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**LEARNING OBJECTIVE:** We will begin to explore systems of equations. (G8M4L21)

## CONCEPT DEVELOPMENT:

A **System of Linear Equations** is when two or more linear equations are involved in the same problem. This is also known as simultaneous linear equations.

*Example*:

Notation for a system →

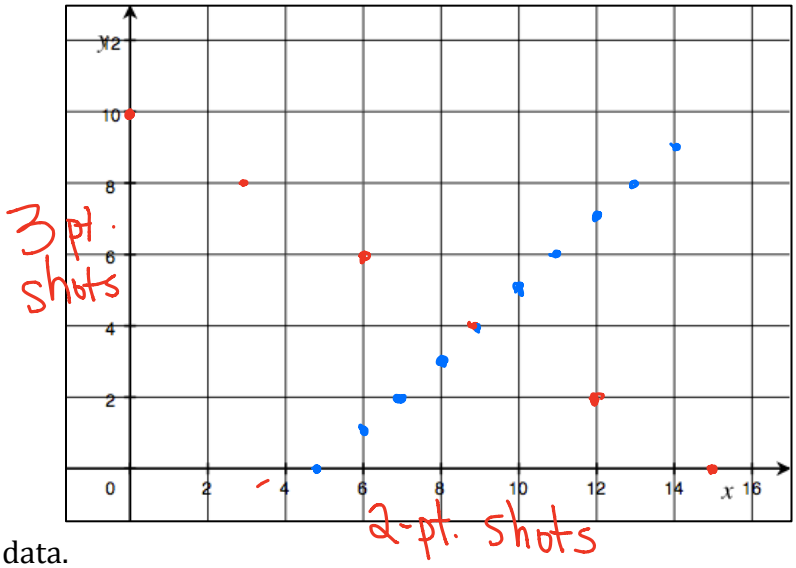
$$\begin{cases} 2x + 3y = 30 \\ x = 5 + y \end{cases}$$

(9,4) or $x=9$ $y=4$

The **solution for a system of equations** is the ordered pair $(x, y)$ that makes both equations true.

Trevor scored 30 points in the basketball game and didn't go to the free throw line once—all of his points were scored on two- and three-point shots. List as many combinations of two and three point shots as you can that would total 30.

| # of two-point shots | # of three-point shots |
|---|---|
| 0 | 10 |
| 15 | 0 |
| 12 | 2 |
| 9 | 4 |
| 6 | 6 |
| 3 | 8 |




Write an equation to describe the data.

$2x+3y=30$

Trevor also said he made 5 more two-point shots than three-point shots. How many combinations can you come up with that would fit this scenario (don't worry about the total number of points scored).

| # of two-point shots | # of three-point shots |
|---|---|
| 9 | 4 |
| 5 | 0 |
| 6 | 1 |
| 7 | 2 |
| 5005 | 5000 |
| 15 | 10 |

Write an equation to describe the data.

$x = y + 5$

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## GUIDED PRACTICE:

**Steps for Finding Solutions for Systems**
1. Read the problem carefully.
2. Create two equations based on the story.
3. Graph each equation and identify the point of intersection.
4. Interpret your answer.

Sandy and Charlie walk at constant speeds. Sandy walks from their school to the library in 15 minutes and Charlie walks the same distance in 10 minutes. Charlie starts 4 minutes after Sandy left. Can Charlie catch up to Sandy? The distance between school and the library in 2 miles.

What is Sandy's speed in miles per minute?

$S = \frac{2}{15}$ miles per minute

What is Charlie's speed in miles per minute?

$C = \frac{2}{10}$ miles per minute $\frac{1}{5}$ mile/min.

Suppose the distance walked by Charlie in $x$ minutes is $y$ miles. What is the linear equation that represents Charlie's motion?

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

Based on the scenario above, at $x$ minutes above, Sandy has already walked for 4 minutes. What is the linear equation that represents her motion?

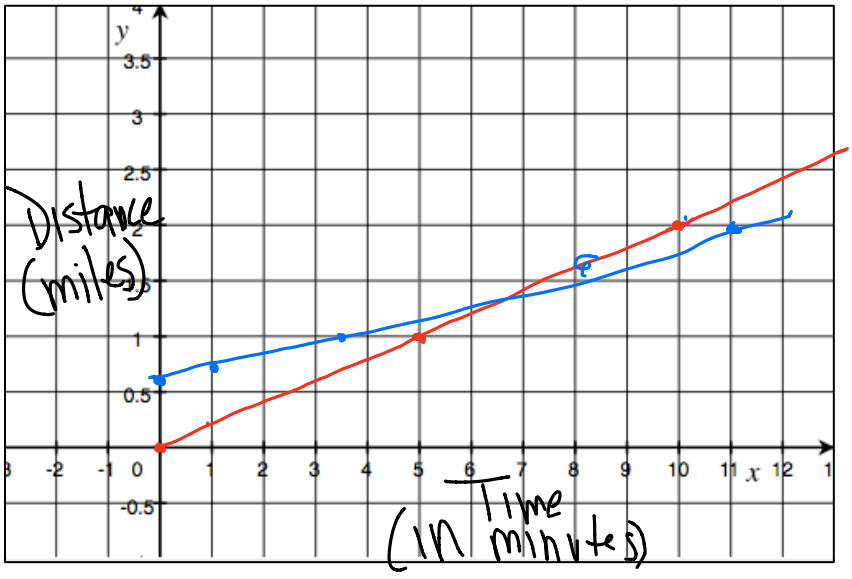
$\frac{y}{x+4} = \frac{2}{15}$ $15y = 2x + 8$ $y = \frac{2}{15}x + \frac{8}{15}$

4 minute head start

How far has Sandy gone before Charlie starts walking?

$\frac{8}{15}$ min.

Can Charlie catch up?



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Aiden and Evan ride their bikes at constant speeds. It takes Aiden 25 minutes to ride 4 miles. Evan can bike 4 miles in 32 minutes. If Aiden gives Evan a 20-minute head start, about how long will it take Aiden to catch up?

What is Aiden's speed in miles per minute? What is the linear equation that represents Aiden's motion?

$A = \frac{4}{25}$ miles/min. $y = \frac{4}{25}x$

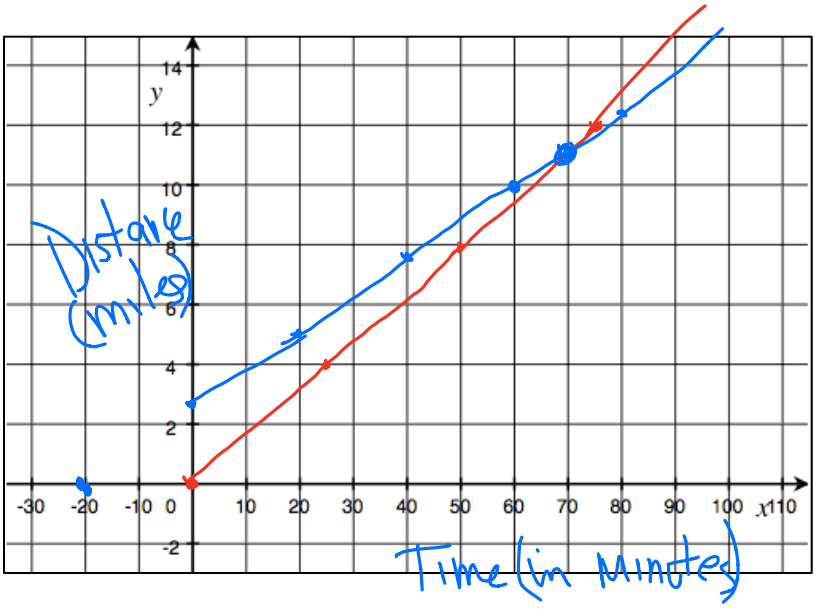
What is Evan's speed in miles per minute? What is the linear equation that represents Evan's motion?

$E = \frac{4}{32}$ or $\frac{1}{8}$ mile/min. $y = \frac{1}{8}x$

How can we account for his 20-minute head start that Evan gets?

$y = \frac{1}{8}x + 2\frac{1}{2}$ $\frac{y}{x+20} = \frac{1}{8}$ $\frac{8y}{8} = \frac{x+20}{8}$ $y = \frac{1}{8}x + 2\frac{1}{2}$

What is the system of equations that represents this situation?




About how long will it take before Aiden catches up to Evan?

About 70 minutes

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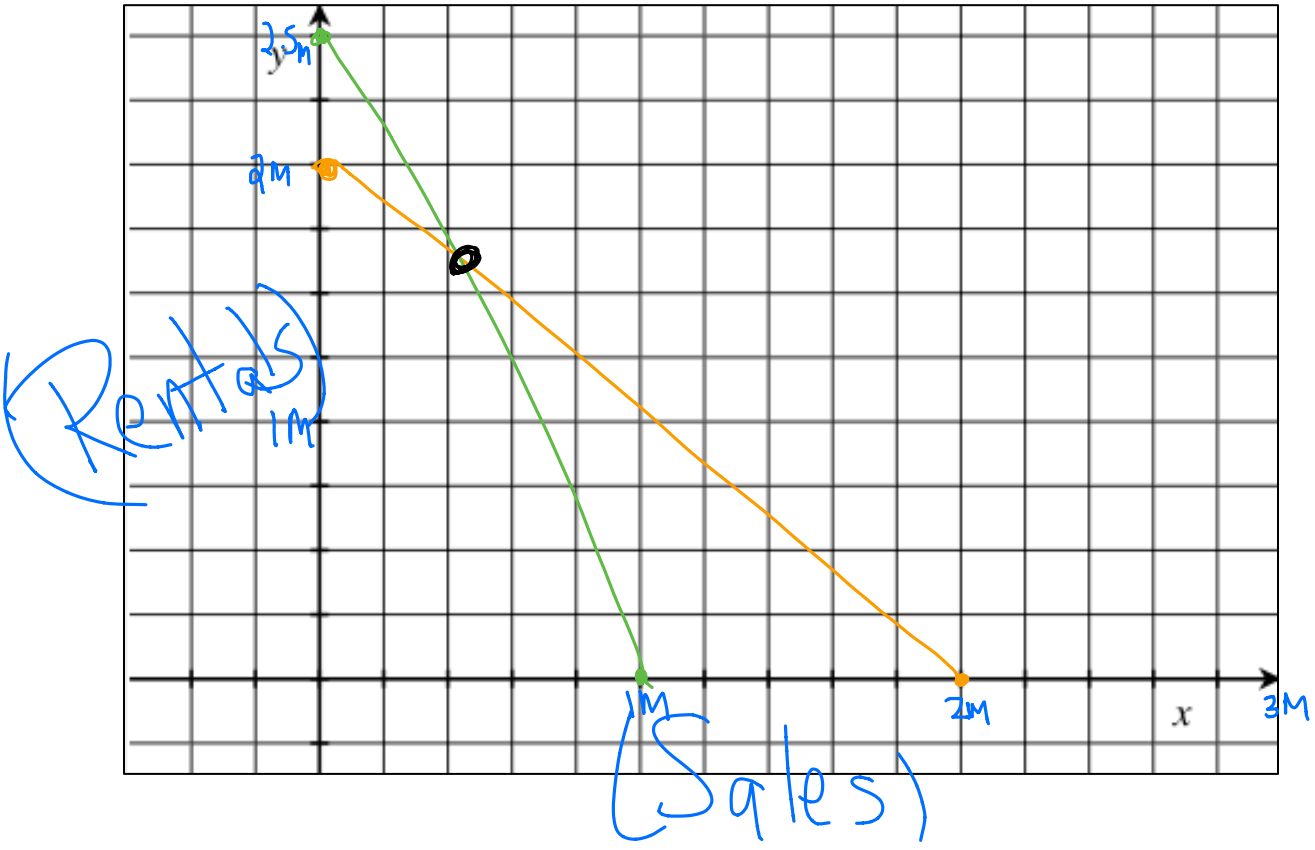
## Closure:

During its first four days of video on demand release, Sony Pictures' controversial movie, The Interview, generated roughly $15 Million in online sales and rentals. Sony did not say how much of the total represented $6 rentals and how much of the total were from $15 sales. They did say there were 2,000,000 transactions overall. Can we use math to figure out how many people rented The Interview, and how many people bought the movie?

Sales & Rentals
x y

$15x+6y=15,000,000$ (Money)

$x+y=2,000,000$ (unit sales)



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## Independent Practice:

Page 141 and 142 of student guide

## Activating Prior Knowledge:

We can identify the number of solutions in equations in one variable.

| $5x + 45 = 2(x + 18) + 3x$ | $3x - 4 = 4x - (x + 4)$ |
|---|---|
| | |

## Teacher Notes:

This is lesson 24 from ENY, no homework for this lesson.