Foundational Numeracy

Module 4: Decimals

Solutions Manual

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NORQUEST COLLEGE

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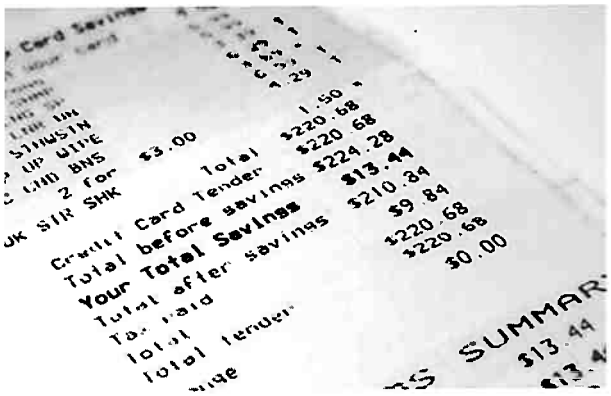
Contents

Introduction to the Module

Welcome to an introduction to decimals. Decimals are used in many aspects of life. Many jobs require the use of decimals, such as sales clerks having to calculate federal or provincial tax and using a cash register. This is an introduction to decimals. Enjoy this very practical module!



Important

When you see an object like the one below, you can use a QR code scanner on your phone or tablet and it will play a video of the math example.

Specific Learning Outcomes

The table below displays the skills and knowledge you will explore in this module. This is your opportunity to evaluate your own skills to see if you can do these things. At the end of this module, you will be invited to re-evaluate your skills to measure the progress you have made.

In this module, I will learn how to ...	I can't do this	I can do this with help	I can do this!
1. Read decimal numbers as digits or in English			
2. Write decimal numbers as digits or in English			
3. Add decimal numbers without carries			
4. Add decimal numbers with carries			
5. Subtract decimal numbers without borrowing			
6. Subtract decimal numbers with borrowing			
7. Multiply decimal numbers			
8. Divide decimal numbers			
9. Convert fractions to decimals			

Essential Skills

Reading: Understanding materials written in sentences or paragraphs

Numeracy: Using and understanding numbers

Writing: Writing on paper or typing on a computer

Vocabulary: Gaining related vocabulary

Unit 1: Introduction to Decimals

Keywords

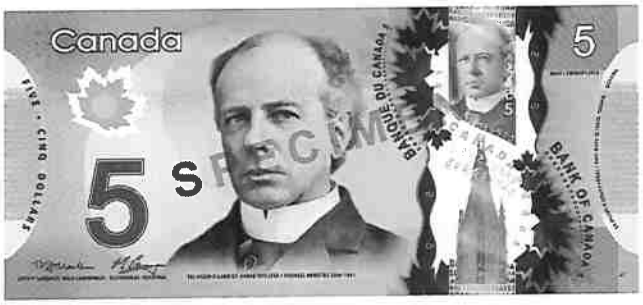
Digit	A single number. For example, 1, 2, and 8 are digits. The number 256 has three digits. The number 10,000 has five digits. (Because we sometimes count using our hands, the word "digit" can also mean "a finger or thumb.")
Period	A group of up to three digits in a number. 1,503,764 has 1 in the *millions* period, 503 in the *thousands* period, and 764 in the *ones* period.
Place value	Place value shows how much one digit of a number is worth. In the number 9.5, the place values are 9 and 0.5 (five tenths).
Symbol	A letter, group of letters, character, or picture that is used instead of a word or group of words.

Decimal Place Values

Suraiya is working the cash register at a clothing store and has to give out change to customers. She has to give her latest customer **$5.65** in change.

Suraiya lays out the money[1] on the counter so that both she and the customer can see it.

1 five-dollar bill



2 quarters

and **3** nickels

The numbers in $5.65 are place values, so we know that going one place to the right means the numbers are one tenth as big, and going one place to the left means the numbers are ten times bigger.

- **1 step right = one tenth as big (or ten times smaller)**
- **1 step left = ten times bigger**

[1] Images courtesy of the Bank of Canada: http://www.bankofcanada.ca/banknotes/image-gallery/

Because the first 5 in \$5.65 represents single dollars, the 6 represents six tenths of a dollar, or 0.6 of a dollar. The second 5 is smaller yet. It represents five hundredths of a dollar, or 0.05 of a dollar.

The dot in \$5.65, called the decimal point, is always right after the "ones" or "units" digit. Everything to the right of the decimal represents amounts that are less than a whole digit, like tenths, hundredths, or thousandths.

You should remember the large place values on the left, like thousands and ones—we saw those in the lesson on whole number place values (Module 1). But now, we also have decimal place values over on the right.

Hundred thousands	Ten thousands	Thousands	Separator	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths	Thousandths
5	**1**	**8**		**3**	**0**	**4**	**.**	**9**	**6**	**7**

Example 1: Let's look at the number 35.45 and see what place values it's made of.

3 tens	30
5 ones	5
4 tenths	.4
5 hundredths	.05

Example 2: The number 518 304.967 breaks into

5 hundred thousands	500 000
1 ten thousand	10 000
8 thousands	8 000
3 hundreds	300
0 tens	00
4 ones	4
9 tenths	.9
6 hundredths	.06
7 thousandths	.007
Total:	518 304.967

Student practice:

Instructor led

1. 235.4

2 hundreds (200)
3 tens (30)
5 ones (5)
4 tenths (0.4)

2. 0.76

0 ones (0), 7 tenths (0.7),
6 hundredths (0.06)

Exercise 1.1

1. In the number 354.718, the first three places are 3 hundreds (300), 5 tens (50), and 4 ones (4). What are the next three places?

7 tenths (0.7)
1 hundredth (0.01)
8 thousandths (0.008)

2. Break up the following numbers, and write the place value for each digit.

   a. 579.162 5 hundreds (500), 7 tens (70), 9 ones (9), 1 tenth (0.1), 6 hundredths (0.06) 2 thousandths (0.02)

   b. 1 018.507 1 thousand (1000), 0 hundreds (0), 1 ten (10), 8 ones (8), 5 tenths (0.5), 0 hundredths (0.00), 7 thousandths (0.007)

Writing Decimals in Words

Read "**and**" when you get to the decimal point, read the decimal part as if it were a whole number, and then say the name of the last decimal place.

So you would read 518 304.967 as "five hundred eighteen thousand, three hundred four **and** nine hundred sixty-seven thousandths."

Now write it exactly the same way.

Example 1: 32.06

"thirty-two and six hundredths"

Example 2: 107.345

"one hundred seven and three hundred forty-five thousandths"

Student practice:

Write 0.17 in words.

Instructor led

Exercise 1.2

1. Write the following numbers in English.

   a. 45.918 forty five and nine hundred eighteen thousandths.

   b. 644.03 Six hundred forty four and three hundredths

   c. 25.137 twenty five and one hundred thirty seven thousandths

   d. 517.0789 five hundred seventeen and seven hundred eighty nine ten thousandths.

2. Write the following as numbers.

a. eighty-six and seven tenths 86.7

b. three and one hundred forty-two thousandths 3.142

c. sixty-five thousand, forty-seven and sixty-three hundredths 65,047.63

d. one hundred thirty-seven and two thousand eight hundred eighty-four ten-thousandths 137.2884

e. seventy thousand two hundred twelve and two hundred nine ten-thousandths 70,212.0209

f. thirty four thousand, twenty-five and fourteen thousand one hundred fifty-nine hundred thousandths 34,025.14159

Comparing Decimals

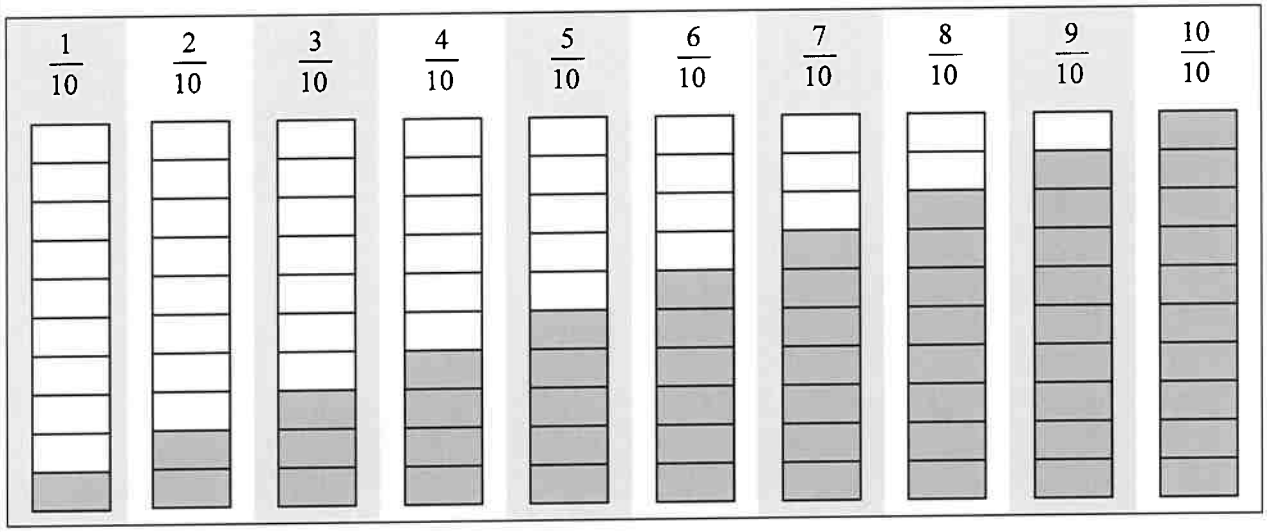
Think about ...

- Jane's son, Alex, is excited about turning 10 and keeps asking how much longer until his birthday.

  This morning when he asked, Jane replied, "Your birthday is half a year away now, so you're halfway to turning 10." Alex thinks about that for a minute, and says, "If somebody asks me how old I am today, I can say I'm 9.5!"

Keywords

>	Greater than
<	Less than
Ascending	Going up; rising or increasing to higher levels, values, or degrees
Descending	Going down; going or moving from a higher to a lower place or level
Equation	A statement that the values of two mathematical expressions are equal (indicated by the symbol "=")



Comparing Symbols

> means **greater than**

< means **less than**

= means **equal to**

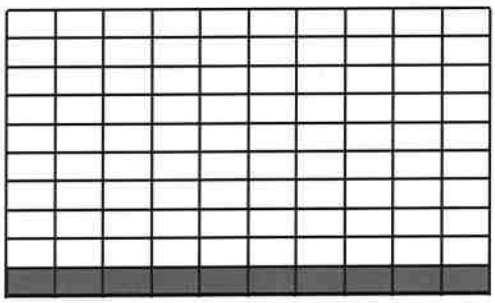
Note: The open end of the symbol always points to the larger number.

Examples: $0.9 > 0.5$ nine tenths is **greater than** five tenths

$0.2 < 0.3$ two tenths is **less than** three tenths

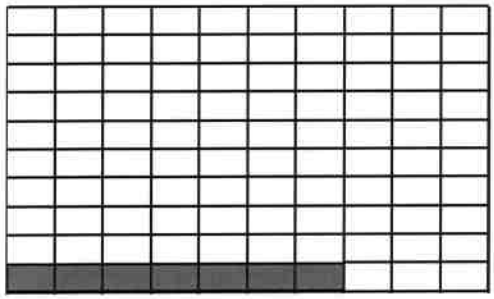
Which is larger?

0.1



$0.1 = \frac{1}{10}$

0.07



$0.07 = \frac{7}{100}$

Looking at the picture, we can see that $0.1 > 0.07$.

If we don't have a picture to look at, the following procedure is used to compare 0.1 and 0.07:

- 0.07 has the greatest place value **(hundredths)**
- $0.1 = 0.10$ (adding the "0" changes **tenths** to **hundredths** but does not change the value, so $\frac{1}{10} = \frac{10}{100}$)

Now we have a common place value and can compare **ten** hundredths to **seven** hundredths.

$0.10 > 0.07$ therefore, **$0.1 > 0.07$**

Examples:

1. Which is smaller: 7.09 or 7.2?

   The common place value is hundredths. Therefore, we compare 7.09 and 7.20.

   $7.09 < 7.20$ thus **$7.09 < 7.2$**

2. Which is smaller: 3 or 3.002?

   The common place value is thousandths. So we compare 3.000 and 3.002.

   3.000 < 3.002 thus **3 < 3.002**

3. Place these numbers in **ascending** (lowest to highest) order: 5.2, 5.023, 5.0032, 0.523

   The common place value is ten thousandths, so we compare: 5.2000, 5.0230, 5.0032, 0.5230

   In ascending order, the numbers are **0.523, 5.0032, 5.023, 5.2**

Student practice:

Place these numbers in ascending order:

0.0790, 0.0709, 0.07, 0.0097, 0.7090

Instructor led

Exercise 1.3

1. Place the following numbers in descending (highest to lowest) order.

   a. 0.7, 0.072, 0.73 0.73, 0.7, 0.072

   b. 0.426, 0.48, 0.471 0.48, 0.471, 0.426

   c. 3.2, 3.21, 3.202, 3 3.21, 3.2, 3.202, 3

   d. 0.5, 0.52, 0.491 0.52, 0.5, 0.491

   If you did not get the answers[2] to the first four questions correct, ask your instructor for help. Otherwise, continue and finish the exercise.

   e. 0.881, 0.81, 0.8 0.881, 0.81, 0.8

   f. 1.05, 1.07, 1.051 1.07, 1.051, 1.05

   g. 0.62, 0.631, 0.612 0.631, 0.62, 0.612

   h. 8.25, 8.2, 8.023, 8 8.25, 8.2, 8.023, 8

   i. 0.1, 0.11, 0.111 0.111, 0.11, 0.1

[2] **Answers:** a) 0.73, 0.7, 0.072; b) 0.48, 0.471, 0.426; c) 3.21, 3.202, 3.2, 3; d) 0.52, 0.5, 0.491

2. Place the following numbers in ascending (lowest to highest) order.

   a. 0.08, 0.081, 0.8 — 0.08, 0.081, 0.8

   b. 0.35, 0.75, 0.375 — 0.35, 0.375, 0.75

   c. 8.275, 8.25, 8.3 — 8.25, 8.275, 8.3

   d. 0.42, 0.04, 0.36 — 0.04, 0.36, 0.42

   e. 0.1, 0.014, 0.02 — 0.014, 0.02, 0.1

   f. 6.04, 6.041, 6.1, 6 — 6, 6.04, 6.041, 6.1

   g. 0.1, 0.12, 0.101 — 0.1, 0.101, 0.12

   h. 0.999, 0.9, 0.99 — 0.9, 0.99, 0.999

   i. 0.812, 8, 8.12 — 0.812, 8, 8.12

   j. 0.073, 0.73, 0.7 — 0.073, 0.7, 0.73

3. Compare the numbers using >, <, or = signs.

   a. 0.08 < 0.081

   b. 0.35 < 0.375

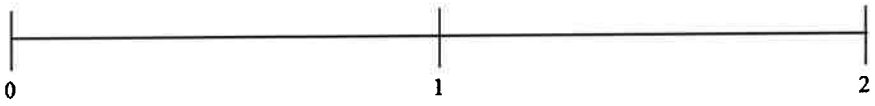
   c. 8.275 > 8.257

   d. 0.3641 > 0.364

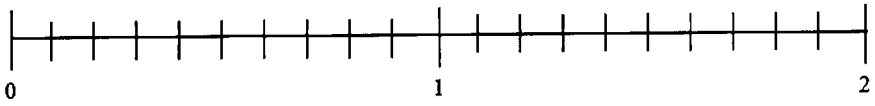
   e. 0.0210 < 0.21

Decimals on a Number Line

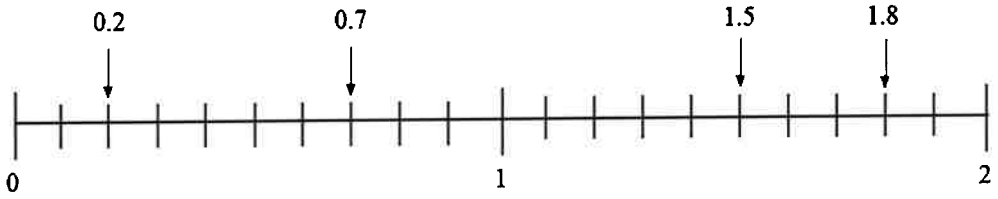
To place a decimal in the tenths place on a number line, you must divide each whole unit into ten equal segments.



After dividing each unit into ten equal segments, the line looks like this:

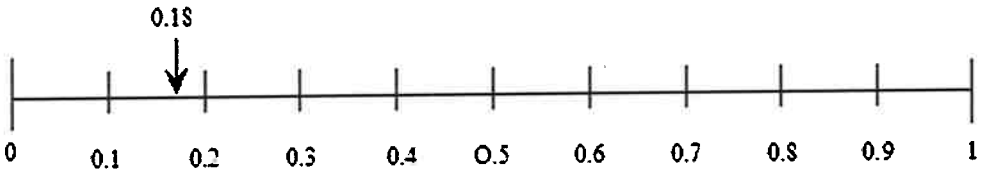


Each small segment represents one tenth of the larger segment. The location of these decimals, 1.8, 0.7, 1.5, and 0.2 are shown in the diagram below.



The location of other decimals (for example, 0.04, 0.012, 2.003) may be shown by dividing each whole unit into hundredths or thousandths as indicated by the place value of decimal numbers you are working with.

Example: Each tenth divided into ten equal portions gives hundredths.
Each hundredth divided into ten equal portions gives thousandths.

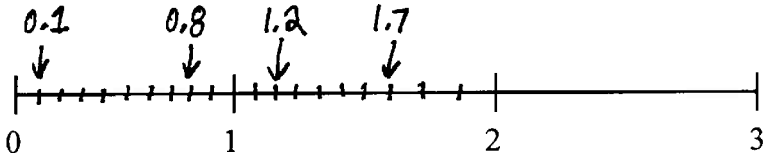


The line above is divided into tenths. To show or plot hundredths, each division shown would have to be further divided by ten.

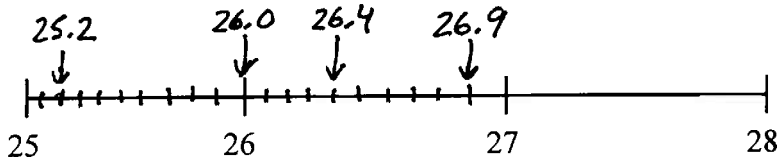
Exercise 1.4

Place the following numbers on the number line. Divide each whole unit into the appropriate number of segments first.

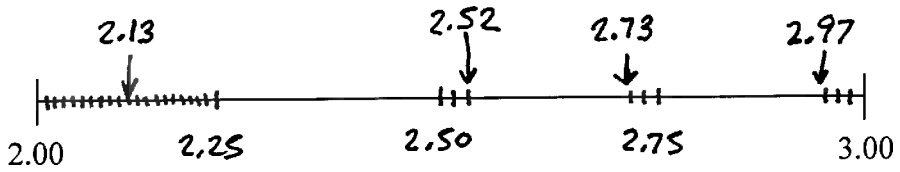
1. 0.8, 1.2, 1.7, 0.1



2. 25.2, 26.4, 26.0, 26.9



3. 2.52, 2.13, 2.73, 2.97



Unit 2: Decimal Addition and Subtraction

Think about ...

- Every two weeks, Tracy orders supplies for the office. Once the order is ready, she has to work out the cost of all the items and get the order approved by the office manager.

  This week, the order includes red pens ($23.80), blank CDs ($36.79), a box of staples ($7.34), and a box of pencils ($5.31). Tracy writes the four numbers in a column, and begins to add them.

  Do you add up prices to keep track of how much you have spent? Students often have to do this to make sure they stay within their budget. (If you want to try Tracy's calculation, the total comes out to $73.24.)

Keywords

Addends	The numbers that are being added together
Adding/ Addition	Joining something to something else to increase the size, number, or amount; in an equation, this is indicated by the symbol "+" Other terms used in word problems to show adding are "increases," "goes up," "plus," "combined with," "together with," "altogether," "in addition to" **Note:** Sometimes the word "and" means addition, as in "How much is 8 and 5?" but don't assume a problem is about adding just because you see the word "and"!
Carry	To transfer a digit from one column of digits to another column of more significant (higher-value) digits
Column	A line of numbers or words written underneath each other
Operation	A single math task. Adding is an "operation" and so are subtracting, multiplying, and dividing. Some math questions require one operation, and some require more than one.
Sum	The answer to an addition problem, also known as a "total"
Total	The answer to an addition problem, also known as a "sum"

Keywords continued

As an example, let's use the subtraction equation: **12 – 3 = 9**

Difference	The *answer* or *result* of a subtraction equation (this is the **9** in our example)
Minuend	The *first number* in a subtraction equation (this is the **12** in our example)
Minus	Take away, reduce, subtract, or remove; in an equation, this is indicated by the sign "–"
Subtrahend	The *second number* in a subtraction equation (this is the **3** in our example)

Using Place Value When Adding Numbers

Marie is working in a clothing store when the cash register breaks. There are customers waiting in line, so Marie doesn't have time to fix the register—she grabs a pad of paper and starts adding. The first customer has picked out items worth $14.95, $3.49, $4.99, and $3.33.

Just as we saw when adding whole numbers, with decimals, the places must be lined up. This is easy with decimals because we can line up the decimal points.

Marie's Calculation

$$\begin{array}{rcccc} & {\scriptstyle 1}\,{\scriptstyle 2} & & {\scriptstyle 2} & \\ & 1 & 4 . & 9 & 5 \\ & & 3 . & 4 & 9 \\ & & 4 . & 9 & 9 \\ + & & 3 . & 3 & 3 \\ \hline & 2 & 6 . & 7 & 6 \end{array}$$

Marie adds the digits in each column, carrying whenever she gets a sum with more than one digit, and ends up with 2676 on the bottom line. "Two thousand six hundred? That doesn't make sense," she says. "Oh, right! The decimal!"

All the numbers being added had their decimal points in line, and the answer also gets a decimal point. It isn't 2676—it's 26.76, or 26 dollars and 76 cents.

Try it yourself here, just to make sure you've got it.

$$\begin{array}{r} 14.95 \\ 3.49 \\ 4.99 \\ +\,3.33 \\ \hline \end{array}$$

Exercise 2.1

1. Complete the following sentences.

   a. Adding decimal numbers is exactly like adding whole numbers, except that the decimals in the addends must line up.

   b. If we add 22.47 and 305.11, the answer will have two decimal places.

   c. If we add 103.518 and 6.1, the answer will have three decimal places.

2. Add the following numbers.

   a. 35.45 + 39.11 = 74.56

   $$\begin{array}{r} {}^{1}35.45 \\ +\ 39.11 \\ \hline 74.56 \end{array}$$

   b. 288.4 + 7.8 = 296.2

   $$\begin{array}{r} {}^{1}288.4 \\ +\ \ 7.8 \\ \hline 296.2 \end{array}$$

   c. 3.142 + 2.718 = 5.860

   $$\begin{array}{r} 3.14{}^{1}2 \\ +\ 2.718 \\ \hline 5.860 \end{array}$$

   d. 56.73 + 416.38 = 473.11

   $$\begin{array}{r} {}^{1}\ {}^{1}\ {}^{1} \\ 56.73 \\ +416.38 \\ \hline 473.11 \end{array}$$

   e. 28.2018 + 310.4366 = 338.6384

   $$\begin{array}{r} 28.201{}^{1}8 \\ +\ 310.4366 \\ \hline 338.6384 \end{array}$$

Inserting Zeros

Marie's calculation showed the three keys to making decimal addition work:

- Line up the places in all your numbers (use the decimal points to help you).
- If you get a total that has more than one digit, write the smallest (rightmost) digit in the total and carry the others.
- Remember that your answer also gets a decimal point, which will line up with all the others.

Example: Find the sum of 17.08, 32.1, 61, and 8.926.

```
  17.08
  32.1
  61.
+ 8.926
```

61 has no decimal part, but you can write it as 61. (61 with a decimal point) if you like, using the decimal points to help line things up.

Now try adding the numbers up (the answer is 119.106).

Did you have any trouble with the blank spaces? Blanks like "61." can make it harder to tell which places should line up.

We can fix that by putting extra zeroes at the end of the decimals to make all the numbers the same length. Here is the same problem written with *inserting zeroes*. (The additional zeroes are shaded in the example to the right.)

```
  17.080
  32.100
  61.000
+  8.926
```

With adding zeroes, all the numbers have three decimal places. Try adding them now. (The answer, of course, is still 119.106!)

Did the inserting zeroes make it easier? Some people use them all the time, but some people find they don't need padding. Use them if they help you.

Student practice:

1. 9.087 +15.31

Instructor led

```
  9.087
+ 15.310
 24.397
```

(24.397)

2. 7.056 + 605.7 + 5.67

```
   1 1
  7.056
 1
605.700
+  5.670
 618.426
```

(618.426)

Exercise 2.2

Add the following numbers. (In this set, the addends have different numbers of decimal places, so line things up carefully. Inserting zeroes if you want.)

1. 867.5309 + 209.24

$$\begin{array}{r} {}^{1}867.5309 \\ +\ 209.2400 \\ \hline 1076.7709 \end{array}$$ (1076.7709)

2. 123.45 + 39.666

$$\begin{array}{r} {}^{1}123.{}^{1}450 \\ +\ 39.666 \\ \hline 163.116 \end{array}$$ (163.116)

3. 2.6 + 40.7531

$$\begin{array}{r} {}^{1}2.6000 \\ +\ 40.7531 \\ \hline 43.3531 \end{array}$$ (43.3531)

4. 571 + 83.248

$$\begin{array}{r} {}^{1}571.000 \\ +\ 83.248 \\ \hline 654.248 \end{array}$$ (654.248)

5. 123.4005 + 88.64

$$\begin{array}{r} {}^{1}{}^{1}123.4005 \\ +\ 88.6400 \\ \hline 212.0405 \end{array}$$ (212.0405)

6. 105.7 + 56.34

$$\begin{array}{r} {}^{1}{}^{1}105.70 \\ +\ 56.34 \\ \hline 162.04 \end{array}$$ (162.04)

7. 4.727 + 786.4

$$\begin{array}{r} {}^{1}4.727 \\ +\ 786.400 \\ \hline 791.127 \end{array}$$ (791.127)

8. 26.13 + 8.033

$$\begin{array}{r} {}^{1}26.130 \\ +\ 8.033 \\ \hline 34.163 \end{array}$$ (34.163)

9. 0.5932 + 41.47

$$\begin{array}{r} {}^{1}0.{}^{1}5932 \\ +\ 41.4700 \\ \hline 42.0632 \end{array}$$ (42.0632)

10. 3.57 + 9.7

$$\begin{array}{r} {}^{1}3.57 \\ +\ 9.70 \\ \hline 13.27 \end{array}$$ (13.27)

11. 0.084 + 0.226 + 0.89

$$\begin{array}{r} {}^{1}0.{}^{2}0{}^{1}84 \\ +\ 0.226 \\ +\ 0.890 \\ \hline 1.200 \end{array}$$ (1.200)

12. 8.3 + 0.05 + 15.3

$$\begin{array}{r} 8.30 \\ +{}^{1}0.05 \\ 15.30 \\ \hline 23.65 \end{array}$$ (23.65)

13. 6 215.4 + 435.21 + 30.045

$$\begin{array}{r} 6{}^{1}215.400 \\ 435.210 \\ +\ 30.045 \\ \hline 6680.655 \end{array}$$ (6680.655)

14. 4.5 + 27.009 + 0.02 + 25.028

$$\begin{array}{r} {}^{1}4.5{}^{1}00 \\ {}^{1}27.009 \\ +\ 0.020 \\ 25.028 \\ \hline 56.557 \end{array}$$ (56.557)

Subtracting Decimals

Keywords

As an example, let's use the subtraction equation: **12 – 3 = 9**

Difference	The *answer* or *result* of a subtraction equation (this is the **9** in our example)
Minuend	The *first number* in a subtraction equation (this is the **12** in our example)
Minus	Take away, reduce, subtract, or remove; in an equation, this is indicated by the sign "–"
Subtrahend	The *second number* in a subtraction equation (this is the **3** in our example)

Few people know the words "minuend" and "subtrahend," so you are probably better off just saying "first number" and "second number" instead. The word "difference" is fairly well known, and almost everyone knows what "answer" means!

Subtracting decimals uses all the rules we've seen already in Module 1:

- Start in the rightmost column and work toward the left.
- If subtraction is not possible, "borrow" from a larger column.

It also includes a **new rule** that we saw in the previous unit:

- All numbers should have decimal points, and all the decimal points should be lined up.

Example 1: Clay works in a shop where he assembles rubber hoses. The metal end-pieces on a hose are attached by crimping, where the metal is crushed down to a smaller size, trapping the hose inside it.

A certain end-piece starts out 1.875 cm (centimetres) across. The instructions say to crimp it so its size decreases by 0.088 cm.

How big will the end-piece be after it's crimped? We can find out by subtracting.

Clay's Calculation

$$\begin{array}{r} {}^{}{}^{}{}^{7}{}^{16}{}^{} \\ 1.\cancel{8}\,\cancel{7}\,{}^{15} \\ -\,0.0\,8\,8 \\ \hline 1.7\,8\,7 \end{array}$$

Follow these steps:

First column: 5 – 8 doesn't work, so borrow 1. (The hundredths column becomes 6, the thousandths column becomes 15. Now we can subtract, 15 – 8 = 7.)

Second column: 6 – 8 doesn't work, so borrow from the next column. (The tenths column becomes 7, the hundredths column becomes 16. Now subtract, 16 – 8 = 8.)

Third column: 7 – 0 = 7

Fourth column: 1 – 0 = 1

Answer: *The end-piece will be 1.787 cm across after crimping.*

Try it yourself here, just to make sure you've got it.

$$\begin{array}{r} 1.875 \\ -\,0.088 \\ \hline \end{array}$$

$$\begin{array}{r} {}^{}{}^{7}{}^{16}{}^{1}{}^{} \\ 1.\cancel{8}\,\cancel{7}\,5 \\ -\,0.088 \\ \hline 1.787 \end{array}$$

Example 2: Clay is working on another end-piece that is 1.8 cm across, and he is supposed to crimp it until it is 0.023 cm smaller. What will be the new size of the end-piece?

We set this up like the other questions we've seen by lining up the decimals, but this time something odd happens.

$$\begin{array}{r} 1.8 \\ -\ 0.023 \\ \hline \end{array}$$

We have two empty columns. How do we subtract this?

As we saw with adding decimals, it helps to insert *zeroes* to make both of these numbers the same length:

$$\begin{array}{r} 1.800 \\ -\ 0.023 \\ \hline \end{array}$$

That's better! But now, when we start the subtraction, another problem occurs. We start with $0 - 3$, which we can't do, so we should borrow. But the next column is also a 0, so we can't borrow from there. Trouble! How do we do this?

We borrow twice. First, we borrow from the 8, turning it into a 7.

$$\begin{array}{r} {\scriptstyle 7\ \ \ \ } \\ 1\ .\ \cancel{8}\ {}^{1}0\ 0 \\ -\ 0\ .\ 0\ 2\ 3 \\ \hline \end{array}$$

Now we borrow again. The 10 we just created turns into a 9.

$$\begin{array}{r} {\scriptstyle 7\ 9\ \ } \\ 1\ .\ \cancel{8}\ {}^{1}\cancel{0}\ {}^{1}0 \\ -\ 0\ .\ 0\ 2\ 3 \\ \hline \end{array}$$

And now we're finally ready to subtract!

$$\begin{array}{r} {\scriptstyle 7\ 9\ \ } \\ 1\ .\ \cancel{8}\ {}^{1}\cancel{0}\ {}^{1}0 \\ -\ 0\ .\ 0\ 2\ 3 \\ \hline 1\ .\ 7\ 7\ 7 \end{array}$$

Our complete list of subtraction rules for decimals:

- Line up all the decimal points.
- Insert zeroes to make both numbers are the same length.
- Do the rightmost column first, then work toward the left.
- Borrow if necessary (you may have to borrow more than once).

Student practice:

39.1 – 0.794

Instructor led

$$\begin{array}{r} {\scriptstyle 8\ 1\ 9\ \ } \\ 3\cancel{9}.\ {}^{1}1\ {}^{1}0\ {}^{1}0 \\ -\ 0.7\ 9\ 4 \\ \hline 38.306 \end{array}$$

(38.306)

Exercise 2.3

Answer the following questions.

1. Subtract the following numbers. (This set has no borrows in it. For now, just concentrate on lining up the decimal points correctly and then subtracting them one at a time.)

a. 35.7 – 2.2

35.7
− 2.2
33.5 (33,5)

b. 589.84 – 62.5

589.84
− 62.50
527.34 (527.34)

c. 2 741.55 – 20.43

2741,55
− 20.43
2721.12 (2721.2)

d. 750.8947 – 10.502

750.8947
− 10.5020
740.3927 (740.3927)

e. 466.875 – 250.622

466.875
−250.622
216.253 (216.253)

f. 0.008 – 0.004

0.008
− 0.004
0.004 (0.004)

g. 3.76 – 3.42

3,76
−3.42
0,34 (0,34)

h. 4.683 – 2.141

4,683
− 2,141
2,542 (2,542)

i. 1.689 – 0.04

1.689
−0.040
1.649 (1.649)

j. 78.29 – 42.142 * must borrow

78,2901
− 42.142
36,148 (36.148)

2. Subtract the following numbers. (This set has borrows! If you get an "impossible" subtraction, like 2 – 3 or 1 – 9, you can make it work by going one column left and borrowing from there.)

a. 7 632.52 – 34.22

7632.52
− 34.22
7598.30 (7598,30)

b. 4.8286 – 0.3303

4.8286
− 0.3303
4.4983 (4,4983)

c. 4 110.216 – 940.5

$$\begin{array}{r} {}^{3}\cancel{4}\,{}^{1}\cancel{1}{}^{9}\cancel{1}{}^{1}0.216 \\ -\ 940.500 \\ \hline 3169.716 \end{array} \quad (3169.716)$$

d. 90.705 – 81.1

$$\begin{array}{r} 8\,{}^{1}\cancel{9}\cancel{0}{}^{1}.705 \\ -\ 81.100 \\ \hline 9.605 \end{array} \quad (9.605)$$

e. 5 460.1 – 5,439.36

$$\begin{array}{r} 5\,{}^{9}\cancel{4}{}^{1}60.10 \\ -\ 5439.36 \\ \hline 20.74 \end{array} \quad (20.74)$$

f. 9.339 – 3.967

$$\begin{array}{r} 8\,{}^{12}\cancel{9}{}^{1}.{}^{1}339 \\ -\ 3.967 \\ \hline 5.372 \end{array} \quad (5.372)$$

g. 84.43 – 81.99

$$\begin{array}{r} 8\cancel{4}{}^{3}.{}^{13}\cancel{4}3{}^{1} \\ -\ 81.99 \\ \hline 2.44 \end{array} \quad (2.44)$$

h. 471.6 – 242.3

$$\begin{array}{r} 4\cancel{7}{}^{6}1.6 \\ -\ 242.3 \\ \hline 229.3 \end{array} \quad (229.3)$$

i. 6 545 – 14.3

$$\begin{array}{r} 654\cancel{5}{}^{4}.0{}^{1} \\ -\ 14.3 \\ \hline 6530.7 \end{array} \quad (6530.7)$$

j. 48.77 – 25.87

$$\begin{array}{r} 4\cancel{8}{}^{7}.{}^{1}77 \\ -\ 25.87 \\ \hline 22.90 \end{array} \quad (22.90)$$

k. 25.3 – 0.8

$$\begin{array}{r} 2\cancel{5}{}^{4}.3{}^{1} \\ -\ 0.8 \\ \hline 24.5 \end{array} \quad (24.5)$$

l. 7 – 0.035

$$\begin{array}{r} 6\cancel{7}.{}^{9}\cancel{0}{}^{9}00{}^{1} \\ -\ 0.035 \\ \hline 6.965 \end{array} \quad (6.965)$$

m. 84 – 18.047

$$\begin{array}{r} 7\,{}^{13}\cancel{8}\cancel{4}.{}^{9}\cancel{0}{}^{9}00{}^{1} \\ -\ 18.047 \\ \hline 65.953 \end{array} \quad (65.953)$$

n. 2.4 – 0.0031

$$\begin{array}{r} 2.\cancel{4}{}^{3}{}^{9}\cancel{0}{}^{9}00{}^{1} \\ -\ 0.0031 \\ \hline 2.3969 \end{array} \quad (2.3969)$$

o. 579 – 63.41

$$\begin{array}{r} 57\cancel{9}.{}^{8}\cancel{0}{}^{9}0{}^{1} \\ -\ 63.41 \\ \hline 515.59 \end{array} \quad (515.59)$$

p. 413.15 – 22.22

$$\begin{array}{r} 3\cancel{4}{}^{12}\cancel{1}{}^{1}3.15 \\ -\ 22.22 \\ \hline 390.93 \end{array} \quad (390.93)$$

Decimal Addition and Subtraction Word Problems

You add numbers together when ...

- you have a starting amount of something, and then you get more
- two groups are combined into one group
- an amount "goes up" or "increases"
- an amount is "more" or "greater than" another
- several prices, weights, or amounts are given and you are asked for a "sum" or a "total"

You subtract numbers when ...

- you have a starting amount of something and then you lose some of it
- you have two numbers and want to know how far apart they are
- a group is split into two groups
- an amount "goes down" or "decreases"
- an amount is "less" or "lower than" another

Exercise 2.4

Solve the following problems. Remember to write your answers in sentence form.

1. The temperature was 22°C at noon. By evening, the temperature has fallen by 6.3°C. What is the evening temperature?

$$\begin{array}{r} {}^{1}{}^{1}{}^{1} \\ 22.0 \\ -\ 6.3 \\ \hline 15.7 \end{array}$$

The evening temperature is 15.7°C.

2. The movie club had $906.33 in their account. They just had a movie night and took in $180.75 from admission and snacks. How much money do they have now?

$$\begin{array}{r} {}^{1} \\ 906.33 \\ +\ 180.75 \\ \hline 1087.08 \end{array}$$

The movie club now has $1087.08

3. Angie is mixing fruit punch. If she uses 3.563 L (litres) of grape juice, 23.4 L of apple juice, and 0.5 L of cherry syrup, how much punch has she made?

$$\begin{array}{r} {}^{1}3.563 \\ +\ 23.400 \\ \quad 0.500 \\ \hline 27.463 \end{array}$$

Angie has made 27.463 L of punch.

4. In 1987, Ben Johnson held the world record for a 100-metre race after finishing in 9.83 seconds. In 2014, Usain Bolt set a new record of 9.58 seconds. How much less was Bolt's record time?

$$\begin{array}{r} {}^{7}9.{}^{1}83 \\ -\ 9.58 \\ \hline 0.25 \end{array}$$

Bolt's record time was 0.25s less.

5. Lori went out to buy groceries and had $140 with her, but she stopped for ice cream on her way to the store and spent $7.75. How much does she have left for groceries now?

$$\begin{array}{r} {}^{3}{}^{9}{}^{1}{}^{1}140.00 \\ -\ 7.75 \\ \hline 132.25 \end{array}$$

Lori has $132.25 left for groceries.

6. Patrick is 83.4 cm (centimetres) tall. His sister Mireille is 8.9 cm taller. How tall is Mireille?

$$\begin{array}{r} {}^{1}{}^{1}83.4 \\ +\ 8.9 \\ \hline 92.3 \end{array}$$

Mirielle is 92.3 cm tall.

7. Chris and Roxanne go out to a movie. Parking costs $2, movie tickets are $13.95 each, and they share a snack combo that costs $17.95. What is the total cost?

- parking $2.00
- tickets $13.95 (x2)
- food $17.95

$$\begin{array}{r} {}^{1}{}^{1}2.00 \\ {}^{1}13.95 \\ +\ 13.95 \\ \quad 17.95 \\ \hline 47.85 \end{array}$$

The total cost for the movie night is $47.85

8. Diane is putting fibre supplement in a home-care client's drink. She gets distracted and forgets how much fibre she has added. If the fibre supplement container originally held 25.646 g (grams) and it now has only 22.397 g, how much has Diane used?

```
  25.646
- 22.397
   3.249
```

Diane has used 3.249g of fibre supplement.

9. The Toronto Stock Exchange Index (TSE) is a number that rates how well the stock market is doing. Over one week, the TSE goes from 14 154.87 to 14 205.72. How much did it increase?

```
  14,205.72
- 14 154.87
  050.85       (50.85)
```

The TSE increased by 50.85

10. Justin's temperature is 38.55°C when he goes to bed. By morning, his temperature has increased another 0.78°C. What is his morning temperature?

```
  38.55
+  0.78
  39.33     (39.33)
```

Justin's morning temperature is 39.33°C.

Unit 3: Decimal Multiplication and Division

Think about ...

- Sophie is closing the cash register at the end of her shift and has to count all the money. She has 37 quarters, worth $0.25 each, and needs to know their total value.

  She thinks about adding, and writes 0.25 + 0.25 + 0.25 … but then stops. She says, "37 quarters? No way! That would take forever." Instead she writes 37 × 0.25 and starts to multiply.

  Multiplication helps when you have to add the same number many times, and it is generally much faster than adding would be. Can you think of a case where you need to add the same number many times? (It often happens when we buy large amounts of the same thing, such as items of food or litres of gasoline.)

  (If you want to try Sophie's calculation, the answer is $9.25.)

Keywords Multiplication

As an example, let's use the multiplication equation: **7 × 4 = 28**

Multiplicand	The *first number* in a multiplication equation (this is the **7** in our example)
Multiplier	The *second number* in a multiplication equation (this is the **4** in our example)
Product	The *answer* or *result* of a multiplication equation (this is the **28** in our example)

Few people know the word "multiplicand," so you are probably better off just saying "first number." The words "multiplier" and "product" are fairly well known, and almost everyone knows what "answer" means!

Keywords Division

As an example, let's use the division equation: **30 ÷ 4 = 7 remainder 2.**

Dividend	The *first number* in a division equation (the **30** in our example)
Divisor	The *second number* in a division equation (the **4** in our example)
Quotient	The *answer* or *result* of a division equation (the **7 remainder 2** in our example)
Remainder	The amount left over when the division of two numbers does not work out to an even whole number. For example, 28 ÷ 4 = 7, but 30 ÷ 4 = 7 with a remainder of 2.

Few people know the words "dividend" or "divisor," so you are probably better off just saying "first number" and "second number." The words "quotient" and "remainder" are fairly well known, and almost everyone knows what "answer" means!

Multiplying Decimals

Fred is building a small wooden airplane, using special tape. He is worried about the plane getting too heavy, so he wants to figure out how much tape there is.

The tape's mass is 12.85 grams per metre, and Fred has used 0.745 metres. He multiplies those two numbers to find the total mass of the tape.

```
  12.85
× 0.745
  6425
 51400
899500
957325
```

After all the steps of the multiplication are complete, Fred has the number 957325, but that isn't the final answer. So far, he hasn't taken the decimals into account.

The number 12.85 has two decimal places, and 0.745 has three decimal places, so there are a total of five decimal places—that means the answer must also have five.

Fred rewrites 957325, putting in a decimal so that the number has five decimal places, and **9.57325** is the final result.

Decimal Multiplication Rules

The rules for decimal number multiplication:

- Take the far right digit of the second row. Multiply it by each of the digits in the first row, one by one. If a product is ever 10 or more, carry the extra digits to the left.
- Take the second digit from the right and multiply it through the first row as before. Put these results in a new row, starting one column to the left.
- Repeat until all the digits in the second row have been used.
- Add up all the "results" rows.
- When the multiplication is complete, count the total number of decimal places in the two numbers you multiplied. Rewrite the answer so it has that many decimal places.

Example: 170.8 × 3.21

170.8	
× 3.21	
1708	Multiplying 1 through 1708 gives 1708.
34160	Multiplying 2 through 1708 gives 3416. (Shift one column left by adding a 0.)
512400	Multiplying 3 through 1708 gives 5124. (Shift two columns left by adding two 0s.)
548268	Add all three results rows to get the total.

Finally, 170.8 has **one** decimal place, 3.21 has **two** decimal places. Add those together and we see that our answer should have **three** decimal places, so **548.268** is the final result.

Student practice:

1.21 × 0.043

Instructor led

1.21
× 0.043
1363
14840
00000
000000
05203

(0.05203)

Exercise 3.1

Complete the following multiplication equations.

1. 0.5×0.3

$$\begin{array}{r} {}^{1}0.5 \\ \times\ 0.3 \\ \hline 15 \end{array} \quad (0.15)$$

2. 0.07×0.2

$$\begin{array}{r} {}^{1}0.07 \\ \times\ 0.2 \\ \hline 014 \end{array} \quad (0.014)$$

3. 0.008×0.06

$$\begin{array}{r} {}^{4}0.008 \\ \times\ 0.06 \\ \hline 00048 \end{array} \quad (0.00048)$$

4. 0.09×0.005

$$\begin{array}{r} 0.0{}^{4}9 \\ \times 0.005 \\ \hline 00045 \end{array} \quad (0.00045)$$

5. 4.5×21

$$\begin{array}{r} {}^{1}4.5 \\ \times\ 21 \\ \hline 45 \\ 900 \\ \hline 94.5 \end{array} \quad (94.5)$$

6. 36.5×0.24

$$\begin{array}{r} {}^{2}3{}^{1}6{}^{2}.5 \\ \times\ 0.24 \\ \hline 1460 \\ 7300 \\ \hline 8.760 \end{array} \quad (8.760)$$

7. 111.1×11.1

$$\begin{array}{r} 111.1 \\ \times\ 11.1 \\ \hline 1111 \\ 11110 \\ 111100 \\ \hline 1233.21 \end{array} \quad (1233.21)$$

8. 42.09×6.37

$$\begin{array}{r} {}^{1}42.{}^{6}{}^{2}09 \\ \times\ 6.37 \\ \hline {}^{2}294{}^{1}63 \\ 126270 \\ 2525400 \\ \hline 268.1133 \end{array} \quad (268.1133)$$

9. 5.388×71.3

$$\begin{array}{r} {}^{1}5.{}^{2}{}^{2}388 \\ \times\ 71.3 \\ \hline {}^{1}{}^{1}{}^{1}6164 \\ 53880 \\ 3771600 \\ \hline 384.1644 \end{array} \quad (384.1644)$$

10. 7.5×5311.4

$$\begin{array}{r} {}^{1}5311.{}^{2}4 \\ \times\ 7.5 \\ \hline 265570 \\ 3717980 \\ \hline 39835.50 \end{array} \quad (39835.5)$$

11. 27.47×14.5

$$\begin{array}{r} {}^{3}27.{}^{2}{}^{3}47 \\ \times\ 14.5 \\ \hline {}^{1}{}^{1}37{}^{1}35 \\ 109880 \\ 27470 \\ \hline 398.315 \end{array} \quad (398.315)$$

12. 289.5×90.6

$$\begin{array}{r} {}^{5}{}^{1}5{}^{3}4 \\ 289.5 \\ \times\ 90.6 \\ \hline 17370 \\ 00000 \\ 2605500 \\ \hline 26228.70 \end{array} \quad (26228.7)$$

13. 44.99×55.5

$$\begin{array}{r} {}^{4}44.99 \\ \times\ 55.5 \\ \hline {}^{1}{}^{1}{}^{+}22495 \\ 224950 \\ 2249500 \\ \hline 2496.945 \end{array}$$

(2496.945)

14. 6.402×51.9

$$\begin{array}{r} {}^{2}{}^{1}36.402 \\ \times\ 51.9 \\ \hline {}^{1}57618 \\ 164020 \\ 3201000 \\ \hline 332.2638 \end{array}$$

(332.2638)

15. 33.1×55.2

$$\begin{array}{r} {}^{1}33.1 \\ \times\ 55.2 \\ \hline {}^{1}662 \\ {}^{1}{}^{1}6550 \\ 16550 \\ \hline 1827.12 \end{array}$$

(1827.12)

16. 123.4×0.023

$$\begin{array}{r} {}^{1}{}^{1}123.4 \\ \times\ 0.023 \\ \hline {}^{1}3702 \\ 24680 \\ \hline 2.8382 \end{array}$$

(2.8382)

Multiplying Decimals by 10, 100, and 1 000

There are shortcuts when multiplying decimals by 10, 100, and 1 000.

- Move the decimal point one place to the right when you multiply by 10.
  0.34 × 10 = 3.4
- Move the decimal point two places to the right when you multiply by 100.
  0.34 × 100 = 34
- Move the decimal point three places to the right when you multiply by 1 000.
  0.34 × 1 000 = 340

There is a pattern of moving the decimal to the left when multiplying by 0.1, 0.01, and 0.001. Notice the pattern for multiplying a number by 0.1, 0.01, or 0.001. (Remember that the decimal is always to the right of the units.)

- Move the decimal point one place to the left when you multiply by 0.1.
  637 × 0.1 = 63.7
- Move the decimal point two places to the left when you multiply by 0.01.
  637 × 0.01 = 6.37
- Move the decimal point three places to the left when you multiply by 0.001.
  637 × 0.001 = 0.637

Study the following examples closely:

Multiply		
By 10	**By 100**	**By 1 000**
3.65 × 10 = 36.5	3.65 × 100 = 365	3.65 × 1 000 = 3 650
0.584 × 10 = 5.84	0.584 × 100 = 58.4	0.584 × 1 000 = 584
By 0.1	**By 0.01**	**By 0.001**
189 × 0.1 = 18.9	189 × 0.01 = 1.89	189 × 0.001 = 0.189
1.72 × 0.1 = 0.172	1.72 × 0.01 = 0.0172	1.72 × 0.001 = 0.00172

Student practice:

0.44 × 1 000

Instructor led

= 0.440

= 440

Exercise 3.2

Solve the following equations.

1. $2.84 \times 1\,000 =$ 2.840. (2840)
2. $99.116 \times 100 =$ 99.116 (9911.6)
3. $2.2 \times 10 =$ 2.2. (22)
4. $3.409 \times 100 =$ 3.409 (3.409)
5. $6.39 \times 100 =$ 6.39. (639)
6. $1.48 \times 10 =$ 1.48. (148.)
7. $15.5 \times 10 =$ 15.5. (155)
8. $63.1 \times 10 =$ 63.1. (631)
9. $0.03 \times 100 =$ 0.03. (3)
10. $22.003 \times 1\,000 =$ 22.003. (22003.)
11. $9.9 \times 100 =$ 9.90. (990)
12. $6.55 \times 100 =$ 6.55. (655.)
13. $8.11 \times 0.1 =$ .8,11 (0.811)
14. $12.3 \times 0.1 =$ 12,3 (1.23)
15. $325 \times 0.01 =$ 325. (3.25)
16. $8\,300 \times 0.01 =$ 8300. (83.)
17. $236 \times 0.001 =$ .236. (0.236)
18. $3 \times 0.001 =$ .003. (0.003)
19. $500 \times 0.1 =$ 500. (50.)
20. $65.7 \times 0.01 =$ .65,7 (0.657)

Whole Number Division

When dividing whole numbers, we want to leave our answers as terminating or rounded decimals. Decimals can be rounded off to the nearest tenth, hundredth, or thousandth, leaving answers as decimals and not remainders. It will normally be stated which place to round to.

Example 1: Terminating decimal

```
  3.75
4)15.00
 12
  30
  28
   20
   20
    0
```

First, 4 goes into 15 three times. Write a 3 in the quotient (above the line). $4 \times 3 = 12$, so write that underneath the 15 (the dividend) and subtract. The result is 3. As there is a remainder and nothing to bring down, put a decimal behind the 15 and add a 0.

There is just one new thing we must do when dividing a decimal number, and we can take care of it right now. In the quotient, directly above where the decimal is in the dividend, we write another decimal point to the left, as shown.

Bring the 0 down next to the 3 and start again. 4 goes into 30 seven times. Write a 7 in the quotient. $4 \times 7 = 28$, so write that underneath the 30 and subtract. $30 - 28 = 2$. As there is still a remainder of 2, write another 0 in the dividend and then bring the 0 down next to the 2.

4 goes into 20 five times, so write a 5 in the quotient. $20 - 20 = 0$.

Now that there is no remainder, you are done. The answer is **3.75**.

Example 2: Non-terminating decimal rounded to the nearest tenth

```
  2.66
6)16.00
 12
  40
  36
   40
   36
    4
```

First, 6 goes into 16 twice. Write a 2 in the quotient (up top). $2 \times 6 = 12$, so write that underneath and subtract. The result is 4.

As there is a remainder and nothing to bring down, add a decimal behind the 16. Add a decimal up in the quotient also. In this case, as we are to round to the nearest tenth, we need to work out to the hundredths place, so two 0s are added behind the decimal. Bring the first 0 down beside the 4 and start again.

6 goes into 40 six times. Write a 6 in the quotient. $6 \times 6 = 36$, so write that underneath and subtract. $40 - 36 = 4$.

Bring down the next 0 and start again. 6 goes into 40 six times. As the answer is to be rounded to the nearest tenth, we have to work to the hundredths place. 2.66 rounds to 2.7, so the answer is **2.7**.

Note: You could continue to add zeros to the dividend, and each time you would be putting a 6 in the quotient and solving for $40 - 36$. We may, therefore, leave the answer as a rounded-off decimal or we can put a line over the repeating number(s) and show it as a *repeating decimal*, which is an exact value. The answer to this questions could also be $2.\overline{6}$.

Decimal Division Rules

The rules for decimal division:

- Write a decimal in the quotient, directly above the decimal in the dividend.
- Then follow all the normal rules for whole number division:
  - Start with the far left digit of the dividend.
  - How many times does the divisor go into that digit? Write the answer in the quotient.
  - Multiply that answer by the divisor. Put the result under the current digit in the dividend.
  - Subtract.
  - Bring down one more digit from the dividend, and start again. If there are no more digits to bring down, the division is finished.

Divide a Whole Number by a Whole Number

Student practice:

$$36\overline{)63}: \quad 1,\ -36,\ 27$$

Instructor led

$$36\overline{)63.0}: \quad 1.75,\ -36,\ 270,\ -252,\ 180,\ -180,\ 0 \qquad (1.75)$$

Exercise 3.3

Solve the following equations. Round to the nearest thousandth where necessary. Add zeros as necessary to continue dividing.

1. $63 \div 12 = 12\overline{)63.00}$: 5.25, −60, 30, −24, 60, −60, 0 (5.25)

2. $27 \div 8 = 8\overline{)27.000}$: 3.375, −24, 30, −24, 60, −56, 40, −40, 0 (3.375)

3. $17 \div 3 = 3\overline{)17.000}$: 5.666, −15, 20, −18, 20, −18, 20, −18, 2 (5.$\bar{6}$)

4. $62 \div 15 = 15\overline{)62.000}$: 4.1333, −60, 20, −15, 50, −45, 50, −45, 5 (4.1$\bar{3}$)

Divide a Decimal by a Whole Number

Example: 15.08 ÷ 7

```
  2.15
7)15.08
  14
  10
   7
  ---
   38
   35
  ---
    3
```

7 goes into 1 zero times. Bring down the next digit, 5, which makes 15.

7 goes into 15 two times. Write 2 in the quotient. 2 × 7 = 14, and 15 – 14 = 1.

Bring down the 0.

7 goes into 10 one time. Write 1 in the quotient. 1 × 7 = 7, and 10 – 7 = 3.

Bring down the 8.

7 goes into 38 five times. Write 5 in the quotient. 5 × 7 = 35, and 38 – 35 = 3.

There are no more digits to bring down, so the division ends there.

The final answer is 2.15, and the remainder is .03. (In other words, if you split 15.08 into seven groups, there will be 2.15 in each group and .03 left over.)

Student practice:

7)5.0005

Instructor led

```
 0.7143 5,...
7)5.0005
 -49
  10
  -7
   30
  -28
   25
  -21
    4
```

(0.714)

Exercise 3.4

Solve the following equations. No remainders.

1. 62.5 ÷ 5

```
  12.5
5)62.5
 -60
  25
 -25
   0
```

(12.5)

2. 6.4 ÷ 4

```
  1.6
4)6.4
 -4
  24
 -24
   0
```

(1.6)

3. 370.7 ÷ 11

```
  33.7
11)370.7
 -33
  40
 -33
   77
  -77
    0
```

(33.7)

4. $92.76 \div 12$

$$\begin{array}{r} 7.73 \\ 12\overline{)92.76} \\ -84 \\ \hline 87 \\ -84 \\ \hline 36 \\ -36 \\ \hline 0 \end{array} \quad (7.73)$$

5. $196.75 \div 25$

$$\begin{array}{r} 7.87 \\ 25\overline{)196.75} \\ -175 \\ \hline 217 \\ -200 \\ \hline 175 \\ -175 \\ \hline 0 \end{array} \quad (7.87)$$

6. $1.89 \div 9$

$$\begin{array}{r} 0.21 \\ 9\overline{)1.89} \\ -18 \\ \hline 9 \\ -9 \\ \hline 0 \end{array} \quad (0.21)$$

7. $2.64 \div 4$

$$\begin{array}{r} 0.66 \\ 4\overline{)2.64} \\ -24 \\ \hline 24 \\ -24 \\ \hline 0 \end{array} \quad (0.66)$$

8. $17.04 \div 2$

$$\begin{array}{r} 8.52 \\ 2\overline{)17.04} \\ -16 \\ \hline 10 \\ -10 \\ \hline 4 \\ -4 \\ \hline 0 \end{array} \quad (8.52)$$

9. $44.4 \div 8$

$$\begin{array}{r} 5.55 \\ 8\overline{)44.40} \\ -40 \\ \hline 44 \\ -40 \\ \hline 40 \\ -40 \\ \hline 0 \end{array} \quad (5.55)$$

Divide a Whole Number by a Decimal

Example: $0.007\overline{)35}$

$0.007\overline{)35}$ 1. Move the decimal point in the **divisor** three places to the right.

$7\overline{)35.000}$ 2. Place a decimal to the right of the whole number and move it three places to the right, holding each place with a zero.

$7\overline{)35000.}$ 3. Bring the decimal point up in the answer and divide.

When dividing a decimal into a whole number, place a decimal point after the whole number. Add zeros to the right of the whole number, then move the decimal as determined by the divisor.

Remember: It is understood that a whole number has a decimal point on the right.

Sometimes when decimals are divided by whole numbers, zeros have to be put in the answer to hold a place.

Example:

$$\begin{array}{r} 0.006 \\ 3\overline{)\,0.036} \\ \underline{36} \\ 0 \end{array}$$

In this example, zeros are put in the answer to show there are no tenths or hundredths in the answer.

Student practice:

$0.7\overline{)518}$ Instructor led

$0.7\overline{)518.0} \rightarrow$

$$\begin{array}{r} 740 \\ 7\overline{)5180} \\ \underline{-49} \\ 28 \\ \underline{-28} \\ 0 \end{array}$$

(740)

Exercise 3.5

Solve the following equations.

1. $26 \div 0.13$

   $0.13\overline{)26.00}$; $13\overline{)2600.}$ = 200. ; −26 ; 0 (200.)

2. $2 \div 0.4$

   $0.4\overline{)2.0}$; $4\overline{)20.}$ = 5.0 ; −20 ; 0 (5.0)

3. $36 \div 1.8$

   $1.8\overline{)36.0}$; $18\overline{)360.}$ = 20. ; −360 ; 0 (20.0)

4. $0.048\overline{)60}$

   $48\overline{)60000.}$ = 1250. ; −48 ; 120 ; −96 ; 240 ; −240 ; 0 (1250)

5. $0.25\overline{)50}$

   $0.25\overline{)50.00}$; $25\overline{)5000.}$ = 200. ; −50 ; 0 ; 0 (200.)

6. $0.014\overline{)112}$

   $0.014\overline{)112.000}$; $14\overline{)112000.}$ = 8000. ; −112 ; 0 (8000)

7. $\frac{1568}{0.112}$

   $0.112\overline{)1568.000}$; $112\overline{)1568000.}$ = 14000. ; −112 ; 448 ; −448 ; 0 (14000.)

8. $2\,656 \div 0.08$

   $0.08\overline{)2656.00}$; $8\overline{)265600.}$ = 33200. ; −24 ; 25 ; −24 ; 16 ; −16 ; 0 (33200.)

9. $726 \div 0.6$

   $0.6\overline{)726.0}$; $6\overline{)7260.}$ = 1210. ; −72 ; 6 ; −6 ; 0 (1210.)

10. $\frac{62}{2.5}$

    $2.5\overline{)62.0}$; $25\overline{)620.00}$ = 24.8 ; −50 ; 120 ; −100 ; 200 ; −200 ; 0 (24.8)

11. $\frac{651}{0.07}$

    $0.07\overline{)651.00}$; $7\overline{)65100.}$ = 9300. ; −63 ; 21 ; −21 ; 0 (9300.)

12. $\frac{3}{0.6}$

    $0.6\overline{)3.0}$; $6\overline{)30.}$ = 5.0 ; −30 ; 0 (5.0)

Divide a Decimal by a Decimal

Example: $0.03\overline{)4.374}$

$0.03\overline{)4.374}$

1. Move the decimal point in the **divisor** to the right as far as it will go.

$3\overline{)437.4}$

2. Move the decimal in the **dividend** the same number of places.

$$\begin{array}{r} 145.8 \\ 3\overline{)437.4} \\ \underline{3}\downarrow \\ 13 \\ \underline{12}\downarrow \\ 17 \\ \underline{15}\downarrow \\ 24 \\ \underline{24} \\ 0 \end{array}$$

3. Bring the decimal up in the answer directly above its new place and divide.

To divide a decimal by a decimal, change the problem to one in which you are dividing by a whole number.

Student practice:

$0.25\overline{)6.3}$

Instructor led

$0.25\overline{)6.30.} \rightarrow 25\overline{)630.0}$ (25.2)

$$\begin{array}{r} 25.2 \\ 25\overline{)630.0} \\ -50 \\ \hline 130 \\ -125 \\ \hline 50 \\ -50 \\ \hline 0 \end{array}$$

Exercise 3.6

Solve the following equations.

1. $0.9\overline{)3.69}$

$0.9\overline{)3.69}$

$9\overline{)36.9}$ (4.1)

$$\begin{array}{r} 4.1 \\ 9\overline{)36.9} \\ -36 \\ \hline 9 \\ -9 \\ \hline 0 \end{array}$$

2. $0.12\overline{)0.144}$

$0.12\overline{)0.144}$

$12\overline{)14.4}$ (1.2)

$$\begin{array}{r} 1.2 \\ 12\overline{)14.4} \\ -12 \\ \hline 24 \\ -24 \\ \hline 0 \end{array}$$

3. $\dfrac{6.25}{2.5}$

$2.5\overline{)6.25}$

$25\overline{)62.5}$ (2.5)

$$\begin{array}{r} 2.5 \\ 25\overline{)62.5} \\ -50 \\ \hline 125 \\ -125 \\ \hline 0 \end{array}$$

4. $0.5\overline{)9.25}$

$0.5.\overline{)9.25}$

$5\overline{)92.5}$ (18.5)

-90

25

-25

0

5. $3.6\overline{)1.0836}$

$3.6\overline{)1.0836}$

$36\overline{)10.836}$ (0.301)

-108

36

-36

0

6. $0.07\overline{)2.849}$

$0.07.\overline{)2.849}$

$7\overline{)284.9}$ (40.7)

-28

49

-49

0

7. $72.6 \div 0.006$

$0.006.\overline{)72.600.}$

$6\overline{)72600.}$ (12,100.)

-72

6

-6

0

8. $265.6 \div 0.08$

$0.08.\overline{)265.60.}$

$8\overline{)26560.}$ (3320.)

-24

25

-24

16

-16

0

9. $72.6 \div 0.6$

$0.6.\overline{)72.6.}$

$6\overline{)726.}$ (121.)

-72

6

-6

0

10. $0.2\overline{)0.0034}$

$0.2.\overline{)0.0034}$

$2\overline{)0.034}$ (0.017)

0

3

-2

14

-14

0

11. $0.007\overline{)6.51}$

$0.007.\overline{)6.510.}$

$7\overline{)6510.}$ (930.)

-63

21

-21

0

12. $0.18\overline{)0.4554}$

$0.18.\overline{)0.4554}$

$18\overline{)45.54}$ (2.53)

-36

95

-90

54

-54

0

13. $1.28 \div 0.32$

$0.32.\overline{)1.28.}$

$32\overline{)128.}$ = 4.0 (4.)
−128
0

14. $\frac{2.50}{0.5}$

$0.5.\overline{)2.5.0}$

$5\overline{)25.0}$ = 5.0 (5.0)
−25
0

15. $0.006\overline{)74.898}$

$0.006.\overline{)74.898.}$

$6\overline{)74898.}$ = 12483. (12483.)
−72
28
−24
49
−48
18
−18
0

16. $0.231\overline{)0.00924}$

$0.231.\overline{)0.009.24}$

$231\overline{)9.24}$ = 0.04 (0.04)
−9.24
0

17. $0.125\overline{)53.75}$

$0.125.\overline{)53.750.}$

$125\overline{)53750.}$ = 430. (430.)
−500
375
−375
0

18. $0.052\overline{)452.4}$

$0.052.\overline{)452.400.}$

$52\overline{)452400.}$ = 8700. (8700.)
−416
364
−364
0

Dividing Decimals by 10, 100, and 1 000

Like shortcuts in multiplying decimals by 10, 100, or 1 000, there are also shortcuts in dividing decimals by 10, 100, and 1 000.

- When multiplying a decimal by 10, move the decimal point one place to the right and the number gets bigger. When multiplying by 100, move the decimal point two places to the right. When multiplying by 1 000, move the decimal point three places to the right.
- When dividing decimals by 10, move the decimal point one place to the left and the number gets smaller. When dividing by 100, move the decimal point two places to the left. When dividing by 1 000, move the decimal point three places to the left.
- If multiplying by a decimal, for example $52 \times 0.1 = 5.2$, the decimal moves one place to the left.
- If dividing by a decimal, for example $52 \div 0.1 = 520$, the decimal moves one place to the right.

Study the following examples closely:

Divide		
By 10	**By 100**	**By 1 000**
$25.9 \div 10 = 2.59$	$25.9 \div 100 = 0.259$	$25.9 \div 1\,000 = 0.0259$
$13 \div 10 = 1.3$	$13 \div 100 = 0.13$	$13 \div 1\,000 = 0.013$
By 0.1	**By 0.01**	**By 0.001**
$0.42 \div 0.1 = 4.2$	$0.42 \div 0.01 = 42$	$0.42 \div 0.001 = 420$
$19 \div 0.1 = 190$	$19 \div 0.01 = 1\,900$	$19 \div 0.001 = 19\,000$

Student practice:

99.061÷ 100

Instructor led

.99,061 (0.99061)

Exercise 3.7

Solve the following equations.

1. $2\,500 \div 10 = 250$ 2500.
2. $0.1284 \div 1\,000 = 0.0001284$
3. $9\,678 \div 1\,000 = 9.678$
4. $54.31 \div 100 = 0.5431$
5. $84.3 \div 10\,000 = 0.00843$
6. $0.6 \div 10\,000 = 0.00006$
7. $67 \div 10 = 6.7$
8. $0.12 \div 10\,000 = 0.000012$
9. $0.75 \div 1\,000 = 0.00075$
10. $2\,500 \div 1\,000 = 2.5$
11. $128.4 \div 10 = 12.84$
12. $2\,500 \div 100 = 25.0$
13. $0.5 \div 10 = 0.05$
14. $128.4 \div 100 = 1.284$
15. $95 \div 10\,000 = 0.0095$
16. $7.2 \div 0.1 = 72.0$
17. $0.593 \div 0.1 = 5.93$
18. $62.5 \div 0.1 = 625.0$
19. $8.35 \div 0.01 = 835.0$
20. $0.7854 \div 0.01 = 78.54$
21. $56.75 \div 0.01 = 5675.0$
22. $3.4552 \div 0.001 = 3455.2$
23. $0.5 \div 0.001 = 500.0$
24. $0.03 \div 0.001 = 30.0$

Convert Fractions to Decimals

Steps to change a fraction to a decimal:

1. Divide the numerator (top number) by the denominator (bottom number).
2. Put the numerator on the inside of the division sign and add a decimal and as many zeros following the decimal as you need.
3. If there is a remainder, add a zero to the dividend and continue dividing.
4. You may need to round to a certain point—thousandths is common. If this is the case, you need to work your answer to the ten thousandths place, then round.

Examples:

1. Change $\frac{4}{5}$ to a decimal.

$$5\overline{)4.0}\quad 0.8$$

Therefore $\frac{4}{5} = 0.8$

2. Change $\frac{3}{8}$ to a decimal.

$$\begin{array}{r} 0.375 \\ 8\overline{)3.000} \\ \underline{24} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

Therefore $\frac{3}{8} = 0.375$

3. Change $\frac{2}{3}$ to a decimal.

$$\begin{array}{r} 0.666 \\ 3\overline{)2.000} \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

This division will not come out evenly, no matter how far it is carried out. We may leave the answer as a rounded-off decimal, or we can put a line over the repeating number and leave it as a repeating decimal, which is an exact value.

Therefore $\frac{2}{3} = 0.667$ or $0.\overline{6}$

4. Change $2\frac{1}{4}$ to a decimal.

There are two ways to change a mixed number into a decimal.

$$\begin{array}{r} 0.25 \\ 4\overline{)1.00} \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

One way is to divide the fraction separately, then put the whole number in front of the decimal point.

$\frac{1}{4} = 0.25$ therefore, $2\frac{1}{4} = 2.25$

$2\frac{1}{4} = \frac{9}{4}$

The other way is to change the mixed number to an improper fraction, then divide.

$$\begin{array}{r} 2.25 \\ 4\overline{)9.00} \\ \underline{8} \\ 10 \\ \underline{10} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Therefore, $2\frac{1}{4} = 2.25$

Student practice:

1. $\frac{7}{8}$

Instructor led

$$\begin{array}{r} 0.875 \\ 8\overline{)7.000} \\ -64 \\ \hline 60 \\ 56 \\ \hline 40 \\ -40 \\ \hline 0 \end{array}$$

(0.875)

2. $\frac{11}{25}$

$$\begin{array}{r} 0.44 \\ 25\overline{)11.00} \\ -100 \\ \hline 100 \\ -100 \\ \hline 0 \end{array}$$

(0.44)

Exercise 3.8

Change each of the following fractions into a decimal and round your answers to the nearest thousandth as necessary.

1. $\frac{7}{100}$

$100\overline{)7.00}$ (0.07)
-700
0

2. $\frac{1}{8}$

$8\overline{)1.000}$ (0.125)
-8
20
-16
40
-40
0

3. $\frac{41}{50}$

$50\overline{)41.00}$ (0.82)
-400
100
-100
0

4. $\frac{2}{5}$

$5\overline{)2.0}$ (0.4)
-20
0

5. $\frac{7}{9}$

$9\overline{)7.000}$ (0.77...)
-63
70
-63
70
⋮

6. $\frac{5}{12}$

$12\overline{)5.0000}$ (0.41̄6)
-48
20
-12
80
-72
80
⋮

7. $\frac{13}{15}$

$15\overline{)13.0000}$ (0.8̄6)
-120
100
-90
100
-90
10
⋮

8. $2\frac{4}{7}$

(0.8̄6)
↓ +2
= 2.8̄6

$7\overline{)4.000}$ (0.571)
-35
50
-49
10
-7
30

9. $\frac{15}{13}$

$13\overline{)15.000}$ (0.1153)
-13
70
-65
50
-39
11

10. $\frac{15}{8}$

$8\overline{)15.000}$ (0.1875)
-14
60
-56
40
-40
0

11. $5\frac{3}{4}$

$4\overline{)3.00}$ (0.75)
-28
20
-20
0

(0.75)
+ 5
= 5.75

12. $7\frac{11}{12}$

$12\overline{)11.0000}$ (0.9166...)
-108
20
-12
80
-72
80

(0.917)
= 7.917

Multiplications and Decimal Division Word Problems

You multiply numbers when ...

- you have a bunch of groups that are the same size, and you want to know the total. (There are 12 frozen waffles in a box. You have 3.5 boxes of waffles. How many waffles do you have?)
- the same amount is added to something multiple times. (Shanna ran 5.25 km per day for 28 days. What is the total distance she ran?)
- one amount is a certain number of times greater than another. (Jaiden is 4 years old. His mom is 7.5 times older than he is. How old is Jaiden's mom?)

You divide numbers when ...

- you have a total and have to break it into a certain number of groups. (You have 90 cookies and there are 15 children. How many cookies per child are there?)
- you have a total and have to break it into groups of a certain size. (You have 90 cookies and are putting 3 cookies in each bag. How many bags can you fill?)
- you've done an assignment or test and want to know your score. (You calculate the number of questions you got right divided by the total number of questions, then you move the decimal of your answer two steps to the right to turn it into a percentage.)

Exercise 3.9

Solve the following word problems. Remember to write your answers in sentence form.

1. You and three friends go out for supper and drinks. The bill is $118.74. How much is your share of the bill? (Round your answer to the nearest cent.)

divide:

$$3\overline{)118.74} \quad 39.58$$
$$-9$$
$$28$$
$$-27$$
$$17$$
$$-15$$
$$24$$
$$-24$$
$$0$$

(39.58)

Your share is $39.58.

2. Monique is 5.5 feet tall. If there are 12 inches in one foot, what is Monique's height in inches?

multiply:

$$\begin{array}{r} {}^{1}12 \\ \times 5.5 \\ \hline 60 \\ 600 \\ \hline 66.0 \end{array}$$

(66.0)

Monique's height is 66 in.

3. Chris ate half (0.5) a chocolate bar every day for a year (365 days). How many chocolate bars did Chris eat?

multiply: 0.5×365

$$\begin{array}{r} {}^{3}{}^{2}365 \\ \times 0.5 \\ \hline 1825 \\ 0000 \\ \hline 182.5 \end{array}$$

Chris ate 182.5 chocolate bars.

4. Once a year, you have to register your car. The registration costs $93.00. You decide to save some money each month for a year so you have it ready for the registration fee. How much would you have to save each month?

divide:

$$12\overline{)93.00} \quad 07.75$$
$$-84$$
$$90$$
$$-84$$
$$60$$
$$-60$$
$$0$$

(7.75)

You would have to save $7.75 per month for one year.

5. A box of candies has a total of 230 calories and contains 12 individual candies. How many calories are there in each candy?

divide!

$$12\overline{)230.00} \quad (19.16)$$

-12

110

-108

20

-12

80

There are 19.16 calories in each candy.

6. A block of butter is 454 g (grams). If you cut it into 16 pieces, how many grams is each piece?

divide!

$$16\overline{)454.0} \quad (28\text{ r}.6)$$

-32

134

-128

60

48

Each piece is 28.375 g.

7. Lesley bought a "flat" of pop for a party. The flat contained 24 cans. If 75% (0.75) of the pop was consumed at the party, how many cans does Lesley have left?

① 24

$\times 0.75$

120

$+1680$

1800 (18.00)

② '24'

-18

6

There are 6 cans left.

8. The population of Canada is 34,880,000 people. It is estimated that one-third (33% or 0.33) of the population is overweight. How many Canadians are overweight?

$34\,880\,000$

$\times \quad 0.33$

$10\,464\,000$

$104\,640\,000$

$11,510,400.00$

There are 11,510,400 overweight people.

9. You get 12/15 on a quiz. What is your score as a decimal?

$\frac{12}{15} \rightarrow 15\overline{)12.0} \quad (0.8)$

-120

0

My score is 0.80 or 80%.

Post-Module Assessment and Glossary

Post-Module Assessment

Now that you have completed this module, reassess what you can do against this checklist:

In this module, I will learn how to ...	I can't do this	I can do this with help	I can do this!
1. Read decimal numbers as digits or in English			
2. Write decimal numbers as digits or in English			
3. Add decimal numbers without carries			
4. Add decimal numbers with carries			
5. Subtract decimal numbers without borrowing			
6. Subtract decimal numbers with borrowing			
7. Multiply decimal numbers			
8. Divide decimal numbers			
9. Convert fractions to decimals			

Glossary for this Module

<	Less than
>	Greater than
Addends	The numbers that are being added together
Adding / Addition	Joining something to something else so as to increase the size, number, or amount; in an equation, this is indicated by the symbol "+" Other terms used in word problems to show adding are "increases," "goes up," "plus," "combined with," "together with," "all together," "in addition to" **Note:** Sometimes the word "and" means addition, as in "How much is 8 and 5?" but don't assume a problem is about adding just because you see the word "and"!
Ascending	Going up; rising or increasing to higher levels, values, or degrees
Carry	To transfer a digit from one column of digits to another column of more significant (higher-value) digits

Column	A line of numbers or words written underneath each other
Descending	Going down; going or moving from a higher to a lower place or level
Difference	The *answer* or *result* of a subtraction equation
Digit	A single number. For example, 1, 2, and 8 are digits. The number 256 has three digits. The number 10,000 has five digits. (Because we sometimes count using our hands, the word "digit" can also mean "a finger or thumb.")
Dividend	The *first number* in a division equation
Divisor	The *second number* in a division equation
Equation	A statement that the values of two mathematical expressions are equal (indicated by the symbol "=")
Minuend	The *first number* in a subtraction equation
Minus	Take away, reduce, subtract, or remove; in an equation, this is indicated by the sign "–"
Multiplicand	The *first number* in a multiplication equation
Multiplier	The *second number* in a multiplication equation
Operation	A single math task. Adding is an "operation," and so are subtracting, multiplying, and dividing. Some math questions require one operation, and some require more than one.
Period	A group of up to three digits in a number. 1 503 764 has 1 in the *millions* period, 503 in the *thousands* period, and 764 in the *ones* period.
Place value	Place value shows how much one digit of a number is worth. In the number 9.5, the place values are 9 and 0.5 (five tenths).
Product	The *answer* or *result* of a multiplication equation
Quotient	The *answer* or *result* of a division equation
Remainder	The amount left over when the division of two numbers does not work out to an even whole number. For example, $28 \div 4 = 7$, but $30 \div 4 = 7$ with a remainder of 2.
Subtrahend	The *second number* in a subtraction equation
Sum	The answer to an addition problem, also known as a "total"
Symbol	A letter, group of letters, character, or picture that is used instead of a word or group of words
Total	The answer to an addition problem, also known as a "sum"

Appendix: Exercise Answer Key

Unit 1: Introduction to Decimals

Exercise 1.1

1. 7 tenths (0.7), 1 hundredth (0.01), 8 thousandths (0.008)

2. a. 500 + 70 + 9 + 0.1 + 0.06 + 0.002

   b. 1 000 + 10 + 8 + 0.5 + 0.007 (If you included 000 and 0.00 because of the two zeroes in the number, that's fine.)

Exercise 1.2

1. a. forty-five and nine hundred eighteen thousandths

   b. six hundred forty-four and three hundredths

   c. twenty-five and one hundred thirty-seven thousandths

   d. five hundred seventeen and seven hundred eighty-nine ten thousandths

2. a. 86.7 b. 3.142 c. 65 047.63

   d. 137.2884 e. 70 212.0209 f. 34 025.14159

Exercise 1.3

1. Answer to a) through d) are given in a footnote on p. 13

   e. 0.881, 0.81, 0.8 f. 1.07, 1.051, 1.05 g. 0.631, 0.62, 0.612

   h. 8.25, 8.2, 8.023, 8 i. 0.111, 0.11, 0.1

2. a. 0.08, 0.081, 0.8 b. 0.35, 0.375, 0.75 c. 8.25, 8.275, 8.3

   d. 0.04, 0.36, 0.42 e. 0.014, 0.02, 0.1 f. 6, 6.04, 6.041, 6.1

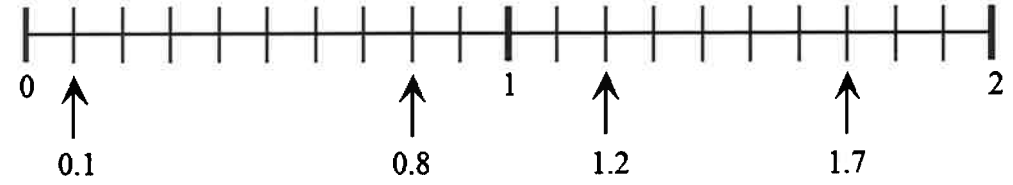
   g. 0.1, 0.101, 0.12 h. 0.9, 0.99, 0.999 i. 0.812, 8, 8.12

   j. 0.073, 0.7, 0.73

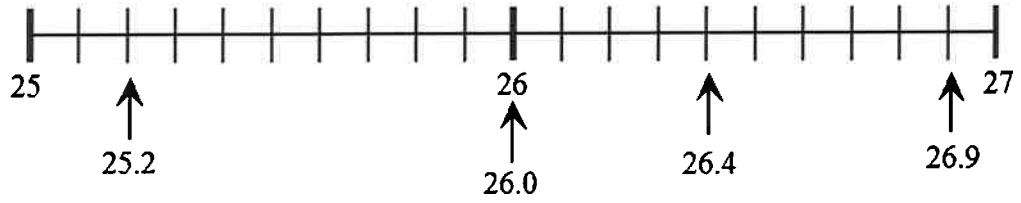
3. a. < b. < c. > d. > e. <

Exercise 1.4

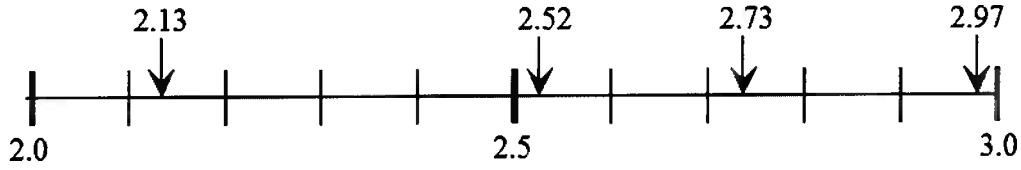
1.



2.



3.



Unit 2: Decimal Addition and Subtraction

Exercise 2.1

1. a. the decimals in all the addends must be lined up
   b. two
   c. three

2. a. 74.56 b. 296.2 c. 5.860 d. 473.11 e. 338.6384

Exercise 2.2

1. 1 076.7709 2. 163.116 3. 43.3531 4. 654.248 5. 212.0405

6. 162.04 7. 791.127 8. 34.163 9. 42.0632 10. 13.27

11. 1.200 12. 23.65 13. 6 680.655 14. 56.557

Exercise 2.3

1.	a.	33.5	b.	527.34	c.	2 721.12	d.	740.3927	e. 216.253
	f.	0.004	g.	0.34	h.	2.542	i.	1.649	j. 36.148
2.	a.	7 598.3	b.	4.4983	c.	3 169.716	d.	9.605	e. 20.74
	f.	5.372	g.	2.44	h.	229.3	i.	6 530.7	j. 22.9
	k.	24.5	l.	6.965	m.	65.953	n.	2.3969	o. 515.59
	p.	390.93							

Exercise 2.4

1. The evening temperature is 15.7°C.
2. The movie club has $1 087.08 now.
3. Angie has made 27.463 L of punch.
4. Bolt's record time is 0.25 seconds less.
5. Lori has $132.25 left for groceries.
6. Mireille is 92.3 cm tall.
7. The total cost to go out to a movie is $47.85.
8. Diane has use 3.249 g of fibre supplement.
9. The TSE increased by 50.85.
10. Justin's morning temperature is 39.33°C.

Unit 3: Decimal Multiplication and Division

Exercise 3.1

1.	0.15	2.	0.014	3.	0.00048	4.	0.00045	5.	94.5
6.	8.760	7.	1 233.21	8.	268.1133	9.	384.1644	10.	39 835.5
11.	398.315	12.	26 228.7	13.	2 496.945	14.	332.2638	15.	1 827.12
16.	2.8382								

Exercise 3.2

1. 2 840	2. 9 911.6	3. 22	4. 340.9	5. 639
6. 14.8	7. 155	8. 631	9. 3	10. 22 003
11. 990	12. 655	13. 0.811	14. 1.23	15. 3.25
16. 83	17. 0.236	18. 0.003	19. 50	20. 0.657

Exercise 3.3

1. 5.25	2. 3.375	3. 5.667	4. 4.133

Exercise 3.4

1. 12.5	2. 1.6	3. 33.7	4. 7.73	5. 7.87
6. 0.21	7. 0.66	8. 8.52	9. 5.55	

Exercise 3.5

1. 200	2. 5	3. 20	4. 1 250	5. 200
6. 8 000	7. 14 000	8. 33 200	9. 1 210	10. 24.8
11. 9 300	12. 0.5			

Exercise 3.6

1. 4.1	2. 1.2	3. 2.5	4. 18.5	5. 0.301
6. 40.7	7. 12 100	8. 3 320	9. 121	10. 0.017
11. 930	12. 2.53	13. 4	14. 5	15. 12 483
16. 0.04	17. 430	18. 8 700		

Exercise 3.7

1. 250	2. 0.0001284	3. 9.678	4. 0.5431	5. 0.00843
6. 0.00006	7. 6.7	8. 0.000012	9. 0.00075	10. 2.5
11. 12.84	12. 25	13. 0.05	14. 1.284	15. 0.0095
16. 72	17. 5.93	18. 625	19. 835	20. 78.54
21. 5 675	22. 3 455.2	23. 500	24. 30	

Exercise 3.8

1. 0.7	2. 0.125	3. 0.82	4. 0.4	5. 0.778
6. 0.417	7. 0.867	8. 2.571	9. 1.154	10. 1.875
11. 5.75	12. 7.917			

Exercise 3.9

1. My share of the bill is $29.69.
2. Monica is 66 inches tall.
3. Chris ate 182.5 chocolate bars.
4. I would have to save $7.75 each month.
5. There are 19.1667 calories in each candy.
6. Each piece is 28.375 g.
7. Lesley has 6 cans left.
8. 11 510 400 Canadians are overweight.
9. My score as a decimal is 0.8.