Warm Up

What is the slope of the following linear equation?

$$3(3x - 7) = 2y$$

$$9x - 21 = 2y \quad \text{same as} \quad 2y = 9x - 21$$

$$\frac{2y}{2} = \frac{9x}{2} - \frac{21}{2}$$

$$y = \frac{9}{2}x - \frac{21}{2} \qquad \text{slope} = \frac{9}{2}$$

slope is just the number $\frac{9}{2}$

NOT $\frac{9}{2}x$

18. On a hot summer day, Jay set up a lemonade stand. He kept track of how many glasses he sold on his phone.

   a. Write two equations that relate the number of large glasses sold *l* and the number of small glasses sold *s*.

   b. Solve the system of equations.

   c. How many small glasses were sol

   d. How many large glasses were sol

Let s = # of small glasses
Let l = # of large glasses

Isolate L and solve for s:

$$s + l = 29 \quad \rightarrow \quad l = 29 - s$$

$$0.35s + .5l = 13.45$$

$$0.35s + 0.5(29 - s) = 13.45$$

$$0.35s + 14.5 - 0.5s = 13.45$$

$$-0.15s + 14.5 = 13.45$$

$$\underline{ -14.5 \quad -14.5}$$

$$\frac{-0.15s}{-0.15} = \frac{-1.05}{-0.15}$$

$$s = 7$$

$$s + l = 29$$
$$7 + l = 29$$
$$\underline{-7 \quad -7}$$
$$l = 22$$

Isolate s and solve for L:

$$\begin{cases} s + l = 29 \quad \rightarrow \quad s = 29 - l \\ 0.35s + 0.5l = 13.45 \end{cases}$$

$$0.35(29 - l) + 0.5l = 13.45$$

$$10.15 - 0.35l + 0.5l = 13.45$$

$$10.15 + 0.15l = 13.45$$

$$\underline{-10.15 \qquad -10.15}$$

$$\frac{0.15l}{0.15} = \frac{3.30}{0.15}$$

$$l = 22$$

$$l + s = 29$$
$$22 + s = 29$$
$$\underline{-22 \quad -22}$$
$$s = 7$$

Either way works!

Pablo and Jasmine decide to try some other food trucks after eating at the taco truck in Problem 2.2. For Exercises 19–22, do the following.

a. Write two equations based on the information.

b. Solve the system of equations to determine the price of 1 serving of food and the price of 1 drink or bag of chips.

19. Pablo buys 3 servings of jambalaya and 2 drinks for $18.00. Jasmine buys 1 serving of jambalaya and 2 drinks for $9.00.

Recap

Use diagrams or reasoning about equations to solve each system.

1. $\begin{cases} 3x + y = 4 \\ x + y = 5 \end{cases}$

2. $\begin{cases} 3x + 2y = 4 \\ x + 2y = 6 \end{cases}$

$$\frac{2x}{2} = \frac{-1}{2}$$

$$x = -\frac{1}{2}$$

$$\left(-\frac{1}{2}, \frac{11}{2}\right)$$

$\big)$ same!

$$(-0.5, 5.5)$$

$$x + y = 5$$

$$-\frac{1}{2} + y = 5$$

$$+\frac{1}{2} \qquad +\frac{1}{2}$$

$$y = 5\frac{1}{2}$$

Method from page 30:

$$+ \begin{cases} 2x - y = 4 \\ x + y = 5 \end{cases}$$

$$3x = 9$$

← Actually adding the same thing to BOTH sides.

If $2x - y = 4$ and $x + y = 5$, then

$$(2x - y) + (x + y) = 4 + 5 \qquad (1)$$
$$3x = 9 \qquad (2)$$
$$x = 3 \qquad (3)$$
$$3 + y = 5 \qquad (4)$$
$$y = 2 \qquad (5)$$

$$x + y = 5$$

Why do you think this "Combination" method is also called Elimination?

$$+ \begin{cases} 2x - y = 4 \\ x + y = 5 \end{cases}$$

$$3x + 0y = 9$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

We are combining the equations to eliminate one of the variables.

If $2x - y = 4$ and $x + y = 5$, then

$$(2x - y) + (x + y) = 4 + 5 \qquad (1)$$

$$3x = 9 \qquad (2)$$

$$x = 3 \qquad (3)$$

Combination/Elimination works if we have the same coefficient for a variable in BOTH equations.

$$\begin{array}{r} 2.5x + y = 10.7 \\ - \quad 2.5x + 2y = 12.9 \\ \hline \end{array}$$

$$0x - y = 2.2$$

$$-1[-y = 2.2]$$

$$y = 2.2$$

Which variable do we want to eliminate?

X

How will we do it?

Subtraction

$$2.5x + 2.2 = 10.7$$
$$\quad\; -2.2 \quad -2.2$$
$$\overline{}$$

$$\frac{2.5x}{2.5} = \frac{8.5}{2.5}$$

$$x = 3.4$$

$$(3.4, 2.2)$$

$$4a + b = 2$$
$$4a + 3b = 10$$
$$0a - 2b = -8$$

Elminate: a

Operation: Subtraction

$$\frac{3}{4}x - \frac{1}{2}y = 8$$
$$+ \frac{3}{2}x + \frac{1}{2}y = 19$$
$$\frac{9}{4}x - 0y = 27$$

Elminate: y

Operation: addition

$$2x + 4y = 10$$
$$x + 4y = -2.5$$

Elminate: y

Operation: addition

$$6m - 8n = 3$$
$$2m - 8n = -3$$

Elminate: n

Operation: subtraction

Use addition if the coefficients have different signs.

Use subtraction if the coefficients have the same signs.

Problem 2.3

A Use the methods of Pablo and Jasmine, and Samantha to solve each system.
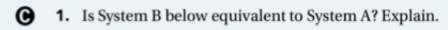
1. $\begin{cases} -x + 4y = 2 \\ x + 2y = 5 \end{cases}$

2. $\begin{cases} 2x + 3y = 4 \\ 5x + 3y = -8 \end{cases}$

3. $\begin{cases} 2x - 3y = 4 \\ 5x - 3y = 7 \end{cases}$

4. $\begin{cases} 3x + 2y = 10 \\ 4x - y = 6 \end{cases}$

Procedure:

1. Figure out which variable to eliminate

2. Figure out operation

3. Solve

4. Find value of other variable.

C **1.** Is System B below equivalent to System A? Explain.

System A	System B
$\begin{cases} 3x + 2y = 10 \\ 4x - y = 6 \end{cases}$	$\begin{cases} 3x + 2y = 10 \\ 8x - 2y = 12 \end{cases}$

2. Use the combination method to solve System B.

3. Check that your solution also satisfies System A.

Homework

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Solve each system by using the combination method.

23. $\begin{cases} 3x - 2y = 12 \\ -3x + 8y = -6 \end{cases}$

24. $\begin{cases} 4x + 9y = 7 \\ 4x - 9y = 9 \end{cases}$

25. $\begin{cases} 12x - 14y = -8 \\ -8x - 14y = 52 \end{cases}$

26. $\begin{cases} 5x + 15y = 10 \\ 5x - 10y = -40 \end{cases}$

27. $\begin{cases} -6x - 4y = 21 \\ -6x + 3y = 0 \end{cases}$

28. $\begin{cases} 2x - 3y = 14 \\ -x + 3y = -6 \end{cases}$