



**DeSoto**  
COUNTY SCHOOLS

**Foundations  
to  
Algebra**

**Week 5**

Name: \_\_\_\_\_

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

## Solving Simple Linear Equations – A Review Algebra 1

We have already used some algebra skills in this course to solve simple linear equations. The keys to solving these simple equations are contained in the properties of equality shown below.

### PROPERTIES OF EQUALITY

If  $a, b$ , and  $c$  represent any real numbers then:

(1) If  $a = b$  then  $a + c = b + c$

(Equals added to equals are equal.)

(2) If  $a = b$  then  $a - c = b - c$

(Equals subtracted from equals are equal.)

(3) If  $a = b$  then  $c \cdot a = c \cdot b$

(Equals multiplied by equals are equal.)

(4) If  $a = b$  then  $\frac{a}{c} = \frac{b}{c}$  assuming  $c \neq 0$ .

(Equals divided by equals are equal.)

These properties lead us to follow one basic rule when manipulating equations – **what you do to one side of the equality you must do to the other side.**

**Exercise #1:** Solve each of the following one-step linear equations by applying the inverse for each operation that occurs.

(a)  $x + 5 = 12$

(b)  $x - 4 = -10$

(c)  $x + 4 = 2$

(d)  $4x = 20$

(e)  $\frac{2}{3}x = -18$

(f)  $\frac{x}{7} = 3$

**Exercise #2:** Consider the expression  $2x + 7$ .

(a) Without your calculator, determine the value of this expression for  $x = 10$ .

(b) When determining this value, what operation was performed first? Which was performed second?

1<sup>st</sup>:

2<sup>nd</sup>:

(c) Solve the equation  $2x + 7 = 15$  for the value of  $x$ .

**Exercise #3:** Solve each of the following two-step linear equations for the value of  $x$ .

(a)  $6x - 1 = 12$

(b)  $\frac{x}{4} + 7 = 13$

(c)  $2x + 25 = 7$

(d)  $\frac{3}{5}x - 6 = 18$

(e)  $15 + 3x = 6$

(f)  $\frac{2}{5}x + 9 = 1$

(g)  $5x - 2.2 = 4$

(h)  $3 = 8 - 0.1x$

(i)  $-\frac{5}{3}x + 2 = -18$

**Exercise #4:** For each of the following word problems, translate the verbal sentence into an equation and solve for the missing number.

(a) Five times a number increased by seven is 37. Find the number.

(b) The difference between twice a number and 3 is 2. Find the number.

(c) Ten less than two-thirds of a number is  $-4$ . Find the number.

Name: \_\_\_\_\_

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

## Solving Simple Linear Equations – A Review Algebra 1 Homework

### Skills

1. Which of the following values of  $x$  is a solution to the equation  $2x+7=1$ ?

(1)  $x=3$

(3)  $x=-3$

(2)  $x=4$

(4)  $x=-4$

2. Which of the following values of  $x$  satisfies  $\frac{4}{5}x-2=10$ ?

(1)  $x=15$

(3)  $x=10$

(2)  $x=-7$

(4)  $x=-2$

3. Solve each of the following two-step linear equations for the value of  $x$ . Check your answers

(a)  $3x+5=35$

(b)  $4x-1=15$

(c)  $55=6x+7$

(d)  $\frac{3}{8}x-3=9$

(e)  $7=\frac{3}{4}x+19$

(f)  $\frac{x}{3}-4=5$

(g)  $3=\frac{10}{3}x-12$

(h)  $14=12x+8$

(i)  $0.12x+1.56=0.66$

(j)  $-2.35x+6.75=-2.18$

(k)  $\frac{x}{2}+4.82=2.57$

(l)  $0.2x+1.6=1$

4. Translate each of the following verbal sentences into equations and then solve for the number.

(a) If 9 is added to one-half of a number, the result is 20. Find the number.

(b) The difference between four times a number and 6 is  $-18$ . Find the number.

(c) If 6 is added to two-sevenths of a number the result is 11. Find the number.

(d) Seven less than three-halves of a number is  $-22$ . Find the number.

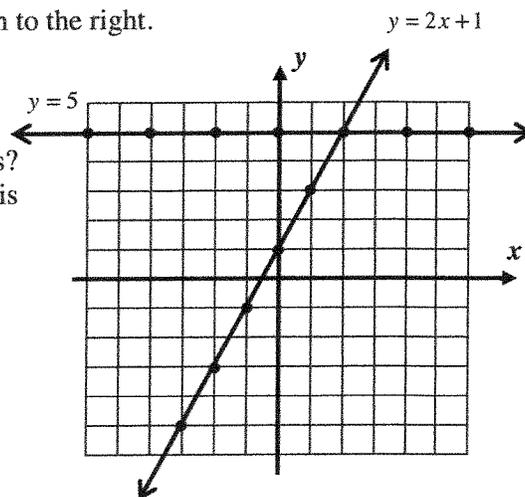
### Reasoning

5. Consider the system of linear equations shown on the graph to the right.

$$y = 2x + 1 \text{ and } y = 5$$

(a) What is the solution to this linear system of equations?  
Recall that the solution to a linear system of equations is the set of all points common to both lines.

(b) Solve the equation  $2x + 1 = 5$ .



(c) How does your solution to the equation in (b) relate to the solution you found in part (a)?

Name: \_\_\_\_\_

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

## Combining Like Linear Terms Algebra 1

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.

$$(1) \quad 5x+7y+4x+5y=5x+4x+7y+5y \quad (1) \quad \underline{\hspace{4cm}}$$

$$(2) \quad \begin{aligned} &= (5+4)x+(7+5)y & (2) \quad \underline{\hspace{4cm}} \\ &= 9x+12y \end{aligned}$$

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.

(a)  $5x+8y+6x+9y$

(b)  $3x+7+x-5$

(c)  $1.4x+2.9y+3.2x-1.5y$

(d)  $6x-5y-10x+8y$

(e)  $-5x+8+12x-3$

(f)  $8x-3-12x+8$

(g)  $-4a+3b+9a-10b$

(h)  $-7x+4+3x-10$

(i)  $12a+2b-6a-8b$

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

**Exercise #3:** Solve the following equation by first combining like terms and check your answer . . .

$$2x+3+3x+4=17$$

**Exercise #4:** Solve each of the following linear equations.

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

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

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

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

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

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

**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.

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

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

Name: \_\_\_\_\_

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

### Combining Like Linear Terms Algebra 1 Homework

#### Skills

1. Which of the following terms could be combined with  $6x$ ?

(1) 6

(3)  $6y$

(2)  $-3x$

(4)  $-6$

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2. Which of the following is equivalent to the expression  $3x + 7y - 5x + 2y$ ?

(1)  $9y - 2x$

(3)  $7xy$

(2)  $10x - 3y$

(4)  $5x + 2y$

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3. For each of the following expressions, simplify by combining like linear terms.

(a)  $6x + 10y + 2x + 15y$

(b)  $-8x - 2y + 7y + 10x$

(c)  $8x + 5 - 4x - 7$

4. Solve each of the following equations by first combining like terms. Check your answers.

(a)  $3x - 9 + 3x = 39$

(b)  $12 = 8x + 4 - 6x - 10$

(c)  $10x - 5 - 4x + 8 = -27$

(d)  $-6x + 2.5 + 8x + 1.2 = 30.9$

(e)  $11 = 8x + 10 - 5x + 5$

(f)  $4x + 20 + 2x + 34 = -27$



Name: \_\_\_\_\_

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

## Solving Linear Equations with Variables on Both Sides Algebra 1

Often we will need to solve linear equations where the variable happens to be on both sides of the equality. The objective in solving these equations is the same as that of the simpler ones that we have seen – isolate the variable and solve for its value. The key is, as always, to manipulate the equation by doing the same thing to both of its sides.

**Exercise #1:** Solve the linear equation below and check your answer

$$5x - 5 = 2x + 13$$

As we see from this exercise, an equation truly works like a balancing scale. As long as we perform the same operation to both sides of the equation, like adding the same amount of weight to both sides of a scale, the equation remains valid - the scale remains balanced.

**Exercise #2:** Solve each of the following equations.

(a)  $7x - 21 = x + 3$

(b)  $-4 + 3x = 6x + 32$

(c)  $-2x - 18 = -4x - 6$

Sometimes we encounter problems where we need to combine like terms as well. It is advisable to combine like terms first.

**Exercise #3:** Solve each of the following equations.

(a)  $10 - 7x + x = 5x - 80 - 2x$

(b)  $10x - 3 - 8x = -x + 11 - 3x + 10$

**Exercise #4:** Which of the following values of  $x$  satisfies the equation  $2x - 14 = 7x + 6$ ?

(1)  $x = -2$

(3)  $x = 5$

(2)  $x = 6$

(4)  $x = -4$

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It is important to continue our work with translating verbal phrases into equations. Some of these can also result in variables on both sides of the equation.

**Exercise #5:** Translate each of the following verbal sentences into an equation and then solve for the number described.

(a) Eight times a number is 36 more than twice the same number.

(b) If three times a number is increased by 24, the result is six times the same number.

(c) If three times a number is increased by 22, the result is 14 less than seven times the same number.

**Exercise #6:** A square and a rectangle are shown below with side lengths in terms of  $x$ . The perimeter of the rectangle is 123 more than the perimeter of the square. Find the value of  $x$ .

