Chapter 2

Decimals

1.1

estimate

- to approximate an answer

overestimate

- estimate that is larger than the actual answer

underestimate

- estimate that is smaller than the actual answer

Literacy Link

Adding zeros

- Adding zeros after the decimal point does not change the value.

  $27.83 = 27.830$

- When there are no digits for place values before a number or after a decimal, you can add a zero as a placeholder.

  $38.73 \rightarrow 038.73$

  This shows there are 0 hundreds in 38.73.

Key Ideas

- There are different ways to estimate the answer to any addition or subtraction question, including front-end estimation and relative size.

  Estimate $125 + 476$.

  Front-End Estimation:
  $100 + 400 = 500$

  Relative Size Estimation:
  125 is between 100 and 200 but closer to 100.
  476 is between 400 and 500 but closer to 500.
  $100 + 500 = 600$

- When you add or subtract decimal numbers, align the decimal points, then add or subtract digits with the same place value.

$$\begin{array}{r} {\scriptstyle 1\,1\,1} \\ 41.65 \\ 9.4 \\ +\ 0.365 \\ \hline 51.415 \end{array} \qquad \begin{array}{r} {\scriptstyle 1\,\ 7\,1} \\ 24.869 \\ -\ 9.570 \\ \hline 15.299 \end{array}$$

2.2

Key Ideas

- You can use front-end estimation and relative size to estimate the answer to a multiplication question.

  Estimate 2.65×3.72.

  Front-End Estimation:

  $2 \times 3 = 6$

  Relative Size Estimation:

  2.65 is between 2 and 3, but closer to 3.
  3.72 is between 3 and 4, but closer to 4.
  $3 \times 4 = 12$

- When using a calculator, estimate to make sure your answer is reasonable.

  C **2.65** × **3.72** = 9.85

  The estimates suggest an answer between 6 and 12.
  The answer 9.858 is reasonable.

- You can multiply decimal numbers the same way you multiply whole numbers and then use estimation to place the decimal point.

  Multiply 1.54×25.

$$\begin{array}{r} {\scriptstyle 1\ \ \ } \\ {\scriptstyle 2\ 2\ } \\ 154 \\ \times\ 25 \\ \hline {\scriptstyle 1\ \ \ } \\ 770 \\ 3080 \\ \hline 3850 \end{array}$$

  $25 \times 1 = 25$
  $25 \times 2 = 50$
  The answer lies between 25 and 50.
  The decimal point should go between the 8 and the 5.

  The answer is 38.50.

2.3

Literacy Link

Understanding Division

A division statement such as $6 \div 2 = 3$ means that in 6 there are 3 groups of 2.

●● ●● ●●

Literacy Link

Reading ≈

The symbol ≈ means "is approximately equal to."

Key Ideas

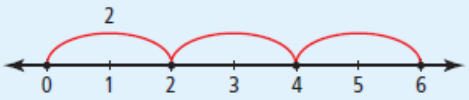
- There is more than one way to estimate the answer to a division problem.

Estimate $4.6 \div 2.5$

Front-End Estimation:

$4 \div 2 = 2$

Number Line Estimation:



$4 \div 2 = 2$ underestimate

$6 \div 2 = 3$ overestimate

- When using a calculator, estimate to make sure your answer is reasonable.

C **23.68** ÷ **3.2** = **7.4**

$21 \div 3 = 7$
$24 \div 3 = 8$
The estimates suggest an answer between 7 and 8. The answer 7.4 is reasonable.

- You can divide decimal numbers the same way you divide whole numbers, and then use estimation to place the decimal point.

Divide $26.5 \div 5$.

$$\begin{array}{r} 53 \\ 5\overline{)265} \\ \underline{250} \quad \leftarrow 50 \times 5 \\ 15 \\ \underline{15} \quad \leftarrow 3 \times 5 \\ 0 \end{array}$$

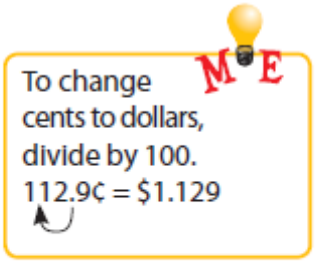
$25 \div 5 = 5$
The answer is around 5. The decimal point goes between the 5 and the 3.

The answer is 5.3.

2.4

order of operations

- brackets first
- multiply and divide in order from left to right
- add and subtract in order from left to right



Literacy Link

Brackets are also known as parentheses.

Key Ideas

- The order of operations is used with operations that involve decimals.

  The order of operations is as follows:
  - Do the work in brackets first.
  - Multiply and divide in order from left to right.
  - Add and subtract in order from left to right.

$$
\begin{aligned}
&(0.75 - 0.5) \times (4.2 \div 0.6) + 7.3 - 1.2 && \text{Brackets.}\\
&= 0.25 \times 7 + 7.3 - 1.2 && \text{Multiply.}\\
&= 1.75 + 7.3 - 1.2 && \text{Add.}\\
&= 9.05 - 1.2 && \text{Subtract.}\\
&= 7.85
\end{aligned}
$$

- Brackets can be used to change the order of operations.

$$
\begin{aligned}
&9.1 \times 2 + 7.5 \div 2.5 && \text{Multiply and divide}\\
&= 18.2 + 3 && \text{Add.}\\
&= 21.2
\end{aligned}
$$

$$
\begin{aligned}
&9.1 \times (2 + 7.5) \div 2.5 && \text{Brackets.}\\
&= 9.1 \times 9.5 \div 2.5 && \text{Multiply and divide.}\\
&= 86.45 \div 2.5\\
&= 34.58
\end{aligned}
$$