

Special Products when Multiplying Binomials

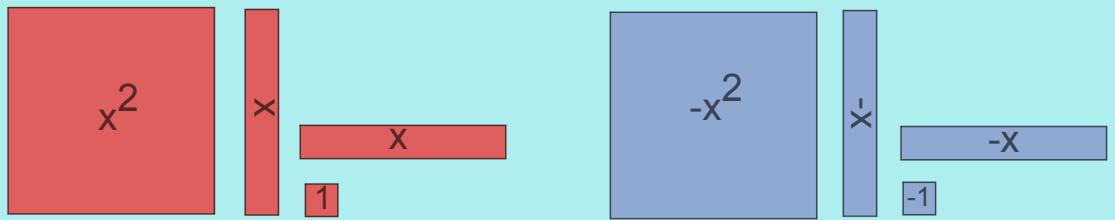
March 23/2011

The diagram illustrates the multiplication of the binomials $(x + 2)(x + 2)$ using two different area models.

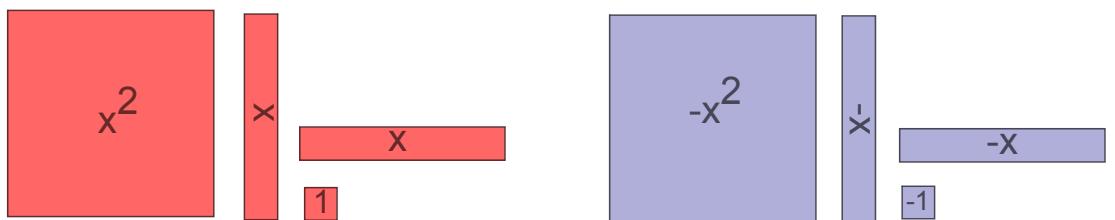
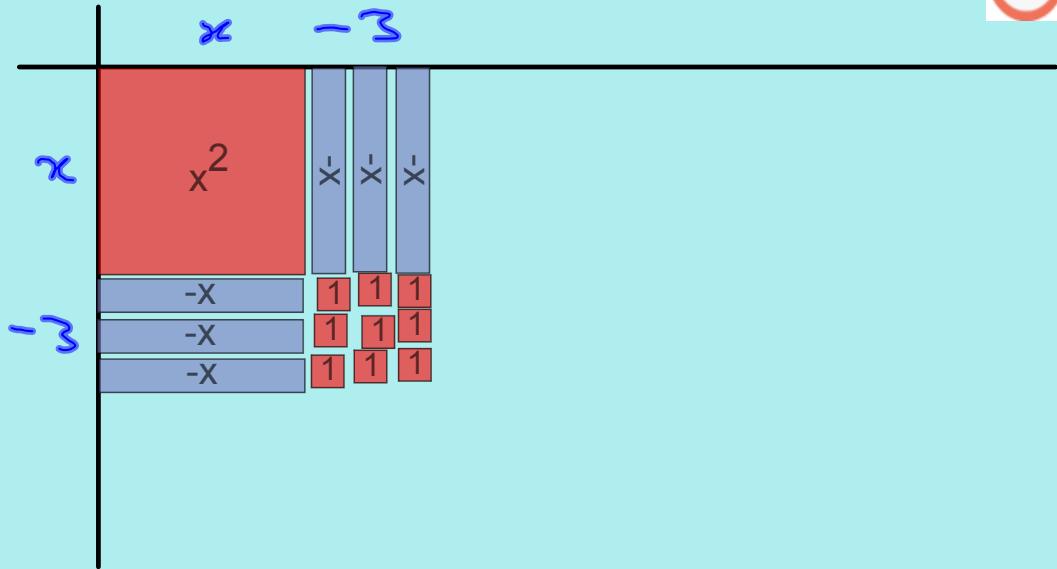
Top Row: Shows the multiplication of x^2 by x and $-x^2$ by $-x$. The first term is multiplied by a factor of 1, indicated by a small red rectangle below the x .

Bottom Left: A square area model representing the product $(x + 2)(x + 2)$. It consists of a large red square labeled x^2 , a row of two smaller red rectangles labeled x , and a column of two smaller red rectangles labeled x . Below the first row of small rectangles is a small red rectangle labeled 1.

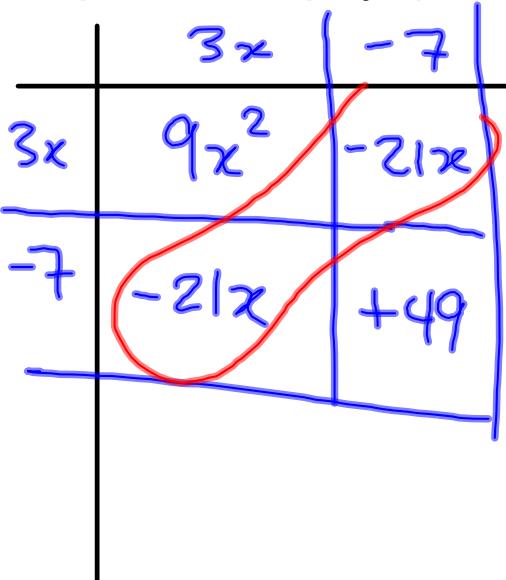
Bottom Right: The expanded form of the expression, $= x^2 + 4x + 4$, with the word "square" written next to it.



Expand & Simplify: $(x - 3)^2 = x^2 - 6x + 9$ F



Expand & Simplify: $(3x - 7)^2 = (3x - 7)(3x - 7) = 9x^2 - 42x + 49$



Special Products when Multiplying Binomials

1. Squaring a binomial

$$(a + b)^2 = (a + b)(a + b)$$

$$\begin{aligned} &= a^2 + ab + ab + b^2 \\ &= a^2 + 2ab + b^2 \end{aligned}$$

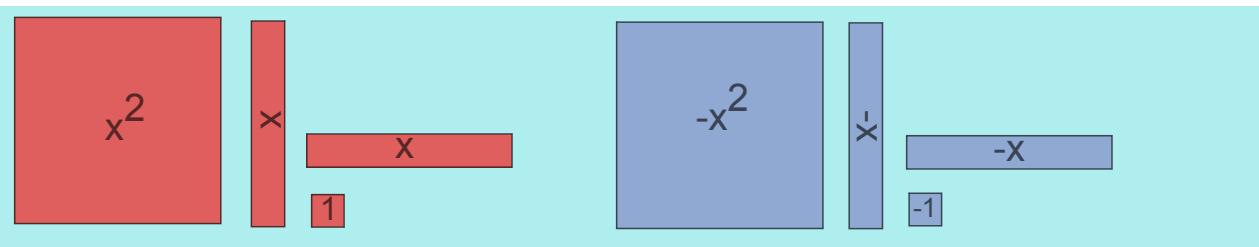
	a	a + b
a	a^2	ab
+b	ab	b^2

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

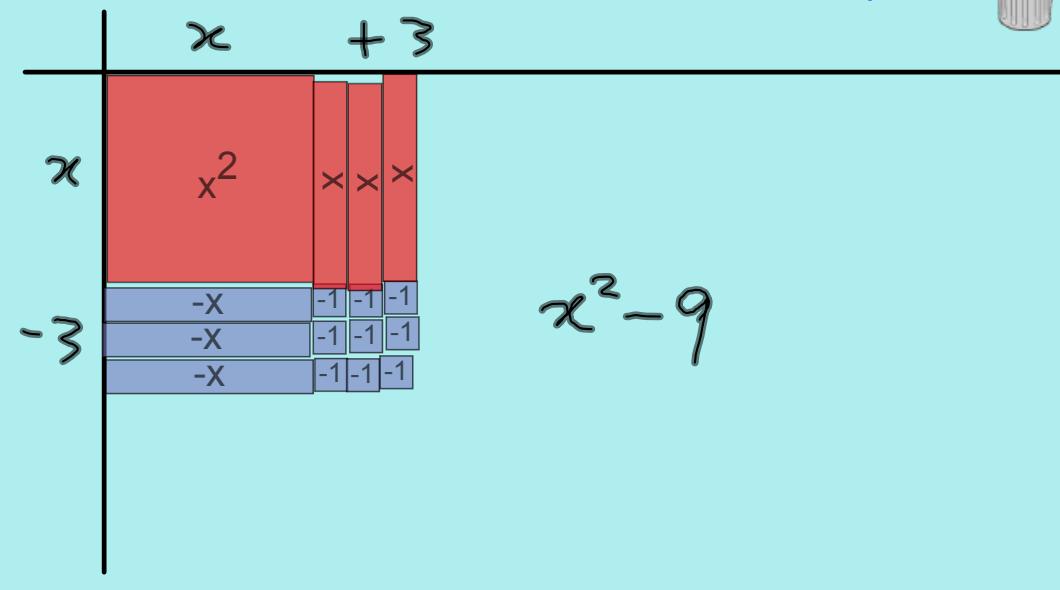
$$\begin{aligned} &= a^2 - ab - ab + b^2 \\ &= a^2 - 2ab + b^2 \end{aligned}$$

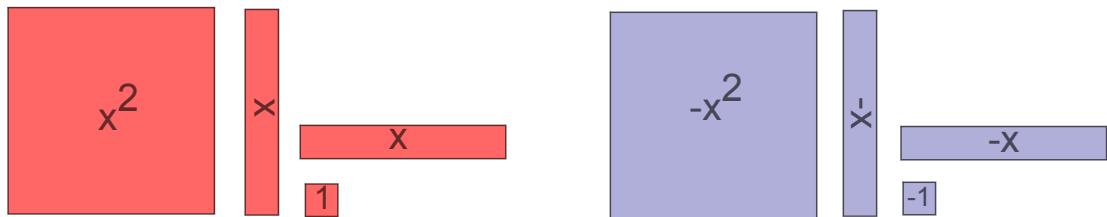
The algebraic result is called a perfect square.

Visually, using tiles, the area is a square.

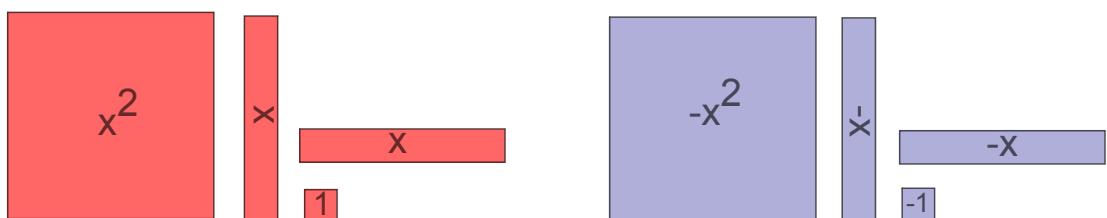
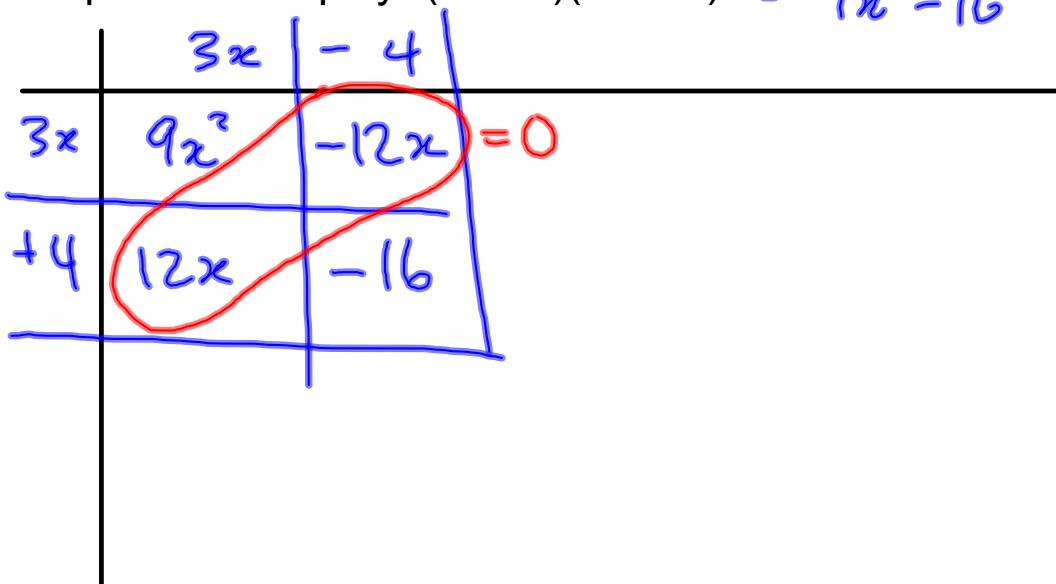


Expand & Simplify: $(x + 3)(x - 3) = x^2 - 9$

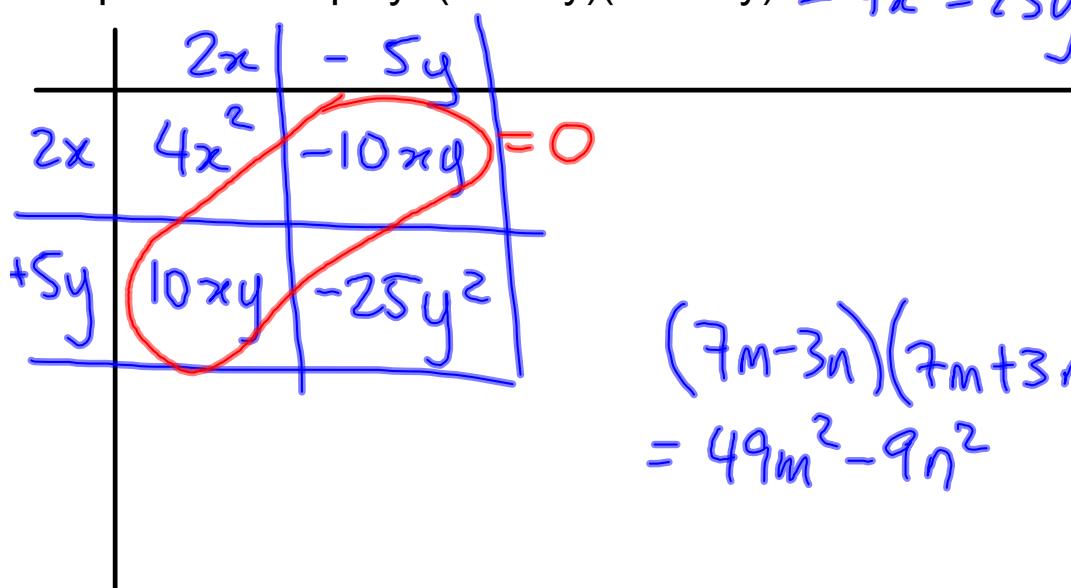




Expand & Simplify: $(3x - 4)(3x + 4) = 9x^2 - 16$



Expand & Simplify: $(2x - 5y)(2x + 5y) = 4x^2 - 25y^2$



2. Product of the Sum and Difference

$$(a + b)(a - b) = (a - b)(a + b) \quad (\text{order does not matter})$$

$$= a^2 - b^2$$

The algebraic result is called a difference of squares.

Visually, the result is a square.

Note: The x-terms add to zero.

$$(a - b)^2 = a^2 - 2ab + b^2$$

Assigned Work:

p. 166 # 6, 7, 9~~f~~, 10~~b~~

$3x$	$+4$
$3x$	$9x^2$
$+4$	$12x$

$9x^2$	$12x$
16	

$$\begin{aligned} 9(f) \quad & 2(3x+4)^2 - 3(x-2)^2 & 9x^2 + 24x + 16 \\ & = 2(9x^2 + 24x + 16) - 3(x^2 - 4x + 4) \\ & = 18x^2 + 48x + 32 - 3x^2 + 12x - 12 \\ & = 15x^2 + 60x + 20 \end{aligned}$$

$$\begin{aligned}
 10. \quad & (9x - 7y)^2 \quad (a-b)^2 = a^2 - 2ab + b^2 \\
 & = 81x^2 - 126xy + 49y^2 \\
 & = (9x - 7y)(9x - 7y) \\
 & = 81x^2 - 63xy - 63xy + 49y^2 \\
 & = 81x^2 - 126xy + 49y^2
 \end{aligned}$$