

The Distributive Property

The distributive property is used when addition or subtraction in parentheses is combined with multiplication outside the parentheses. The secret is that the value outside the parentheses is multiplied into each term inside the parentheses. Let's look at some examples:

$$\begin{aligned}3(x + 4) &= 3 \cdot x + 3 \cdot 4 \\ &= 3x + 12\end{aligned}$$

$$\begin{aligned}-3(x + 4) &= -3 \cdot x + -3 \cdot 4 \\ &= -3x - 12\end{aligned}$$

$$\begin{aligned}5(2x - 3z) &= 5 \cdot 2x + 5 \cdot -3z \\ &= 10x - 15z\end{aligned}$$

Now, let's distribute together:

- $5(x + 2)$

- $3(2x + 1)$

- $8(x - 2)$

- $3(5x + 3y)$

- $4(3x - 2)$

- $5a(2a + 5b)$

- $6c(5c + 2d)$

- $2x(3x + 2y + 4)$

- $3x(4x + 5xy)$

Distributing a Negative Sign

When the parentheses have a negative sign outside, that means that the expression in parentheses is being multiplied by -1 . This means, in turn, that the sign of each term switches. Let's see a couple of examples:

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

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

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

Let's try a couple more complicated versions together:

$$\bullet -(2a^2 - 5a + 1)$$

$$\bullet -(5x^2 + 2x - 1)$$

Of course, the expressions can get a bit more complicated. So, after distributing, we need to try to combine like terms. Let's simplify these expressions together:

$$\bullet 2(3x + 4) + 5x$$

$$\bullet 3(2x - 1) + 5(3x + 2)$$

Now, try some on your own. Simplify each of the following expressions, by first distributing then combining like terms:

1. $6 + 2(4x + 3)$

2. $8 + 3(5x + 3) + 6x$

3. $6x + 2(5x + 3)$

4. $3(4x + 2) + 2(5x + 1)$

5. $3(5x + 2) - (6x + 5)$

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

7. $x(3x + 2)$

8. $0.5(4a - 2b)$

9. $\frac{1}{2}(10x - 4y)$

10. $-(5x - 1)$

11. $6 + 2(4x + 5)$

12. $2x(4x + 5)$

13. $3(2x - 4) - 6x$

14. $\frac{1}{2}(10x - 4) + 3(5x + 2)$

15. $3(3x - 2) + 2(3x + 6)$

16. $8 - (4x + 3) + 8x$