LESSON 4

# The Distributive Property

**LEARNING OBJECTIVES**

- Today I am: looking for mistakes in someone's work.
- So that I can: use the distributive property correctly.
- I'll know I have it when I can: distribute fractions to a polynomial.

**Exploratory Exercise**

Kim was working on an exercise in math when she ran across this problem:

| Distribute and simplify if possible. |
| --- |
| $2(3x + 5)$ |

Kim's dad said, "I remember doing something like this in school." He then drew two arcs on her paper.

| Distribute and simplify if possible. |
| --- |
| $2(3x + 5)$ |
| $-2(3x+5)$ |

1. Talk to your partner about what Kim's dad was trying to show. Then complete Kim's problem.

2. What does the word "distribute" mean? Give two examples of the word in everyday use.

To give equally

3. In math, distribute means to multiply out the parts of an expression. How does this definition relate to your definition from Exercise 2?

Same

4. In each example below, one or more mistakes were made when distributing. Circle the mistakes and then write the correct expression.

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

$6x + 10$

B. $3(2x^2 - 3) =$
$6x^2 - 3$

$6x^2 - 9$

C. $-3(3x - 4) =$
$-9x + 4$

$-9x + 12$

D. $-4(4x - 5) =$
$-16x - 20$

$-16x + 20$

E. $-2(4x^2 + 6) =$
$-8x^2 + 12$

$-8x^2 - 12$

F. $-9(4x^3 - 5x + 6) =$
$36x^3 - 45x + 54$

$-36x^3 + 45x - 54$

5. What was the common mistake made in 4A, 4B and 4C?

The second term was not multiplied.

6. What was the common mistake made in 4D, 4E and 4F?

The signs were not distributed

### Adding Polynomials

7. Add the following polynomials by combining like terms. Be careful—you will have to distribute in a few of them.

A. $(3x + 5) + (7x - 3)$

$3x+5+7x-3$

$10x+2$

B. $(2x^2 - 3) + (7x + 2)$

C. $(3x + 4) + (-4x - 7)$

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

E. $-2(4x^2 + 6) + (7x^2 - 9x + 3)$

$-8x^2-12+7x^2-9x+3$

$-x^2-9x-9$

F. $-(4x^3 - 5x + 6) + (6x^2 + 7x - 3)$

$-4x^3+5x-6+6x^2+7x-3$

$-4x^3+6x^2+12x-9$

### Subtracting Polynomials

When subtracting polynomials, you will need to distribute the negative sign to all the terms in the parentheses.

8. Subtract these polynomials and then combine like terms.

A. $(8x^2 - 9) - (6x^2 - 2)$

$8x^2-9-6x^2+2$

$2x^2-7$

B. $(5x - 2) - (3x + 9)$

C. $5(x + 1) - 6(x - 1)$

$5x+5-6x+6$

$-x+11$

D. $6x - 5 - (5x - 6)$

E. $30x^2 - 20 - 2(10x^2 - 5x + 7)$

$30x^2-20-20x^2+10x-14$

$10x^2+10x-34$

F. $7x^3 - (8x^2 + 9x - 4)$

$\frac{1}{2} \cdot 5 = \frac{5}{2}$

## Distributing Fractions

9. Distribute and then combine like terms to simplify each expression. Remember, you **aren't** solving equations. These are all expressions.

A. $\frac{1}{2}(2x^3 - 4x + 8)$

$\frac{1}{2} \cdot 2x^3 \quad \frac{1}{2} \cdot \frac{4x^2}{1} \quad \frac{1}{2} \cdot \frac{8}{1}$

$x^3 - 2x + 4$

B. $\frac{2}{3}(9x^2 + 3x - 6)$

$\frac{2}{3} \cdot \frac{9x^3}{1} \quad \frac{2}{3} \cdot \frac{3x}{1} \quad \frac{2}{3} \cdot \frac{6}{1}$

$6x^2 + 2x - 4$

C. $\frac{1}{4}(4x^2 + 4x + 8) + x^2 - 4x$

D. $16\left(\frac{3}{8}y + \frac{3}{4}\right) - (4y - 5) - 18\left(-\frac{15}{9}y + \frac{2}{3}\right)$

E. $-\frac{3}{4}(4x^2 + 4x + 16) + 3x^2 - 14x + 14$

F. $-\frac{1}{6}(18x + 6) + 3\left(6x - \frac{5}{3}\right)$

$-\frac{1}{6} \cdot \frac{18}{1} \quad -\frac{1}{6} \cdot 6 \quad 3 \cdot 6 \quad \frac{1}{3} \cdot \frac{5}{3}$

$-3x - 1 + 18x - 5$

$15x - 6$

G. $-\frac{1}{2}(6y + 4) - (4y - 5) - \frac{2}{5}(-10y - 15)$

H. $\frac{3}{5}(15x + 5) + 2(6x - 8)$

I. $32\left(\frac{3}{8}y + \frac{3}{4}\right) - 32(y - 1) - 32\left(-\frac{5}{16}y + \frac{2}{32}\right)$

$\frac{4}{32} \cdot \frac{3}{8} \quad \frac{8}{32} \cdot \frac{3}{4} \quad \frac{2}{32} \cdot \frac{5}{16} \quad \frac{1}{32} \cdot \frac{2}{32}$

$12y + 24 - 32y + 32 + 10y - 2$

$-10y + 54$

J. $\frac{5}{7}(7x + 14) - \frac{2}{3}(6a - 9)$

NAME: _____ PERIOD: _____ DATE: _____

# Homework Problem Set

**Find each sum or difference.**

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

2. $(6x^2 - 1) - (2x^2 + 8)$

3. $(12x - 9) - (7x + 3) + 2(6x - 1)$

4. $(4x^2 + x + 7) + (2x^2 + 3x + 1)$

5. $(3x^3 - x^2 + 8) - (x^3 + 5x^2 + 4x - 7)$

6. $3(x^3 + 8x) - 2(x^3 + 12)$

7. $(5 - t - t^2) + (9t + t^2)$

8. $(3p + 1) + 6(p - 8) - (p + 2)$

9. $(2p + 4) + 5(p - 1) - (p + 7)$

10. $(6 - t - t^4) + (9t + t^4)$

11. $(7x^4 + 9x) - 2(x^4 + 13)$

12. $(5 - t^2) + 6(t^2 - 8) - (t^2 + 12)$

13. $(8x^3 + 5x) - 3(x^3 + 2)$

14. $(12x + 1) + 2(x - 4) - (x - 15)$

15. $(13x^2 + 5x) - 2(x^2 + 1)$

16. $(9 - t - t^2) - \frac{3}{2}(8t + 2t^2)$

17. $(4m + 6) - 12(m - 3) + (m + 2)$

18. $(15x^4 + 10x) - 12(x^4 + 4x)$

19. **Challenge** Celina says that each of the following expressions is actually a 2-term expression (called a ***binomial***) in disguise. For example, she sees that the expression in (i) is algebraically equivalent to $11abc - 2a^2$, which is indeed a 2-term expression. Is she right about the remaining two expressions? Explain your thinking.

    i. $5abc - 2a^2 + 6abc = 11abc - 2a^2$

    ii. $5x^3 \cdot 2x^2 - 10x^4 + 3x^5 + 3x \cdot (-2)x^4$

    iii. $5(a - 1) - 10(a - 1) + 100(a - 1)$