Addition and Subtraction of Whole Numbers: Properties of Addition*

Wade Ellis
Denny Burzynski

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Abstract

This module is from Fundamentals of Mathematics by Denny Burzynski and Wade Ellis, Jr. This module discusses properties of addition. By the end of the module students should be able to understand the commutative and associative properties of addition and understand why 0 is the additive identity.

1 Section Overview

- The Commutative Property of Addition
- The Associative Property of Addition
- The Additive Identity

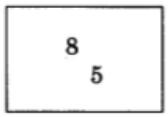
We now consider three simple but very important properties of addition.

2 The Commutative Property of Addition

Commutative Property of Addition
If two whole numbers are added in any order, the sum will not change.

2.1 Sample Set A

Example 1
Add the whole numbers



$8 + 5 = 13$
$5 + 8 = 13$

The numbers 8 and 5 can be added in any order. Regardless of the order they are added, the sum is 13.

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2.2 Practice Set A

Exercise 1 *(Solution on p. 7.)*

Use the commutative property of addition to find the sum of 12 and 41 in two different ways.

12
41

Exercise 2 *(Solution on p. 7.)*

Add the whole numbers

837
1,958

3 The Associative Property of Addition

Associative Property of Addition

If three whole numbers are to be added, the sum will be the same if the first two are added first, then that sum is added to the third, or, the second two are added first, and that sum is added to the first.

Using Parentheses

It is a common mathematical practice to **use parentheses** to show which pair of numbers we wish to combine first.

3.1 Sample Set B

Example 2

Add the whole numbers.

43
16
27

43 and 16 are associated.

$$(43 + 16) + 27 = 59 + 27 = 86.$$
$$43 + (16 + 27) = 43 + 43 = 86.$$

16 and 27 are associated.

3.2 Practice Set B

Exercise 3 *(Solution on p. 7.)*

Use the associative property of addition to add the following whole numbers two different ways.

17
32
25

Exercise 4 *(Solution on p. 7.)*

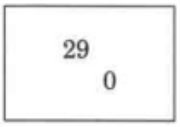
1,629
806
429

4 The Additive Identity

0 Is the Additive Identity
The whole number 0 is called the **additive identity**, since when it is added to any whole number, the sum is identical to that whole number.

4.1 Sample Set C

Example 3
Add the whole numbers.

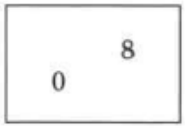


$29 + 0 = 29$
$0 + 29 = 29$
Zero added to 29 does not change the identity of 29.

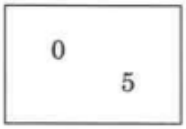
4.2 Practice Set C

Add the following whole numbers.

Exercise 5 *(Solution on p. 7.)*

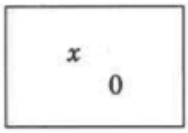


Exercise 6 *(Solution on p. 7.)*

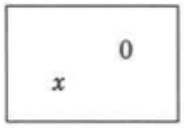


Suppose we let the letter x represent a choice for some whole number. For the first two problems, find the sums. For the third problem, find the sum provided we now know that x represents the whole number 17.

Exercise 7 *(Solution on p. 7.)*



Exercise 8 *(Solution on p. 7.)*



Exercise 9 *(Solution on p. 7.)*

0
x

5 Exercises

For the following problems, add the numbers in two ways.

Exercise 10 *(Solution on p. 7.)*

8
29

Exercise 11

36
12

Exercise 12 *(Solution on p. 7.)*

36
48

Exercise 13

26
117

Exercise 14 *(Solution on p. 7.)*

456
112

Exercise 15

1,096
4,251

Exercise 16 *(Solution on p. 7.)*

73,205
49,118

Exercise 17

265,094	
	32,508

Exercise 18 *(Solution on p. 7.)*

32	
	8
5	

Exercise 19

16	
18	
	14

Exercise 20 *(Solution on p. 7.)*

52	
10	
	38

Exercise 21

84	
	7
36	

Exercise 22 *(Solution on p. 7.)*

114	
17	
	425

Exercise 23

1019	
11	
	586

Exercise 24 *(Solution on p. 7.)*

37,728	
	1,261
4,472	

For the following problems, show that the pairs of quantities yield the same sum.

Exercise 25

$(11 + 27) + 9$ and $11 + (27 + 9)$

Exercise 26 *(Solution on p. 7.)*
$(80 + 52) + 6$ and $80 + (52 + 6)$

Exercise 27
$(114 + 226) + 108$ and $114 + (226 + 108)$

Exercise 28 *(Solution on p. 7.)*
$(731 + 256) + 171$ and $731 + (256 + 171)$

Exercise 29
The fact that (a first number + a second number) + third number = a first number + (a second number + a third number) is an example of the _____ property of addition.

Exercise 30 *(Solution on p. 7.)*
The fact that 0 + any number = that particular number is an example of the _____ property of addition.

Exercise 31
The fact that a first number + a second number = a second number + a first number is an example of the _____ property of addition.

Exercise 32 *(Solution on p. 7.)*
Use the numbers 15 and 8 to illustrate the commutative property of addition.

Exercise 33
Use the numbers 6, 5, and 11 to illustrate the associative property of addition.

Exercise 34 *(Solution on p. 7.)*
The number zero is called the additive identity. Why is the term identity so appropriate?

5.1 Exercises for Review

Exercise 35
() How many hundreds in 46,581?

Exercise 36 *(Solution on p. 7.)*
() Write 2,218 as you would read it.

Exercise 37
() Round 506,207 to the nearest thousand.

Exercise 38 *(Solution on p. 7.)*
() Find the sum of $\begin{array}{r} 482 \\ \underline{+\ \ 68} \end{array}$

Exercise 39
() Find the difference: $\begin{array}{r} 3,318 \\ \underline{-\ \ 429} \end{array}$

Solutions to Exercises in this Module

Solution to Exercise (p. 2)
$12 + 41 = 53$ and $41 + 12 = 53$
Solution to Exercise (p. 2)
$837 + 1,958 = 2,795$ and $1,958 + 837 = 2,795$
Solution to Exercise (p. 2)
$(17 + 32) + 25 = 49 + 25 = 74$ and $17 + (32 + 25) = 17 + 57 = 74$
Solution to Exercise (p. 2)
$(1,629 + 806) + 429 = 2,435 + 429 = 2,864$
$1,629 + (806 + 429) = 1,629 + 1,235 = 2,864$
Solution to Exercise (p. 3)
8
Solution to Exercise (p. 3)
5
Solution to Exercise (p. 3)
x
Solution to Exercise (p. 3)
x
Solution to Exercise (p. 4)
17
Solution to Exercise (p. 4)
37
Solution to Exercise (p. 4)
45
Solution to Exercise (p. 4)
568
Solution to Exercise (p. 4)
122,323
Solution to Exercise (p. 5)
45
Solution to Exercise (p. 5)
100
Solution to Exercise (p. 5)
556
Solution to Exercise (p. 5)
43,461
Solution to Exercise (p. 6)
$132 + 6 = 80 + 58 = 138$
Solution to Exercise (p. 6)
$987 + 171 = 731 + 427 = 1,158$
Solution to Exercise (p. 6)
Identity
Solution to Exercise (p. 6)
$15 + 8 = 8 + 15 = 23$
Solution to Exercise (p. 6)
...because its partner in addition remains identically the same after that addition
Solution to Exercise (p. 6)
Two thousand, two hundred eighteen.
Solution to Exercise (p. 6)
550