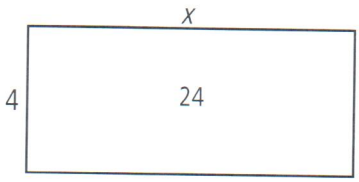
MULTIPLICATION AND DIVISION 4

Name: Key Date:_____ Period:_____

SECTION 4.5 THE DIVISION ALGORITHM

Big Idea: How can we use the area model to divide?

Another way of thinking of division is by using the area model. This is similar to the missing factor model. To divide 24 by 4, draw a length of 4 and find the width x such that the total area is equal to 24. Solve for the missing factor x in the equation $24 = 4x$



We often say that division is the reverse operation of multiplication, and that subtraction is the reverse operation of addition. What do we mean by this?

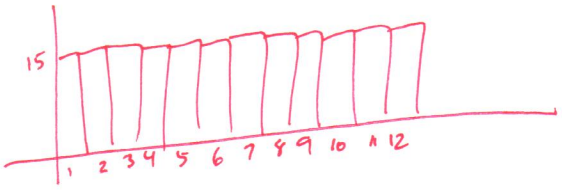
If we multiply 2 numbers (factors), we get a certain product. If we divide the product by one factor, we get the other factor.

If we add 2 numbers, then subtract one from the result, we will get the other number.

Begin with the number 12. Add 3 to get 15. To undo the addition, you need to subtract 3 from 15 and return to the original number 12. Similarly, in the example above, you found the number 6. Multiply by 4 to obtain 24. That is, $24 = 6 \cdot 4$. To undo this multiplication, divide 24 by 4 and return to the start because $24 \div 4 = 6$.

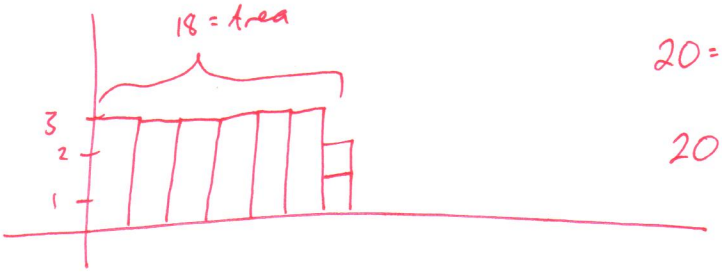
Using the area model, find 180 ÷ 15.

$x = 12$



EXAMPLE 1

Using the area model, find 20 ÷ 3.



$20 = 3 \cdot 6 + 2$

$20 \div 3 = 6$ with a remainder of 2.

Theorem 4.1: DIVISION ALGORITHM

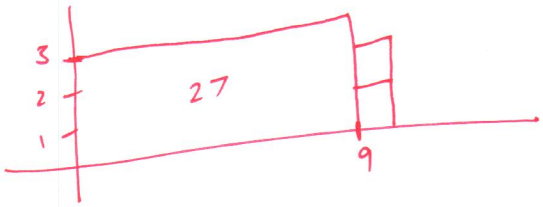
Given two positive integers **a** and **b**, we can always find unique integers **q** and **r** such that

$$a = bq + r \quad \text{with} \quad 0 \le r < b.$$

We call **a** the **dividend**, **b** the **divisor**, **q** the **quotient**, and **r** the **remainder**.

PRACTICE EXERCISES

1. Compute the following division problem 29 ÷ 3 by writing the corresponding division algorithm form. Use the area model to explain what the algorithm represents.



$29 = 3 \cdot 9 + 2$

2. Why should we not say that 29 ÷ 3 has a quotient of 7 and a remainder of 8?

The remainder should be less than the divisor.

3. Compute the following using the division algorithm:

a. 36 ÷ 5

$36 \div 5$

$36 = 5 \cdot 6 + 6$ X

$36 = 5 \cdot 7 + 1$

b. 48 ÷ 7

$48 = 7 \cdot 6 + 6$

c. 52 ÷ 6

$52 = 6 \cdot 8 + 4$

SUMMARY (What I learned today)