

Name: Key

Date: \_\_\_\_\_

## Using the Distributive Property in Solving Linear Equations Algebra 1

One of the most important and essential properties of real numbers is that of distribution. We will use this property over and over again in this course and in future years in mathematics, so it warrants a review.

*\* TO Distribute means to Multiply*

### THE DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION

$$\text{If } a, b, \text{ and } c \text{ are all real numbers, then } a(b+c) = ab+ac$$
$$a(b-c) = ab-ac$$

*\* you can multiply unlike terms*

**Exercise #1:** For each problem below, write an equivalent expression without parentheses.

(a)  $2(3x+4)$   
 $6x+8$

(b)  $-3(x+6)$   
 $-3x-18$

(c)  $4(2x-1)$   
 $8x-4$

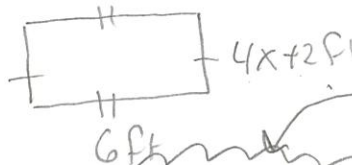
**Exercise #2:** A rectangle has a length of 6 feet and a width of  $4x+2$  feet. Which of the following expressions represents the area of the rectangle in square feet?

(1)  $8x+16$

(3)  $24x+2$

(2)  $24x+12$

(4)  $4x+12$



$A = L \times w$   
 $A = 6(4x+2)$   
 $A = 24x+12$

The distributive property is often used when solving linear equations.

*\* You MUST always place a binomial (or higher) in a set of ( ) when performing operations*

**Exercise #3:** Solve the following linear equations. Check your answers and list the properties you used.

(a)  $2(x+4) = 22$   
 $2x+8 = 22$  Dist. Prop.  
 $-8$  S.P.O.C.  
 $2x = 14$   
 $\frac{2x}{2} = \frac{14}{2}$  D.P.O.E.  
 $x = 7$

(b)  $3(2x+5) = 25$   
 $6x+15 = 25$  Dist. Prop.  
 $-15$  S.P.O.C.  
 $6x = 10$   
 $\frac{6x}{6} = \frac{10}{6}$  Div. P.O.E.  
 $x = \frac{10}{6}$

(c)  $5(3x+12) = -45$   
 $15x+60 = -45$  Dist. Prop.  
 $-60$  S.P.O.C.  
 $15x = -105$   
 $\frac{15x}{15} = \frac{-105}{15}$  Div. P.O.E.  
 $x = -7$

*\* Don't distribute in a check*

Check  
 $2(x+4) = 22$   
 $2(7+4) = 22$   
 $2(11) = 22$   
 $22 = 22$  ✓

PEMDAS

*→ means division and not distributive*

Distribute

Combine like terms  
on same side of =  
(same operation)

Move smaller variable  
to larger across =  
(opposite operation)

Solve  
remaining  
equation

When solving a linear equation, distribution could occur on either or both sides of the equation.

**Exercise #4:** Solve each of the following linear equations by using distribution on both sides. Check your answers and list the properties you used.

(a)  $7(2x-1) = 5(4x-5)$

$14x - 7 = 20x - 25$  Dist. Prop.  
 $-14x \quad -14x$  S.P.O.C.  
 $-7 = 6x - 25$   
 $+25 \quad +25$  A.P.O.C.  
 $18 = 6x$   
 $\frac{18}{6} = \frac{6x}{6}$  Div. P.O.C.  
 $x = 3$

(b)  $3(3x-1) = 16(x+2)$

$9x - 3 = 16x + 32$  Dist. Prop.  
 $-9x \quad -9x$  S.P.O.C.  
 $-3 = 7x + 32$   
 $-32 \quad -32$  S.P.O.C.  
 $-35 = 7x$   
 $\frac{-35}{7} = \frac{7x}{7}$  Div. P.O.C.  
 $x = -5$

(c)  $4(4x-3) = 3(8x-8)$

$16x - 12 = 24x - 24$  Dist. Prop.  
 $-16x \quad -16x$  S.P.O.C.  
 $-12 = 8x - 24$   
 $+24 \quad +24$  A.P.O.C.  
 $12 = 8x$   
 $\frac{12}{8} = \frac{8x}{8}$  Div. P.O.C.  
 $x = 1\frac{1}{2}$

D  
C  
M  
S

A tricky situation arises when we are asked to subtract a binomial when solving a linear equation. This is a special case of distribution that requires a closer look.

**Exercise #5:** Solve each of the following linear equations and check your answers and list the properties you used.

(a)  $12 - (2x-3) = 7$

$12 - 2x + 3 = 7$  Dist. Prop.  
 $15 - 2x = 7$  C.L.T.  
 $-15 \quad -15$  S.P.O.C.  
 $-2x = -8$   
 $\frac{-2x}{-2} = \frac{-8}{-2}$  Div. P.O.C.  
 $x = 4$

(b)  $7 - (x+4) = 8$

$7 - x - 4 = 8$  Dist. Prop.  
 $3 - x = 8$  C.L.T.  
 $+3 \quad +3$  S.P.O.C.  
 $-x = 5$   
 $\frac{-x}{-1} = \frac{5}{-1}$  Div. P.O.C.  
 $x = -5$

*can't have x as final answer*

(c)  $x - (12-x) = 38$

$x - 12 + x = 38$  Dist. Prop.  
 $2x - 12 = 38$  C.L.T.  
 $+12 \quad +12$  A.P.O.C.  
 $2x = 50$   
 $\frac{2x}{2} = \frac{50}{2}$  Div. P.O.C.  
 $x = 25$

D  
C  
M  
S

**Exercise #6:** Translate each sentence below into an equation and solve for the number described.

(a) Three times the sum of a number and four is 45.

Let  $x =$  the #

$3(x+4) = 45$   
 $3x + 12 = 45$   
 $-12 \quad -12$   
 $3x = 33$   
 $\frac{3x}{3} = \frac{33}{3}$   
 $x = 11$

The # is 11

(b) Four times the difference of a number and two is four more than six times the number.

Let  $x =$  the #

$4(x-2) = 6x + 4$   
 $4x - 8 = 6x + 4$   
 $-4x \quad -4x$   
 $-8 = 2x + 4$   
 $-4 \quad -4$   
 $-12 = 2x$   
 $\frac{-12}{2} = \frac{2x}{2}$   
 $x = -6$

The # is -6