

Day 17/18/19 Guided Notes

Name: Key

Date: 7/15

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OBJECTIVE: We will be able to...

1. Comprehend that solving systems of equations involves finding values of the variables that satisfy both equations simultaneously
2. Coordinate this understanding by solving equations with variables on each side
3. Recognize these solutions as points of intersection in systems of two linear equations.

Day 17: Representing 2 Separate Relationships as Systems of Equations

What are Systems of Equations?

- A set of 2 or more linear equations working together

Ex: I have 2 different kinds of bamboo planted at the same time. On which day would both plants be the same height?

- Plant A starts at 6 ft tall and grows $\frac{1}{4}$ foot each day
- Plant B starts at 3 ft tall and grows $\frac{1}{2}$ foot each day
- How could this be represented algebraically?

Algebraically Representation:

Plant A:

$$6 + \frac{1}{4}x$$

Plant B:

$$3 + \frac{1}{2}x$$

$x = \# \text{ of days}$

PRACTICE PROBLEMS: SITUATIONS AND SYSTEMS

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Consider the following scenarios. Write a system of expressions (without solving) and interpret what the solution to the system would tell you about the situation.

1. Sam and Alex start working on their homework at the same time. Sam starts with 5 problems already done and completes 4 problems each hour. Alex starts with 8 problems already done and completes 3 problems each hour.

Equation: initial # of problems + problems solved per hour

$$\text{Sam: } 5 + 4x$$

$$\text{Alex: } 8 + 3x$$

$$x = \text{hour(s)}$$

2. A town's water tank has 1000 liters of water and 200 liters is added every day. Another tank starts with 3000 liters but is used up at a rate of 100 liters every day.

Equation 1: (initial liters of water) + liters add per day

Equation 2: (initial liters of water) - liters used per day

$$\text{TANK A: } 1,000 + 200d$$

$$\text{TANK B: } 3,000 - 100d$$

$d = \text{\# of days}$

3. Jordan is looking to join fitness classes. Fitness Studio A charges a base fee of \$25 plus \$7 per class. Fitness Studio B charges a base fee of \$20 plus \$8 per class.

Equation: \$ base fee + \$ charge per class

$$\text{A: } \$25 + 7c$$

$$\text{B: } \$20 + 8c$$

$c = \text{\# of classes}$

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4. Warren and Danielle are both making paintings at the same time. Warren made 10 Paintings yesterday, and is completing 1 painting every hour today. Danielle made 4 paintings yesterday, but is making 5 paintings every hour today.

Equation: (Initial # of paintings) + # of paintings per hour

$$W: 10 + 1h$$

$$D: 4 + 5h$$

$$h = \text{\# of hours}$$

5. Sarah is comparing two cell phone plans. Plan A charges a flat fee of \$20 per month plus \$0.10 per text message. Plan B charges a flat fee of \$15 per month plus \$0.15 per text message. Write a system of expressions to represent the total monthly cost for each plan based on the number of text messages sent.

monthly Equation: \$ flat month rate + \$ rate per text message

monthly: Plan A: $\$20 + .10m$

Plan B: $\$15 + .15m$

$\hookrightarrow m$ represents # of text messages used monthly.

Student Solution (CLASS discussion):

\hookrightarrow Solution: Plan A: $\$20x + 0.10m$

Plan B: $\$15x + 0.15m$

* $m = \text{message(s)}$

* $x = \text{\# of months}$

* This only works if you are solving for the annual or total amount paid over-time because it has a variable (x) to substitute # of months with the rate per text message

Day 18: Graphically representing Systems of Equations Method 1: Table

Video Notes:

* student complete on their own for Khan Academy video.

Slope-Intercept Form of Linear Equation

$$y = mx + b$$

↑ ↑

Slope y-intercept

Example:

$$y = 2x + 3$$

↑ ↑

Slope y-intercept

* y-intercept can be found on a graph by looking at the point that crosses the y-axis.

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Example 2: Let's review the bamboo problem from yesterday: What is the system of equations created for Plant A and Plant B?

Plant A: $y = \frac{1}{4}x + 6$

Plant B: $y = \frac{1}{2}x + 3$

Fill out the table below for x and y values for each Plant based on the equation:

Plant A

x	y
0	6
1	$6.25 = 6\frac{1}{4}$
2	6.5
4	7
6	7.5
8	8
10	8.5
12	9

Plant B

x	y
0	3
1	3.5
2	4
4	5
6	6
8	7
10	8
12	9

Question: At what ~~week~~^{day} would they both be the same height? At what height?
At 12 days both plants will be 9ft tall.
 Flip back to Practice Problems on page 2.

*** Work will differ based on problem selected.**

- Write down the system of equations you created for the scenario below

using slope intercept form:

→ Problem # 3 (Jordan)

Equation 1:

$A: \$25 + 7C$

$y = 7C + 25$

Equation 2:

$B: \$20 + 8C$

$y = 8C + 20$

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2. Create a table for each equation (there should be 2 separate tables like Plant A and B from page 4):

$y = 7x + 25$	
x	y
0	25
2	39
4	53
6	67

$y = 8x + 20$	
x	y
0	20
2	36
4	52
6	68

$$x = 5 \Rightarrow \text{both equal } 60$$

3. Explain your solution for the system of equations in context of the problem and provide your solution in coordinate form.

At 5 months, Jordan will pay \$60 at both studios. However, after 5 months plan B will have a slightly higher monthly rate than plan A.

Day 19: Graphing Systems of Equations

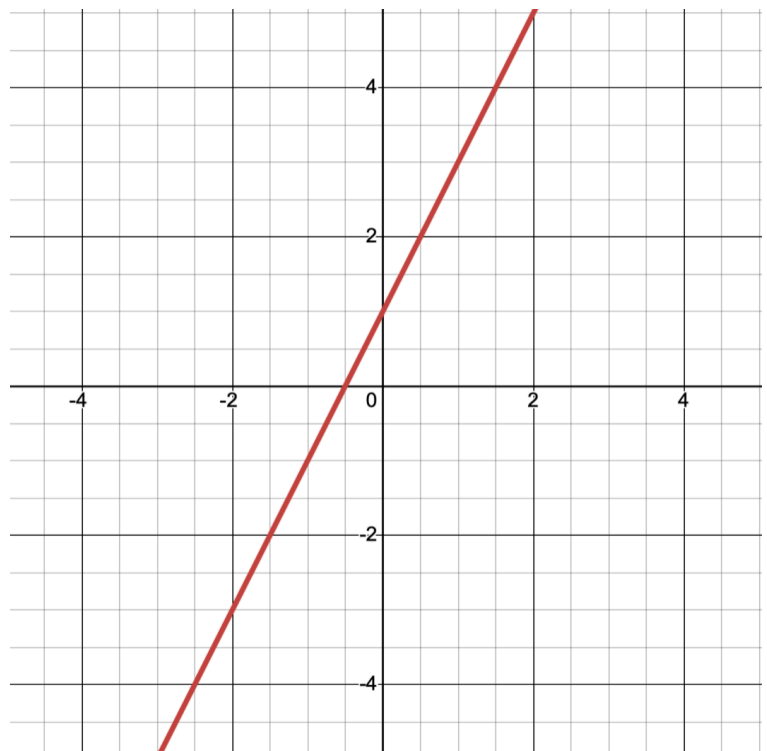
→ To graph each linear equation we have in slope-intercept form, we need to find the _____ and the _____.

- **y-intercept:** where the line _____ the y-axis which is written as _____ in coordinate form
- **Slope:** is represented as _____ over _____, it is often written in _____ form mathematically as:

Intro Example of Applying the Skills:

1. Consider the following Graph:

- a. Find the intercepts of the given graph



- b. Find the slope of the graph

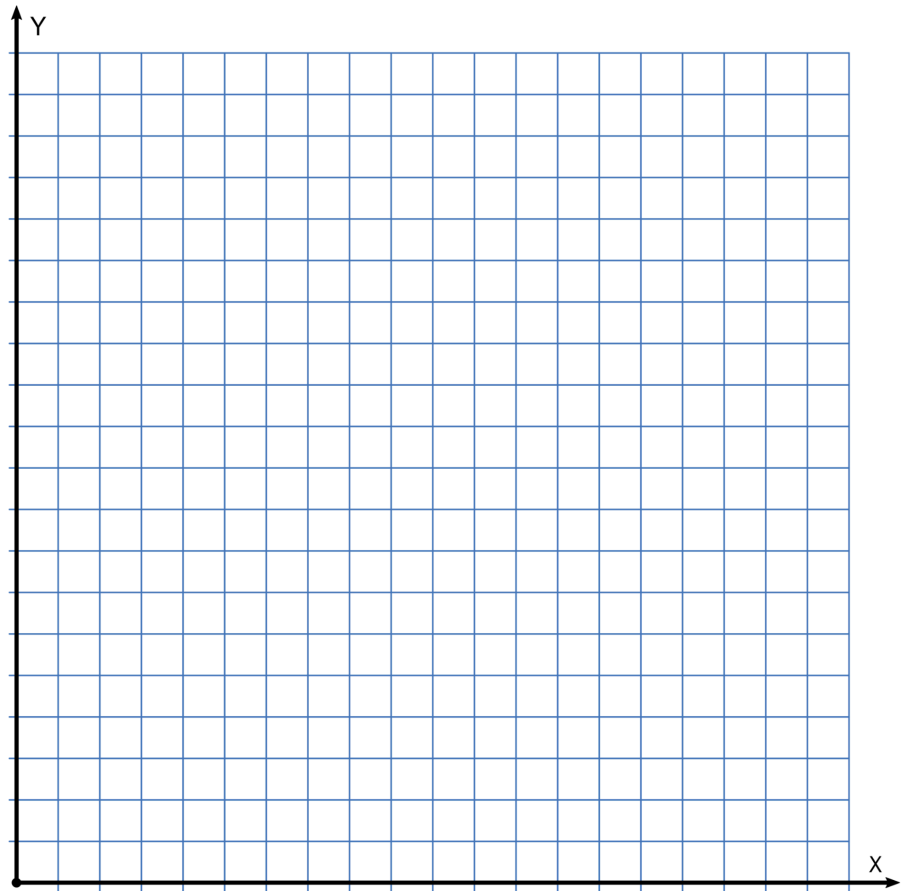
- c. Write the linear equation in slope intercept form that represents the given graph.

Second Example:

Let's try graph the bamboo problem onto the graph below:

Equation 1:

Equation 2:



The graph tells me that...

1. There is a _____ of _____ at the coordinate: _____.
- Solving system of equations means finding the _____ to the equations that make both _____ equal and _____.

PRACTICE PROBLEMS

1. Consider the two following equations:

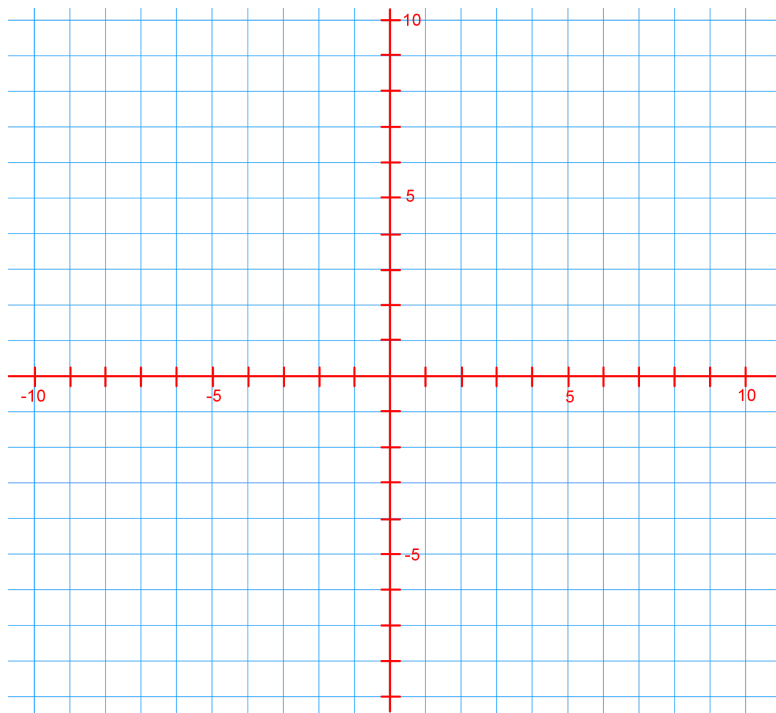
I. $y = 3x + 2 - 14$

II. $y = 5x - 7 - 18$

a. Graph the system of equations onto the graph

b. Label the axes

c. Does there exist a point of intersection? If so, state the coordinate point notation and respond to what does this tell about the situation?



Equation 1

- Slope: _____
- y-intercept: _____

Equation 2:

- Slope: _____
- y-intercept: _____

This tells me that....

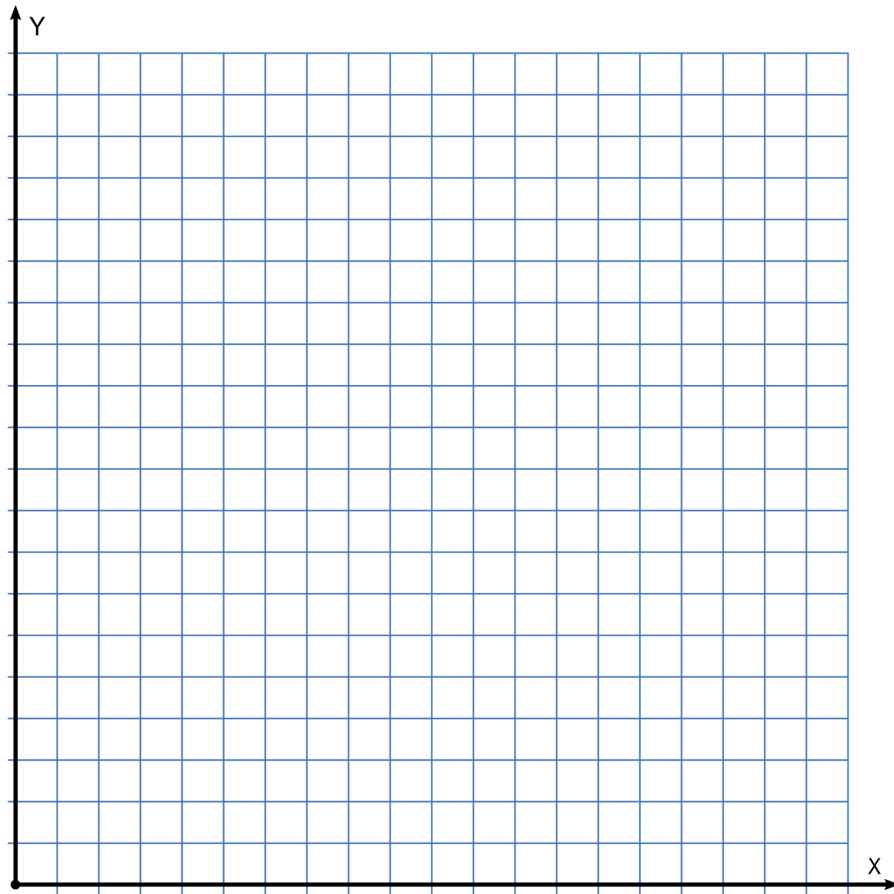
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2. A stack of n small cups have a height, h , in centimeters represented by $h = 1.5n + 6$. A stack of n large cups have a height, h , represented by $h = 1.5h + 9$.

a. Graph each of the equations for each of the cups on the same Cartesian plane.

b. Label your axis



c. At what value of cups will the heights be the same? (provide the coordinate form solution)