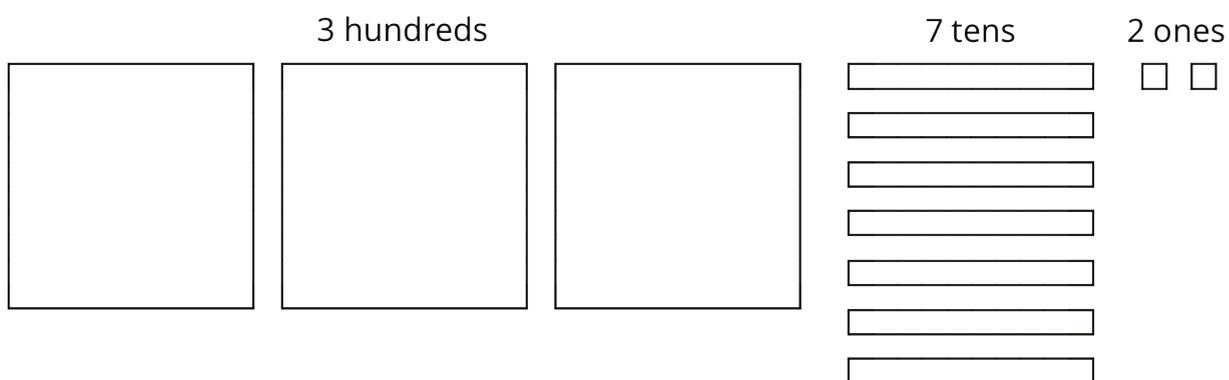


Unit 3 Lesson 18: Using Long Division

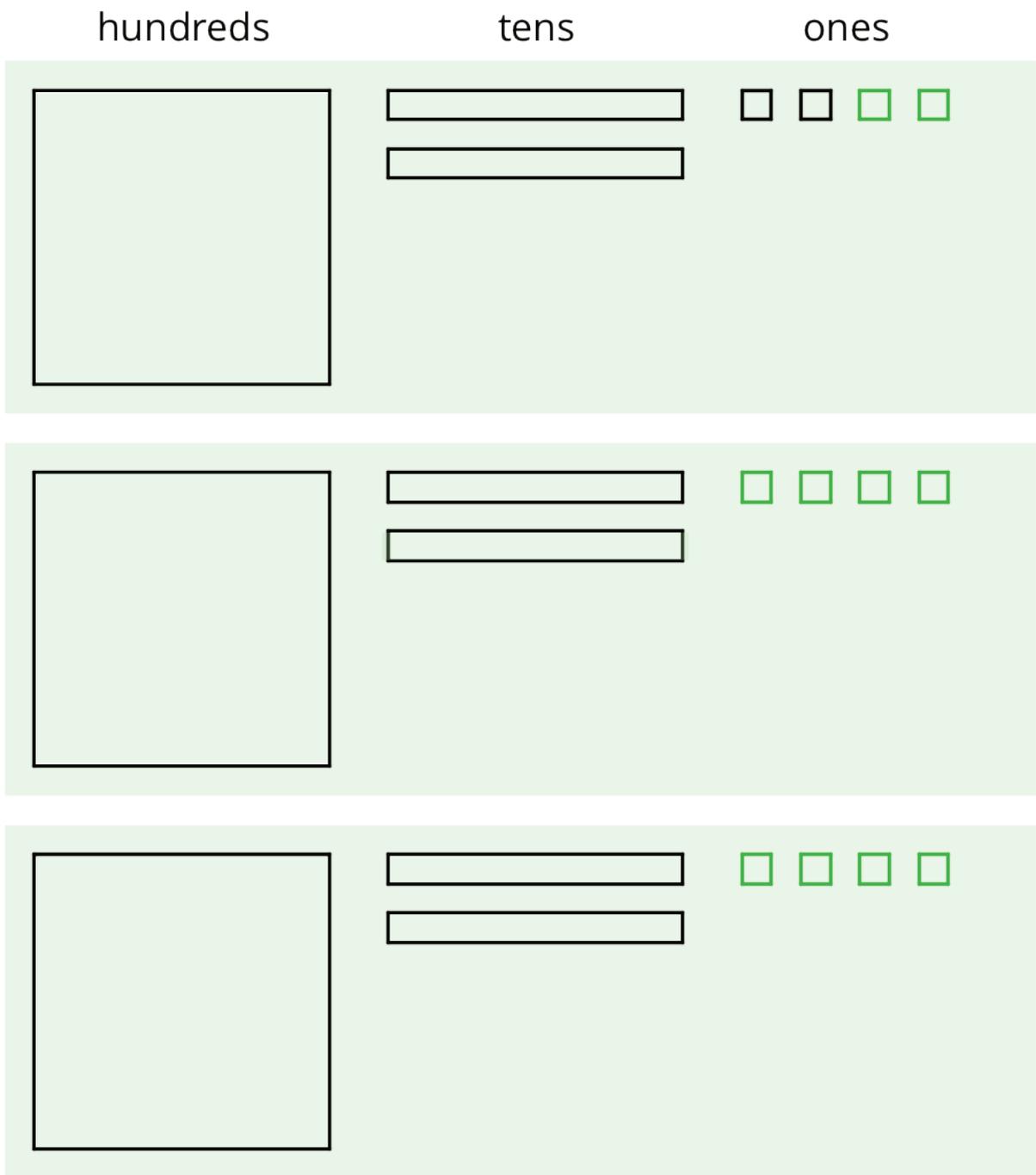
1 Using Base-Ten Diagrams to Calculate Quotients (Warm up)

Student Task Statement

Elena used base-ten diagrams to find $372 \div 3$. She started by representing 372.



She made 3 groups, each with 1 hundred. Then, she put the tens and ones in each of the 3 groups. Here is her diagram for $372 \div 3$.



Discuss with a partner:

- Elena's diagram for 372 has 7 tens. The one for $372 \div 3$ has only 6 tens. Why?
- Where did the extra ones (small squares) come from?

2 Using the Partial Quotients Method to Calculate Quotients

Images for Launch

hundreds tens ones

The image shows three identical base ten blocks representing the number 657. Each block consists of two hundred flats (large squares), one ten rod (horizontal bar), and seven one units (small squares). The units are arranged in two rows: five in the top row and two in the bottom row. In the first block, the two units in the bottom row are highlighted in green. In the second and third blocks, all units are white.

Student Task Statement

1. Andre calculated $657 \div 3$ using a method that was different from Elena's.

He started by writing the dividend (657) and the divisor (3).

$$3 \overline{)657}$$

He then subtracted 3 groups of different amounts from 657, starting with 3 groups of 200...

$$\begin{array}{r} 200 \\ 3 \overline{)657} \\ - 600 \\ \hline 57 \end{array}$$

... then 3 groups of 10, and then 3 groups of 9.

$$\begin{array}{r} 9 \\ 10 \\ 200 \\ 3 \overline{)657} \\ - 600 \\ \hline 57 \\ - 30 \\ \hline 27 \\ - 27 \\ \hline 0 \end{array}$$

Andre calculated $200 + 10 + 9$ and then wrote 219.

$$\begin{array}{r} \boxed{219} \\ 9 \\ 10 \\ 200 \\ 3 \overline{)657} \\ - 600 \\ \hline 57 \\ - 30 \\ \hline 27 \\ - 27 \\ \hline 0 \end{array}$$

- Andre subtracted 600 from 657. What does the 600 represent?
 - Andre wrote 10 above the 200, and then subtracted 30 from 57. How is the 30 related to the 10?
 - What do the numbers 200, 10, and 9 represent?
 - What is the meaning of the 0 at the bottom of Andre's work?
2. How might Andre calculate $896 \div 4$? Explain or show your reasoning.

3 Lin Uses Long Division

Student Task Statement

Lin has a method of calculating quotients that is different from Elena’s method and Andre’s method. Here is how she found the quotient of $657 \div 3$:

Lin arranged the numbers for vertical calculations.

Her plan was to divide each digit of 657 into 3 groups, starting with the 6 hundreds.

$$3 \overline{)657}$$

There are 3 groups of 2 in 6, so Lin wrote 2 at the top and subtracted 6 from the 6, leaving 0.

Then, she brought down the 5 tens of 657.

$$\begin{array}{r} 2 \\ 3 \overline{)657} \\ - 6 \downarrow \\ \hline 05 \end{array}$$

There are 3 groups of 1 in 5, so she wrote 1 at the top and subtracted 3 from 5, which left a remainder of 2.

$$\begin{array}{r} 21 \\ 3 \overline{)657} \\ - 6 \\ \hline 5 \\ - 3 \\ \hline 2 \end{array}$$

She brought down the 7 ones of 657 and wrote it next to the 2, which made 27.

There are 3 groups of 9 in 27, so she wrote 9 at the top and subtracted 27, leaving 0.

$$\begin{array}{r} 219 \\ 3 \overline{)657} \\ - 6 \\ \hline 5 \\ - 3 \downarrow \\ \hline 27 \\ - 27 \\ \hline 0 \end{array}$$

- Discuss with your partner how Lin’s method is similar to and different from drawing base-ten diagrams or using the partial quotients method.
 - Lin subtracted $3 \cdot 2$, then $3 \cdot 1$, and lastly $3 \cdot 9$. Earlier, Andre subtracted $3 \cdot 200$, then $3 \cdot 10$, and lastly $3 \cdot 9$. Why did they have the same quotient?
 - In the third step, why do you think Lin wrote the 7 next to the remainder of 2 rather than adding 7 and 2 to get 9?

2. Lin's method is called **long division**. Use this method to find the following quotients. Check your answer by multiplying it by the divisor.

a. $846 \div 3$

b. $1,816 \div 4$

c. $768 \div 12$

Activity Synthesis

a.

$$\begin{array}{r} \overline{) 282} \\ 3 \overline{) 846} \\ \underline{-6} \\ 24 \\ \underline{-24} \\ 6 \\ \underline{-6} \\ 0 \end{array}$$

b.

$$\begin{array}{r} \overline{) 454} \\ 4 \overline{) 1816} \\ \underline{-16} \\ 21 \\ \underline{-20} \\ 16 \\ \underline{-16} \\ 0 \end{array}$$

c.

$$\begin{array}{r} \overline{) 64} \\ 12 \overline{) 768} \\ \underline{-72} \\ 48 \\ \underline{-48} \\ 0 \end{array}$$

4 Dividing Whole Numbers (Optional)

Student Task Statement

1. Find each quotient.

a. $633 \div 3$

b. $1001 \div 7$

c. $2996 \div 14$

2. Here is Priya's calculation of $906 \div 3$.

$$\begin{array}{r} 320 \\ 3 \overline{) 906} \\ \underline{- 9} \\ 06 \\ \underline{- 6} \\ 0 \end{array}$$

a. Priya wrote 320 for the value of $906 \div 3$. Check her answer by multiplying it by 3. What product do you get and what does it tell you about Priya's answer?

b. Describe Priya's mistake, then show the correct calculation and answer.