LESSON

4·3

Divide by Multiples of 10

What happens when we divide by a multiple of 10?

Students discuss ways to use blocks to find 320 ÷ 10. They discover that the result is a number with the same digits, only shifted one place to the right. They connect it to the inverse operation, multiplication, and see that the shift works in reverse. They use the shift and their facts to solve problems with multiples of 10 (e.g., 1500 ÷ 30 = 50).

Objectives

- To explore ways to divide a number by 10 and by 100
- To see that dividing a number by 10 results in a number with the same digits shifted one place to the right
- To extend division facts to solve problems with multiples of 10

Materials

- 320 blocks packed
- 6 blocks of each size (1, 10, 100)
- place value chart (drawn on the board or overhead)

Each group will need:

- 240 packed blocks
- 1 whole number mat

- 1 *See the Shift* activity sheet and 1 *Extend the Facts* activity sheet **per student**

◆ Class Introduction 45 MIN.

- As a class, begin by modeling a few problems with a divisor of 10:

90 ÷ 10 **140 ÷ 10** **310 ÷ 10**

Discuss various ways to model the problems. Some students may want to model the dividend with blocks and distribute them equally among 10 groups (that is, make **equal shares**). Others may want to see how many groups of size 10 they can make (that is, use **repeated subtraction**). Both methods, of course, yield the same answer.

Point out that repeated subtraction is the same as finding out how many 10's are in the number 310. Students can simply uncover the packed blocks to see how many tens are inside. Also, remind students of the notion of **reading a number from any place**. *(See Lesson 1-8.)* For example, they would read the number from the tens place to see that there are 14 tens in the number 140.

Record the quotients for each problem and ask students to describe any patterns they observe.

90 ÷ 10 = 9 **140 ÷ 10 = 14** **310 ÷ 10 = 31**

What patterns do you see? *(The quotient has the same digits as the dividend, only shifted one place smaller.)*

Identify the Shift

- Present the problem:

320 ÷ 10

Use blocks to model the problem in one or more of the ways described. Write the result and compare it to the inverse operation, multiplication.

320 ÷ 10 = 32 **(32 × 10 = 320)**

When shared among 10 people, notice that each block yields a block one size smaller.

When we divide by 10, the answer is a number with the same digits shifted one place smaller. When we multiply by 10, the digits shift one place larger.

- Present other problems in which the divisor is 10. Each time, ask students to say the answer and explain the solution in terms of blocks. Repeat with problems in which the divisor is 100.

100 ÷ 10 = 10
180 ÷ 10 = 10
820 ÷ 10 = 82

1000 ÷ 10 = 100
1230 ÷ 10 = 123

2000 ÷ 10 = 200
2350 ÷ 10 = 235

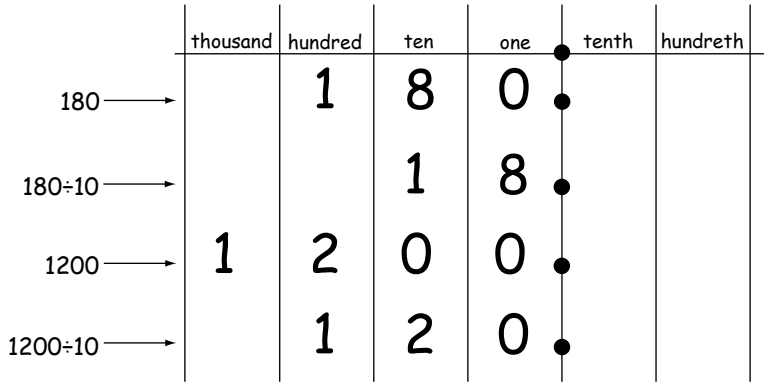
10,000 ÷ 10 = 1000
16,500 ÷ 10 = 1650

1000 ÷ 100 = 10
1200 ÷ 100 = 12

10,000 ÷ 100 = 100
13,000 ÷ 100 = 130
17,400 ÷ 100 = 174

Ask students to describe patterns in these problems. Make sure students see that when they divide a number by 10, the result is a number with the same digits shifted **one place smaller**. When they divide a number by 100, the answer is a number with the same digits shifted **two places smaller**.

Show these relationships on a place value chart:



Compare this result to multiplying by 10 and by 100. Students should see that the results are similar, but that the digits shift in opposite directions.

Extend the Facts

- Have two students share 6 single blocks, then 6 blocks-of-10, and finally 6 blocks-of-100. Write the results of each example as a division problem.
- Repeat, having students divide 12 into 3 equal groups, using 12 single blocks, 12 blocks-of-10, and 12 blocks-of-100 (if available). Write the results as division problems.

6 ÷ 2 = 3	**6 ÷ 2 = 3**
6 tens ÷ 2 = 3 tens	**60 ÷ 2 = 30**
6 hundreds ÷ 2 = 3 hundreds	**600 ÷ 2 = 300**
12 ÷ 3 = 4	**12 ÷ 3 = 4**
12 tens ÷ 3 = 4 tens	**120 ÷ 3 = 40**
12 hundreds ÷ 3 = 4 hundreds	**1200 ÷ 3 = 400**

- Have students model **24 ÷ 3** and then **240 ÷ 3** by separating the blocks into 3 equal-sized groups. Write the results on the board. Have students predict the results for **2400 ÷ 3**. Ask,

How can you use the fact, 24 ÷ 3 = 8, to solve the problem 2400 ÷ 3?
(The result is a number with the digit 8. Since the dividend is the number 24 shifted two places larger, the answer must have the digit 8 shifted two places larger: 800.)

- Do more examples of division problems where students can extend the facts. Help them use both powers of 10 and the inverse operation, multiplication, to find the products.

  Here are some problems to try:

150 ÷ 3 =	**(related fact: 15 ÷ 3 = 5)**
1500 ÷ 30 =	**(related fact: 15 ÷ 3 = 5)**
720 ÷ 90 =	**(related fact: 72 ÷ 9 - 8)**
4000 ÷ 80 =	**(related fact: 40 ÷ 8 = 5)**
4000 ÷ 800 =	**(related fact: 40 ÷ 8 = 5)**

◆ Group Activity 25 MIN.

- Distribute the activity sheets and materials. Explain to students that for the *See the Shift* activity, they will model the problems with blocks and draw their block models on the activity sheet.

  For the *Extend the Facts* activity, model how to write a division fact with single-digit numbers and how to make a list of other facts based on this fact. For example:

Basic Fact:	Related Facts:
42 ÷ 6 = 7	420 ÷ 6 = 70
	4200 ÷ 6 = 700
	420 ÷ 60 = 7
	4200 ÷ 60 = 70
	42,000 ÷ 60 = 700
	4200 ÷ 600 = 7
	etc.

- While students are working, have them explain how they use basic division facts to solve problems with larger numbers.

◆ Closure 10 MIN.

- Discuss students' answers to the problems and have them share their methods for extending the facts and solving the problems.
- Explain how this activity will help students estimate answers to problems such as 275 ÷ 7 or 1549 ÷ 4 *(see lesson 4-4)*. Using basic facts and rounding to the nearest multiple of 10 or 100 provides a quick and easy way to make an estimate.

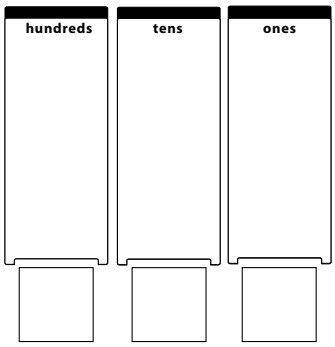
◆ Assessment

- Do students know how to divide by 10 in more than one way? (i.e., making 10 equal groups, using repeated subtraction of 10, and/or reading the number from the tens place)
- Do students know that dividing by 10 results in a number with the same digits shifted one place to the right?
- Do students know that dividing by 100 results in a number with the same digits shifted two places to the right?
- Do students identify related division facts when dividing with multiples of 10?
- Do students find the correct answers when dividing by multiples of 10 and 100? Can they explain how they find the answers?

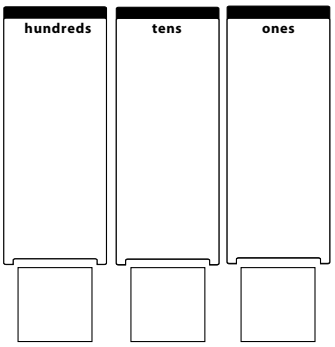
Name

See the Shift

1. Draw the blocks for the number 240.

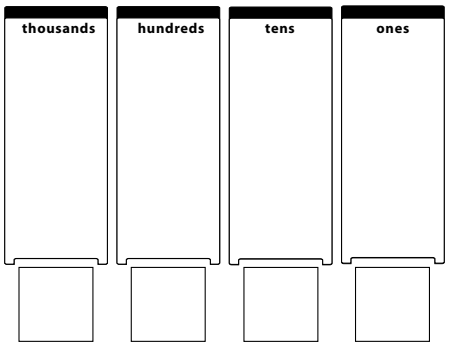


Use blocks to model 240 ÷ 10. Draw the result.

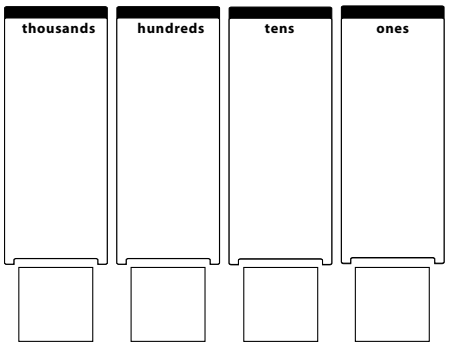


What do you notice about the number 240 and the result of 240 ÷ 10? Why do you think this happened?

2. Draw blocks for the number 3,600.



Imagine using blocks to model 3,600 ÷ 100. Draw what you think the result will be.



Why do you think this will be the result?

3. Solve these problems.

310 ÷ 10 = _____ 780 ÷ 10 = _____ 1010 ÷ 10 = _____

900 ÷ 10 = _____ 8700 ÷ 100 = _____ 12,000 ÷ 100 = _____

Name

Extend the Facts

For problems #1 and #2, write a basic division fact. Then write a list of other division facts you know based on this fact.

For example: 32 ÷ 8 = 4

Other division facts I know based on this fact:

320 ÷ 8 = 40 3200 ÷ 8 = 400 320 ÷ 80 = 4 3200÷ 800 = 4

1. ____ ____ ÷ ____ = ____

Other division facts I know based on this fact:

2. ____ ____ ÷ ____ = ____

Other division facts I know based on this fact:

For problems #3 and #4, give the answer and explain how you know.

3. 280 ÷ 7

Answer: _____ Explanation:

4. 540 ÷ 6

Answer: _____ Explanation: