

## Ch. 6 - System of Equations

Name Exemplar PER \_\_\_\_\_ DATE \_\_\_\_\_

## Lesson 3

## DO NOW

Solve the following equation for  $y$ . Show each step and box your answer.

$$5y + 3x = -13$$

$$\quad -3x \quad -3x$$

$$\frac{5y}{5} = \frac{-3x - 13}{5}$$

$$y = -\frac{3x}{5} - \frac{13}{5}$$

## TPS-C

Below we have a system of equations. How can we use our work from the DO NOW to solve for both  $x$  and  $y$ ?

$$y = -x - 7$$
$$5y + 3x = -13$$

we can set the answer to the  
Do Now Equal to the first equation.

$$\left(-\frac{3x}{5} - \frac{13}{5} = -x - 7\right) 5$$

$$-3x - 13 = -5x - 35$$

$$+5x \quad +5x$$

$$2x - 13 = -35$$

$$+13 \quad +13$$

$$2x = -22$$

$$x = -11$$

$$\text{if } x = -11$$

$$y = -(-11) - 7$$

$$y = 11 - 7$$

$$y = 4$$

Done?

Check!

$$(-11, 4)$$

### Avoiding the Mess

A new method, called the **Substitution Method**, can help you solve the system in the TPSC without using fractions. This method is outlined below.

$$\begin{array}{l} -8 = -1 - 7 \\ -1 - 7 = -8 \end{array}$$

- a. If  $y = -x - 7$ , then does  $-x - 7 = y$ ? That is, can you switch the  $y$  and the  $-x - 7$ ? Why or why not?

Yes, both expressions represent the exact same number.

- b. Since you know that  $y = -x - 7$ , can you replace the  $y$  in the second equation with  $-x - 7$  from the top equation? Why or why not?

Yes, since both equations equal the same number.

$$y = -x - 7$$

$$5y + 3x = -13$$

don't forget

- c. Once you replace the  $y$  in the second equation with  $-x - 7$ , you have an equation with only one variable, as shown below. This is called **substitution** because you are substituting for (replacing)  $y$  with an expression that it equals. Solve this new equation for  $x$  and then use that result to find  $y$  in either of the original equations.

$$\begin{array}{l} x = -11 \\ y = 4 \end{array}$$

$$5(-x - 7) + 3x = -13$$

$$-5x - 35 + 3x = -13$$

$$\begin{array}{r} -2x - 35 = -13 \\ \phantom{-2x} + 35 \phantom{=} + 35 \end{array}$$

$$\begin{array}{r} -2x = 22 \\ \underline{-2} \quad \underline{2} \end{array}$$

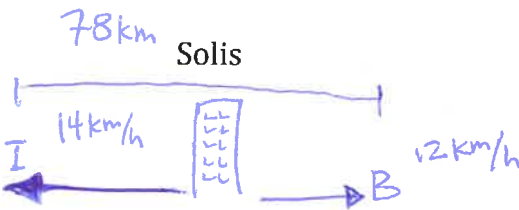
$$x = -11$$

$$y = -(-11) - 7$$

$$y = 11 - 7$$

$$y = 4$$

$$(-11, 4)$$



UPS - Check!

Names

6-57. Bharat and Ingrid leave their building at the same time on their bikes and travel in opposite directions. If Bharat's speed is 12 kilometers per hour and the Ingrid's speed is 14 kilometers per hour, how long will it take until they are 78 kilometers apart?

54  
28 24  
14 14 12 12  
26

a. If Bharat rides a distance of  $b$  kilometers, write an expression to represent how far Ingrid rides.

Distance Ingrid rides =  $78 - b$

b. Write two equations, then solve your system using the Substitution Method.

$d = rt$

$d = rt$

Bharat  
EQUATION 1  $b = 12t$

Ingrid  
EQUATION 2  $(78 - b) = 14t$

SOLVE  $78 - 12t = 14t$

$78 = 26t$

$3 = t$

After 3 hours,  
Bharat and Ingrid will be  
78 km apart.

Number Talk

6-58. When Mei solved the system of equations below, she got the solution  $x = 1, y = 6$ . Without solving the system yourself, can you tell her whether this solution is correct? How do you know?

$4x + 3y = 22$

$x - 2y = 0$

No,  $1 - 12 \neq 0$  substituting the values  $x=1$  and  $y=6$  does not yield a true equation.

## 6-59. HAPPY BIRTHDAY!

Green is 2x Red

You have decided to give your best friend a bag of red and green marbles for his birthday. Your friend likes green marbles better than red ones, so the bag has twice as many green marbles as red. The label on the bag says it contains a total of 84 marbles.

- a. How many green marbles are in the bag? Write a system of equations for this problem. Then solve the problem using any method you like. Be sure to check your solution.

EQUATION 1  $G = 2r$

EQUATION 2  $G + r = 84$

28 red  
56 green

$r =$   
 $g =$

$$2r + r = 84$$

$$\frac{3r}{3} = \frac{84}{3}$$

$$r = 28$$

Time on Bus = 2 x Time Walking

6-60. Carter walked for a while at three miles per hour, and then continued his journey on a bus travelling at 15 miles per hour. His time on the bus was twice as long as his time walking. How long did he ride on the bus if the total distance he covered was 66 miles? Let  $t$  equal the time he walked (hours).

~~distance~~  $b = 2t$

$$3t + 15(2t) = 66$$

2hr (walking)  
4hr (on bus)

$d =$  distance walked (miles)

$$d = 3t$$

$$66 - d = (15)(2t)$$