4.3   Multiplying and Dividing Monomials
(pp. 128-13)

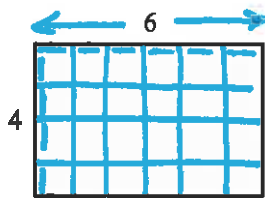Name: _____

Date: **Apr. 17 / 18**

Learning Goals: *I will learn to*
- use multiple strategies to multiply and divide monomials
- solve problems involving multiplication and division of monomials

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An area model can be used to illustrate multiplication.

<u>Example:</u> 6×4

$Area = 6 \times 4$
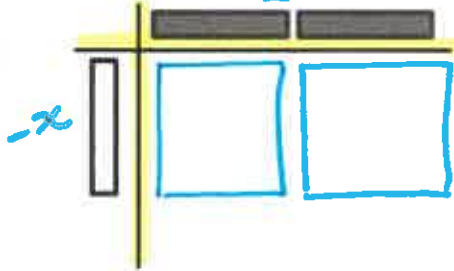$= 24 \, units^2$

Similarly, we can use algebra tiles to model **multiplication of monomials**.

<u>Examples:</u>

a) $2x(3) = 6x$

b) $2x(-x) = -2x^2$

c) $-2x(2y) = -4xy$

To multiply two monomials:

   <u>multiply the coefficients</u>

and   <u>use exponent rules to multiply the variables</u>

Remember…

		Product of Powers
pos × pos neg × neg	= pos	
pos × neg neg × pos	= neg	$a^m \times a^n = a^{m+n}$

Develop Understanding

Example 1: Multiply Monomials *(p. 129)*

Multiply each pair of monomials.

a) $(3x)(2x)$
$= (3)(2)(x)(x)$
$= 6x^2$

b) $(3x)(-2x)$
$= (3)(-2)(x)(x)$
$= -6x^2$

c) $(3x)(2y)$
$= (3)(2)(x)(y)$
$= 6xy$

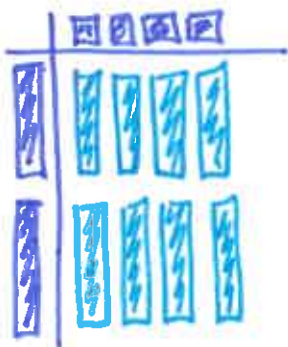## Show You Know

Multiply each pair of monomials.

a) $4(2x) = 8x$

b) $(-3x)(5x) = -15x^2$

c) $(5y)(4x) = 20xy$

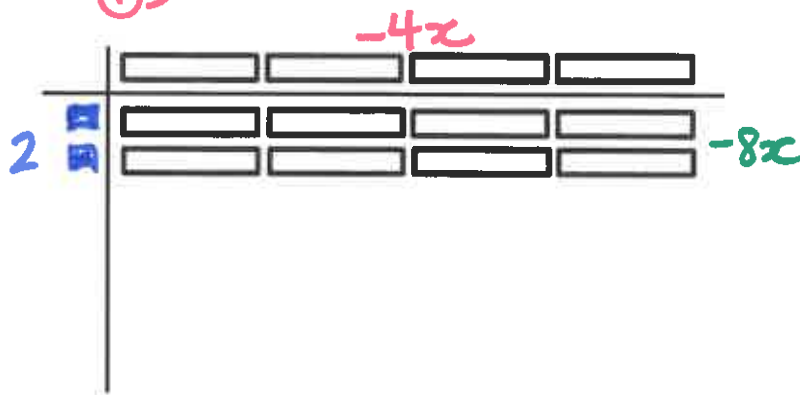We can use algebra tiles to model **division of monomials** (multiplication in reverse).
1. Place tiles representing the denominator along one edge.
2. Place tiles representing the numerator inside the grid (match to the known edge).
3. Place tiles representing the quotient (answer) along the remaining edge.

<u>Examples:</u>

a) $\dfrac{-6x^2}{2x} = -3x$

b) $\dfrac{-8x}{-4x} = 2$

To **divide two monomials:**

<u>divide the coefficients</u>

and <u>use exponent rules to divide the variables</u>

Remember…

pos ÷ pos neg ÷ neg = pos	**Quotient of Powers**
pos ÷ neg neg ÷ pos = neg	$\dfrac{a^M}{a^n} = a^{M-n}$

Example 2: Divide Monomials (p. 130)

Divide each pair of monomials.

a) $(8x^2) \div (4x) = 2x$

$$2x$$

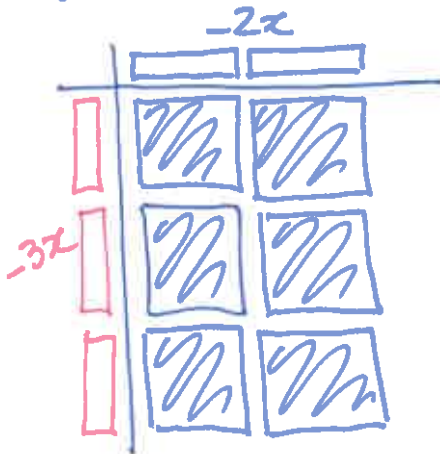b) $\frac{-4xy}{2y} = \left(\frac{-4}{2}\right)\left(\frac{x}{1}\right)\left(\frac{y}{y}\right)$

$$= \boxed{-2x}$$

Show You Know

Divide each pair of monomials.

a) $(6x^2) \div (-2x) = \boxed{-3x}$

*draw tiles

$$-2x$$

b) $\frac{10xy}{5y}$

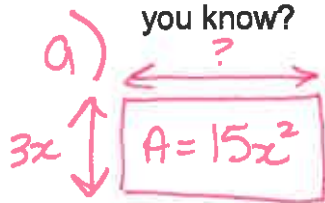$$= \left(\frac{10}{5}\right)\left(\frac{x}{1}\right)\left(\frac{y}{y}\right)$$

$$= \boxed{2x}$$

c) $\frac{-12xy}{-3x} = \left(\frac{-12}{-3}\right)\left(\frac{x}{x}\right)\left(\frac{y}{1}\right)$

$$= \boxed{4y}$$

Example 3: Apply Monomial Division *(p. 131)* *area*

The area of a rectangle is given by the expression $15x^2$. The width of the rectangle is represented by $3x$. *width*

a) What is the length of the rectangle in terms of x?

b) Choose a value for x. Draw the rectangle to scale. Is the area of the rectangle $15x^2$? How do you know?
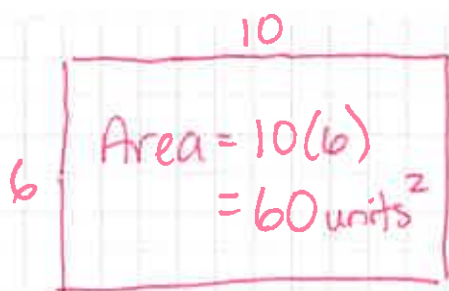
a)

$A = 15x^2$, width $3x$

$\dfrac{A}{w} = \dfrac{l \cdot \cancel{w}}{\cancel{w}}$

$\dfrac{A}{w} = l \implies \dfrac{15x^2}{3x} = 5x$

the length is $5x$

Area = $10(6)$
$= 60$ units^2

10, 6

$A = 15x^2$
$= 15(2^2)$
$= 15(4) = 60$ units^2 ✓

b) choose $x = 2$

length $= 5x$
$= 5(2)$
$= 10$

width $= 3x$
$= 3(2)$
$= 6$

Key Ideas

- You can use a model, such as algebra tiles, to represent the multiplication and division of monomials.
- To multiply two monomials, multiply the coefficients and use the exponent rules to multiply the variables.
- To divide two monomials, divide the coefficients and use the exponent rules to divide the variables.