

Lesson 8-7

Example 1 The Distributive Property

Find $(r - 6)(r + 4)$.

Method 1 Vertical

| | | |
|---|---|---|
| <p>Multiply by 4.</p> $\begin{array}{r} r - 6 \\ (\times) r + 4 \\ \hline 4r - 24 \end{array}$ <p>$4(r - 6) = 4r - 24$</p> | <p>Multiply by r.</p> $\begin{array}{r} r - 6 \\ (\times) r + 4 \\ \hline 4r - 24 \\ r^2 - 6r \end{array}$ <p>$r(r - 6) = r^2 - 6r$</p> | <p>Add like terms.</p> $\begin{array}{r} r - 6 \\ (\times) r + 4 \\ \hline 4r - 24 \\ r^2 - 6r \\ \hline r^2 - 2r - 24 \end{array}$ |
|---|---|---|

Method 2 Horizontal

$$\begin{aligned} (r - 6)(r + 4) &= r(r + 4) + -6(r + 4) && \text{Distributive Property} \\ &= r(r) + r(4) + -6(r) + -6(4) && \text{Distributive Property} \\ &= r^2 + 4r - 6r - 24 && \text{Multiply.} \\ &= r^2 - 2r - 24 && \text{Combine like terms.} \end{aligned}$$

Example 2 FOIL Method

Find each product.

a. $(x - 9)(x - 2)$

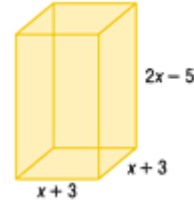
$$\begin{aligned} (x - 9)(x - 2) &= \overset{\text{F}}{(x)}(\overset{\text{O}}{x}) + \overset{\text{I}}{(x)}(\overset{\text{L}}{-2}) + \overset{\text{I}}{-9}(\overset{\text{O}}{x}) + \overset{\text{L}}{-9}(\overset{\text{L}}{-2}) && \text{FOIL method} \\ &= x^2 - 2x - 9x + 18 && \text{Multiply.} \\ &= x^2 - 11x + 18 && \text{Combine like terms.} \end{aligned}$$

b. $(3a - 5)(5a - 2)$

$$\begin{aligned} (3a - 5)(5a - 2) &= \overset{\text{F}}{(3a)}(\overset{\text{O}}{5a}) + \overset{\text{I}}{(3a)}(\overset{\text{L}}{-2}) + \overset{\text{I}}{-5}(\overset{\text{O}}{5a}) + \overset{\text{L}}{-5}(\overset{\text{L}}{-2}) && \text{FOIL method} \\ &= 15a^2 - 6a - 25a + 10 && \text{Multiply.} \\ &= 15a^2 - 31a + 10 && \text{Combine like terms.} \end{aligned}$$

Example 3 FOIL Method

GEOMETRY The surface area of a box is found by finding the area of each of the six sides. Write an expression for the surface area of the box.



Identify the area of each side.

$$\text{Area of bottom} = \text{area of top} = (x + 3)(x + 3)$$

$$\text{Area each side} = (x + 3)(2x - 5)$$

Now write the formula.

Surface

$$\underbrace{\text{Area}}_{SA} \underbrace{\text{equals}}{=} \underbrace{\text{two}}{2} \underbrace{\text{times}}{\cdot} \underbrace{\text{area of base}}{(x + 3)(x + 3)} \underbrace{\text{plus}}{+} \underbrace{\text{four}}{4} \underbrace{\text{times}}{\cdot} \underbrace{\text{area of a side}}{(x + 3)(2x - 5)}$$

$$\begin{aligned} SA &= 2(x + 3)(x + 3) + 4(x + 3)(2x - 5) \\ &= 2[(x)(x) + (x)(3) + (3)(x) + (3)(3)] + 4[(x)(2x) + (x)(-5) + (3)(2x) + (3)(-5)] \\ &= 2[x^2 + 3x + 3x + 9] + 4[2x^2 - 5x + 6x - 15] \\ &= 2[x^2 + 6x + 9] + 4[2x^2 + x - 15] \\ &= 2x^2 + 12x + 18 + 8x^2 + 4x - 60 \\ &= 10x^2 + 16x - 42 \end{aligned}$$

Original formula
FOIL method
Multiply
Combine like terms.
Distributive Property
Combine like terms.

The surface area of the box is $10x^2 + 16x - 42$ square units.

Example 4 The Distributive Property

Find each product.

a. $(2y - 3)(y^2 + 5y - 1)$

$$\begin{aligned} &(2y - 3)(y^2 + 5y - 1) \\ &= 2y(y^2 + 5y - 1) - 3(y^2 + 5y - 1) \quad \text{Distributive Property} \\ &= 2y^3 + 10y^2 - 2y - 3y^2 - 15y + 3 \quad \text{Distributive Property} \\ &= 2y^3 + 7y^2 - 17y + 3 \quad \text{Combine like terms.} \end{aligned}$$

b. $(2p^2 + p - 2)(p^2 + 4p - 3)$

$$\begin{aligned} &(2p^2 + p - 2)(p^2 + 4p - 3) \\ &= 2p^2(p^2 + 4p - 3) + p(p^2 + 4p - 3) - 2(p^2 + 4p - 3) \quad \text{Distributive Property} \\ &= 2p^4 + 8p^3 - 6p^2 + p^3 + 4p^2 - 3p - 2p^2 - 8p + 6 \quad \text{Distributive Property} \\ &= 2p^4 + 9p^3 - 4p^2 - 11p + 6 \quad \text{Combine like terms.} \end{aligned}$$