Chapter 4

123.456789

In Words

52.543201
52 and 543,201
fifty-two and five hundred forty-three thousand
2 hundred one

-48.512
-48 and 512
negative forty-eight

589,123.0546
five hundred eighty-nine thousand, one hundred twenty-three
and five hundred forty-six ten-thousandths

2.09

-2.009

101,002003
Three hundred two and three thousandths
\[ 302 \, \frac{3}{10^3} \]

Negative Four thousand and three hundredths
\[ -4000 \, \frac{3}{10^2} \]

One hundred million, thirty-three thousand, five hundred eleven
\[ 100,000,033 \, 511 \]

Thirty-two million, twenty thousand, five and three thousand, two hundred three ten-thousandths
\[ 32,020,003 \, \frac{203}{10^5} \]

Two hundred thousand and four hundred-thousandths
\[ 200,000 \, \frac{4}{10^5} \]

Decimal to Fraction:

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>6 \div 10 = 3/5</td>
</tr>
<tr>
<td>0.65</td>
<td>65 \div 100 = 13/20</td>
</tr>
<tr>
<td>0.654</td>
<td>654 \div 1000 = 327/500</td>
</tr>
<tr>
<td>1.6</td>
<td>6 \div 10 = 3/5</td>
</tr>
<tr>
<td>12.65</td>
<td>1265 \div 100 = 127/20</td>
</tr>
<tr>
<td>123.654</td>
<td>123654 \div 1000 = 327/80</td>
</tr>
<tr>
<td>0.0006</td>
<td>6 \div 1000 = 3/500</td>
</tr>
<tr>
<td>1.0065</td>
<td>10065 \div 10000 = 13/500</td>
</tr>
<tr>
<td>0.4 \div 4 = 1/25</td>
<td></td>
</tr>
</tbody>
</table>

Write the following fractions as decimals:

\[ \frac{5}{10} = 0.5 \quad \frac{2}{10} = 0.2 \quad \frac{3}{100} = 0.03 \]

\[ \frac{923}{1000} = 0.923 \quad \frac{21}{100} = 0.21 \]
<table>
<thead>
<tr>
<th>Decimal</th>
<th>Written</th>
<th>Mixed number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.235</td>
<td>One and two hundred thirty-five thousandths</td>
<td>1 235 (\frac{5}{8})</td>
</tr>
<tr>
<td>523.042</td>
<td>Five hundred twenty-three and forty-two thousandths</td>
<td>523 (\frac{42}{100} + \frac{2}{10})</td>
</tr>
<tr>
<td>25.003</td>
<td>Twenty-five and three thousandths</td>
<td>25 (\frac{3}{100})</td>
</tr>
<tr>
<td>0.42</td>
<td>Forty-two hundredths</td>
<td>42 (\frac{2}{10})</td>
</tr>
<tr>
<td>0.055</td>
<td>Fifty-five thousandths</td>
<td>55 (\frac{5}{100})</td>
</tr>
<tr>
<td>501.02</td>
<td>Five hundred one and two hundredths</td>
<td>501 (\frac{2}{100})</td>
</tr>
<tr>
<td>555.55</td>
<td>Five hundred fifty-five and fifty-five hundredths</td>
<td>555 (\frac{11}{10})</td>
</tr>
<tr>
<td>23.02</td>
<td>Twenty-three and two hundredths</td>
<td>23 (\frac{2}{10})</td>
</tr>
<tr>
<td>1111.0001</td>
<td>Eleven thousand one hundred eleven and one ten-thousandths</td>
<td>1111 (\frac{1}{10000})</td>
</tr>
<tr>
<td>0.0021</td>
<td>Twenty-one thousandth</td>
<td>21 (\frac{1}{100})</td>
</tr>
<tr>
<td>35.5301</td>
<td>Thirty-five and five thousand three hundred</td>
<td>35 (\frac{5301}{10000})</td>
</tr>
<tr>
<td>0.410</td>
<td>Four hundred ten thousandths</td>
<td>410 (\frac{1}{1000})</td>
</tr>
<tr>
<td>0.0400</td>
<td>Four hundred ten-thousandths</td>
<td>400 (\frac{1}{10000})</td>
</tr>
<tr>
<td>2.2353</td>
<td>Two and two thousand fifty-five thousandths</td>
<td>2 (\frac{2353}{10000})</td>
</tr>
<tr>
<td>5.02</td>
<td>Five and two hundredths</td>
<td>5 (\frac{2}{10})</td>
</tr>
<tr>
<td>1.568</td>
<td>One and five hundred sixty-eight thousandths</td>
<td>158 (\frac{68}{100})</td>
</tr>
<tr>
<td>1.0409</td>
<td>One and four hundred nine ten-thousandths</td>
<td>1 (\frac{409}{10000})</td>
</tr>
</tbody>
</table>
Rounding to the nearest?

Round to the nearest thousandth.

1) 234,123.5643     2) 0.2345     3) 1009.009     4) 1.235363333
   234.1235643       0.2345           1009.009      1.235

Round to the nearest hundredth

1) 234,123.5643     2) 0.2345     3) 1009.009     4) 1.235363333
   234.1235643       0.2345           1009.009      1.235

Round to the nearest whole number

1) 234,123.5643     2) 0.2345     3) 1009.009     4) 1.235363333
   234.1235643       0.2345           1009.009      1.235

Round to the nearest cent

1) $234,123.5643     2) 0.2345     3) $1009.009     4) $1.235363333
   $234.1235643       0.2345           $1009.009     $1.235

---

Adding Whole Numbers


The number in front tells you how many you have. So, one apple plus three apples is four apples.

Remember this—the + means you can only count or remove your like terms, that is all.

A) 5 🍎 + 3 🍎 ➞ 8 🍎

B) 4 X + 7 X ➞ ! ! X

D) \( \frac{6}{2} + \frac{3}{2} \ ➞ \frac{9}{2} \)
53.803 + 52.000 = ~1.803

Multiplying

1. Multiply
2. Count the number of decimal places in both numbers.
3. Give the product that number of decimal places.

\[
\begin{array}{c}
2.04 \quad \Rightarrow 2 \, \text{dec} \\
\times 1.3 \quad \Rightarrow 1 \, \text{dec} \\
\hline
2.04 \quad \Rightarrow 3 \, \text{dec} \\
\hline
2.652 \\
\end{array}
\]

The number of decimal places for the product is the sum of the number of decimal places in the factors. Two from the first number and one from the second number.

1. \(1 \times 9 = 9\)
2. \(12 \times 0.1 = 1.2\)
3. \(0.1 \times 0.11 = 0.011\)
4. \(9 \times 6 = 54\)
5. \(8 \times 0.6 = 4.8\)
6. \(12 \times 0.07 = 0.84\)
7. \(12 \times 0.2 = 2.4\)
8. \(2 \times 0.12 = \)
9. \(0.01 \times 0.01 = \)
10. \(0.04 \times 8 = \)

1. \(0.0843 \times 0.083 =\)
2. \(1.418 = 1.418\)
3. \(0.069 \times 0.1 = 0.0069\)
4. \(0.0843 \times 0.083 = 0.0069\)
5. \(-572 \times 0.0072 = -4.0944\)
6. \(-0.676 \times 3.1 = -2.1066\)
7. \(0.84 \times 0.063 = 0.0534\)
8. \(70.7 \times 0.7 = 49.59\)
9. \(9.72 \times 0.038 = 0.369\)
10. \(0.0407 \times 0.05 = 0.002035\)

Evaluate: 1) \(2(R - T), \) \(R = -0.32 \text{ AND } T = -0.022\)

2) \(XY^2 - X, \) \(X = 0.1 \text{ AND } Y = -0.2\)
Dividing

1. If dividing by a decimal, then move the decimal place to the right in both numbers until there are no decimal places on the outside number (the divisor).
2. Place a decimal on the line above the other decimal.
3. Divide as before until you have a remainder of zero, repeating digits, or it asks you to round. If the digits repeat, then place a bar over the repeating digits.

\[
\begin{array}{c}
13)33.28 \\
- 261 \\
\hline
728 \\
- 728 \\
\hline
0
\end{array}
\]

The outside number had one decimal place. So we had to move the decimal to the right one place in both numbers.

\[2.56\]

Divide \( \frac{53}{25} \):

\[
\begin{array}{c}
5.33 \\
- 5 \\
\hline
33 \\
- 30 \\
\hline
3 \\
- 2 \\
\hline
10
\end{array}
\]

\[8.3\]

Round to the nearest hundredth:

\[
\begin{array}{c}
13)300.00 \\
- 260 \\
\hline
400 \\
- 390 \\
\hline
10 \\
- 10 \\
\hline
0
\end{array}
\]

\[15.38\]

Converting Fractions to Decimals

Decimals to Fractions

\[
\frac{5}{3}
\]

\[
\begin{array}{c}
\frac{3}{8} \\
\hline
0.6
\end{array}
\]

\[
\frac{6}{10}
\]

\[1.325\]

\[\frac{13}{48}\]
Power of 10

\[
\begin{align*}
2.33 \cdot 10 & = 23.3 \\
23.3 & \\
2.33 \div 10 & = 0.233 \\
0.233 & \\
\end{align*}
\]

Converting fractions to decimals:

\[
\begin{align*}
\frac{9}{10} & = 0.9 \\
\frac{3}{5} & = 0.6 \\
\frac{7}{8} & = 0.875 \\
\frac{2}{11} & = 0.181818 \\
\end{align*}
\]

Converting decimals to fractions (review):

\[
\begin{align*}
0.6 & = \frac{6}{10} = \frac{3}{5} \\
0.65 & = \frac{65}{100} = \frac{13}{20} \\
0.654 & = \\
1.6 & = \\
12.65 & = \\
123.654 & = \\
0.0006 & = \\
1.0065 & = \\
1000.004 & = \\
\end{align*}
\]
Solving Equations

Simplify

(simplify each side)

c) Remove decimals — Multiply by powers of ten

\[ 0.3x = 0.18 \]
\[ \frac{0.3}{0.3} \]
\[ x = 0.6 \]

\[ \frac{30x = 18}{30} \]
\[ x = \frac{3}{5} \]

<table>
<thead>
<tr>
<th>1) [ a ] [ 4x = -5.73 ]</th>
<th>2) [ b ] [ x - 5.2 = 2.3 ]</th>
<th>3) [ c ] [ \frac{t}{8} = -8.1 ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>0.4</td>
<td>-1.2</td>
</tr>
<tr>
<td>5</td>
<td>33</td>
<td>-3.2</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>2.3</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>x = -14.725</td>
<td>x = -0.9</td>
<td>t = 24.3</td>
</tr>
</tbody>
</table>

\[ x + 8.1 = 9.8 \]
\[ \frac{y}{2.22} = -6 \]
\[ -1.65 = -0.5f \]
Applications:
The average acceleration of an object is given by \( a = \frac{v}{t} \), where \( a \) is the average acceleration, \( v \) is the velocity, and \( t \) is the time. Find the velocity after 3 seconds of an object whose acceleration is 16 ft/sec squared.

\[
D = rt \quad C = \frac{5}{9}(F - 32) \quad \text{profit} = \text{revenue} - \text{cost} \quad \text{Retail price} = \text{cost} + \text{markup}
\]

1) Find the distance covered by a jet if it travels for 3.5 hours at 550 mph.

2) Find the Celsius temperature reading if the Fahrenheit reading is 89.3°?

3) For the month of June, a florist’s cost of doing business was $3758.95. If June’s revenues totaled $5,115.22, what was her profit for the month of June?

4) You find a shoe for $1.33 at a yard sale and want to sell it with a markup of $2.55. What is the Retail or selling price?

5) The markup on a refrigerator is $523.44. If the selling price is $1045.66, then what is the dealers cost?
SQUARE TO SQUARE ROOT

\[ \begin{align*}
2 \times 2 &= 4 & \sqrt{4} &= 2 \\
3 \times 3 &= 9 & \sqrt{9} &= 3 \\
4 \times 4 &= 16 & \sqrt{16} &= 4 \\
5 \times 5 &= 25 & \sqrt{25} &= 5 \\
6 \times 6 &= 36 & \sqrt{36} &= 6 \\
7 \times 7 &= 49 & \sqrt{49} &= 7 \\
8 \times 8 &= 64 & \sqrt{64} &= 8 \\
9 \times 9 &= 81 & \sqrt{81} &= 9 \\
10 \times 10 &= 100 & \sqrt{100} &= 10 \\
11 \times 11 &= 121 & \sqrt{121} &= 11 \\
12 \times 12 &= 144 & \sqrt{144} &= 12 \\
\end{align*} \]

\[ \begin{align*}
-\sqrt{64} &= -8 \\
-\sqrt{0.064} &= -0.8 \\
\frac{-1}{\sqrt{4}} &= -\frac{1}{2} \\
-6 \sqrt{81} + 5 \sqrt{1} &= -49 \\
\frac{\sqrt{25}}{9} - \frac{\sqrt{64}}{81} &= \frac{5}{3} - \frac{8}{9} \\
\frac{5}{3} - \frac{8}{9} &= \frac{7}{9} \\
\end{align*} \]

Approximate using your calculator:

\[ \sqrt{11} \quad \sqrt{52} \]
Radical Land

$\sqrt{32}$  $\sqrt{108}$

$\sqrt{50}$  $\sqrt{250}$

$\sqrt{81}$  $5\sqrt{99}$

$\sqrt{625}$  $\sqrt{42}$
**NATURAL NUMBERS** (counting numbers) 1, 2, 3, 4, 5, ...

0 1 2 3 4 5 6 7 8 9 10

**WHOLE NUMBERS** 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, ...

**INTEGERS** -3, -2, -1, 0, 1, 2, 3, ...

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

**RATIONAL NUMBERS** Integers, Repeating and ending Decimals, and Fractions -3, -2 \(\frac{7}{8}\), 0, 3, 5.7, 4.3333...

-5.5 0 \(\frac{1}{2}\) 1

**IRRATIONAL NUMBERS**
Decimals that don’t repeat or end. We don’t know exactly where they are on the number line. Like radicals, \(\pi\), 1.235698425624... there is no pattern.

**REAL NUMBERS** All of the previous numbers

- REAL
- RATIONAL
- INTEGERS
- WHOLE NUMBERS
- NATURAL
- IRRATIONAL

So all natural numbers are whole numbers, all whole numbers are integers, all integers are rational, and all rational are real. The real numbers are all the numbers on the real number line.

### List of numbers
- \(\frac{1}{2}\), 3, -1, 0.5, 2.3412, 0, \(\sqrt{3}\), \(\pi\)

List all of the numbers that are:
1) whole numbers
2) Integers
3) Irrational
4) Rational
5) Real
Plot the following:

**Whole numbers:** plot -2

Plot 5

**Decimals:** plot -2.3

Plot 5.6

**Fractions:** plot $4\frac{1}{2}$

Plot $-3\frac{1}{4}$

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**Linear Inequalities**

$x \leq 4$  
$x > -5$  
$x < 0$

Graph  
Interval notation

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1) $x > 2$

Interval notation

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2) $x \geq 6$

Interval notation