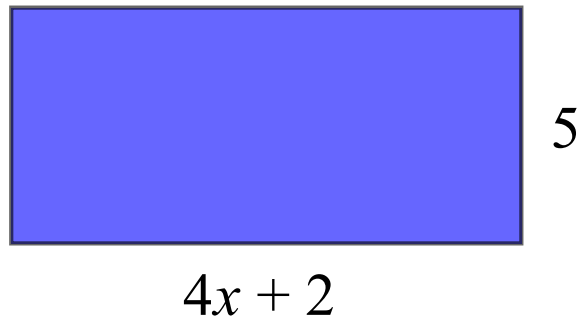


## 3.7 Distributive Property

### Part 1: DO IT NOW!

*Write a simplified expression for the area of the rectangle:*

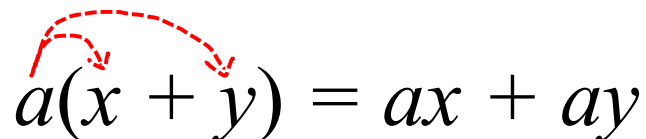


**Remember:** Area of a rectangle = length x width.

Area of the rectangle =  $5(4x + 2)$

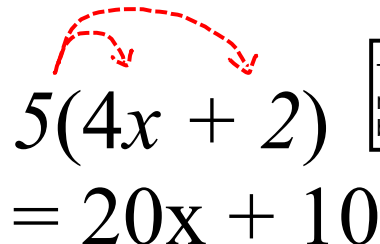
Before we can simplify the expression we need to learn the distributive property!

### Distributive Property


$$a(x + y) = ax + ay$$

When you apply the distributive property, you are getting rid of the brackets by multiplying everything in the brackets by the term in front of the brackets.

Example:


$$\begin{aligned} &5(4x + 2) \\ &= 20x + 10 \end{aligned}$$

To apply the distributive property, I must multiply both terms in the bracket by 5.

## Part 2: Multiply a Constant by a Polynomial

Expand and Simplify the Following:

$$\begin{aligned} 1) \quad & 2(5x + 3) \\ &= 2(5x) + 2(3) \\ &= 10x + 6 \end{aligned}$$

$$\begin{aligned} 2) \quad & -2(7x - 4) \\ &= -2(7x) - 2(-4) \\ &= -14x + 8 \end{aligned}$$

**Note:** Make sure to include the negative sign when distributing the -2. Follow integer rules for multiplication.

$$\begin{aligned} 3) \quad & -3(2x^2 - 5x + 4) \\ &= -3(2x^2) - 3(-5x) - 3(4) \\ &= -6x^2 + 15x - 12 \end{aligned}$$

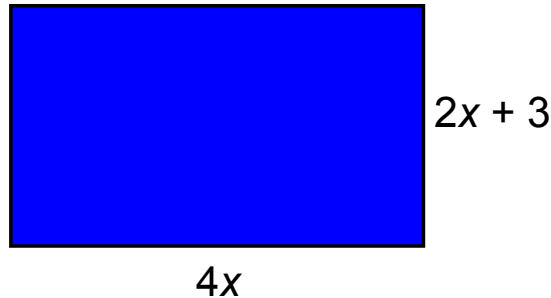
**Note:** You can also apply the distributive property to trinomials.

$$\begin{aligned} 4) \quad & 2(6m - 3) + 3(16 + 4m) \\ &= 2(6m) + 2(-3) + 3(16) + 3(4m) \\ &= 12m - 6 + 48 + 12m \\ &= 12m + 12m - 6 + 48 \\ &= 24m + 42 \end{aligned}$$

**Remember:** You can collect like terms! Like terms have identical variables (same letters and exponents)

### Part 3: Apply Our Knowledge

- 5) Write an expression for the area of the rectangle in expanded form:



$$\begin{aligned}\text{Area} &= 4x(2x+3) \\ &= 4x(2x) + 4x(3) \\ &= 8x^2 + 12x\end{aligned}$$

What is the area of the rectangle if  $x = 5$  cm

$$\begin{aligned}\text{Area} &= 8x^2 + 12x \\ &= 8(5)^2 + 12(5) \\ &= 8(25) + 60 \\ &= 200 + 60 \\ &= 260 \text{ cm}^2\end{aligned}$$

## Part 4: Distribute Variables

**Example:**

$$\begin{aligned} & x(x^2 - 3) \\ &= x^3 - 3x \end{aligned}$$

Remember exponent laws:

$$x(x^2) = x^{(1+2)} = x^3$$

**Expand and Simplify the following:**

$$\begin{aligned} 6) \quad & x(x - 3) \\ &= x(x) + x(-3) \\ &= x^2 - 3x \end{aligned}$$

$$\begin{aligned} 7) \quad & -x(7x - 4) \\ &= -x(7x) - x(-4) \\ &= -7x^2 + 4x \end{aligned}$$

$$8) \quad -3x(2x^2 - 5x + 4)$$

$$= -6x^3 + 15x^2 - 12x$$

$$9) \quad 3m(m - 5) - (2m^2 - m)$$

$$= 3m^2 - 15m - 2m^2 + m$$

$$= m^2 - 14m$$

For this question you can multiply the second polynomial by -1 or use the properties for subtracting polynomials; both give the same result!

$$10) \quad \frac{1}{2}(2w - 6) - \frac{2}{3}(9w - 6)$$

$$= \frac{1}{2}(2w) + \frac{1}{2}(-6) - \frac{2}{3}(9w) - \frac{2}{3}(-6)$$

$$= \frac{2w}{2} - \frac{6}{2} - \frac{18w}{3} + \frac{12}{3}$$

$$= w - 3 - 6w + 4$$

$$= -5w + 1$$

## Part 5: Nested Brackets

If there is a bracket inside of a bracket, simplify the inner most brackets first and then work your way out.

11)  $3[2 + 5(2k - 1)]$

$$= 3(2 + 10k - 5)$$

$$= 3(10k - 3)$$

$$= 30k - 9$$