Warm Up

Use substitution to find the common solution for the system of equations below.

$$x + 2y = 16$$

$$y = 3x + 15$$

$x+2(3x+15)=16$

$x+6x+30=16$

$-30 \quad -30$

$\frac{7x}{7} = \frac{-14}{7}$

$x=-2$

$-2+2y=16$

$+2 \quad +2$

$\frac{2y}{2} = \frac{18}{2}$

$y=9$

$(-2, 9)$

Could also:

$x+2y=16$

$-2y \quad -2y$

$x=16-2y$

could substitute this in for x

$y=3(16-2y)+15$

Homework Questions?

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Solving Systems of Equations by Substitution Date_____ Period____

Solve each system by substitution.

1) $x + 3y = 1$
$-3x - 3y = -15$

(7, –2)

2) $-3x - 8y = 20$
$-5x + y = 19$

(–4, –1)

3) $-3x + 3y = 4$
$-x + y = 3$

No solution

4) $-3x + 3y = 3$
$-5x + y = 13$

(–3, –2)

5) $6x + 6y = -6$
$5x + y = -13$

(–3, 2)

6) $2x + y = 20$
$6x - 5y = 12$

(7, 6)

7) $-3x - 4y = 2$
$3x + 3y = -3$

(–2, 1)

8) $-2x + 6y = 6$
$-7x + 8y = -5$

(3, 2)

Write the equations and solve. Define the variables

9) My neighbor has both chickens and roosters. He has a total of 31 birds. The number of chickens is ten more than twice the number of roosters. How many chickens does he have?

let x = number of chickens
Let y = number of roosters
x + y = 31
x = 2y + 10

24 chickens, 7 roosters

10) Alfred is four years older than Tina. Together they are 36 years old. How old is Alfred?

Let x = Alfreds age
Let y = Tina's age
x + y = 36
x = y + 4

Alfred = 20
Tina = 16

11) Jonas has three more nickels than dimes. He has 41 coins in all. How many are dimes?

Let x = # of nickels
Let y = # of dimes
x + y = 41
x = y + 3
22 nickels, 19 dimes

12) The number of nails in the bucket is 50 less than twice the number of screws. Together, there are 400 nails and screws in the bucket. How many of each are there?

Let x = # of nails
Let y = # of screws
x + y = 400
x = 2y - 50
250 nails, 150 screws

13) Pippi sold ten more cups of lemonade than cups of iced tea. She sold 120 cups in all. How many cups of lemonade did she sell?

Let x = cups of lemonade
Let y = cups of iced tea
x + y = 120
x = y + 10
65 cups of Lemonade
55 cups of Iced Tea

1) $x + 3y = 1$
$-3x - 3y = -15$ → $x = 1 - 3y$

2) $-3x - 8y = 20$
$-5x + y = 19$

$-3(1-3y) - 3y = -15$

OR

$\frac{-3x - 3y}{-3} = \frac{-15}{-3}$

$x + y = 5$
$-y \quad -y$
$x = 5 - y$

$5 - y + 3y = 1$

3) $-3x + 3y = 4$
$-x + y = 3$

$+x \quad +x$

$y = 3 + x$

$-3x + 3(3 + x) = 4$

$-3x + 9 + 3x = 4$

$9 = 4$ ← this statement is false

No Solution

These lines must be parallel

$-3x + 3y = 4$

$+3x \quad +3x$

$\frac{3y}{3} = \frac{3x}{3} + \frac{4}{3}$

$y = 1x + \frac{4}{3}$

$-x + y = 3$

$+x \quad +x$

$y = 1x + 3$

Yes parallel!

Slope same, y-int not

4) $-3x + 3y = 3$
$-5x + y = 13$

$y = 5x + 13$

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

$-3x + 15x + 39 = 3$

$12x + 39 = 3$

$-39 \quad -39$

$\frac{12x}{12} = \frac{-36}{12}$

$x = -3$

$\frac{-3(-3) + 3y = 3}{3}$

$3 + y = 1$

$-3 \quad -3$

$y = -2$

5) $6x + 6y = -6$
$5x + y = -13$

$y = -5x - 13$

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

$6x - 30x - 78 = -6$

$+78 \qquad +78$

$\frac{-24x}{-24} = \frac{72}{-24}$

$x = -3$

6) $2x + y = 20$
$6x - 5y = 12$

7) $-3x-4y=2$
$3x+3y=-3$

8) $-2x+6y=6$
$-7x+8y=-5$

$\frac{-2x+6y=6}{-2\quad -2}$

$x-3y=-3$
$+3y \quad +3y$

$x=3y-3$

$-7(3y-3)+8y=-5$

$-21y+21+8y=-5$

$-13y+21=-5$

$-21 \quad -21$

$\frac{-13y}{-13}=\frac{-26}{-13}$

$y=2$

$-2x+6(2)=6$

$-2x+12=6$
$-12 \quad -12$

$\frac{-2x}{-2}=\frac{-6}{-2}$

$x=3$

2.2 Taco Truck Lunch

Solving Systems by Combining Equations I

In Problem 2.1, you developed strategies for solving systems of equations by writing each equation in the equivalent form $y = mx + b$ or $x = ny + c$. Then you found the solution of the system by graphing or by solving one linear equation for x or y.

In this Problem, you will learn another strategy for solving linear systems.

Pablo and Jasmine each took their brothers out for lunch. They stopped at a taco truck where the prices were not posted.

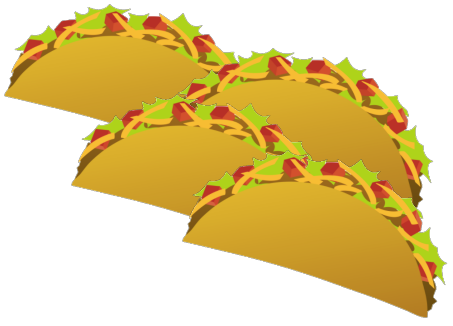
After placing their orders, they compared what they bought with the total cost for each order.

Pablo and his brother got 6 tacos and 2 drinks for $9.

- Can you use this information to find the price of one taco? Of one drink? Explain.

Jasmine and her brother got 4 tacos and 2 drinks for $7.

- Does the additional information help you find the price of one taco? Of one drink? Explain.



What is the price of one taco and the price of one drink? Explain your reasoning.

Problem 2.2

A Pablo's younger brother Pedro used the orders and total prices to find the price of each taco and each drink.

When asked how he figured out the prices, Pedro said, "It's kind of like what we did in school with coins and pouches." Then he made the following sketch.

T = $1

6t + 2d = 9

4t + 2d = 7

1. How does the sketch help you find the price of one taco and the price of one drink?
2. Find another way to use Pedro's sketch to solve the problem.

Problem 2.2 continued

Let t = $ of tacos
Let d = $ of drinks

B Pablo and Jasmine had just started studying systems of linear equations in algebra. They looked at Pedro's drawing and said, "We could write that as a system of equations."

1. Write an equation that represents the cost of Pablo's order and one that represents the cost of Jasmine's order. Use t for the price of each taco and d for the price of each drink. $6t+2d=9$
2. What operations with the equations from part (1) match your way of using Pedro's sketch to find the prices t and d? Why do the operations make sense? $4t+2d=7$

$6t+2d=9$
$-\ 4t+2d=7$

$\frac{2t}{2}=\frac{2}{2}$

$t=1$

C In algebra class the next day, Pablo and Jasmine tried to solve the system of linear equations. $\begin{cases} x+4y=11 \\ x+y=5 \end{cases}$

1. How could they represent the system with a sketch similar to the one Pedro drew of the taco truck orders?
2. How could the sketch and reasoning about the equations lead them to a solution of the system?

D Use diagrams or reasoning about equations to solve each system.

1. $\begin{cases} 3x+y=4 \\ x+y=5 \end{cases}$
2. $\begin{cases} 3x+2y=4 \\ x+2y=6 \end{cases}$

$x+4y=11$
$-\ x+y=5$

$\frac{3y}{3}=\frac{6}{3}$

$y=2$

$x+4(2)=11$
$x+8=11$
$-8\ \ -8$
$x=3$

$(3,2)$

$\begin{cases} xxx+y=1111 \\ x+y=11111 \end{cases}$

Homework

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