

# Estimating Quotients

**Goal** Estimate quotients when dividing decimal numbers.

1. Estimate each quotient. Show your work.

a)  $8.4 \div 5$

Suggested answer: Round 8.4 to 8.0.

Rename 8 ones as 80 tenths.

$80 \text{ tenths} \div 5 = 16 \text{ tenths}$

$8.4 \div 5$  is about 1.6.

b)  $13.7 \div 7$

Suggested answer: Round 13.7 to 14.

$14 \div 7 = 2$

$13.7 \div 7$  is about 2.

c)  $18.3 \div 4$

Suggested answer:  $4 \times \square = 18.3$

$4 \times 4.0 = 16.0$

$4 \times 5.0 = 20.0$

$4 \times 4.5 = 18.0$

$18.3 \div 4$  is about 4.5.

d)  $24.2 \div 3$

Suggested answer: Round 24.2 to 24.

$24 \div 3 = 8$

$24.2 \div 3$  is about 8.

2. Ray bought 15.5 m of wire to make four sculptures with equal lengths of wire. Estimate the length of wire for each sculpture.

Suggested answer:

The problem can be solved by calculating  $15.5 \text{ m} \div 4$ .

$4 \times \square = 15.5$

$4 \times 3.0 = 12.0$

$4 \times 4.0 = 16.0$

$4 \times 3.5 = 14.0$

The answer is between 3.5 and 4.0.

$15.5 \text{ m} \div 4$  is about 3.75.

Ray needs about 3.75 m of wire for each sculpture.

## At-Home Help

To estimate a quotient when dividing a decimal number by a one-digit number, use one of these methods.

- Round the decimal number to the nearest whole number.

For example:  $5.9 \div 3$

Round 5.9 to 6.

$6 \div 3 = 2$

$5.9 \div 3$  is about 2.

- Rename the decimal number.

For example:  $2.8 \div 3$

2.8 is close to 2.7, which is an easier number to divide by 3.

Rename 2.7 as 27 tenths.

$27 \text{ tenths} \div 3 = 9 \text{ tenths}$ , or 0.9

$2.8 \div 3$  is about 0.9.

- Rewrite the division as a multiplication question.

For example:  $7.7 \div 6$

$6 \times \square = 7.7$

$6 \times 1.0 = 6.0$

$6 \times 1.1 = 6.6$

$6 \times 1.5 = 9.0$

$7.7 \div 6$  is between 1.1 and 1.5, or about 1.3.

# Dividing Money

**Goal** Solve problems by dividing money.

You will need a calculator.

1. Use a calculator to divide. Use multiplication to check your answers.

a)  $\$27.84 \div 3 = \underline{\$9.28}$

$$\begin{array}{r} 2 \\ \$9.28 \\ \times \quad 3 \\ \hline \$27.84 \end{array}$$

b)  $\$36.85 \div 5 = \underline{\$7.37}$

$$\begin{array}{r} 13 \\ \$7.37 \\ \times \quad 5 \\ \hline \$36.85 \end{array}$$

c)  $\$29.50 \div 2 = \underline{\$14.75}$

$$\begin{array}{r} 11 \\ \$14.75 \\ \times \quad 2 \\ \hline \$29.50 \end{array}$$

d)  $\$45.96 \div 6 = \underline{\$7.66}$

$$\begin{array}{r} 33 \\ \$7.66 \\ \times \quad 6 \\ \hline \$45.96 \end{array}$$

e)  $\$51.66 \div 7 = \underline{\$7.38}$

$$\begin{array}{r} 25 \\ \$7.38 \\ \times \quad 7 \\ \hline \$51.66 \end{array}$$

2. Lara and two friends bought a book for \$28.95, a CD for \$22.99, and a DVD for \$26.85. Each person paid the same amount.

- a) What was the cost for each person? Use a calculator.

Suggested answer: (total cost)  $\$28.95$

$$22.99$$

$$+ 26.85$$

$$\hline \$78.79$$

$$\$78.79 \div 3 = \$26.26$$

- b) Use estimation to show that your answer is reasonable.

Suggested answer: Estimated total cost:  $30 + 23 + 27 = 80$

Estimated cost per person:  $80 \div 3$  is close to  $81 \div 3 = 27$

My estimate of \$27 is close to \$26.26. So my answer is reasonable.

## At-Home Help

To solve division problems involving money, use multiplication or estimation to check your answers.

For example: Four friends share the cost of three DVDs equally. The DVDs cost \$26.99, \$22.99, and \$16.99. What is the cost for each person?

(total cost)

$$\$26.99 + \$22.99 + \$16.99 = \$66.97$$

$$\$66.97 \div 4 = \$16.74$$

Check by multiplying:

$$\begin{array}{r} 221 \\ \$16.74 \\ \times \quad 4 \\ \hline \$66.96 \end{array}$$

Check by estimating:

Estimated total cost:

$$\$27 + \$23 + \$17 = \$67$$

Estimated cost per person:

$67 \div 4$  is close to  $68 \div 4 = 17$ , or about \$17

# Dividing Decimals by One-Digit Numbers

**Goal** Express quotients as decimal numbers to tenths.

1. Divide. Check two answers using multiplication.

a)  $23.4 \div 3$

$$\begin{array}{r} 7.8 \\ 3 \overline{)23.4} \\ \underline{21} \phantom{0} \\ 2.4 \\ \underline{2.4} \\ 0 \end{array}$$

b)  $30.4 \div 4$

$$\begin{array}{r} 7.6 \\ 4 \overline{)30.4} \\ \underline{28} \phantom{0} \\ 2.4 \\ \underline{2.4} \\ 0 \end{array}$$

c)  $7 \overline{)41.3}$

$$\begin{array}{r} 5.9 \\ 7 \overline{)41.3} \\ \underline{35} \phantom{0} \\ 6.3 \\ \underline{6.3} \\ 0 \end{array} \quad \begin{array}{r} 6 \\ 5.9 \\ \times 7 \\ \hline 41.3 \end{array}$$

d)  $6 \overline{)37.2}$

$$\begin{array}{r} 6.2 \\ 6 \overline{)37.2} \\ \underline{36} \phantom{0} \\ 1.2 \\ \underline{1.2} \\ 0 \end{array}$$

e)  $44.5 \div 5$

$$\begin{array}{r} 8.9 \\ 5 \overline{)44.5} \\ \underline{40} \phantom{0} \\ 4.5 \\ \underline{4.5} \\ 0 \end{array} \quad \begin{array}{r} 4 \\ 8.9 \\ \times 5 \\ \hline 44.5 \end{array}$$

f)  $8 \overline{)25.6}$

$$\begin{array}{r} 3.2 \\ 8 \overline{)25.6} \\ \underline{24} \phantom{0} \\ 1.6 \\ \underline{1.6} \\ 0 \end{array}$$

## At-Home Help

To divide a decimal tenth by a whole number, use the same procedure as dividing two whole numbers.

For example:

$$\begin{array}{r} 8.5 \\ 9 \overline{)76.5} \\ \underline{72} \phantom{0} \\ 4.5 \\ \underline{4.5} \\ 0 \end{array} \quad \begin{array}{l} \leftarrow 9 \times 8 = 72 \\ \leftarrow 9 \times 0.5 = 4.5 \end{array}$$

To check if a quotient is reasonable, use multiplication or estimation.

For example:

$$\begin{array}{r} 4 \\ 8.5 \\ \times 9 \\ \hline 76.5 \end{array}$$

Estimate:

$$8 \times 10 = 80 \text{ or } 80 \div 10 = 8$$

2. Sheila has 3.0 kg of raisins. She keeps one-half for herself. She divides the remaining amount equally among three friends. How many kilograms of raisins does each person get? Show your work.

Suggested answer:

$$\text{(Sheila)} \quad 3.0 \text{ kg} \div 2 = 1.5 \text{ kg}$$

$$\text{(each friend)} \quad 1.5 \text{ kg} \div 3 = 0.5 \text{ kg}$$

$$\begin{array}{r} 0.5 \\ 3 \overline{)1.5} \\ \underline{1.5} \\ 0.0 \end{array}$$

# Dividing by 10, 100, 1000, and 10 000

**Goal**

Divide whole and decimal numbers by 10, 100, 1000, and 10 000 using mental math.

1. Calculate. Use mental math.

a)  $321 \div 100 = \underline{\quad 3.21 \quad}$

b)  $25 \div 10 = \underline{\quad 2.5 \quad}$

c)  $4.5 \div 10 = \underline{\quad 0.45 \quad}$

d)  $321 \div 10\,000 = \underline{\quad 0.0321 \quad}$

e)  $18 \div 1000 = \underline{\quad 0.018 \quad}$

f)  $60.7 \div 100 = \underline{\quad 0.607 \quad}$

g)  $58\,240 \div 1000 = \underline{\quad 58.24 \quad}$

h)  $58\,240 \div 10\,000 = \underline{\quad 5.824 \quad}$

**At-Home Help**

To divide a decimal tenth by 10, 100, or 1000, move the digits to the right one, two, or three places.

For example,

$$553 \div 10 = 55.3$$

$$553 \div 100 = 5.53$$

$$553 \div 1000 = 0.553$$

$$553 \div 10\,000 = 0.0553$$

$$55.3 \div 10 = 5.53$$

$$55.3 \div 100 = 0.553$$

$$55.3 \div 1000 = 0.0553$$

$$55.3 \div 10\,000 = 0.00533$$

2. Chris has 12.3 L of juice. He wants to pour equal amounts of juice into 10 glasses. How many litres of juice will be in each glass?

Suggested answer:

$$12.3 \text{ L} \div 10 = 1.23 \text{ L}$$

3. 56.2 kg of rice is divided equally into 100 containers. How many kilograms of rice are in each container?

Suggested answer:

$$56.2 \text{ kg} \div 100 = 0.562 \text{ kg}$$

4. Concert organizers ordered 3550 L of water for an audience of 10 000 people. How many millilitres of water will be available for each person?

Suggested answer:

$$3550 \text{ L} \div 10\,000 = 0.355 \text{ L}$$

$$0.355 \times 1000 = 355 \text{ mL}$$

# Solving Problems by Working Backward

**Goal** Use a working-backward strategy to solve problems.

Lynne has 17.2 m of ribbon to wrap two sizes of gifts. There are four small gifts and one larger gift. She needs 4.8 m to wrap the larger gift. How much ribbon does she need to wrap each smaller gift?

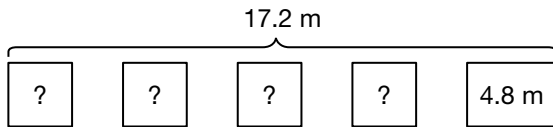
Suggested answer:

*Understand the Problem*

I need to determine the length of ribbon for each of the smaller gifts. I know the total length of ribbon and the length needed for the larger gift.

*Make a Plan*

I'll draw a diagram to represent the problem.



The diagram shows four lengths of ribbon added to the length of 4.8 m. The total length is 17.2 m. I can work backward to estimate and calculate the length needed for each of the four small gifts.

*Carry Out the Plan*

I estimate the length needed for each small gift is greater than 3 m.

Step 1: I subtract the length used for the larger gift from the total length. The length needed for all four smaller gifts is 12.4 m.

Step 2: I divide the length needed for the four gifts to determine the length for each gift.

$$12.4 \text{ m} \div 4 = 3.1 \text{ m}$$

The length needed for each of the smaller gifts is 3.1 m.

## At-Home Help

Some problems can be solved by working backward.

Use the problem-solving steps Understand the Problem, Make a Plan, Carry Out the Plan, and Look Back.

# Test Yourself

Circle the correct answer.

- Which quotient is the closest estimate for  $14.6 \div 3$ ?  
A. 4      **B. 5**      C. 6      D. 7
- Miranda got 4.94 when she divided 34.58 by 7. Which method is incorrect to use to check her answer?  
**A. Multiply 34.58 by 4.94.**      C. Round 4.94 to 5. Then multiply by 7.  
B. Multiply 4.94 by 7.      D. Use a calculator to divide 34.58 by 7.
- Which quotient answers the question  $\$46.32 \div 4$ ?  
**A. \$11.58**      B. \$11.98      C. \$12.58      D. \$12.98
- Royce and four friends bought a CD and a DVD. The CD cost \$16.99 and the DVD cost \$24.96. Each person paid the same amount. What was the cost for each person?  
A. \$11.39      B. \$10.75      C. \$10.48      **D. \$8.39**
- Yvette paid \$26.08 for eight different flags. Each flag cost the same amount. How much did each flag cost?  
A. \$2.61      B. \$3.00      **C. \$3.26**      D. \$3.50
- What is the quotient of  $67.2 \div 3$ ?  
A. 21.8      **B. 22.4**      C. 24.3      D. 25.4
- Nigel bought 4.5 kg of trail mix. He kept 2 kg for himself. He divided the remaining amount equally among five friends. How many kilograms of trail mix did each friend get?  
A. 0.3 kg      B. 0.4 kg      **C. 0.5 kg**      D. 0.6 kg
- Which quotient is incorrect?  
A.  $40.3 \div 10 = 4.03$       **C.  $3.5 \div 100 = 0.35$**   
B.  $690 \div 1000 = 0.69$       D.  $7 \div 1000 = 0.007$
- 20.4 L of fruit punch is divided equally into 100 containers. How many litres of punch are in each container?  
A. 204 L      B. 2.04 L      **C. 0.204 L**      D. 0.024 L
- Nemil added 0.6 years to his age, and divided that result by 4. The final answer was 2.4. How old is Nemil?  
A. 8      **B. 9**      C. 10      D. 11