2.5: Apply the Distributive Property

Goals: *Identify terms, like terms, coefficients and constants of an expression
*Apply the distributive property
*Distribute a negative number
*Use the distributive property to simplify an expression

Distributive Property: $a(b + c) = ab + ac$ $a(b - c) = ab - ac$

$(b + c)a = ab + ac$

Simplify:

Ex: $4(y + 3)$ **Ex:** $(y + 7)y$ **Ex:** $n(n - 9)$

$4y + 12$ $y^2 + 7y$ $n^2 - 9n$

Ex: $(2 - n)8$ **Ex:** $(2n + 6)\left(\frac{1}{2}\right)$

$16 - 8n$ $n + 3$

Simplify:

Ex: $-2(x + 7)$ **Ex:** $(5 - y)(-3y)$ **Ex:** $-(2x - 11)$
                                                    Rewrite: $-1(2x - 11)$
$-2x - 14$ $-15y + 3y^2$ $-2x + 11$

Term: Parts of an expression separated by addition (or subtraction)

Ex: Identify the terms in the expression: $3x - 4 - 6x + 2$

$3x, -4, -6x, 2$ When identifying terms, it is helpful to rewrite all subtraction as adding a
                         negative. Then you can correctly identify the sign of each term.

Coefficient: The number multiplying a variable

Ex: Identify the coefficients in the expression: $3x - 4 - 6x + 2$

3 and -6 (Can only have coefficients when there is a variable present)

<u>Constants</u>: Numbers without variables (Constant means NOT changing)

Ex: Identify the constants in the expression: $3x - 4 - 6x + 2$

   –4 and 2

<u>Like Terms</u>: Terms with the **<u>exact same</u>** variable piece

Ex: Identify the like terms in the expression: $3x - 4 - 6x + 2$

   Like terms: $3x$ and $-6x$ (Both have x for a variable)
                  –4 and 2   (Since neither has a variable, then their variable piece is the same)

*Allowed to combine like terms by adding or subtracting. To do so, add or subtract the <u>coefficients</u> of the like terms.

Simplify:

Ex: $2(x + 8) + 4(x - 3)$ **Ex:** $4(n + 9) - 3(2 + n)$

   $2x + 16 + 4x - 12$ $4n + 36 - 6 - 3n$
          $6x + 4$ $n + 30$

Ex: $8(x + 3) - 2(8 + x)$

   $8x + 24 - 16 - 2x$
          $6x + 8$

Ex: Your daily workout consists of a total of 50 minutes of running and swimming. You burn 15 calories per minute running and 9 calories per minute when swimming. Let r be the number of minutes that you run.

   a)   Write a variable expression to represent the total number of calories burned both running and swimming, based only on r, the number of minutes you run.
   If r = the number of minutes you run, and you want to workout for 50 minutes total, then the number of minutes you swim is $50 - r$

   Calories from swimming + calories from running
   (Number of minutes swimming)·(Calories burned per minute) + (Number of min. running)·(Cals/min)
   $(50 - r)(9) + (r)(15)$
   $450 - 9r + 15r$
   $450 + 6r$

b) If you run for 20 minutes, how many calories would you burn during your exercise session?

450 + 6(20)
450 + 120
570 calories   Check using common sense. 20 minutes running · 15 cal/min = 300 cal.
                                           30 minutes swimming · 9 cal/min = 270 cal.
                                                           570 cal. total

Ex: During the summer you give one-hour saxophone lessons to 20 students each week. For a beginner student, the rate you charge is $20 for each hourly lesson, and for an advanced student, the rate you charge is $35 for each hourly lesson.

a) Write an equation to represent your total weekly earnings, y, as a function of x, the number of beginning students that you teach.
Total earnings = earnings from beginners + earnings from advanced
Total earnings = (Number of beginners)(Cost per beg.) + (Number of advanced)(Cost per adv)

$y = 20x + (20 - x)(35)$
$y = 20x + 700 - 35x$
$y = -15x + 700$

b) Find your weekly earnings if 15 of your 20 students are beginners.

$y = -15(15) + 700$
$y = -225 + 700$
$y = 475$

c) Suppose you plan to teach for 10 weeks and want to earn $4000. How many advanced students do you need to teach?

10 weeks - $4000 means that you need to make $400 per week.
$400 = -15x + 700$
$-300 = -15x$
$x = 20$ (Beginner students each week)

You don't need to teach any advanced students

Simplify each expression: Can rewrite each expression using multiplication rather than division.

Ex: $\dfrac{36x-24}{6}$ **Ex:** $\dfrac{40x+32}{8}$ **Ex:** $\dfrac{2x-8}{-4}$

Rewrite in a single line: $(36x - 24) \div 6$ $5x + 4$ $-\frac{1}{2}x + 2$

To divide, multiply by reciprocal: $(36x - 24) \cdot \dfrac{1}{6}$

Distribute: $6x - 4$

SHORTCUT
Divide each term on top by denominator

Ex: $\dfrac{-6y+18}{3}$ **Ex:** $\dfrac{-10z-20}{-5}$

     $-2y + 6$ $2z + 4$