

Name: Key

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

## Combining Like Linear Terms Algebra 1

Like Terms: Same variables having the same exponents.

In our manipulation of linear equations, we will often need to combine like linear terms. We will begin by reviewing the real number properties that you will use in this process.

**Exercise #1:** Fill in the blanks of each of the following lines with the real number property that justifies the particular step.

(1)  $(5x + 7y + 4x) + 5y = 5x + 4x + 7y + 5y$  (1) Commutative Prop. of Add

(2)  $= (5+4)x + (7+5)y \rightarrow = 9x + 12y$  (2) Distributive Property  
 (3) Combine like terms.  $\rightarrow$  NOT a property

Of course, we would like to be able to combine like terms without this multi-step process. Clearly, terms will only be "like" if they contain the same linear variable.

**Exercise #2:** Simplify each expression by combining like terms.

<p>(a) <math>5x + 8y + 6x + 9y</math>  <math>5x + 6x + 8y + 9y</math> Comm. Prop.  <math>(5+6)x + (8+9)y</math> Dist. Prop.  <math>11x + 17y</math> C.L.T.</p>	<p>(b) <math>3x + 7 + x - 5</math>  <math>3x + x + 7 - 5</math> Comm. Prop.  <math>(3+1)x + (7-5)</math> Dist. Prop.  <math>4x + 2</math> C.L.T.</p>	<p>(c) <math>(1.4x + 2.9y) + (3.2x - 1.5y)</math>  <math>4.6x + 1.4y</math></p>
<p>(d) <math>6x - 5y - 10x + 8y</math>  <math>-4x + 3y</math>  <math>(3y - 4x \text{ or } 100!)</math></p>	<p>(e) <math>-5x + 8 + 12x - 3</math>  <math>7x + 5</math></p>	<p>(f) <math>8x - 3 - 12x + 8</math>  <math>-4x + 5</math></p>
<p>(g) <math>-4a + 3b + 9a - 10b</math>  <math>5a - 7b</math></p>	<p>(h) <math>-7x + 4 + 3x - 10</math>  <math>-4x - 6</math></p>	<p>(i) <math>12a + 2b - 6a - 8b</math>  <math>6a - 6b</math></p>

The skill of combining like terms will arise frequently when solving linear equations.

**Exercise #3:** Solve the following equation by first combining like terms. Make sure to list the properties that you used to solve these equations.

Check REMOVS

$2x + 3 + 3x + 4 = 17$   
 $2x + 3x + 3 + 4 = 17$  Comm. Prop. of Add  
 $5x + 7 = 17$  Combining like terms  
 $-7 -7$  Sub. Prop. of Equal  
 $5x = 10$   
 $\frac{5x}{5} = \frac{10}{5}$  Div. Prop. of Equal  
 $x = 2$

MUST re-write original equation

Check REMOVS

$2x + 3 + 3x + 4 = 17$   
 $2(2) + 3 + 3(2) + 4 = 17$   
 $4 + 3 + 6 + 4 = 17$   
 $17 = 17$

Can check on calc

**Exercise #4:** Solve each of the following linear equations. Make sure to list the properties that you used to solve these equations.

(a)  $5x + 4 + 4x = -104$

$$\begin{array}{r} 9x + 4 = -104 \quad \text{C.L.T.} \\ \underline{-4 \quad -4} \quad \text{S.P.O.E.} \\ 9x = -108 \\ \underline{\frac{9}{9} \quad \frac{9}{9}} \quad \text{D.P.O.E.} \\ x = -12 \end{array}$$

(b)  $3 + 7x - 2x + 4 = 22$

$$\begin{array}{r} 5x + 7 = 22 \quad \text{C.L.T.} \\ \underline{-7 \quad -7} \quad \text{S.P.O.E.} \\ 5x = 15 \\ \underline{\frac{5}{5} \quad \frac{5}{5}} \quad \text{D.P.O.E.} \\ x = 3 \end{array}$$

(c)  $-26 = 2 + 3x + 4 + x$

$$\begin{array}{r} -26 = 4x + 6 \quad \text{C.L.T.} \\ \underline{-6 \quad -6} \quad \text{S.P.O.E.} \\ -32 = 4x \\ \underline{\frac{-32}{4} \quad \frac{4x}{4}} \quad \text{D.P.O.E.} \\ -8 = x \\ \text{m} \\ x = -8 \end{array}$$

(d)  $-1 + 2.7x + 4 + 0.3x = 21$

$$\begin{array}{r} 3x + 3 = 21 \quad \text{C.L.T.} \\ \underline{-3 \quad 3} \quad \text{S.P.O.E.} \\ 3x = 18 \\ \underline{\frac{3}{3} \quad \frac{3}{3}} \quad \text{D.P.O.E.} \\ x = 6 \end{array}$$

(e)  $\frac{6}{11}x + 3 + \frac{3}{11}x + 5 = 26$

$$\begin{array}{r} \frac{9}{11}x + 8 = 26 \quad \text{C.L.T.} \\ \underline{-8 \quad -8} \quad \text{S.P.O.E.} \\ \left(\frac{11}{9}\right) \frac{9}{11}x = 18 \quad \left(\frac{11}{9}\right) \text{M.P.O.E.} \\ x = 22 \end{array}$$

(f)  $13 = -6x - 5 + 2x + 6$

$$\begin{array}{r} 13 = -4x + 1 \quad \text{C.L.T.} \\ \underline{-1 \quad 1} \quad \text{S.P.O.E.} \\ 12 = -4x \\ \underline{\frac{12}{-4} \quad \frac{-4x}{-4}} \quad \text{D.P.O.E.} \\ -3 = x \\ \text{or} \\ x = -3 \end{array}$$

**Exercise #5:** Translate each of the following verbal phrases into equations and then solve for the number described.

(a) The sum of four times a number and six times a number increased by eleven is 51.

Legend  
let  $x =$  the #

Equation  
 $4x + 6x + 11 = 51$   
 $10x + 11 = 51$   
 $\underline{-11 \quad -11}$   
 $10x = 40$   
 $\underline{\frac{10x}{10} \quad \frac{40}{10}}$   
 $x = 4$

Solution  
The # is 4

(b) Four less than three times a number increased by six times the same number is 32.

Legend  
let  $x =$  the #

Equation  
 $3x + 6x - 4 = 32$   
 $9x - 4 = 32$   
 $\underline{+4 \quad +4}$   
 $9x = 36$   
 $\underline{\frac{9x}{9} \quad \frac{36}{9}}$   
 $x = 4$

Solution  
The # is 4

(c) Three times a number subtracted from 4 less than seven times a number is 28.

Legend  
let  $x =$  the #

Equation  
 $7x - 4 - 3x = 28$   
 $4x - 4 = 28$   
 $\underline{+4 \quad +4}$   
 $4x = 32$   
 $\underline{\frac{4x}{4} \quad \frac{32}{4}}$   
 $x = 8$

Solution  
The # is 8

Switch order w/ less than + subtracted from