities for both 1971 and 1978?

Exercise 70

The number of persons on food stamps in 1975, 1979, and 1980 was 19,179,000, 19,309,000, and 22,023,000, respectively. What was the total number of people on food stamps for the years 1975, 1979, and 1980?

Exercise 71

The enrollment in public and nonpublic schools in the years 1965, 1970, 1975, and 1984 was 54,394,000, 59,899,000, 61,063,000, and 55,122,000, respectively. What was the total enrollment for those years?

Exercise 72

(Solution on p. 19.)

(Solution on p. 19.)

The area of New England is 3,618,770 square miles. The area of the Mountain states is 863,563 square miles. The area of the South Atlantic is 278,926 square miles. The area of the Pacific states is 921,392 square miles. What is the total area of these regions?

Exercise 73

In 1960, the IRS received 1,188,000 corporate income tax returns. In 1965, 1,490,000 returns were received. In 1970, 1,747,000 returns were received. In 1972 —1977, 1,890,000; 1,981,000; 2,043,000; 2,100,000; 2,159,000; and 2,329,000 returns were received, respectively. What was the total number of corporate tax returns received by the IRS during the years 1960, 1965, 1970, 1972 —1977?

Exercise 74

Find the total number of scientists employed in 1974.

(Solution on p. 19.)



EMPLOYMENT STATUS OF MATHEMATICAL

Exercise 75

Find the total number of sales for space vehicle systems for the years 1965-1980.



Exercise 76

Find the total baseball attendance for the years 1960-1980.

(Solution on p. 19.)



Exercise 77





For the following problems, try to add the numbers mentally.



(Solution on p. 19.)



Exercise 88 (Solution on p. 19.) 36 147.1 Exercises for Review Exercise 89 (here¹) Each period of numbers has its own name. From right to left, what is the name of the fourth period? Exercise 90 (Solution on p. 19.) $(here^2)$ In the number 610,467, how many thousands are there? Exercise 91 $(here^3)$ Write 8,840 as you would read it. Exercise 92 (Solution on p. 19.) (here⁴) Round 6,842 to the nearest hundred. Exercise 93 (here⁵) Round 431,046 to the nearest million.

 1 "Addition and Subtraction of Whole Numbers: Whole Numbers" < http://cnx.org/content/m34795/latest/>

²"Addition and Subtraction of Whole Numbers: Whole Numbers" http://cnx.org/content/m34795/latest/

³"Addition and Subtraction of Whole Numbers: Reading and Writing Whole Numbers"

<http://cnx.org/content/m34778/latest/>

⁴"Addition and Subtraction of Whole Numbers: Rounding Whole Numbers" http://cnx.org/content/m34780/latest/ ⁵"Addition and Subtraction of Whole Numbers: Rounding Whole Numbers" http://cnx.org/content/m34780/latest/

Solutions to Exercises in this Module

```
Solution to Exercise (p. 3)
88
       6 \text{ tens} + 3 \text{ ones}
    +2 tens +5 ones
       8 \text{ tens} + 8 \text{ ones}
Solution to Exercise (p. 3)
5,527
        4 thousands + 0 hundreds + 2 tens + 6 ones
     +1 thousand +5 hundreds +0 tens +1 one
        5 \text{ thousands} + 5 \text{ hundreds} + 2 \text{ tens} + 7 \text{ ones}
Solution to Exercise (p. 3)
267,166
Solution to Exercise (p. 6)
87
        5 \text{ tens} + 8 \text{ ones}
     +2 tens + 9 ones
        7 \text{ tens} + 17 \text{ ones}
     = 7 \operatorname{tens} + 1 \operatorname{ten} + 7 \operatorname{ones}
          = 8 \text{ tens} + 7 \text{ ones}
                 = 87
Solution to Exercise (p. 6)
561
       4 \text{ hundreds} + 7 \text{ tens} + 6 \text{ ones}
     +
                       8 \text{ tens} + 5 \text{ ones}
       4 \text{ hundreds} + 15 \text{ tens} + 11 \text{ ones}
          = 4 hundreds + 15 tens + 1 ten + 1 one
                    = 4 hundreds + 16 tens + 1 one
     = 4 hundreds + 1 hundred + 6 tens + 1 one
                     = 5 hundreds + 6 tens + 1 one
                                                   = 561
Solution to Exercise (p. 6)
115
         2 \text{ tens} + 7 \text{ ones}
     + 8 \text{ tens} + 8 \text{ ones}
       10 \text{ tens} + 15 \text{ ones}
       = 10 \text{ tens} + 1 \text{ ten} + 5 \text{ ones}
            = 11 \text{ tens} + 5 \text{ ones}
     = 1 hundred + 1 ten + 5 ones
                    = 115
Solution to Exercise (p. 6)
153,525
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Solution to Exercise (p. 6) 167Solution to Exercise (p. 6) 2,468Solution to Exercise (p. 6) 434,826 Solution to Exercise (p. 7) 155Solution to Exercise (p. 7) 19,750Solution to Exercise (p. 7) 30,682Solution to Exercise (p. 8) 19Solution to Exercise (p. 8) 48Solution to Exercise (p. 8) 98Solution to Exercise (p. 8) 978 Solution to Exercise (p. 8) 368Solution to Exercise (p. 8) 12,777Solution to Exercise (p. 8) 58,738Solution to Exercise (p. 8) 45,169,739 Solution to Exercise (p. 8) 33 Solution to Exercise (p. 9) 81 Solution to Exercise (p. 9) 91Solution to Exercise (p. 9) 809 Solution to Exercise (p. 9) 862 Solution to Exercise (p. 9) 2,321Solution to Exercise (p. 9) 1,141,204 Solution to Exercise (p. 9) 562,364,111 Solution to Exercise (p. 9) 942,302,364,207,060 Solution to Exercise (p. 10) 234Solution to Exercise (p. 10) 95,365

Solution to Exercise (p. 10) 1,972,128 Solution to Exercise (p. 10) 3,700Solution to Exercise (p. 11) 3,101,500Solution to Exercise (p. 11) 100Solution to Exercise (p. 11) 0 Solution to Exercise (p. 11) 1,000Solution to Exercise (p. 11) 5Solution to Exercise (p. 12) 19Solution to Exercise (p. 12) 88 Solution to Exercise (p. 12) 60,511,000 Solution to Exercise (p. 12) 5,682,651 square miles Solution to Exercise (p. 12) 1,190,000 Solution to Exercise (p. 13) 271,564,000 Solution to Exercise (p. 14) 20Solution to Exercise (p. 15) 25Solution to Exercise (p. 15) 40Solution to Exercise (p. 15) 50Solution to Exercise (p. 15) 50Solution to Exercise (p. 16) 50Solution to Exercise (p. 16) 0 Solution to Exercise (p. 16) 6,800