Decimals: Addition and Subtraction of Decimals*

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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 and subtract decimals. By the end of the module students should understand the method used for adding and subtracting decimals, be able to add and subtract decimals and be able to use the calculator to add and subtract decimals.

1 Section Overview

- The Logic Behind the Method
- The Method of Adding and Subtracting Decimals
- Calculators

2 The Logic Behind the Method

Consider the sum of 4.37 and 3.22. Changing each decimal to a fraction, we have $4\frac{37}{100} + 3\frac{22}{100}$ Performing the addition, we get

$$\begin{aligned} 4.37 + 3.22 = 4\tfrac{37}{100} + 3\tfrac{22}{100} &= \tfrac{4\cdot 100+37}{100} + \tfrac{3\cdot 100+22}{100} \\ &= \tfrac{437}{100} + \tfrac{322}{100} \\ &= \tfrac{437+322}{100} \\ &= \tfrac{759}{100} \\ &= 7\tfrac{59}{100} \\ &= \text{seven and fifty-nine hundredths} \\ &= 7.59 \end{aligned}$$

Thus, $4.37 + 3.22 = 7.59$.

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3 The Method of Adding and Subtracting Decimals

When writing the previous addition, we could have written the numbers in columns.

$$\begin{array}{r} 4.37 \\ \underline{+3.22} \\ 7.59 \end{array}$$

This agrees with our previous result. From this observation, we can suggest a method for adding and subtracting decimal numbers.

Method of Adding and Subtracting Decimals

To add or subtract decimals:

1. Align the numbers vertically so that the decimal points line up under each other and the corresponding decimal positions are in the same column.
2. Add or subtract the numbers as if they were whole numbers.
3. Place a decimal point in the resulting sum or difference directly under the other decimal points.

3.1 Sample Set A

Find the following sums and differences.

Example 1

$9.813 + 2.140$

$$\begin{array}{r} 9.813 \\ \underline{+2.140} \\ 11.953 \end{array}$$

The decimal points are aligned in the same column.

Example 2

$841.0056 + 47.016 + 19.058$

$$\begin{array}{r} 841.0056 \\ 47.016 \\ \underline{+19.058} \end{array}$$

To insure that the columns align properly, we can write a 0 in the position at the end of the numbers 47.016 and 19.058 without changing their values.

$$\begin{array}{r} {\scriptstyle 11\quad 1} \\ 841.0056 \\ 47.0160 \\ \underline{+19.0580} \\ 907.0796 \end{array}$$

Example 3

$1.314 - 0.58$

$$\begin{array}{r} 1.314 \\ \underline{-0.58} \end{array}$$

Write a 0 in the thousandths position.

$$\begin{array}{r} {\scriptstyle 12} \\ {\scriptstyle 0\ \cancel{2}11} \\ \cancel{1}.\cancel{3}\cancel{1}4 \\ \underline{-0.580} \\ 0.734 \end{array}$$

Example 4

$16.01 - 7.053$

$$\begin{array}{r} 16.01 \\ \underline{-7.053} \end{array}$$ Write a 0 in the thousandths position.

$$\begin{array}{r} {\scriptstyle 15\ 9\,10\,10} \\ 1\not{6}.\not{0}\not{1}\not{0} \\ \underline{-\ \ 7.053} \\ 8.957 \end{array}$$

Example 5

Find the sum of 6.88106 and 3.5219 and round it to three decimal places.

$$\begin{array}{r} 6.88106 \\ \underline{+3.5219} \end{array}$$ Write a 0 in the ten thousandths position.

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 6.88106 \\ \underline{+\ \ 3.52190} \\ 10.40296 \end{array}$$

We need to round the sum to the thousandths position. Since the digit in the position immediately to the right is 9, and 9>5, we get

10.403

Example 6

Wendy has \$643.12 in her checking account. She writes a check for \$16.92. How much is her new account balance?

To find the new account balance, we need to find the difference between 643.12 and 16.92. We will subtract 16.92 from 643.12.

$$\begin{array}{r} {\scriptstyle 3\ 12\,11} \\ 643.12 \\ \underline{-\ \ 16.92} \\ 626.20 \end{array}$$

After writing a check for \$16.92, Wendy now has a balance of \$626.20 in her checking account.

3.2 Practice Set A

Find the following sums and differences.

Exercise 1 *(Solution on p. 8.)*

3.187 + 2.992

Exercise 2 *(Solution on p. 8.)*

14.987 − 5.341

Exercise 3 *(Solution on p. 8.)*

0.5261 + 1.0783

Exercise 4 *(Solution on p. 8.)*

1.06 − 1.0535

Exercise 5 *(Solution on p. 8.)*

16,521.07 + 9,256.15

Exercise 6 *(Solution on p. 8.)*

Find the sum of 11.6128 and 14.07353, and round it to two decimal places.

4 Calculators

The calculator can be useful for finding sums and differences of decimal numbers. However, calculators with an eight-digit display cannot be used when working with decimal numbers that contain more than eight digits, or when the sum results in more than eight digits. In practice, an eight-place decimal will seldom be encountered. There are some inexpensive calculators that can handle 13 decimal places.

4.1 Sample Set B

Use a calculator to find each sum or difference.

Example 7
42.0638 + 126.551

		Display Reads
Type	42.0638	42.0638
Press	+	42.0638
Type	126.551	126.551
Press	=	168.6148

Table 1

The sum is 168.6148.

Example 8
Find the difference between 305.0627 and 14.29667.

		Display Reads
Type	305.0627	305.0627
Press	—	305.0627
Type	14.29667	14.29667
Press	=	290.76603

Table 2

The difference is 290.76603

Example 9
51.07 + 3,891.001786

Since 3,891.001786 contains more than eight digits, we will be unable to use an eight-digit display calculator to perform this addition. We can, however, find the sum by hand.

$$\begin{array}{r} 51.070000 \\ \underline{3891.001786} \\ 3942.071786 \end{array}$$

The sum is 3,942.071786.

4.2 Practice Set B

Use a calculator to perform each operation.

Exercise 7 *(Solution on p. 8.)*
4.286 + 8.97

Exercise 8 *(Solution on p. 8.)*
452.0092 − 392.558

Exercise 9 *(Solution on p. 8.)*
Find the sum of 0.095 and 0.001862

Exercise 10 *(Solution on p. 8.)*
Find the difference between 0.5 and 0.025

Exercise 11 *(Solution on p. 8.)*
Find the sum of 2,776.00019 and 2,009.00012.

5 Exercises

For the following 15 problems, perform each addition or subtraction. Use a calculator to check each result.

Exercise 12 *(Solution on p. 8.)*
$1.84 + 7.11$

Exercise 13
$15.015 - 6.527$

Exercise 14 *(Solution on p. 8.)*
$11.842 + 28.004$

Exercise 15
$3.16 - 2.52$

Exercise 16 *(Solution on p. 8.)*
$3.55267 + 8.19664$

Exercise 17
$0.9162 - 0.0872$

Exercise 18 *(Solution on p. 8.)*
$65.512 - 8.3005$

Exercise 19
$761.0808 - 53.198$

Exercise 20 *(Solution on p. 8.)*
$4.305 + 2.119 - 3.817$

Exercise 21
$19.1161 + 27.8014 + 39.3161$

Exercise 22 *(Solution on p. 8.)*
$0.41276 - 0.0018 - 0.00011$

Exercise 23
$2.181 + 6.05 + 1.167 + 8.101$

Exercise 24 *(Solution on p. 8.)*
$1.0031+6.013106+0.00018+0.0092+2.11$

Exercise 25
$27 + 42 + 9.16 - 0.1761 + 81.6$

Exercise 26 *(Solution on p. 8.)*

$10.28 + 11.111 + 0.86 + 5.1$

For the following 10 problems, solve as directed. A calculator may be useful.

Exercise 27

Add 6.1121 and 4.916 and round to 2 decimal places.

Exercise 28 *(Solution on p. 8.)*

Add 21.66418 and 18.00184 and round to 4 decimal places.

Exercise 29

Subtract 5.2121 from 9.6341 and round to 1 decimal place.

Exercise 30 *(Solution on p. 8.)*

Subtract 0.918 from 12.006 and round to 2 decimal places.

Exercise 31

Subtract 7.01884 from the sum of 13.11848 and 2.108 and round to 4 decimal places.

Exercise 32 *(Solution on p. 8.)*

A checking account has a balance of \$42.51. A check is written for \$19.28. What is the new balance?

Exercise 33

A checking account has a balance of \$82.97. One check is written for \$6.49 and another for \$39.95. What is the new balance?

Exercise 34 *(Solution on p. 8.)*

A person buys \$4.29 worth of hamburger and pays for it with a \$10 bill. How much change does this person get?

Exercise 35

A man buys \$6.43 worth of stationary and pays for it with a \$20 bill. After receiving his change, he realizes he forgot to buy a pen. If the total price of the pen is \$2.12, and he buys it, how much of the \$20 bill is left?

Exercise 36 *(Solution on p. 8.)*

A woman starts recording a movie on her video cassette recorder with the tape counter set at 21.93. The movie runs 847.44 tape counter units. What is the final tape counter reading?

5.1 Exercises for Review

Exercise 37

(here[1]) Find the difference between 11,206 and 10,884.

Exercise 38 *(Solution on p. 8.)*

(here[2]) Find the product, $820 \cdot 10{,}000$.

Exercise 39

(here[3]) Find the value of $\sqrt{121} - \sqrt{25} + 8^2 + 16 \div 2^2$.

[1] "Addition and Subtraction of Whole Numbers: Subtraction of Whole Numbers" <http://cnx.org/content/m34784/latest/>

[2] "Multiplication and Division of Whole Numbers: Multiplication of Whole Numbers" <http://cnx.org/content/m34863/latest/>

[3] "Exponents, Roots, Factorization of Whole Numbers: Grouping Symbols and the Order of Operations" <http://cnx.org/content/m34872/latest/>

Exercise 40 ***(Solution on p. 9.)***

(here[4]) Find the value of $8\frac{1}{3} \cdot \frac{36}{75} \div 2\frac{2}{5}$.

Exercise 41

(here[5]) Round 1.08196 to the nearest hundredth.

[4] "Introduction to Fractions and Multiplication and Division of Fractions: Division of Fractions" <http://cnx.org/content/m34929/latest/>

[5] "Decimals: Rounding Decimals" <http://cnx.org/content/m34959/latest/>

Solutions to Exercises in this Module

Solution to Exercise (p. 3)
6.179
Solution to Exercise (p. 3)
9.646
Solution to Exercise (p. 3)
1.6044
Solution to Exercise (p. 3)
0.0065
Solution to Exercise (p. 3)
25,777.22
Solution to Exercise (p. 3)
25.69
Solution to Exercise (p. 5)
13.256
Solution to Exercise (p. 5)
59.4512
Solution to Exercise (p. 5)
0.096862
Solution to Exercise (p. 5)
0.475
Solution to Exercise (p. 5)
Since each number contains more than eight digits, using some calculators may not be helpful. Adding these by "hand technology," we get 4,785.00031
Solution to Exercise (p. 5)
8.95
Solution to Exercise (p. 5)
39.846
Solution to Exercise (p. 5)
11.74931
Solution to Exercise (p. 5)
57.2115
Solution to Exercise (p. 5)
2.607
Solution to Exercise (p. 5)
0.41085
Solution to Exercise (p. 5)
9.135586
Solution to Exercise (p. 6)
27.351
Solution to Exercise (p. 6)
39.6660
Solution to Exercise (p. 6)
11.09
Solution to Exercise (p. 6)
$23.23
Solution to Exercise (p. 6)
$5.71
Solution to Exercise (p. 6)
869.37

Solution to Exercise (p. 6)
8,200,000
Solution to Exercise (p. 7)
$\frac{20}{9} = \frac{5}{3}$ or $2\frac{2}{9}$