LESSON

6·2

Divide by 0.1 and by 0.01

What patterns do we observe when we divide numbers by 0.1 and by 0.01?

Students consider the problem 2.4 ÷ 0.1. They use repeated subtraction (partitioning) to see how many groups of 0.1 they can make. They see how the answer, 24, is the same as reading the number from the tenths place: there are 24 tenths in the number 2.4. They notice that dividing by a number between 0 and 1 makes a number bigger.

Objectives

- To understand that dividing a number by 0.1 results in a number with the same digits shifted one place larger
- To understand that dividing a number by 0.01 results in a number with the same digits shifted two places larger
- To see that dividing by 0.1 and by 0.01 yields the same result as multiplying by 10 and by 100

Materials

Each group will need:

- blocks of each size (10, 1, 0.1, 0.01)
- 1 decimal mat
- 1 calculator (optional) **per student**
- 1 *See the Shift* activity sheet **per student**

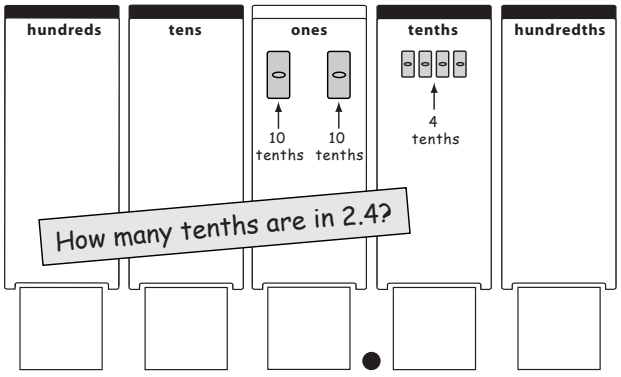
◆ Class Introduction 30 MIN.

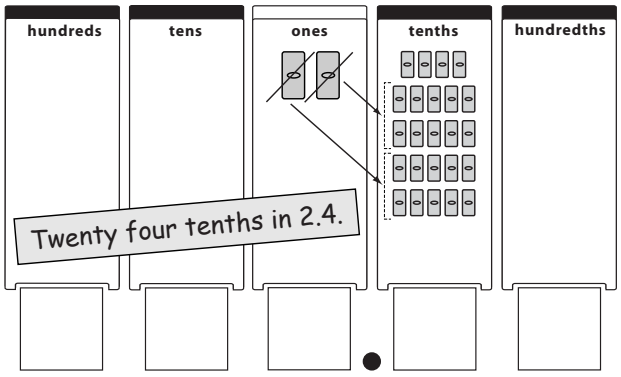
- Present the problem:

2.4 ÷ 0.1

As a class, decide that it is difficult to model 0.1 equal shares from 2.4 with the blocks. Distribute materials and have students model the problem using repeated subtraction (partitioning) to see how many groups of 0.1 can be made.

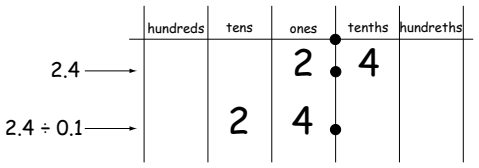
2.4 ÷ 0.1 = 24





(Note that this is the same as reading the number from the tenths place: there are 24 tenths in the number 2.4.)

Write the original dividend, 2.4, and the number of groups, 24, on a place value chart *(see figure)*. Ask,



How is the quotient, 24, similar to the number we started with, 2.4? *(It has the same digits as 2.4, shifted one place larger.)*

When have we seen this kind of result before? *(The same shift occurs when we multiply a number by 10.)*

Point out that this result, 24, is larger than the number they started with, 2.4. Ask,

How is it possible that when we divided we ended up with a larger number than we started with?

- Dividing by 0.1 is the same as asking how many tenths there are in the number. There are always 10 times as many tenths as there are single blocks. Therefore, the answer will be 10 times the number we started with.

$2.4 \div 0.1 = 24$

same result as

$2.4 \times 10 = 24$

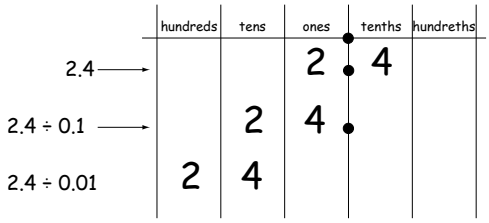
- Present a second problem. This time the divisor is by 0.01.

2.4 ÷ 0.01

Have students model the number 2.4 on their decimal mats. Ask them to predict how many groups of 0.01 they can make from this number.

Do you think the quotient will be larger or smaller than the number we started with? Why?

How many groups of 0.01 do you think we can make? Explain.



Have students regroup the 2 ones and 4 tenth blocks to make 240 hundredth blocks. The single blocks will be "unpacked" twice to get hundredths. Record the results, discuss the shift of the digits 2 places larger, and compare to multiplication.

2.4 ÷ 0.1 = 24	**(Dividing a number by 0.1 results in a number with the same digits shifted one place larger.)**
	(Same as 2.4 x 10 = 24)
2.4 ÷ 0.01 = 240	**(Dividing a number by 0.01 results in a number with the same digits shifted two places larger.)**
	(Same as 2.4 x 100 = 240)

- Give students more opportunities to predict answers. In each case, have them check their predictions with blocks. For example, try:

0.3 ÷ 0.1 **0.78 ÷ 0.01** **7 ÷ 0.01**

If available, distribute calculators and have students extend the problems to other powers of 10, such as dividing a number by 0.001 (one thousandth).

◆ Group Activity 30 MIN.

- Distribute the activity sheet, *See the Shift*. Have students model and solve the first two problems with blocks and then draw their results on the activity sheet. Then have them predict the answers to the problems in #3.
- If students finish the problems early, have them explain in writing why dividing a number by 0.1 produces the same result as multiplying the number by 10.

◆ Closure 30 MIN.

- Go over the problems on the activity sheet and then discuss the connection between dividing by 0.1 and multiplying by 10. Ask,

Why do we get the same result when we divide a number by 0.1 as we get when we multiply the number by 10? *(Dividing by 0.1 is the same as asking how many tenths there are in the number. There are always 10 times as many tenth blocks as there are single blocks.)*

Have students respond in writing then collect and discuss their responses.

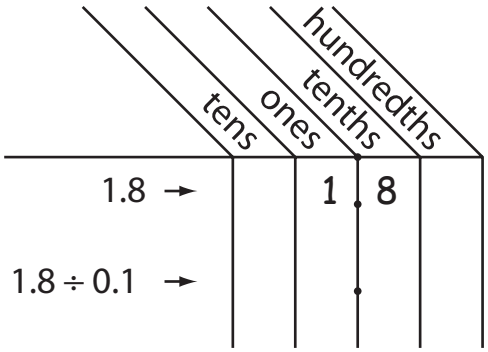
◆ Assessment

- Do students use partitioning (repeated subtraction) to determine the number of groups of 0.1? Groups of 0.01?
- Do students identify the shift of the digits when dividing a number by 0.1 and by 0.01?
- Do students understand that division can result in a quotient that is larger than the dividend?
- Can students explain why dividing a number by 0.1 has the same effect as multiplying the number by 10?

Name

See the Shift

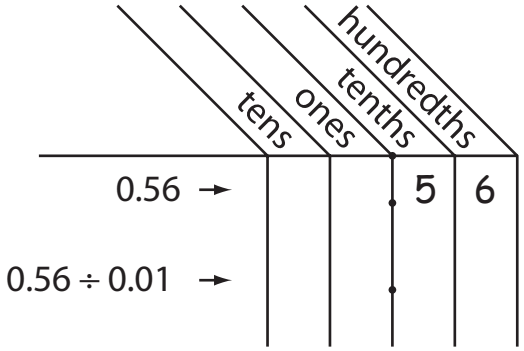
1. Start with 1.8 blocks. See how many groups of 0.1 can you make from these blocks. (Hint: How many tenth blocks are in 1.8?) Write your answer on the chart:



Complete the number sentence:

1.8 ÷ 0.1 = _____

2. Start with 0.56 blocks. See how many groups of 0.01 can you make from these blocks. (Hint: How many hundredth blocks are in 0.56?) Write your answer on the chart:



Complete the number sentence:

0.56 ÷ 0.01 = _____

3. Predict the answers to these problems.

25.98 ÷ 0.1 = _____

25.98 × 10 = _____

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168 ÷ 0.01 = _____

168 × 100 = _____

0.03 ÷ 0.1 = _____

0.03 × 10 = _____

0.087 ÷ 0.01 = _____

0.087 × 100 = _____