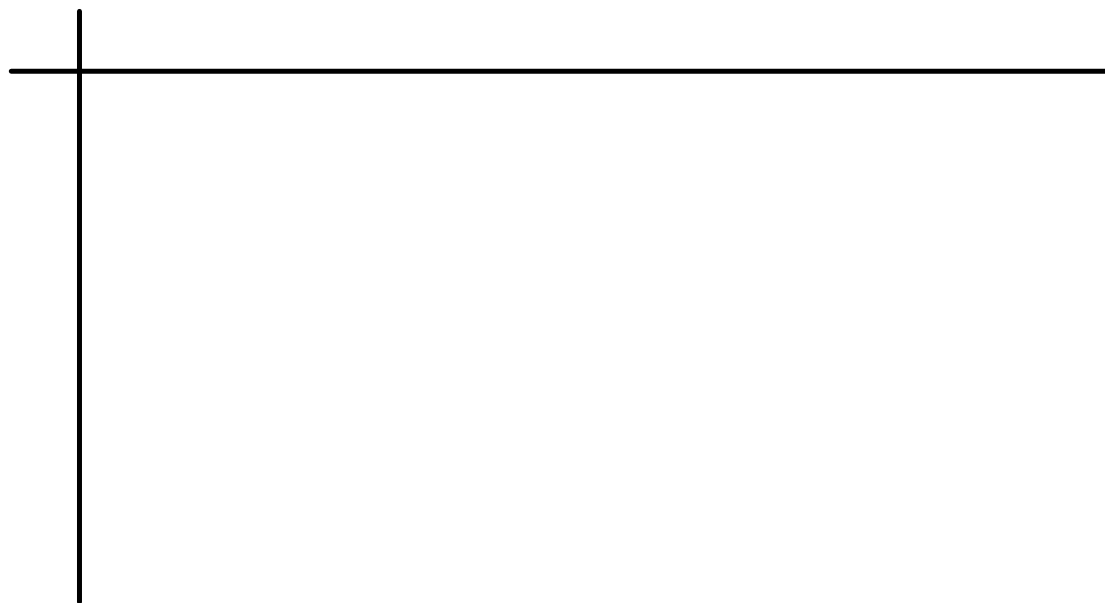


## Using the Area Model with Algebraic Expressions

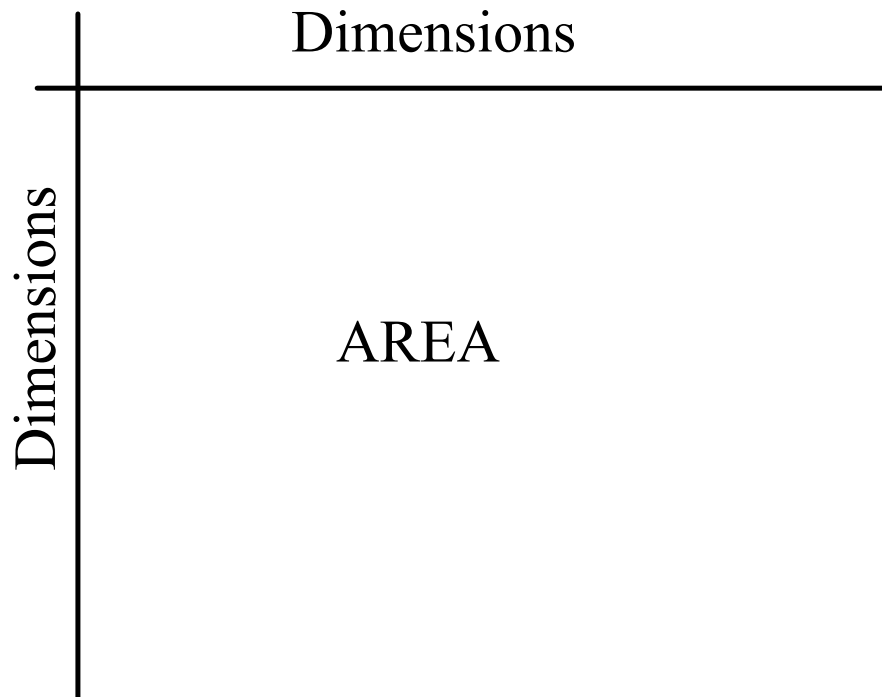
Learning Goal: By the end of today we will have two techniques for multiplying algebraic expressions together.

# Area Model for Multiplication

$34 \times 41$



# Using the Algebra Tiles and Area Model Together



Polynomial Definitions - Refresher

**Monomial** - "ONE Term" - consisting of a *constant*, an unknown, or a constant and unknown multiplied together

ie. 5

ie.  $9x$

ie.  $-12x^2$

**Binomial** - "Two Terms" - consisting of a constant and an unknown, or two unknowns separated by the addition or subtraction operation

ie.  $x + 5$

ie.  $7x - 16$

ie.  $-12x^2 + 7x$

**Trinomial** - "Three Terms" - consisting of a constants and unknowns separated by the addition or subtraction operation

ie.  $x^2 - 6x + 5$

ie.  $-12x^2 + 7x - 1$

**What is an Alge-Tile? And what can it be used for?****Part One**

An alge-tile can be used as a two colour counter to illustrate such things as:

- used to illustrate the ZERO Principle
- adding/subtracting integers

**Part Two**

An alge-tile can be used to represent the collection of "like" and "unlike" terms

**Part Three**

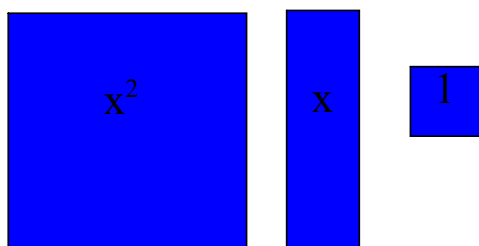
An alge-tile can be used with a multiplication array to create an AREA MODEL that can be used to illustrate the following:

- the Distributive Property
- Common Factoring
- Factoring of Trinomials
- Factoring of a Difference of Squares
- Illustrate Completing the Square

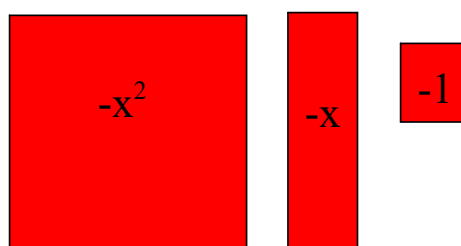
## Alge-Tiles and the Multiplication Array

Alge-Tile Pieces we will be using, both positive and negative

Positive Alge-Tiles



Negative Alge-Tiles



The ZERO Principle still applies to Alge-Tiles, a positive and negative of the same value (size) cancel each out.

What is the value of each group?

(a)

Diagram (a) consists of two blue squares, each containing the expression  $X^2$ . To the right of these squares are three green horizontal rectangles, each containing the letter  $x$ . To the right of the green rectangles are four yellow squares, each containing the number 1, arranged in a 2x2 grid.

(b)

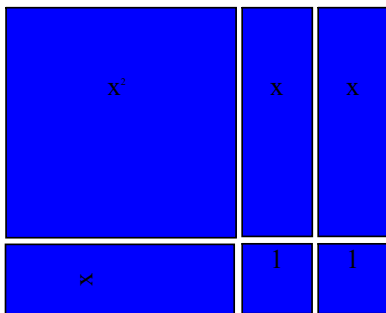
Diagram (b) consists of three squares: a blue square containing  $X^2$ , and two red squares each containing  $-X^2$ . Below the blue square are two red horizontal rectangles, each containing  $-x$ . Below the two red squares are three green horizontal rectangles, each containing  $x$ . To the right of the squares are eight small squares: four yellow squares containing 1 (arranged in a 2x2 grid) and four red squares containing -1 (arranged in a 2x2 grid).

## Alge-Tiles and the Multiplication Array

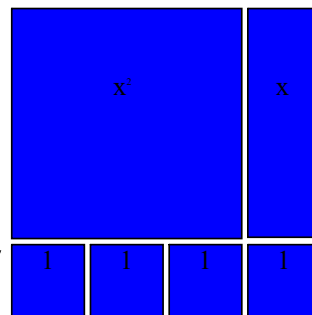
### Alge-Tile Guide Lines

The one important guideline for using Alge-Tiles is that  
**ONLY SIDES OF THE SAME LENGTH ARE  
 ALLOWED TO BE IN CONTACT.**

**Correct** Alge-Tile Placement



**Incorrect** Alge-Tile Placement



The one important guideline for using Alge-Tiles is that  
**ONLY SIDES OF THE SAME LENGTH ARE  
 ALLOWED TO BE IN CONTACT.**



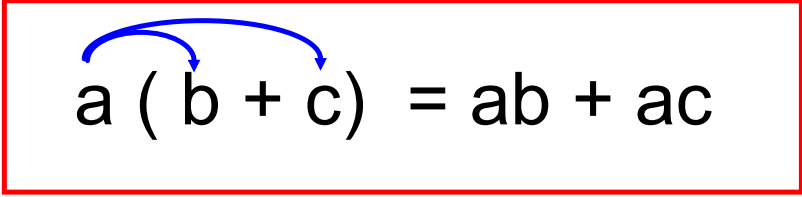
Expand/Multiply  $3(x+2)$   
 (use the dimensions to find the area)

Expand/Multiply  $-4(2x - 3)$   
 (use the dimensions to find the area)

Expand/Multiply  $x(2x + 4)$   
 (use the dimensions to find the area)

Expand/Multiply  $-2x(3x - 1)$   
 (use the dimensions to find the area)

Short cut for Distributive property


$$a ( b + c ) = ab + ac$$

The diagram shows the equation  $a ( b + c ) = ab + ac$  enclosed in a red rectangular box. Two blue curved arrows originate from the letter 'a' inside the parentheses. One arrow points down to the letter 'b', and the other points down to the letter 'c', illustrating the process of distributing 'a' to both terms inside the parentheses.

Expand (multiply together)

$$2x ( x + 8)$$

Expand (multiply together)

$$2(a + b + c)$$

Expand (multiply together)

$$2x^3 ( 3x^2 + 5x)$$



Expand (multiply together)

$$-3x^2 ( 5x - 2x^2 - x^5 )$$

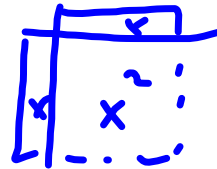
## Consolidation Questions:

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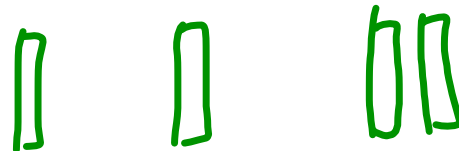
Watch for

$$(x)(x) = x^{\textcircled{2}}$$

#1-4,6,7,9



$$x + x = 2x$$



## Extra Examples


$$3a(a+4)$$

$$= (3a)(a) + (3a)(4)$$

$$= 3a^2 + 12a$$

$$x(x^2 + 3x)$$

$$= (x)(x^2) + (x)(3x)$$

$$= x^3 + 3x^2$$

$$3(a + b + c)$$

$$\begin{aligned} &= a + b + c \\ &+ a + b + c \\ &+ a + b + c \\ &= 3a + 3b + 3c \end{aligned}$$

$$3 \times 2 = 6$$

$$2 + 2 + 2 = 6$$

$$\begin{aligned} & 2a^2 (3a + 4b) \\ &= (2a^2)(3a) + (2a^2)(4b) \\ &= 6a^3 + 8a^2b \end{aligned}$$