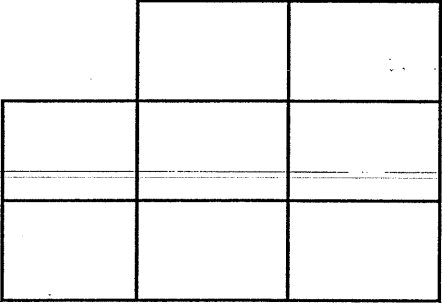


Let's see the way each of these 3 methods simplifies $(x + 3)(2x - 1)$:

<p>a. FOIL method:</p> <ul style="list-style-type: none"> • Multiply each pair of terms that the acronym indicates: First terms, Outer terms, Inner terms, and Last terms. • Simplify the products. 	<p>c. Box/Grid (Punnett square) method:</p> <ul style="list-style-type: none"> • Create a grid with each term of one polynomial listed across the top and each term of the second polynomial listed down one side. • Fill in each box within the grid by multiplying the row by the column. • Simplify the products. <div style="text-align: center; margin-top: 20px;">  </div>
<p>b. Old fashioned multiplication:</p> <ul style="list-style-type: none"> • Line up expressions, make sure to include zero's for missing terms • Multiply like you did in 3rd grade 	

From previous study in mathematics, we know that exponents show how many factors are being multiplied.

Example 2: Expand each expression.

a. $-3x^4 =$ _____

b. $2m^3p^2 =$ _____

c. $(5y^2x)(-4y^3x^2) =$ _____

Reasoning: How is the product of two monomials simplified? Simplify Example 2c.

Example 3: Simplify.

a. $5x^2(-3x^3 + x^2 - 7x + 4)$

b. $(-8a^3b)(2a^2 + 3ab - 4ab^2)$

Example 4: Simplify.

a. $(3b + 7)(2b + 4)$

b. $(2y - 5)(2y + 5)$

c. $(6g - 7)^2$

d. $(8e^3 + 2)(-3e^4 - 1)$

e. $(7m - 2)(3m^2 + 4m - 8)$

f. $9w(2w - 3) + (8w + 5)(3w - 4)$

Multiplying Polynomials

Homework

Find each product.

1) $(m + 3)(2m - 3)$

2) $(p + 1)(4p - 5)$

3) $(5n - 1)(4n - 4)$

4) $3a(4a - 1)(5a - 2)$

5) $(-8k - 4)(3k - 7)$

6) $(6x - 6)(-6x - 4)$

$$7) -2(-6m - 8)(-6m + 4)$$

$$8) (-7v - 6)(4v - 8)$$

$$9) (-7a - 5)(3a^2 - 3a + 4)$$

$$10) (2n + 3)(-2n^2 + 3n + 3)$$

$$11) (-v - 4)(v^2 + 6v - 3)$$

$$12) 5(-4a + 6)(2a^2 - 5a - 3)$$

$$13) (-3x^2 + 6x + 8)(6x^2 - x + 1)$$

$$14) (n^2 + 2n + 2)(4n^2 - n - 8)$$

Key

Let's see the way each of these 3 methods simplifies $(x + 3)(2x - 1)$:

a. FOIL method: *(Distribute)*

- Multiply each pair of terms that the acronym indicates: First terms, Outer terms, Inner terms, and Last terms.
- Simplify the products.

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

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

$2x^2 + 5x - 3$

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

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

$2x^2 + 5x - 3$

b. Old fashioned multiplication:

- Line up expressions, make sure to include zero's for missing terms
- Multiply like you did in 3rd grade

$$\begin{array}{r} x+3 \\ \times 2x-1 \\ \hline -x-3 \\ 2x^3+6x0 \\ \hline 2x^2+5x-3 \end{array}$$

c. Box/Grid (Punnett square) method:

- Create a grid with each term of one polynomial listed across the top and each term of the second polynomial listed down one side.
- Fill in each box within the grid by multiplying the row by the column.
- Simplify the products.

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

$2x^2 + 5x - 3$

From previous study in mathematics, we know that exponents show how many factors are being multiplied.

Example 2: Expand each expression.

a. $-3x^4 = \underline{-3 \cdot x^4}$ b. $2m^3p^2 = \underline{2 \cdot m^3 \cdot p^2}$

c. $(5y^2x)(-4y^3x^2) = \underline{5 \cdot y^2 \cdot x^1 \cdot -4 \cdot y^3 \cdot x^2}$

Reasoning: How is the product of two monomials simplified? Simplify Example 2c.

$-20y^5x^3$

Example 3: Simplify,

a. $5x^2(-3x^3 + x^2 - 7x + 4)$

$$-15x^5 + 5x^4 - 35x^3 + 20x^2$$

b. $(-8a^3b)(2a^2 + 3ab - 4ab^2)$

$$-16a^5b - 24a^4b^2 + 32a^4b^3$$

Example 4: Simplify.

a. $(3b + 7)(2b + 4)$

$$3b(2b+4) + 7(2b+4)$$

$$6b^2 + 12b + 14b + 28$$

$$6b^2 + 26b + 28$$

b. $(2y - 5)(2y + 5)$

$$2y(2y+5) - 5(2y+5)$$

$$4y^2 + 10y - 10y - 25$$

$$\boxed{4y^2 - 25}$$

c. $(6g - 7)^2 (6g - 7)(6g - 7)$

$$36g^2 - 84g + 49$$

d. $(8e^3 + 2)(-3e^4 - 1)$

$$8e^3(-3e^4 - 1) + 2(-3e^4 - 1)$$

$$\boxed{-24e^{12} - 8e^3 - 6e^4 - 2}$$

e. $(7m - 2)(3m^2 + 4m - 8)$

$$3m^2 + 4m - 8$$

$$\times \quad 7m - 2$$

$$-6m^2 - 8m + 16$$

$$+21m^3 + 28m^2 - 56m \quad 0$$

$$\boxed{21m^3 + 22m^2 - 64m + 16}$$

f. $9w(2w - 3) + (8w + 5)(3w - 4)$

$$9w(2w-3) + 8w(3w-4) + 5(3w-4)$$

$$18w^2 - 27w + 24w^2 - 32w + 15w - 20$$

$$42w^2 - 59w + 15w - 20$$

$$\boxed{42w^2 - 44w - 20}$$

Multiplying Polynomials

Solutions

Find each product.

1) $(m + 3)(2m - 3)$

$$2m^2 + 3m - 9$$

2) $(p + 1)(4p - 5)$

$$4p^2 - p - 5$$

3) $(5n - 1)(4n - 4)$

$$20n^2 - 24n + 4$$

4) $3a(4a - 1)(5a - 2)$

~~$$20a^2 - 13a + 2$$~~

$$6a^3 - 39a^2 + 6a$$

5) $(-8k - 4)(3k - 7)$

$$-24k^2 + 44k + 28$$

6) $(6x - 6)(-6x - 4)$

$$-36x^2 + 12x + 24$$

$$7) -2(-6m - 8)(-6m + 4)$$

$$~~36m^2 + 24m - 32~~$$

$$\boxed{-72m^2 - 48m + 64}$$

$$8) (-7v - 6)(4v - 8)$$

$$-28v^2 + 32v + 48$$

$$9) (-7a - 5)(3a^2 - 3a + 4)$$

$$-21a^3 + 6a^2 - 13a - 20$$

$$10) (2n + 3)(-2n^2 + 3n + 3)$$

$$-4n^3 + 15n + 9$$

$$11) (-v - 4)(v^2 + 6v - 3)$$

$$-v^3 - 10v^2 - 21v + 12$$

$$12) 5(-4a + 6)(2a^2 - 5a - 3)$$

$$~~-8a^3 + 32a^2 - 18a - 18~~$$

$$\boxed{-40a^3 + 160a^2 - 90a - 90}$$

$$13) (-3x^2 + 6x + 8)(6x^2 - x + 1)$$

$$-18x^4 + 39x^3 + 39x^2 - 2x + 8$$

$$14) (n^2 + 2n + 2)(4n^2 - n - 8)$$

$$4n^4 + 7n^3 - 2n^2 - 18n - 16$$