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Mr. Rogove Date:_____

LEARNING OBJECTIVE: We will solve word problems that require us to use systems of equations. (Lesson 54)

ACTIVATING PRIOR KNOWLEDGE:

We can solve systems of equations using elimination and substitution.

Solve using Substitution	Solve using Elimination
$\begin{cases} 2x - y = 6 \\ 3x + 2y = 16 \end{cases}$ $-y = -2x + 6$ $y = 2x - 6$ $3x + 2y = 16$ $3x + 2(2x - 6) = 16$ $3x + 4x - 12 = 16$ $7x - 12 = 16$ $\frac{7x}{7} = \frac{28}{7}$ $x = 4$ $y = 2$	$\begin{cases} (2x - y = 6)2 \\ 3x + 2y = 16 \end{cases}$ $+ \begin{cases} 4x - 2y = 12 \\ 3x + 2y = 16 \end{cases}$ $\frac{7x}{7} = \frac{28}{7}$ $x = 4$ $2(4) - y = 6$ $8 - y = 6$ $y = 2$ $3(4) + 2(2) \stackrel{?}{=} 16$ $12 + 4 = 16$ $16 = 16$

CONCEPT DEVELOPMENT:

Many real world and word problems can be solved by using systems of equations.

Example:

The Warriors played the Cavaliers and they scored 117 points…but they only scored 2 and 3 point shots—no free throws. If they hit a total of 46 shots, how many 2-pointers did they make, and how many 3-point shots did they make?

x = # of 2 point shots

y = # of 3 point shots

$\begin{cases} 2x + 3y = 117 \\ x + y = 46 \end{cases}$ ← Substitution or elimination?

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Guided Practice:

Steps for Solving System of Equations Word Problems

1. Read the problem carefully and define your variables.
2. Create your system of equations.
3. Study the structure of the problem, and decide the best method to use to solve the system.
4. Use methods previously learned to solve the system.

A farmyard is overrun with dogs and chickens. The farmer counted 148 legs and 60 heads among the dogs and chickens. How many dogs does the farmer have? How many chickens does the farmer have?

d = dogs c = chicken

$\begin{cases} 4d + 2c = 148 \\ (d + c = 60) \cdot -2 \end{cases}$

$\begin{cases} -2d - 2c = -120 \\ 4d + 2c = 148 \end{cases}$ +

$\frac{2d}{2} = \frac{28}{2}$

$d = 14$

$14 + c = 60$

$c = 46$

$14 \cdot 4 + 46 \cdot 2 \stackrel{?}{=} 148$

$56 + 92 \stackrel{?}{=} 148$

$148 \checkmark 148$

There are 46 chickens & 14 dogs

A test is worth 145 points total and has 50 questions on it. Each question is either worth 2 points or 5 points. How many questions are worth 2 points? How many are worth 5 points?

x = # of 2 point questions

y = # of 5 point questions

$(x + y = 50) \cdot -2$

$2x + 5y = 145$

$-2x - 2y = -100$ +

$\frac{3y}{3} = \frac{45}{3}$

$y = 15$

$x + 15 = 50$

$x = 35$

$15 \cdot 5 + 35 \cdot 2 \stackrel{?}{=} 145$

$75 + 70 \stackrel{?}{=} 145$

$145 \checkmark 145$

15 five point Qs

35 two point Qs

Andy has some five dollar bills and one dollar bills in his wallet. Altogether he has 18 bills and a total of $62. How many of each bill does he have?

x = $5 bills

y = $1 bills

$5x + y = 62$

$-(x + y = 18)$

$\frac{4x}{4} = \frac{44}{4}$

$x = 11$

$11 + y = 18$

$y = 7$

11 5 dollar bills

7 1 dollar bills

Two numbers have a sum of 1,212 and a difference of 518. What are the two numbers?

x is larger #

y is smaller #

$x + y = 1212$

$+ \; x - y = 518$

$\frac{2x}{2} = \frac{1730}{2}$

$x = 865$

$865 + y = 1212$

$y = 347$

The larger # is 865 and the smaller # is 347

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James bought 2 boxes of pencils and 8 notebooks for school and it cost him $11.00. He went back to the store the same day to buy school supplies his brother. He spent $11.25 on 3 boxes of pencils and 5 notebooks. How much would 7 notebooks cost?

Mr. Harter goes to the movies by himself and buys 4 buckets of popcorn and 6 boxes of candy. He pays $46.50 for his snack. The last time he went with his wife, they only got one bucket of popcorn and one box of candy and paid $9.75. How much would 2 buckets of popcorn and 3 boxes of candy cost?

x = popcorn cost
y = candy cost

$$\begin{cases} 4x+6y=46.50 \\ x+y=9.75 \end{cases}$$

$y = 9.75 - x$

$4x + 6(9.75 - x) = 46.50$

$4x + 58.50 - 6x = 46.50$

$-2x = -12.00$

$x = 6.00$

$6 + y = 9.75$

$y = 3.75$

Popcorn cost $6
candy cost $3.75
2 buckets + 3 boxes is $23.25

Mr. Rogove and Mr. Gomez go to Taco Bell. Mr. Rogove orders 9 burritos and 5 tacos and pays $23.56. Mr. Gomez orders 3 burritos and 4 tacos and pays $11.33. How much does Ms. Lo pay for 2 burritos and 3 tacos?

x = cost for burrito
y = cost for taco

$$\begin{cases} 9x+5y=23.56 \\ (3x+4y=11.33)\,3 \end{cases}$$

$9x + 12y = 33.99$

$-(9x + 5y = 23.56)$

$\frac{7y}{7} = \frac{10.43}{7}$

$y = 1.49$

$3x + 4(1.49) = 11.33$

$3x + 5.96 = 11.33$

$3x = 5.37$

$x = 1.79$

Ms. Lo pays $8.65

Graham sold 375 tickets for their fall concert. Students paid $4.50 each and adults paid $10.00 each. All together, the school raised $2375 for the music program. How many student tickets were sold? How many adult tickets were sold?

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Independent Practice:

You have a total of 59 coins and $12.05. You only have quarters and dimes. How many of each coin do you have?	Los Altos High and Mountain View High are both planning New York City trips during spring break. Los Altos filled 1 van and 6 buses with 372 students. Mountain View had 780 students on the trip and filled up 4 vans and 12 buses. Each van and bus carried the same number of students. How many students can a bus carry? What about the van?
The sum of a two digit number is 7. Reversing its digits increases the number by 9. What is the number?	Emma and Gem are selling apples and oranges to raise money for their trip to Southern California. Emma sells 3 boxes of apples and 14 boxes of oranges for a total of $203. Gem sold 11 boxes of oranges and 11 boxes of apples for $220. How much would it cost for 2 boxes of apples and 3 boxes of oranges?

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Closure:

You have 28 coins—all nickels or dimes…and the total amount is $2.05. Which system can be used to find the number of nickels and dimes?

A. $n + d = 28$ $10n + 5d = 2.05$	B. $n + d = 28$ $n + d = 205$
C. $5n + 10d = 205$ $n + d = 28$	D. $n + d = 205$ $5n + 10d = 205$

Teacher Notes:

Lesson 29 from ENY Mod 4 Grade 8
HW: Khan System of Equations Word Problems