

NAME _____

DATE _____

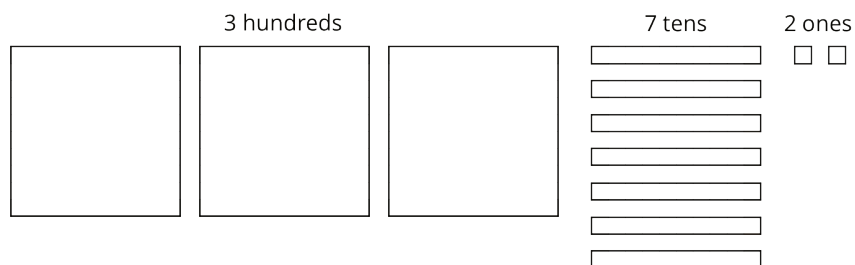
PERIOD _____

Unit 5, Lesson 9: Using the Partial Quotients Method

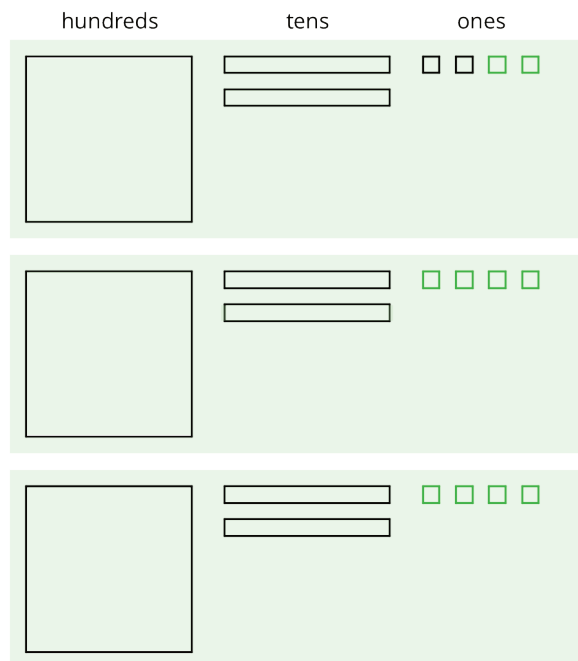
Let's divide whole numbers.

9.1: Using Base-Ten Diagrams to Calculate Quotients

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?

NAME _____

DATE _____

PERIOD _____

9.2: Using the Partial Quotients Method to Calculate Quotients

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.

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

Discuss the following questions with a partner:

- 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.

NAME

DATE

PERIOD

9.3: What's the Quotient?

1. Find the quotient of $1,332 \div 9$ using one of the methods you have seen so far. Show your reasoning.

2. Find each quotient and show your reasoning. Use the partial quotients method at least once.

a. $1,115 \div 5$

b. $665 \div 7$

c. $432 \div 16$

NAME

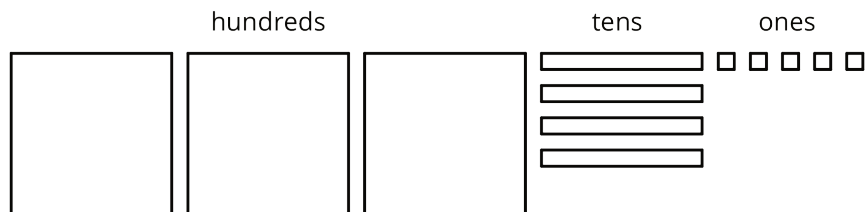
DATE

PERIOD

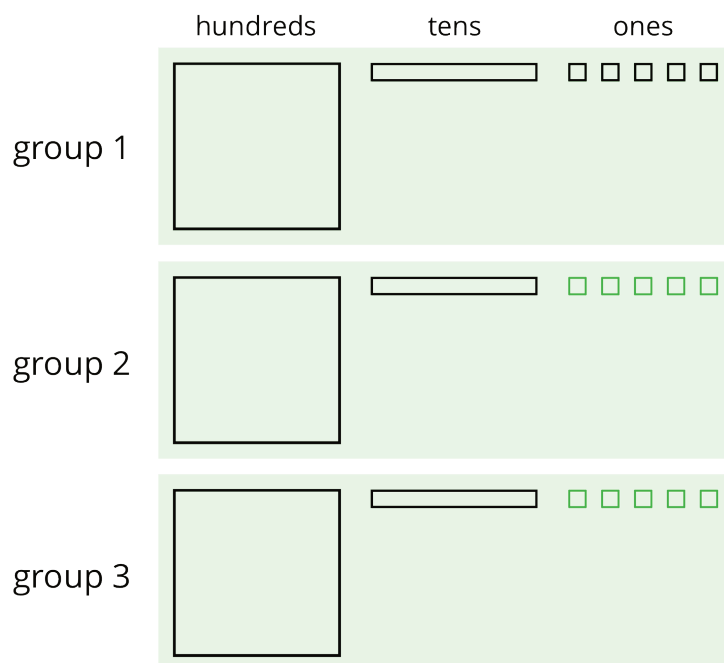
Lesson 9 Summary

We can find the quotient $345 \div 3$ in different ways.

One way is to use a base-ten diagram to represent the hundreds, tens, and ones and to create equal-sized groups.



We can think of the division by 3 as splitting up 345 into 3 equal groups.



Each group has 1 hundred, 1 ten, and 5 ones, so $345 \div 3 = 115$. Notice that in order to split 345 into 3 equal groups, one of the tens had to be unbundled or decomposed into 10 ones.

NAME _____

DATE _____

PERIOD _____

Another way to divide 345 by 3 is by using the partial quotients method, in which we keep subtracting 3 groups of some amount from 345.

$$\begin{array}{r}
 \boxed{115} \\
 5 \\
 10 \\
 100 \\
 3 \overline{) 345} \\
 \underline{- 300} \leftarrow 3 \text{ groups of } 100 \\
 45 \\
 \underline{- 30} \leftarrow 3 \text{ groups of } 10 \\
 15 \\
 \underline{- 15} \leftarrow 3 \text{ groups of } 5 \\
 0
 \end{array}$$

$$\begin{array}{r}
 \boxed{115} \\
 50 \\
 50 \\
 15 \\
 3 \overline{) 345} \\
 \underline{- 45} \leftarrow 3 \text{ groups of } 15 \\
 300 \\
 \underline{- 150} \leftarrow 3 \text{ groups of } 50 \\
 150 \\
 \underline{- 150} \leftarrow 3 \text{ groups of } 50 \\
 0
 \end{array}$$

- In the calculation on the left, first we subtract 3 groups of 100, then 3 groups of 10, and then 3 groups of 5. Adding up the partial quotients ($100 + 10 + 5$) gives us 115.
- The calculation on the right shows a different amount per group subtracted each time (3 groups of 15, 3 groups of 50, and 3 more groups of 50), but the total amount in each of the 3 groups is still 115. There are other ways of calculating $345 \div 3$ using the partial quotients method.

Both the base-ten diagrams and partial quotients methods are effective. If, however, the dividend and divisor are large, as in $1,248 \div 26$, then the base-ten diagrams will be time-consuming.

NAME

DATE

PERIOD

Unit 5, Lesson 9: Using the Partial Quotients Method

1. Here is one way to find $2,105 \div 5$ using partial quotients.

$$\begin{array}{r}
 \boxed{421} \\
 1 \\
 20 \\
 400 \\
 5 \overline{) 2105} \\
 \underline{- 2000} \\
 105 \\
 \underline{- 100} \\
 5 \\
 \underline{- 5} \\
 0
 \end{array}$$

Show a different way of using partial quotients to divide 2,105 by 5.

2. Andre and Jada both found $657 \div 3$ using the partial quotients method, but they did the calculations differently, as shown here.

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

Andre's Work

$$\begin{array}{r}
 \boxed{219} \\
 9 \\
 60 \\
 100 \\
 50 \\
 3 \overline{) 657} \\
 \underline{- 150} \\
 507 \\
 \underline{- 300} \\
 207 \\
 \underline{- 180} \\
 27 \\
 \underline{- 27} \\
 0
 \end{array}$$

Jada's Work

a. How is Jada's work similar to and different from Andre's work?

b. Explain why they have the same answer.

3. Which might be a better way to evaluate $1,150 \div 46$: drawing base-ten diagrams or using the partial

NAME _____

DATE _____

PERIOD _____

quotients method? Explain your reasoning.

4. Here is an incomplete calculation of $534 \div 6$.

$$\begin{array}{r}
 \boxed{89} \\
 9 \\
 80 \\
 6 \overline{) 534} \\
 \underline{ } \\
 ? \\
 ? \\
 \underline{ } \\
 ? \\
 0
 \end{array}$$

Write the missing numbers (marked with “?”) that would make the calculation complete.

5. Use the partial quotients method to find $1,032 \div 43$.

6. Which of the polygons has the greatest area?

- A. A rectangle that is 3.25 inches wide and 6.1 inches long.
- B. A square with side length of 4.6 inches.
- C. A parallelogram with a base of 5.875 inches and a height of 3.5 inches.
- D. A triangle with a base of 7.18 inches and a height of 5.4 inches.

(from Unit 5, Lesson 8)

7. One micrometer is a millionth of a meter. A certain spider web is 4 micrometers thick. A fiber in a shirt is 1 hundred-thousandth of a meter thick.

a. Which is wider, the spider web or the fiber? Explain your reasoning.

b. How many meters wider?

NAME

DATE

PERIOD

(from Unit 5, Lesson 4)