MULTIPLYING AND DIVIDING 2

Name: Key Date: Period:

SECTION 2.4 THE DIVISION ALGORITHM

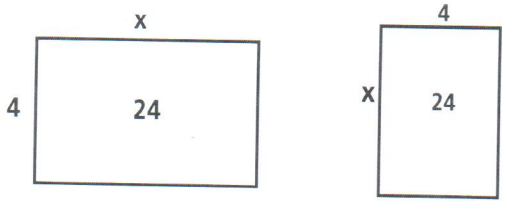
VOCABULARY

DEFINITION	EXAMPLE
Division: The reverse of multiplication	$6 \cdot 4 = 24$ $24 \div 6 = 4$
Algorithm: a process or method to do something	division algorithm: used to find quotient and remainder

Big Idea: How do we divide using the area model? What is the division algorithm?

EXPLORATION 1: THE DIVISION ALGORITHM

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 ask what the width x of the rectangle must equal to have a total area of 24. What you are doing is looking for the missing factor x, so that: $24 = 4 \cdot x$, and $24 = x \cdot 4$. This is an example of the commutative property of multiplication.

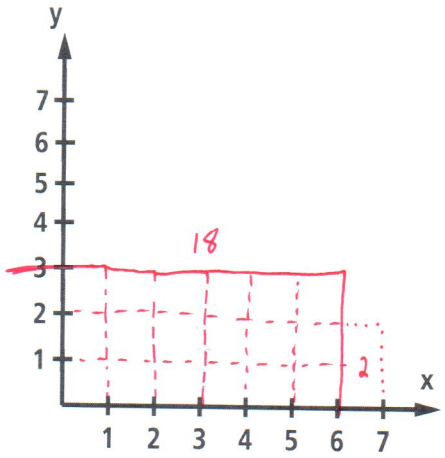


You know that division is the reverse operation for multiplication, just as subtraction is the reverse operation for addition. What do we mean by this? Begin with the number 12. Add 3 to get 15. To undo the addition, you need to subtract 3 from 15 and return to the original number 12. Similarly, in the 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 6 because $24 \div 4 = 6$.

EXAMPLE 1:

Using the Area Model, what is 20 ÷ 3?

To solve, let's look at Quadrant I on the Coordinate Plane.



Since we're dividing by 3, mark off a length of 3 on the y-axis and begin shading a rectangle of width 1 along the x-axis.

a. Notice that at mark 1 on the x-axis, you have a rectangle with an area of 3 square units. This shows that 3 · 1 = 3, and you would need 17 more squares to reach 20.

b. Shade to the second mark along the x-axis. What is the area of your next rectangle?
6

c. Write the associated multiplication fact if you stopped at the second mark.
3·2 = 6

Continue shading along the *x*-axis to determine the biggest rectangle you can form with an area less than or equal to 20 square units.

d. Write the dimensions (side lengths) of your rectangle: 3 by 6

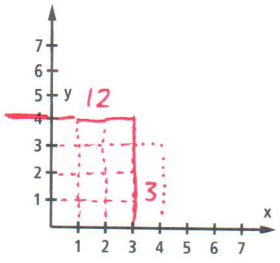
e. How many extra squares would you need to shade to reach 20? 2

f. Write the associated multiplication fact, making the remainder as small as possible.
3·6 = 18 20 = 3·6 + 2

PROBLEMS:

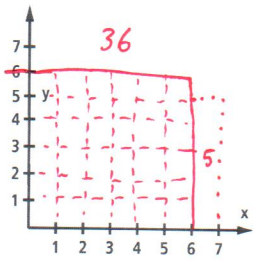
1. Draw the area model for each of the following then use the division algorithm to compute.

a. $15 \div 4$



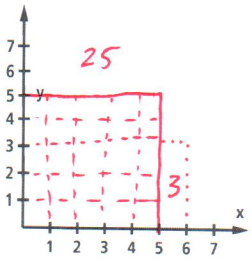
$15 = 4 \cdot 3 + 3$

b. $41 \div 6$



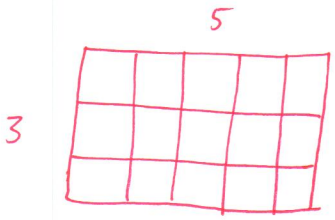
$41 = 6 \cdot 6 + 5$

c. $28 \div 5$

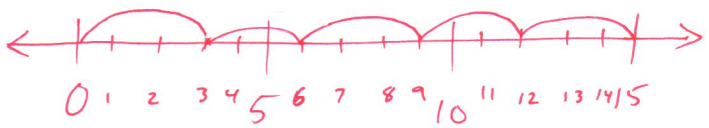


$28 = 5 \cdot 5 + 3$

2. Given the problem $15 \div 3$, show why the area and linear models for division give the same results.



$15 \div 3 = 5$ and $3 \cdot 5 = 15$



3. Randyn is making snack bags for her class field trip. She has 791 treats to share evenly among 22 snack bags. Estimate to find about how many treats should be placed in each bag so that she uses up as many of the treats as possible.

22 is $20 + 2$

770 is a multiple of 22 & close to 791

$20 \cdot 35 + 2 \cdot 35 = 700 + 70$

$22(35) = 770$

so she can put about 35 treats in each bag (only 21 will be left over)

4. Destiny is planning a fiesta for her family and friends. There will be 74 people attending, and Destiny wants to place 5 or 6 people at each table. Draw a diagram of the tables and number of people seated at each that satisfy these conditions.

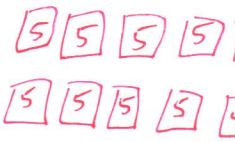
Two possibilities: $20 + 54 = 74$

$= 20$

$= 54$

OR $24 + 50 = 74$

$= 24$



$= 50$

SUMMARY (What I learned in this section)