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Unit 5, Lesson 11: Dividing Numbers that Result in Decimals

Let's find quotients that are not whole numbers.

11.1: Number Talk: Evaluating Quotients

Find the quotients mentally.

$400 \div 8$

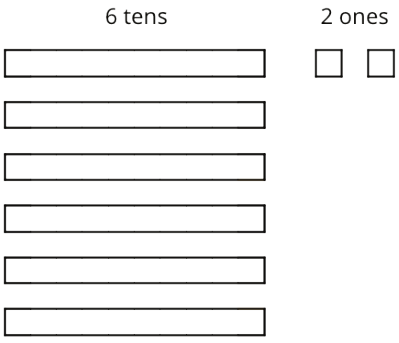
$80 \div 8$

$16 \div 8$

$496 \div 8$

11.2: Keep Dividing

Here is how Mai used base-ten diagrams to calculate $62 \div 5$.



She started by representing 62.

She then made 5 groups, each with 1 ten. There was 1 ten left. She unbundled it into 10 ones and distributed the ones across the 5 groups.

Here is her diagram for $62 \div 5$.

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1. Discuss these questions with a partner and write down your answers:

   a. Mai should have a total of 12 ones, but her diagram shows only 10. Why?

   b. She did not originally have tenths, but in her diagram each group has 4 tenths. Why?

   c. What value has Mai found for $62 \div 5$? Explain your reasoning.

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2. Find the quotient of $511 \div 5$ by drawing base-ten diagrams or by using the partial quotients method. Show your reasoning. If you get stuck, work with your partner to find a solution.

3. Four students share a $271 prize from a science competition. How much does each student get if the prize is shared equally? Show your reasoning.

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11.3: Using Long Division to Calculate Quotients

1. Here is how Lin calculated $62 \div 5$.

Lin set up the numbers for long division.	She subtracted 5 times 1 from the 6, which leaves a remainder of 1. She wrote the 2 from 62 next to the 1, which made 12, and subtracted 5 times 2 from 12.	Lin drew a vertical line and a decimal point, separating the ones and tenths place. 12 – 10 is 2. She wrote 0 to the right of the 2, which made 20.	Lastly, she subtracted 5 times 4 from 20, which left no remainder. At the top, she wrote 4 next to the decimal point.
$5 \overline{)62}$	$\begin{array}{r} 1 \\ 5 \overline{)62} \\ -5 \\ \hline 12 \\ -10 \\ \hline 2 \end{array}$	$\begin{array}{r} 12. \\ 5 \overline{)62} \\ -5 \\ \hline 12 \\ -10 \\ \hline 20 \end{array}$	$\begin{array}{r} 12.4 \\ 5 \overline{)62} \\ -5 \\ \hline 12 \\ -10 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$

Discuss with your partner:

- Lin put a 0 after the remainder of 2. Why? Why does this 0 not change the value of the quotient?
- Lin subtracted 5 groups of 4 from 20. What value does the 4 in the quotient represent?
- What value did Lin find for $62 \div 5$?

2. Use long division to find the value of each expression. Then pause so your teacher can review your work.

a. $126 \div 8$

b. $90 \div 12$

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3. Use long division to show that:

a. $5 \div 4$, or $\frac{5}{4}$, is 1.25.

c. $1 \div 8$, or $\frac{1}{8}$, is 0.125.

b. $4 \div 5$, or $\frac{4}{5}$, is 0.8.

d. $1 \div 25$, or $\frac{1}{25}$, is 0.04.

4. Noah said we cannot use long division to calculate $10 \div 3$ because there will always be a remainder.

a. What do you think Noah meant by “there will always be a remainder”?

b. Do you agree with his statement? Why or why not?

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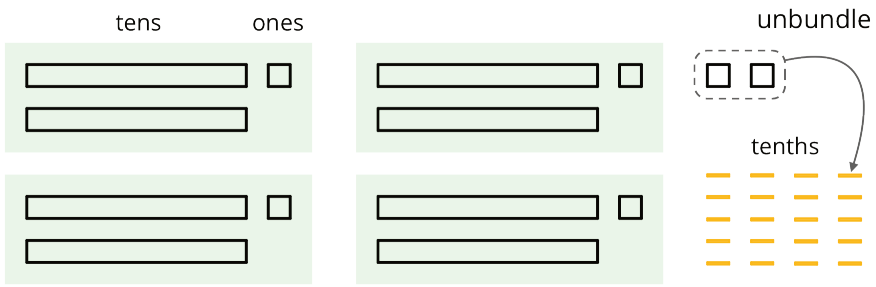
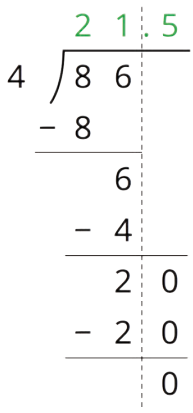
Lesson 11 Summary

Dividing a whole number by another whole number does not always produce a whole-number quotient. Let's look at $86 \div 4$, which we can think of as dividing 86 into 4 equal groups.



We can see in the base-ten diagram that there are 4 groups of 21 in 86 with 2 ones left over. To find the quotient, we need to distribute the 2 ones into the 4 groups. To do this, we can unbundle or decompose the 2 ones into 20 tenths, which enables us to put 5 tenths in each group.

Once the 20 tenths are distributed, each group will have 2 tens, 1 one, and 5 tenths, so $86 \div 4 = 21.5$.



We can also calculate $86 \div 4$ using long division.

The calculation shows that, after removing 4 groups of 21, there are 2 ones remaining. We can continue dividing by writing a 0 to the right of the 2 and thinking of that remainder as 20 tenths, which can then be divided into 4 groups.

To show that the quotient we are working with now is in the tenth place, we put a decimal point to the right of the 1 (which is in the ones place) at the top. It may also be helpful to draw a vertical line to separate the ones and the tenths.

There are 4 groups of 5 tenths in 20 tenths, so we write 5 in the tenths place at the top. The calculation likewise shows $86 \div 4 = 21.5$.

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Unit 5, Lesson 11: Dividing Numbers that Result in Decimals

1. Use long division to show that the fraction and decimal in each pair are equal.

   a. $\frac{3}{4}$ and 0.75

   b. $\frac{3}{50}$ and 0.06

   c. $\frac{7}{25}$ and 0.28

2. Mai walked $\frac{1}{8}$ of a 30-mile walking trail. How many miles did Mai walk? Explain or show your reasoning.

3. Use long division to find each quotient. Write your answer as a decimal.

   a. $99 \div 12$

   b. $216 \div 5$

   c. $1{,}988 \div 8$

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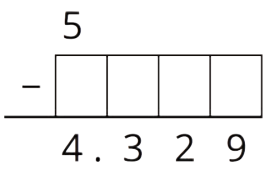
4. To find the decimal of $\frac{9}{25}$, Tyler reasoned: "$\frac{9}{25}$ is equivalent to $\frac{18}{50}$ and to $\frac{36}{100}$, so the decimal of $\frac{9}{25}$ is 0.36."

   a. Use long division to show that Tyler is correct.

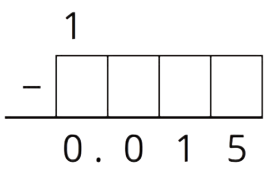
   b. Is the decimal of $\frac{18}{50}$ also 0.36? Use long division to support your answer.

5. Complete the calculations so that each shows the correct difference.

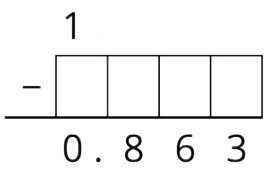
   a.

   b.

   c.

   (from Unit 5, Lesson 4)

6. Use the equation $124 \cdot 15 = 1{,}860$ and what you know about fractions, decimals, and place value to explain how to place the decimal point when you compute $(1.24) \cdot (0.15)$.

   (from Unit 5, Lesson 6)