Pre-Algebra

Aim: How do we multiply a binomial by another binomial?

Do Now: Multiply.

A. $2x(x + 5)$
$2x^2 + 10x$

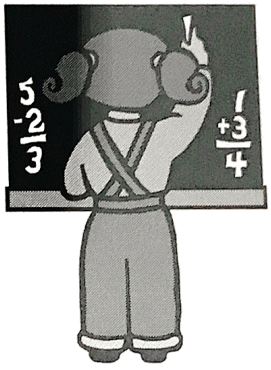
B. $3(x + 5)$
$3x + 15$

C. Based on examples A and B, how do you think you might find the product of $(2x + 3)$ and $(x + 5)$?

Multiplying Binomials

Think about this...

Jillian, a 4th grade student, is asked to find the product of 23 and 42. She writes the following on the chalkboard.



$(20 + 3) \times (40 + 2)$

	40	2
20	800	40
3	120	6

$800 + 40 + 120 + 6 = 966$

Is it possible to use Jillian's method to multiply $(2x + 3)$ and $(x + 5)$?

$2x^2 + 13x + 15$

	2x	+3
x	$2x^2$	3x
+5	10x	15

This method is the same as Double Distributing **.**
Multiply each term of one polynomial by each term of the other polynomial.

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

$2x^2 + 10x + 3x + 15$

$2x^2 + 13x + 15$

Multiplying Binomials

- Use the Distributive property ("Double Distribute").
- Multiply each term in the first set of ( ) by each term in the second set of ( ). Add exponents of like bases.
- Combine like terms.

Examples:

1. $(x+8)(x+6)$

$x^2+6x+8x+48$

$\boxed{x^2+14x+48}$

2. $(x-1)(x+7)$

$x^2+7x-1x-7$

$\boxed{x^2+6x-7}$

3. $(2x-5)(x+3)$

$2x^2+6x-5x-15$

$\boxed{2x^2+1x-15}$

4. $(x-11)(x+4)$

$x^2+4x-11x-44$

$\boxed{x^2-7x-44}$

5. $(x+9)(x-2)$

$x^2-2x+9x-18$

$\boxed{x^2+7x-18}$

6. $(3x+1)(x-2)$

$3x^2-6x+1x-2$

$\boxed{3x^2-5x-2}$

7. $(b+7)^2$

$(b+7)(b+7)$

$b^2+7b+7b+49$

$\boxed{b^2+14b+49}$

8. $(3x+y)(2x+2y)$

$6x^2+6xy+2xy+2y^2$

$\boxed{6x^2+8xy+2y^2}$

9. $(3x^2-1)^2$

$(3x^2-1)(3x^2-1)$

$9x^4-3x^2-3x^2+1$

$\boxed{9x^4-6x^2+1}$

For #'s 10 and 11, use a diagram to multiply the binomials.

10. $(3m^3+4)(3m^3-2)$

	$3m^3$	$+4$
$3m^3$	$9m^6$	$12m^3$
-2	$-6m^3$	-8

$\boxed{9m^6+6m^3-8}$

11. $(x^2-8x)(x^2+8x)$

$x^4+8x^3-8x^3-64x^2$

$\boxed{x^4-64x^2}$

Special Binomial Products

Do you see a pattern?

a) $(x-3)(x+3)$

$x^2+3x-3x-9$

$\boxed{x^2-9}$

b) $(x+5)(x-5)$

$x^2-5x+5x-25$

$\boxed{x^2-25}$

c) $(7x-4)(7x+4)$

$49x^2+28x-28x-16$

$\boxed{49x^2-16}$

d) $(9x+1)(9x-1)$

$81x^2-9x+9x-1$

$\boxed{81x^2-1}$

e) $(b^2+7)(b^2-7)$

$b^4-7b^2+7b^2-49$

$\boxed{b^4-49}$

f) $(3a^3-2)(3a^3+2)$

$9a^6+6a^3-6a^3-4$

$\boxed{9a^6-4}$

Sum and Difference Rule: $(a+b)(a-b)=a^2-b^2$

***When possible*, use the sum and difference rule to multiply each pair of binomials.**

1. $(x-8)(x+8)$

$\boxed{x^2-64}$

2. $(x+9)(x+9)$

$x^2+9x+9x+81$

$\boxed{x^2+18x+81}$

3. $(2x+6)(2x-6)$

$\boxed{4x^2-36}$

4. $(x+3)(x^2-3)$

$x^3-3x+3x^2-9$

$\boxed{x^3+3x^2-3x-9}$