

# learning focus:

- ✓ solve systems of two linear equations by graphing, substitution, and elimination
- ✓ write and graph systems of two linear equations for real-world situations
- ✓ graph the solution set of a system of linear inequalities

# SYSTEMS UNIT

## 11 DAY TEKS-ALIGNED UNIT



A MANEUVERING THE MIDDLE® RESOURCE

# SYSTEMS



an 11 day TEKS-aligned unit

TEKS: A.2I, A.3F, A.3G, A.3H, A.5C

## ready-to-go, scaffolded student materials

### SYSTEMS UNIT

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# SYSTEMS



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## student friendly + real-world application

scaffolded concepts

Unit: Systems  
Student Handout 3

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

### SOLVING SYSTEMS BY SUBSTITUTION

Ava and Amy are sisters who make videos with cheerleading tips. Ava, the older sister, wants her part of their next video to be four times as long as Amy's. The video will be a total of 16 minutes. Let  $x$  represent Amy's part of the video and  $y$  represent Ava's. The system below represents this situation.

$$y = 4x \quad \text{and} \quad x + y = 16$$

a. Graph the system and estimate the solution.

b. Check your solution by plugging  $(x, y)$  into both equations. Was your estimation correct?

c. Discuss some of the disadvantages of solving systems of equations by graphing.

Another method to solve systems of equations is substitution.

**STEPS TO SOLVE SYSTEMS BY SUBSTITUTION**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

Use the substitution method to solve the following systems of equations.

1. Find the number of minutes each sister spent on their video. Did your graphing estimation compare to the substitution method?

$$\begin{cases} 5x + y = 34 \\ y = 2x - 1 \end{cases}$$

Use the substitution method to solve 4-6, then check your solution.

<p>4.</p> $\begin{cases} 3x - y = 4 \\ 3y = 9x - 12 \end{cases}$	<p>5.</p> $\begin{cases} -4x + 3y = 30 \\ 2x - 3y = -27 \end{cases}$	<p>6.</p> $\begin{cases} -2x + 5y = 22 \\ x = \frac{5}{2}y - 3 \end{cases}$
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✓CHECK: \_\_\_\_\_ ✓CHECK: \_\_\_\_\_

Use your knowledge of substitution to solve the following systems of equations.

7. Fish 'n Fins sells clown fish and angelfish. At the end of the day, Fish 'n Fins had 156 fish and made \$260. Let  $x$  represent the number of clown fish sold and  $y$  represent the number of angelfish sold. Write a system of equations that represents this situation.

$$\begin{cases} x + y = 156 \\ 1.5x + 2y = 260 \end{cases}$$

8. Use the system shown on the graph below to solve the system.

a. Write the system of equations.

b. Using the substitution method, find the solution to the system of equations.

c. Explain when it is advantageous to use the substitution method to solve a system of equations.

Unit: Systems  
Homework 3

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

### SOLVING SYSTEMS BY SUBSTITUTION

Solve each system of equations using substitution. Three of the systems have a solution of  $(4, 16)$ . Unscramble the letters of those three systems to create a secret code.

$\begin{cases} 7x + y = 12 \\ y = 4x - 21 \end{cases}$ <p style="text-align: center;"><b>T</b></p>	$\begin{cases} 2x + 3y = 18 \\ y = -6x - 2 \end{cases}$ <p style="text-align: center;"><b>E</b></p>	$\begin{cases} -3x + \frac{1}{4}y = -8 \\ 8x - y = 16 \end{cases}$ <p style="text-align: center;"><b>U</b></p>
$\begin{cases} 11x + 9y = -20 \\ x = -5y - 6 \end{cases}$ <p style="text-align: center;"><b>R</b></p>	$\begin{cases} -2x + y = 8 \\ \frac{1}{2}x + 3y = 50 \end{cases}$ <p style="text-align: center;"><b>B</b></p>	$\begin{cases} 5x - 3y = -4 \\ y = \frac{5}{3}x + 6 \end{cases}$ <p style="text-align: center;"><b>P</b></p>

A piggy bank holds \$4.40 in quarters and dimes. There are 20 coins in the bank. Let  $x$  be the number of dimes and  $y$  be the number of quarters. Find the number of each coin in the bank.

$$\begin{cases} x + y = 20 \\ 0.10x + 0.25y = 4.40 \end{cases}$$

**S**

Rose is mailing a package of magazines and chips to her kids at camp. The package weighs a total of 9 pounds and has 14 items inside. The magazines each weigh 1 pound and the chips each weigh .5 pounds. How many magazines,  $x$ , and chips,  $y$ , is Rose mailing in the package?

$$\begin{cases} x + y = 14 \\ x + 0.5y = 9 \end{cases}$$

**A**

**SECRET CODE:** \_\_\_\_\_

self-checking practice



# SYSTEMS



an 11 day TEKS-aligned unit

TEKS: A.2I, A.3F, A.3G, A.3H, A.5C

## streamline your planning process with unit overviews

### SYSTEMS OVERVIEW

STANDARDS	
READINESS	SUPPORTING
<p><b>A.2I</b> write systems of two linear equations given a table of values, a graph, and a verbal description</p> <p><b>A.5C</b> solve systems of two linear equations with two variables for mathematical and real-world problems</p>	<p><b>A.3F</b> graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist</p> <p><b>A.3G</b> estimate graphically the solutions to systems of two linear equations with two variables in real-world problems</p> <p><b>A.3H</b> graph the solution set of systems of two linear inequalities in two variables on the coordinate plane</p>

**PIG IDEAS**

- Systems of equations can be used to solve mathematical and real-world problems, and they can be solved using various methods.
- Systems of equations can have one, no, or infinite solutions.
- The solution set to systems of equations can be represented by a point, a line, or a region.

- ✓ key vocabulary
- ✓ vertical alignment

sample pacing calendar

### SYSTEMS PACING GUIDE

DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Intro to Systems of Equations	Solving Systems by Graphing	Solving Systems by Substitution	Solving Systems by Elimination	Quiz: Solving Systems of Equations
Student Handout 1 Homework 1	Student Handout 2 Homework 2	Student Handout 3 Homework 3	Student Handout 4 Homework 4	
DAY 6	DAY 7			
Writing Systems of Equations	Applying Systems of Equations			
Student Handout 5 Homework 5	Student Handout 6 Homework 6			
DAY 11				
Systems Unit Test				
Test				

teaching ideas

### SYSTEMS OVERVIEW

TOPIC	TEACHING TIPS
Intro to Systems of Equations	<ul style="list-style-type: none"> <li>Search teacher.desmos.com for "Playing Catch-Up" as an engaging way to introduce the concepts of systems of equations as well as the fact that systems can be represented using graphs, tables and equations.</li> </ul>
Solving Systems by Graphing	<ul style="list-style-type: none"> <li>Consider allowing time during or after this lesson to show students how to graph and solve a system of equations on their graphing calculator.</li> <li>It may be helpful to explain to students that solving by graphing is often considered a tool to "estimate" a solution to a system since many times the point of intersection is not at whole numbers.</li> </ul>
Solving Systems by Substitution	<ul style="list-style-type: none"> <li>It can be difficult for students to keep track of their work during this lesson. I like to have students use highlighters to highlight their variables in order to see exactly what is being substituted, and where.</li> <li>This is a link to a game similar to "Who Wants to Be a Millionaire" that could be played as a class. Students could show work on paper or dry erase boards. <a href="https://www.quia.com/rr/298579.html">https://www.quia.com/rr/298579.html</a></li> </ul>
Solving Systems by Elimination	<ul style="list-style-type: none"> <li>Be sure that students understand the vocabulary of "opposite coefficients" so they have a clear understanding of how to "eliminate" one of the variables and what the goal of this method is.</li> </ul>
Graphing Systems of Inequalities	<ul style="list-style-type: none"> <li>Be sure to have students solve each inequality for y first.</li> <li>If possible, have students use two different colored pencils to make the solution set clearer. Students can lightly shade each inequality with a different color and then darken the area of overlap which represents the solution set.</li> </ul>

# SYSTEMS



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## unit study guide + assessments

✓ quizzes

✓ editable unit test

Unit: Systems  
Quiz 1

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

**QUIZ: SOLVING SYSTEMS OF EQUATIONS**

Show all work as you answer each question below. Record your solutions in the box at the right.

1. What must be true about the graph of a system of equations that has infinitely many solutions?

a. The lines will have the same slope and the same y-intercept.  
b. The lines will have the same slope and different y-intercepts.  
c. The lines will have different slopes and the same y-intercept.  
d. The lines will have different slopes and different y-intercepts.

2. The graph at the right represents which system of equations?

a.  $y = 0.5x + 6$       b.  $y = -0.5x + 6$   
 $y = x + 3$              $y = x + 6$

c.  $y = -0.5x + 6$       d.  $y = 0.5x - 6$   
 $y = x + 3$              $y = -x + 3$

3. Solve the system by graphing.

$y =$  \_\_\_\_\_  
 $2x =$  \_\_\_\_\_

5. Mario graphed a system of equations. If the first equation is shown on the graph, could it represent the second equation.

a.  $y = \frac{1}{2}x$   
b.  $y = x - 4$   
c.  $y = -x + 8$   
d.  $y = -\frac{1}{2}x - 2$

Unit: Systems  
Review

Name \_\_\_\_\_  
Date \_\_\_\_\_ Pd \_\_\_\_\_

**SYSTEMS STUDY GUIDE**

Solve each problem below. Be sure to ask questions if you need more help with a topic.

**I CAN GRAPH SYSTEMS OF LINEAR EQUATIONS AND DETERMINE SOLUTIONS. A.3F**

1. Solve the system by graphing.

$y = -\frac{1}{5}x - 1$   
 $y = x - 7$

2. Solve the system by graphing.

3. The following system of equations is solved by graphing. James thinks there is one solution while Rebekah thinks there are many solutions. Who do you agree with and why?

$y = \frac{3}{4}x + 2$   
 $6x + 8y = 16$

5. Georgia's neighbors pay her \$20 a month for their pets. Greg's neighbors pay him \$10 a month for his. The system below represents the situation.

a. Graph the system.  
b. Estimate the solution.  
c. Explain the meaning of the solution.

ALGEBRA 1 CURRICULUM

# SYSTEMS

UNIT FIVE: ANSWER KEY

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answer keys included