

MULTIPLICATION AND DIVISION

4

Name: Key Date: _____ Period: _____

SECTION 4.4 THE LINEAR MODEL FOR DIVISION

VOCABULARY

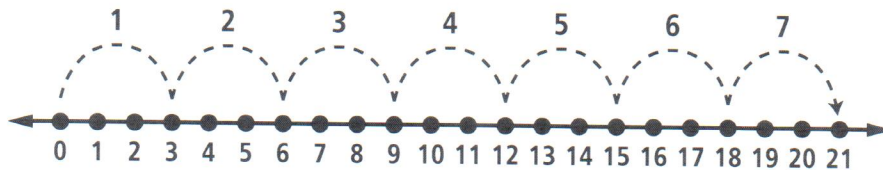
DEFINITION	EXAMPLE
Dividend: <i>number that will be divided</i>	$21 \div 3 = 7$
Divisor: <i>what the dividend is divided by</i>	$21 \div 3 = 7$
Quotient: <i>result of a division problem</i>	$21 \div 3 = 7$
Factor: <i>another word for divisor (a number multiplied to get a product)</i>	$3 \cdot x = 21$

Big Idea: How do we divide using the linear model?

ACTIVITY: MODELS FOR DIVISION

Linear Model

You divided a class of 21 by 3 in the activity. One method involved subtracting 3 objects at each step from the original group and counting the number of times it took to distribute all 21 objects. Another way to think about this problem is to add groups of 3 until you have 21. Skip count by 3's to accumulate objects until you have the desired number, 21. The number of skips that it takes to get to 21 is the result 21 divided by 3.



To skip count by 3's, count 3, 6, 9, 12, 15, 18, 21, and so on. You know that $21 = 3 \cdot 7$ because we must skip count 7 steps by 3's to get to 21. The inverse is $21 \div 3 = 7$, which means when you divide 21 by 3, the result is 7 because 21 is decomposed into 7 skips of 3 units per skip. This is equivalent to 7 groups of 3. We call 3 the **divisor**, the quantity by which another quantity, the **dividend**, is to be divided. We call 7 the **quotient**, the end result of a division problem, and 21 the dividend, a quantity to be divided by the divisor.

Missing Factor Model

Dividing 21 by 3 is the same as looking for the missing factor x that satisfies $3 \cdot x = 21$. The x that satisfies this equation is called the quotient and represents the number of skips of length 3 it takes to reach 21. We call this the missing factor model. It is the reverse of the multiplication process.

PROBLEM 1

- a. What is the missing factor x that satisfies the equation: $2x = 8$?

$$2 \cdot (4) = 8$$

- b. Using the result from part a, what is $8 \div 2$?

$$8 \div 2 = 4$$

PROBLEM 2

- a. What is the missing factor x that satisfies the equation: $-2x=8$?

$$-2 \cdot (-4) = 8$$

- b. Using the result from above, what is $8 \div -2$?

$$8 \div -2 = -4$$

State the rule for dividing a positive dividend and a negative divisor

a positive number divided by a negative divisor gives a
 (dividend) negative quotient

PROBLEM 3

- a. What is the missing factor x that satisfies the equation: $2x = -8$?

$$2(-4) = -8$$

- b. Using the result from above, what is $-8 \div 2$?

$$-8 \div 2 = -4$$

State the rule for dividing a negative dividend and a positive divisor

A negative dividend divided by a positive divisor gives a negative quotient

PROBLEM 4

a. What is the missing factor x that satisfies the equation: $-2x = -8$?

$-2(4) = -8$

b. Using the result from above, $-8 \div -2 = ?$

$-8 \div -2 = 4$

State the rule for dividing a negative dividend and a negative divisor

a negative dividend divided by a negative divisor gives a positive quotient.

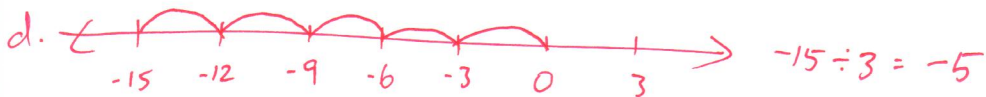
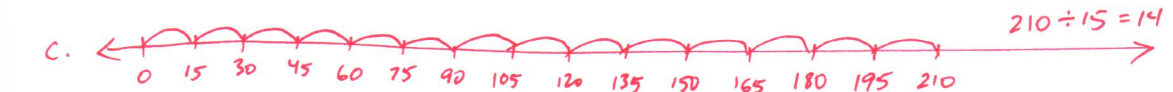
PROBLEM 5

1. Use a number line with the appropriate scale and the skip counting model to compute the following quotients:

a. $56 \div 7 = 8$ b. $91 \div -13 = -7$ c. $210 \div 15 = 14$



d. $-15 \div 3 = -5$ e. $12 \div -4 = -3$ f. $-18 \div -6 = 3$



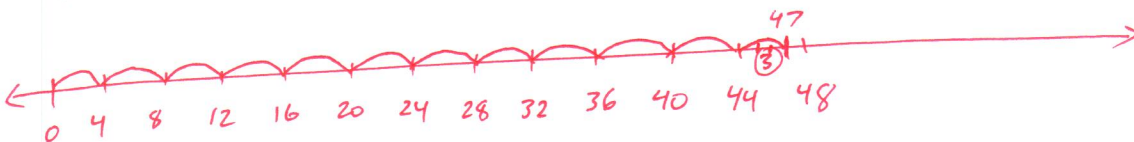
PROBLEM 6

Solve each of the following equations.

a. $4x = -12$	b. $-3x = 15$	c. $2x = 18$	d. $-2x = -8$
$4(-3) = -12$	$-3(-5) = 15$	$2(9) = 18$	$-2(4) = -8$
$x = -12 \div 4$	$x = 15 \div -3$	$x = 18 \div 2$	$x = -8 \div -2$
$x = -3$	$x = -5$	$x = 9$	$x = 4$

EXAMPLE 1

Robin has 47 feet of ribbon on a roll. She wants to cut this roll into 4-foot strips for decorations. How many 4-foot strips of ribbon can she make? How much ribbon will be left over, if any?



$47 = 4 \cdot 11 + 3$ 11 strips with 3 feet left over.

SUMMARY (What I learned today)
