

Multiplying Polynomials

MONOMIAL x POLYNOMIALS:

$$x = |x^1$$

Refresh: $3x^2y^3 \cdot -4x^5y^7 = -12x^7y^{10}$

- What did we do with the **COEFFICIENTS**? multiply
- What did we do with the **EXPONENTS**? add

Apply that same concept with the **distributive property**:

$$2x^2(3x^2 - 2x^1 + 4) = 6x^4 - 4x^3 + 8x^2$$

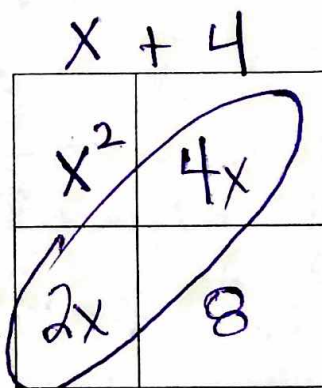
You Try:

- 1) $-2x^3(x^2 + 3x - 5) =$
- 2) $x^5y(x^5 + xy^2 + y^3) =$
- 3) $a^2b^2(2a^3 - 2a^2b^2 + 3b^2) =$
- 4) $-y(x^3 + 2xy^2 - 5y^3) =$

BINOMIAL x BINOMIAL:

Box Method: $(x + 4)(x + 2) = x^2 + 6x + 8$

- Label each part with a term.
- Find the area of each small box.
- Combine like terms: (Usually will be diagonals)



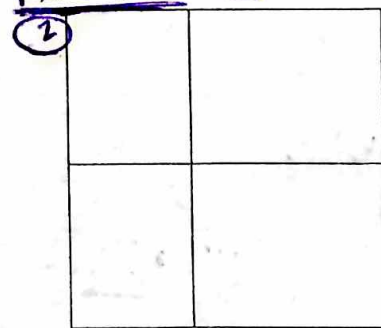
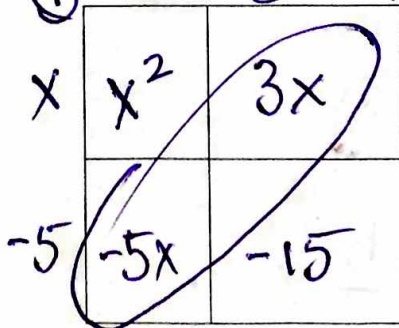
1) $(x + 3)(x - 5)$

$$= x^2 - 2x - 15$$

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

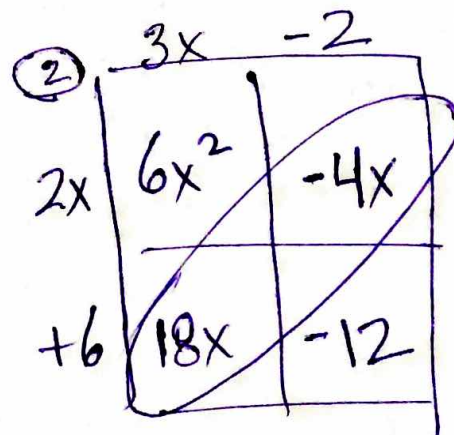
$$= 6x^2 + 14x - 12$$

① $x + 3 = x^2 + 4x + 2x + 8$



You Try:

- 1) $(x + 4)(x - 5)$
- 2) $(-x - 7)(4x - 2)$
- 3) $(2x - 5)(x - 3)$



FOIL Method: $(x + 7)(x + 6) = x^2 + 6x + 7x + 42$

- F: first terms
- O: outside terms
- I: inside terms
- L: last terms

$= x^2 + 13x + 42$

*****FOIL CAN ONLY BE USED FOR BINOMIAL x BINOMIAL*****

You Try: (Choose box method OR FOIL method)

- 1) $(2x + 1)(x - 3)$
- 2) $(x - 2)(x + 2)$ two terms in final answer
- * 3) $(x + 2)^2 = (x + 2)(x + 2)$

#2: What happened when we combined the middle terms? Why do you think this happened?

#3: There is only one binomial. How are we supposed to FOIL?

BINOMIAL x TRINOMIAL:

- FOIL can only be used for bi x bi. Therefore, we have to use box.
- The dimensions of your box should match the type of polynomials you are multiplying.
 - Binomial x binomial = 2 x 2
 - Binomial x trinomial = 2 x 3
 - Trinomial x trinomial = 3 x 3

EX: $(x + 2)(2x^2 + 3x - 2)$

$= 2x^3 + 3x^2 + 4x^2 + 6x - 4$

You Try:

1) $(x - 2)(2x^2 - 4x + 2)$

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

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

EX: $2x^2 + 3x - 2$

$1x^1$	$2x^3$	$3x^2$	$-2x$
$+2$	$4x^2$	$6x$	-4

$\rightarrow = 2x^3 + 7x^2 + 4x - 4$

$$\textcircled{1} \quad \boxed{-2x^3} (x^2 + 3x - 5) = \boxed{-2x^5 - 6x^4 + 10x^3}$$

$$\textcircled{2} \quad \boxed{x^5 y} (x^5 + xy^2 + y^3) = \boxed{x^{10} y + x^6 y^3 + x^5 y^4}$$

$$\textcircled{3} \quad \boxed{a^2 b^2} (2a^3 - 2a^2 b^2 + 3b^2) = \boxed{2a^5 b^2 - 2a^4 b^4 + 3a^2 b^4}$$

$$\textcircled{4} \quad \boxed{-y} (x^3 + 2xy^2 - 5y^3) = \boxed{-x^3 y - 2xy^3 + 5y^4}$$

①

	x	$+4$	
x	x^2	$4x$	$= \boxed{x^2 - x - 20}$
-5	$-5x$	-20	

②

	$-x$	-7	
$4x$	$-4x^2$	$-28x$	$= \boxed{-4x^2 - 26x + 14}$
-2	$2x$	14	

③

	$2x$	-5	
x	$2x^2$	$-5x$	$= \boxed{2x^2 - 11x + 15}$
-3	$-6x$	15	

① $(2x+1)(x-3) = 2x^2 - \underline{6x} + x - 3$

I

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

② $(x-2)(x+2) = x^2 + 2x - 2x - 4$

I

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

③ $(x+2)(x+2) = x^2 + \underline{2x} + 2x + 4$

I

$= \boxed{x^2 + 4x + 4}$

$$\textcircled{1} (x-2)(2x^2-4x+2)$$

$$\begin{array}{r} 2x^2 - 4x + 2 \\ x \begin{array}{|c|c|c|} \hline 2x^3 & -4x^2 & 2x \\ \hline -4x^2 & 8x & -4 \\ \hline \end{array} \\ -2 \end{array}$$

$$= 2x^3 - 8x^2 + 10x - 4$$

$$\textcircled{2} (2x+1)(x^3+2x^2-3)$$

$$= 2x^4 + 4x^3 - 6x + x^3 + 2x^2 - 3$$

$$= 2x^4 + 5x^3 + 2x^2 - 6x - 3$$

LET'S COMBINE ALL OF THESE AND PRACTICE:

1) $(2x - 2)(5x + 1)$

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

3) $(3x + 1)(x^2 - 2x + 4)$

4) $(x - 6)^2 = (x - 6)(x - 6)$

5) CHALLENGE: $(x + 3)^3 = \underbrace{(x + 3)(x + 3)}_{\text{multiply}}(x + 3) = \underbrace{(x^2 + 6x + 9)}_{\text{multiply}}(x + 3)$
 $= x^3 + 9x^2 + 27x + 27$

APPLYING TO GEOMETRY:

Area of a square = $(\text{side})^2 = s^2$

Area of a rectangle = $(\text{length})(\text{width}) = L \times W$

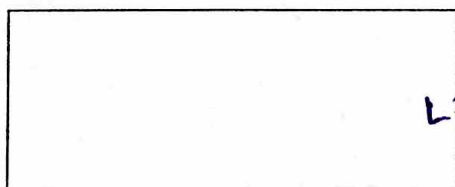
Area of a triangle = $\frac{1}{2}(\text{base})(\text{height}) = \frac{1}{2}bh$

Volume of a cube = $(\text{side})^3 = s^3$

Volume of a rectangular prism = $(\text{length})(\text{width})(\text{height}) = L \times W \times H$

FIND THE AREA OR VOLUME OF THE FIGURES:

Area:



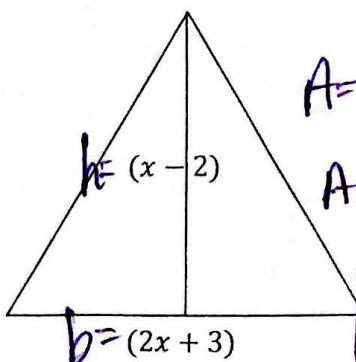
$W = x^2 + 2x - 1$

$A = L \times W$

$A = (x + 2)(x^2 + 2x - 1)$

$A = x^3 + 4x^2 + 3x - 2$

Area:



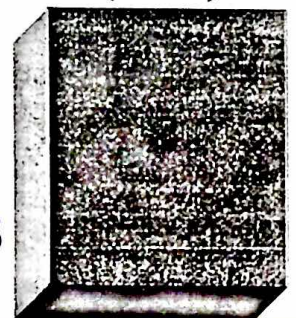
$A = \frac{1}{2}bh$

$A = \frac{1}{2}(2x + 3)(x - 2)$

$A = \frac{1}{2}(2x^2 - x - 6)$

Volume:

$(2x + 3)$



$V = s^3$

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

$V = 8x^3 + 36x^2 + 54x + 27$