

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)

$$\begin{array}{r} \$28.95 \\ 22.99 \\ + 26.85 \\ \hline \$78.79 \end{array}$$

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

- 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) $23.4 \div 3$

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

b) $30.4 \div 4$

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

c) $7 \overline{)41.3}$

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

d) $6 \overline{)37.2}$

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

e) $44.5 \div 5$

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

f) $8 \overline{)25.6}$

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

At-Home Help

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

For example:

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

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?

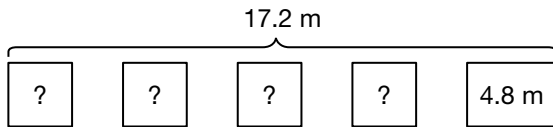
Suggested answer:

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