TEXAS

ESSENTIAL KNOWLEDGE AND SKILLS

Algebra 1

Program Overview and Sampler

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TEXAS

ESSENTIAL KNOWLEDGE AND SKILLS

Algebra 1

Preparing for College and Career

The ***Texas Essential Knowledge and Skills*** program provides the foundation for Algebra 1 success. Students learn through direct instruction, discovery-based learning, and guided practice, allowing them to transfer skills to real-world situations, problem-solving activities, and the STAAR Exam. Through active discourse and collaborative activities, students learn to communicate effectively and gain the perseverance necessary to solve difficult problems.

Learning Through Multiple Approaches

Discovery-Based Learning	Application
• Guided Instruction • Guided Practice • Connect to Testing	• Concepts in the Real World • Extension and Interactive Activities • Authentic STAAR Practice
Personalized Practice	**Direct Instruction**
• *i-Practice* Personalized Assignments (Digital) • Video Model Problems (QR Codes, Digital) • Multiple Problem Help Options (Digital)	• Lesson Introduction • Words to Know • Remediation Activities



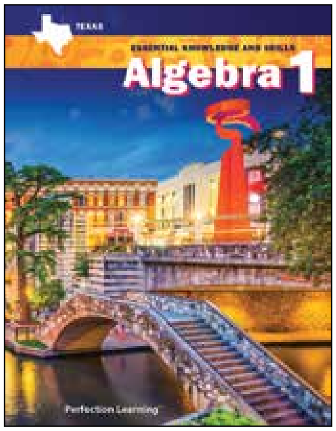
Student-Centered Approach to Algebra 1

The ***Texas Essential Knowledge and Skills*** program focuses on active learning. Engage students as they explore concepts, learn through guided instruction, and apply their knowledge in the extension and assessment activities.

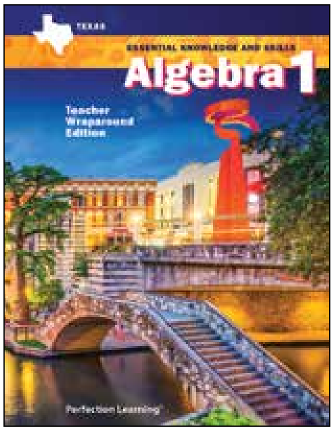
Prepare Students for Success

Designed specifically for the TEKS standards, the curriculum ensures that students will have the knowledge and skills that matter for both the STAAR Exam and their college and career paths.

Program Components

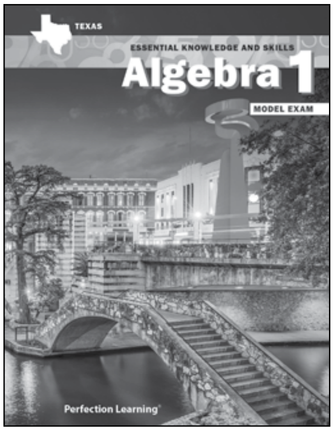


Student Worktext



Teacher Wraparound Edition

Texas Algebra 1 Digital



Model Exam

PERSONALIZED LEARNING

- Lesson videos, accessed through QR codes, provide students with model problems on demand.
- Digital assignments can be customized and delivered individually, to small groups, or to the whole class.
- Through *i-Practice*, each student can practice skills to mastery.

ACTIVE DISCOURSE AND MATH LITERACY

Throughout each lesson, students and teachers engage in whole class, small group, and peer discussions. Students develop communication skills and math literacy as they work with others to understand concepts, build skills, and tackle more complex problems.

DEPTH OF KNOWLEDGE (DOK)

Concepts, questions, and activities are carefully designed to meet the full range of Webb's task complexity. All practice and assessment items are tagged with DOK levels. Independent practice and chapter tests prepare students for the rigor of the STAAR Exam as well as other complex tasks and projects.

4. Which of the following equations is not equivalent to the rest?

A. $y=\frac{1}{3}x-7$

B. $y+5=\frac{1}{3}(x-6)$

C. $x-3y=21$

[✓ D. $3x-y=21$]

(DOK 3)

ASSESSMENT

Each chapter and lesson focuses on specific learning outcomes with aligned formative and summative assessments. Items mirror those on high-stakes assessments with an emphasis on the STAAR Exam.

- Connect to Testing
- independent practice
- chapter-level and comprehensive STAAR practice
- chapter tests

- diagnostic tests
- digital assignments, quizzes, and tests
- teacher-built assignments and tests using an extensive item bank and online assignment builder

DIFFERENTIATION

Support for ELLs, struggling, and advanced students helps all students succeed and be challenged.

- **Point-of-use vocabulary and math literacy support, remediation suggestions, and videos ensure content is accessible.**
- **Extension activities and a rich problem item bank ensure students remain challenged.**

ELL

Provide the following sentence frames to help students respond to the RECAP question.

Beginning/Intermediate:

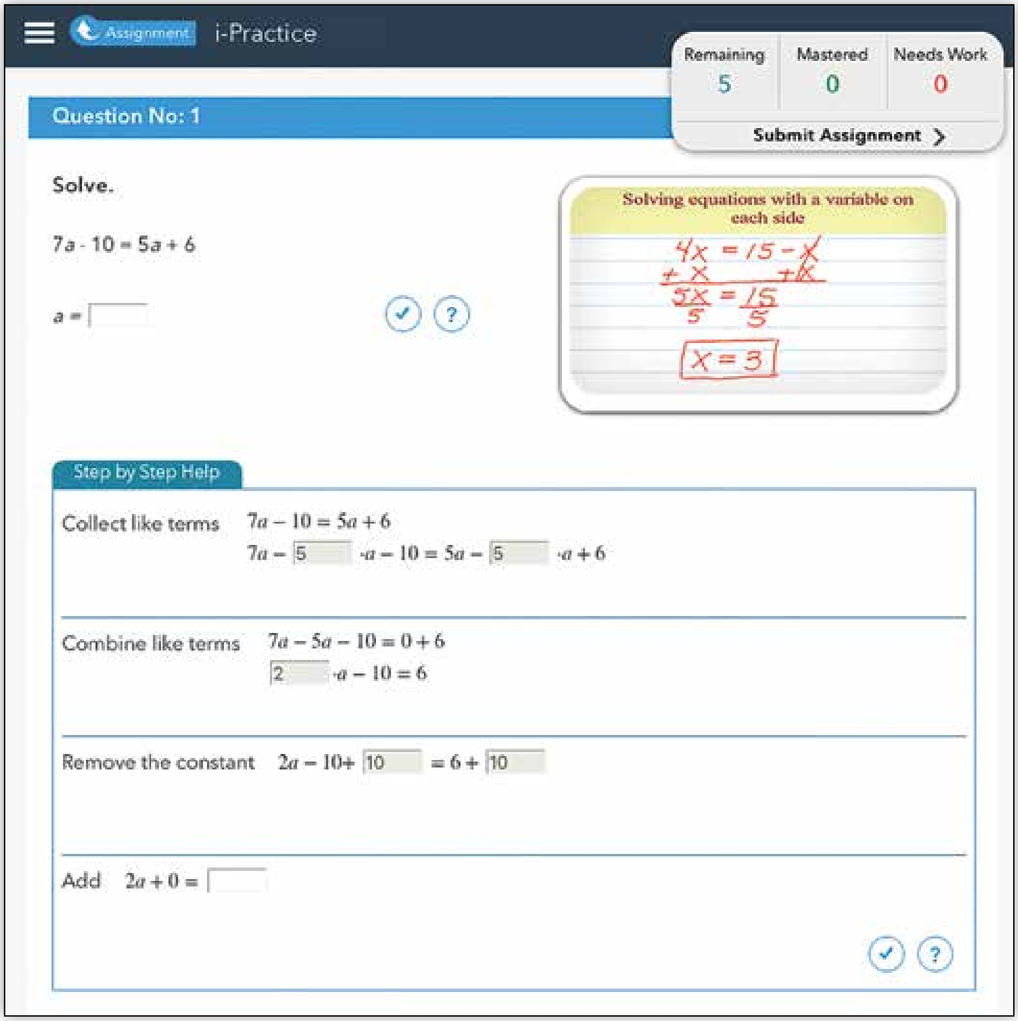
- *One way to find slope is* _______.
- *This way is best for* _______.
- *Another way to find slope is* _______.
- *This way is best for* _______.

Intermediate/Advanced:

- *One way to find slope is* _______.
- *This way is most appropriate for* _______.
- *Another way to find slope is* _______.
- *This way is most appropriate for* _______.

DIGITAL ASSIGNMENTS, QUIZZES, AND TESTS

- *i-Practice* personalized assignments
- point-of-use support (videos, hints, step-by-step help) and smart feedback
- pre-built diagnostic, chapter, and summative tests
- STAAR practice
- technology-enhanced items (equation editor, multi-select, drag and drop, matching, and much more)
- multiple attempts allowed for homework and *i-Practice*
- print capability for offline assignments



Question No: 1

Solve.

$7a - 10 = 5a + 6$

$a =$ ☐

Solving equations with a variable on each side

$4x = 15 - x$

$+x \quad +x$

$\frac{5x}{5} = \frac{15}{5}$

$\boxed{x = 3}$

Collect like terms $7a - 10 = 5a + 6$

$7a - \boxed{5} \cdot a - 10 = 5a - \boxed{5} \cdot a + 6$

Combine like terms $7a - 5a - 10 = 0 + 6$

$\boxed{2} \cdot a - 10 = 6$

Remove the constant $2a - 10 + \boxed{10} = 6 + \boxed{10}$

Add $2a + 0 =$ ☐

CLASS AND STUDENT ANALYTICS

- performance measures by skill and TEKS standard
- extensive drill down capabilities (class, student, item)
- visual highlighting of strengths and performance gaps

Class: Algebra 1 Standard: ALL Standards Student: All Students

All Students
Allen, Violet
Brown, Ava
Clark, Skylar
Cooper, Christopher
Evans, Lucas
Gonzalez, Allison
Harris, Samantha
Jackson, Penelope
King, Mason
Lopez, Audrey
Miller, Mia
Morgan, Andrew
Nelson, Alexander
Perez, Ariana
Ramirez, Benjamin
Robinson, Anna
Sanchez, Noah
Stewart, Gabriel
Thompson, Riley

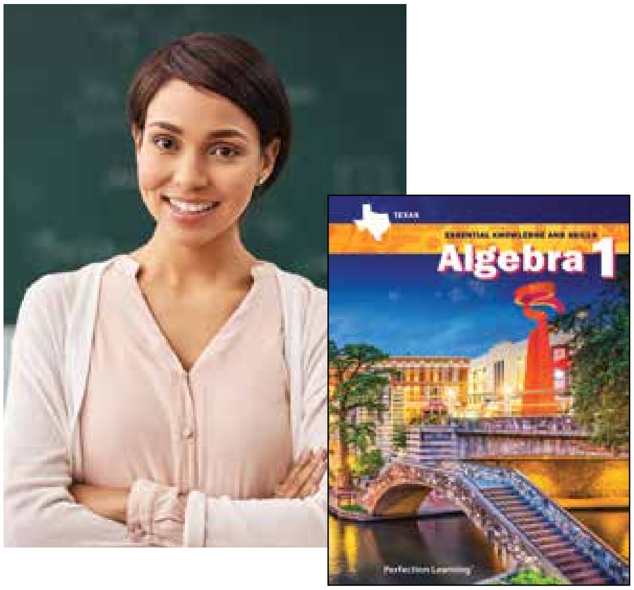
Standard	Performance	Problems	Average
2A	7 15	5	69%
2B	4 18	1	82%
2C	4 18	2	82%
2D	10 2 10	11	75%
3A	4 17	7	83%
3C	22	1	100%
[illegible]	4 14 4	3	75%
[illegible]	6 6 10	1	0%
[illegible]	9 5 8	6	66%

Average 77%
Excelling 10 students
Passing 6 students
Failing 6 students

LESSON PLANNING AND INSTRUCTIONAL SUPPORT

The teacher wraparound edition, available in both print and digital formats, provides planning guidance for each chapter and lesson, including

- Chapter Planner
- chapter goals with sample problems
- lesson prerequisites and suggested pacing
- discussion questions and suggested answers
- guided practice objectives with implementation ideas to encourage active discourse



OPEN EDUCATIONAL RESOURCES

No more searching the internet for lessons and videos! Open educational resources are provided at point of use.

- reviewed and vetted by math educators to ensure usefulness and appropriateness
- videos, interactive activities, and lesson-specific activities using programs such as **Desmos** and **GeoGebra**
- one-click access to all suggested resources via the digital teacher edition

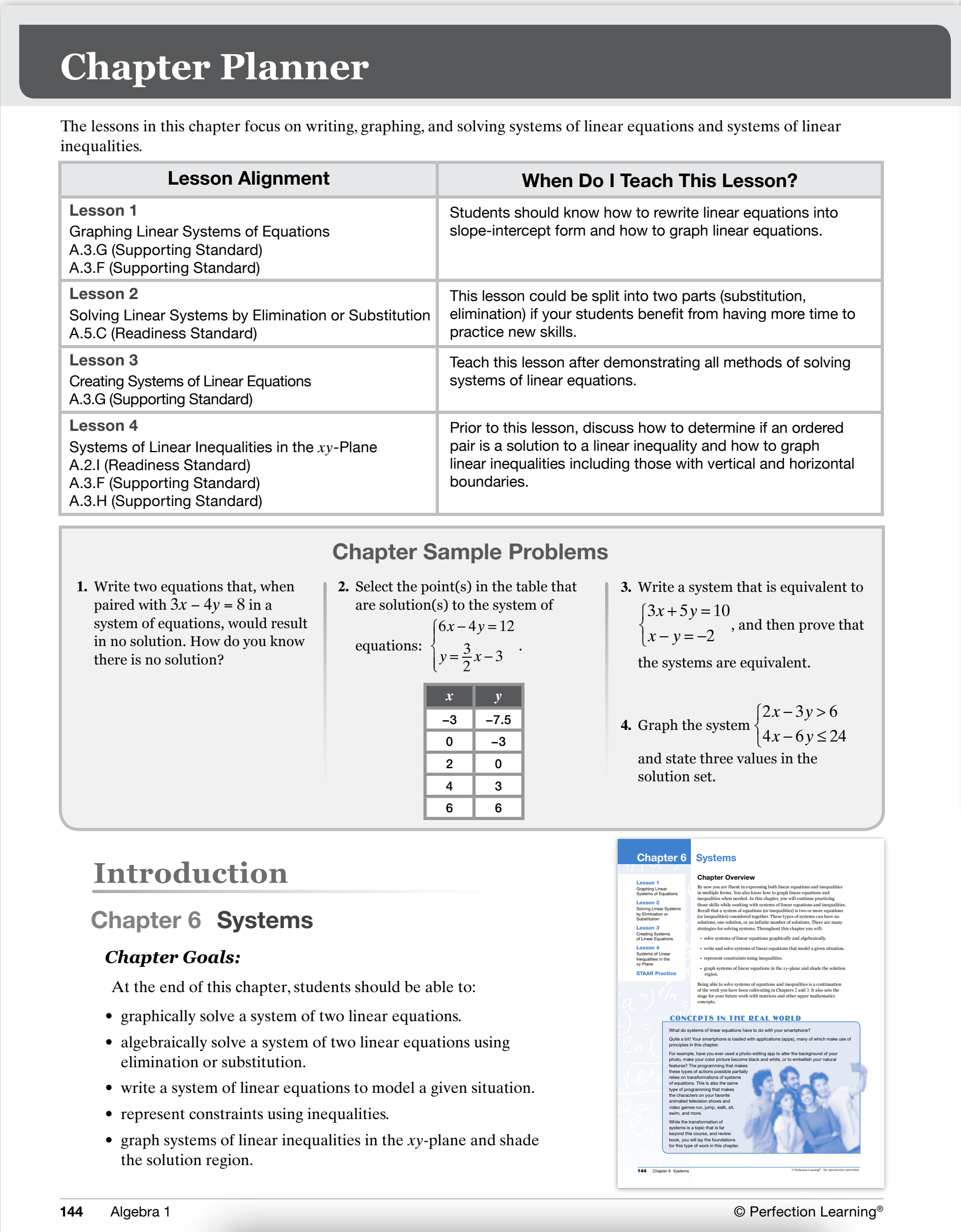
DIGITAL COURSE MANAGEMENT

Teachers can easily create, modify, and share digital assignments, quizzes, and tests.
In addition, teachers can

- automate grading with instant feedback
- customize assignments
- create individual, group, and whole class assignments
- review answers and modify grades
- modify assignments and due dates

CHAPTER INTRODUCTION

- **Chapter Planner** includes standards, lesson prerequisites, sequencing, and representative sample problems. Lesson pacing suggestions are also available.
- **Chapter Overview** and **Chapter Goals** clearly state the learning objectives.
- **Concepts in the Real World** provides students insight into how chapter concepts are applied outside the classroom.
- **Connect to Testing** engages students in chapter concepts using a STAAR-style example problem. Guided instruction and active discourse promotes student discovery of new concepts and their application.
- **Words to Know** introduces chapter concept vocabulary.



Chapter Planner

The lessons in this chapter focus on writing, graphing, and solving systems of linear equations and systems of linear inequalities.

Lesson Alignment	When Do I Teach This Lesson?
Lesson 1 Graphing Linear Systems of Equations A.3.G (Supporting Standard) A.3.F (Supporting Standard)	Students should know how to rewrite linear equations into slope-intercept form and how to graph linear equations.
Lesson 2 Solving Linear Systems by Elimination or Substitution A.5.C (Readiness Standard)	This lesson could be split into two parts (substitution, elimination) if your students benefit from having more time to practice new skills.
Lesson 3 Creating Systems of Linear Equations A.3.G (Supporting Standard)	Teach this lesson after demonstrating all methods of solving systems of linear equations.
Lesson 4 Systems of Linear Inequalities in the xy-Plane A.2.I (Readiness Standard) A.3.F (Supporting Standard) A.3.H (Supporting Standard)	Prior to this lesson, discuss how to determine if an ordered pair is a solution to a linear inequality and how to graph linear inequalities including those with vertical and horizontal boundaries.

Chapter Sample Problems

1. Write two equations that, when paired with $3x - 4y = 8$ in a system of equations, would result in no solution. How do you know there is no solution?

2. Select the point(s) in the table that are solution(s) to the system of equations: $\begin{cases} 6x - 4y = 12 \\ y = \frac{3}{2}x - 3 \end{cases}$.

x	y
−3	−7.5
0	−3
2	0
4	3
6	6

3. Write a system that is equivalent to $\begin{cases} 3x + 5y = 10 \\ x - y = -2 \end{cases}$, and then prove that the systems are equivalent.

4. Graph the system $\begin{cases} 2x - 3y > 6 \\ 4x - 6y \leq 24 \end{cases}$ and state three values in the solution set.

Introduction

Chapter 6 **Systems**

Chapter Goals:

At the end of this chapter, students should be able to:

- graphically solve a system of two linear equations.
- algebraically solve a system of two linear equations using elimination or substitution.
- write a system of linear equations to model a given situation.
- represent constraints using inequalities.
- graph systems of linear inequalities in the xy-plane and shade the solution region.

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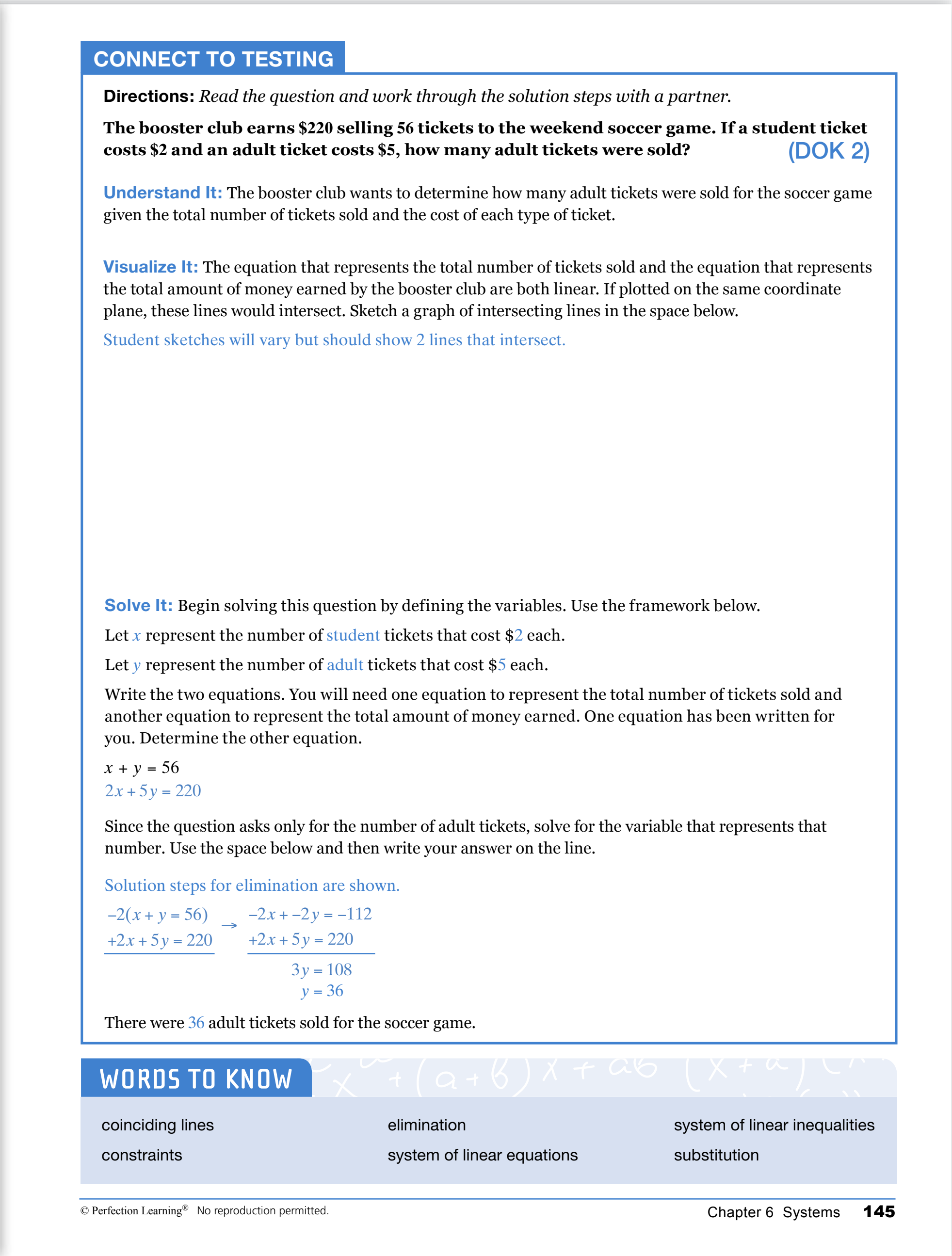
CONCEPTS IN THE REAL WORLD

What do systems of linear equations have to do with your smartphone?

Quite a bit! Your smartphone is loaded with applications (apps), many of which make use of principles in this chapter.

For example, have you ever used a photo-editing app to alter the background of your photo, make your color picture become black and white, or to embellish your natural features? The programming that makes these types of actions possible partially relies on transformations of systems of equations. This is also the same type of programming that makes the characters on your favorite animated television shows and video games run, jump, walk, sit, swim, and more.

While the transformation of systems is a topic that is far beyond this course, and review book, you will lay the foundations for this type of work in this chapter.



CONNECT TO TESTING

Directions: *Read the question and work through the solution steps with a partner.*

The booster club earns $220 selling 56 tickets to the weekend soccer game. If a student ticket costs $2 and an adult ticket costs $5, how many adult tickets were sold? (DOK 2)

Understand It: The booster club wants to determine how many adult tickets were sold for the soccer game given the total number of tickets sold and the cost of each type of ticket.

Visualize It: The equation that represents the total number of tickets sold and the equation that represents the total amount of money earned by the booster club are both linear. If plotted on the same coordinate plane, these lines would intersect. Sketch a graph of intersecting lines in the space below.

Student sketches will vary but should show 2 lines that intersect.

Solve It: Begin solving this question by defining the variables. Use the framework below.

Let x represent the number of student tickets that cost \$2 each.

Let y represent the number of adult tickets that cost \$5 each.

Write the two equations. You will need one equation to represent the total number of tickets sold and another equation to represent the total amount of money earned. One equation has been written for you. Determine the other equation.

$x + y = 56$
$2x + 5y = 220$

Since the question asks only for the number of adult tickets, solve for the variable that represents that number. Use the space below and then write your answer on the line.

Solution steps for elimination are shown.

$$\begin{array}{l} -2(x+y=56) \\ \underline{+2x+5y=220} \end{array} \rightarrow \begin{array}{r} -2x+-2y=-112 \\ \underline{+2x+5y=220} \\ 3y=108 \\ y=36 \end{array}$$

There were 36 adult tickets sold for the soccer game.

WORDS TO KNOW

coinciding lines
constraints
elimination
system of linear equations
system of linear inequalities
substitution

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CONNECT TO TESTING

Use these questions to help your students engage with the process of solving a simulated state test question.

1. **Which solution method is the best choice for this problem?**

   Student answers will vary. One possible answer: Since neither of the equations initially had a single variable isolated on one side of the equation, elimination is a better choice.

2. **Give an example of an instance in which graphing a given system is the best choice for solving.**

   Student answers will vary. One possible answer: Graphing a system of equations is the best solution method when the numbers are small and the solution is suspected to happen at integer coordinates.

3. **What types of solutions are possible for systems of linear equations?**

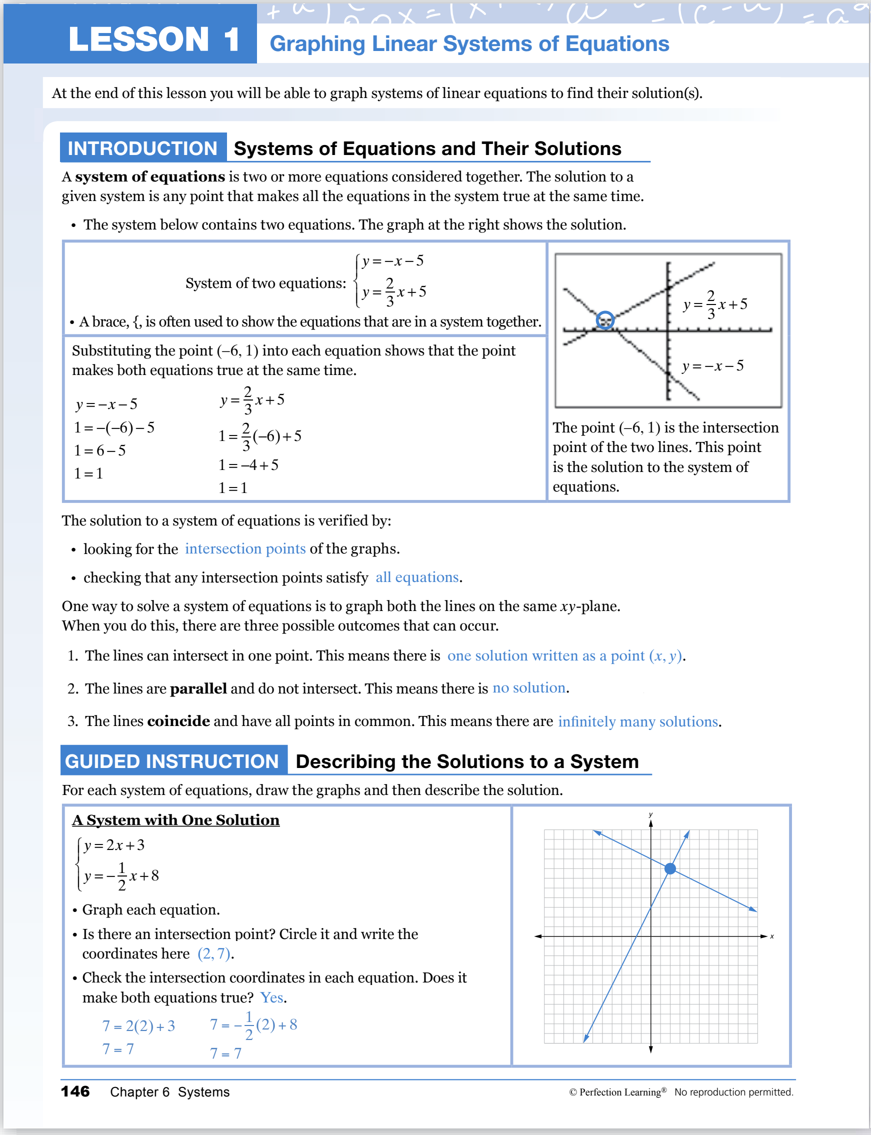
   It is possible for systems of linear equations to intersect, to coincide, or to have no solution. *Extend this question by asking students to sketch each of the different solution types.*

4. **Suppose your friend is confused about how to use the substitution method to solve a system of linear equations. What real world examples could you give your friend to help explain the process?**

   Student answers will vary. One possible answer: Substitution means to replace something with another item that is equivalent. Some examples are substituting out an athlete on a team when another athlete becomes fatigued or injured, or when you have a substitute classroom teacher.

LESSON: INTRODUCTION

- Each lesson begins with short, direct instruction and transitions to guided instruction.
- Discussion questions and interactive activities prompt active discourse and student discovery.
- Extension activities promote visualization and application of concepts.
- ELL activities such as sentence frames, vocabulary notebooks, and graphic organizers help build math literacy.
- Videos give learners additional support.



LESSON 1 Graphing Linear Systems of Equations

At the end of this lesson you will be able to graph systems of linear equations to find their solution(s).

INTRODUCTION Systems of Equations and Their Solutions

A **system of equations** is two or more equations considered together. The solution to a given system is any point that makes all the equations in the system true at the same time.

- The system below contains two equations. The graph at the right shows the solution.

System of two equations: $\begin{cases} y = -x - 5 \\ y = \frac{2}{3}x + 5 \end{cases}$

- A brace, {, is often used to show the equations that are in a system together.

Substituting the point (–6, 1) into each equation shows that the point makes both equations true at the same time.

$y = -x - 5$
$1 = -(-6) - 5$
$1 = 6 - 5$
$1 = 1$

$y = \frac{2}{3}x + 5$
$1 = \frac{2}{3}(-6) + 5$
$1 = -4 + 5$
$1 = 1$

$y = \frac{2}{3}x + 5$
$y = -x - 5$

The point (–6, 1) is the intersection point of the two lines. This point is the solution to the system of equations.

The solution to a system of equations is verified by:

- looking for the intersection points of the graphs.
- checking that any intersection points satisfy all equations.

One way to solve a system of equations is to graph both the lines on the same xy-plane. When you do this, there are three possible outcomes that can occur.

1. The lines can intersect in one point. This means there is one solution written as a point (x, y).
2. The lines are **parallel** and do not intersect. This means there is no solution.
3. The lines **coincide** and have all points in common. This means there are infinitely many solutions.

GUIDED INSTRUCTION Describing the Solutions to a System

For each system of equations, draw the graphs and then describe the solution.

A System with One Solution

$\begin{cases} y = 2x + 3 \\ y = -\frac{1}{2}x + 8 \end{cases}$

- Graph each equation.
- Is there an intersection point? Circle it and write the coordinates here (2, 7).
- Check the intersection coordinates in each equation. Does it make both equations true? Yes.

$7 = 2(2) + 3$
$7 = 7$

$7 = -\frac{1}{2}(2) + 8$
$7 = 7$

y
x

146 Chapter 6 Systems

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INTRODUCTION

Give an example of a real world situation that can be solved by graphing a system of equations.

Student answers will vary. One possible answer: Graphing demand and supply equations on the same xy-plane. The intersection of these two lines will allow you to predict when price and demand of a product will hit equilibrium.

How do you show if a point is a solution to a system of equations?

Student answers will vary. One possible answer: I can show that a point is a solution to a system of equations by substituting the point into the equations to see if both equations produce a true statement.

How would you generate the equations of a graphed system?

Student answers will vary. One possible answer: I would find the slope and y-intercept of both equations and write the equations using slope-intercept form.

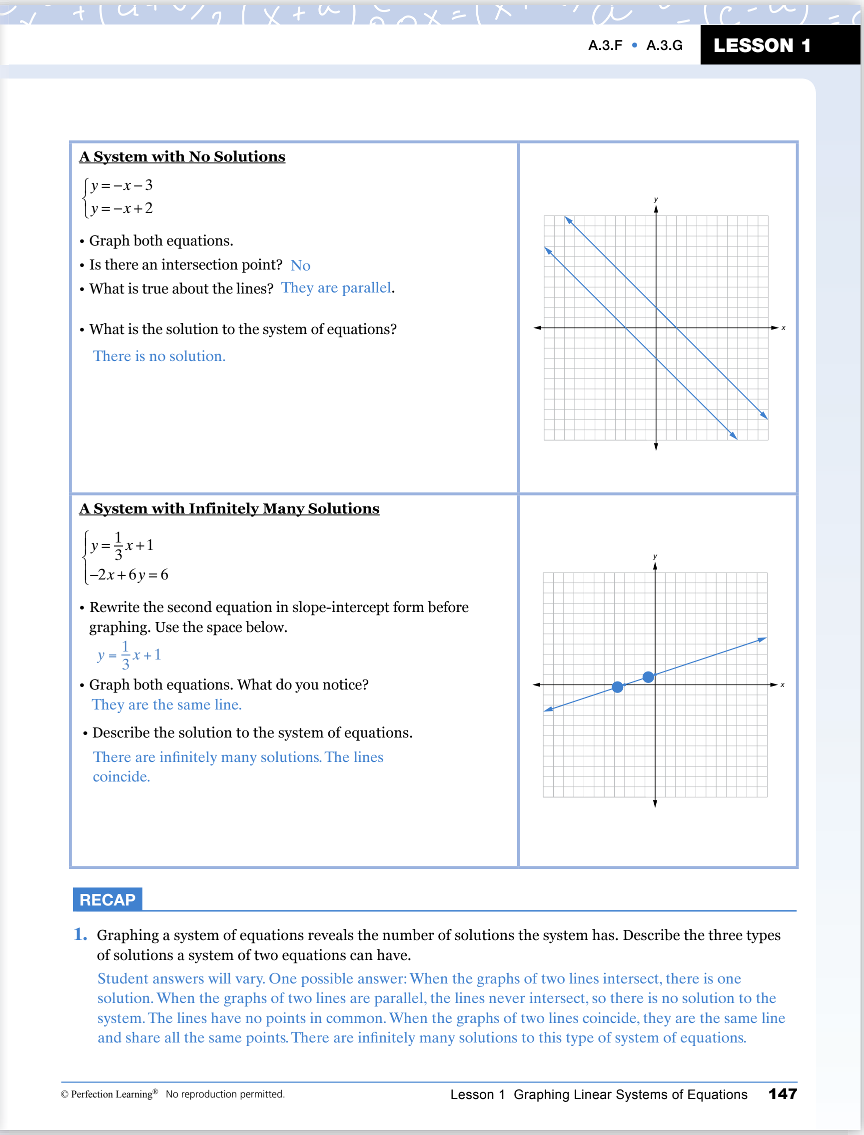
EXTENSION ACTIVITIES

Activity

Graphing Linear Equations (I)

Students graph a generated linear equation on the xy-plane. Use this activity as remediation for students who need more practice graphing lines. (Approximately 10 minutes)

https://www.geogebra.org/m/S8QhwdX6



A.3.F • A.3.G **LESSON 1**

A System with No Solutions

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

- Graph both equations.
- Is there an intersection point? No
- What is true about the lines? They are parallel.
- What is the solution to the system of equations?

  There is no solution.

A System with Infinitely Many Solutions

$$\begin{cases} y = \frac{1}{3}x + 1 \\ -2x + 6y = 6 \end{cases}$$

- Rewrite the second equation in slope-intercept form before graphing. Use the space below.

  $y = \frac{1}{3}x + 1$
- Graph both equations. What do you notice?

  They are the same line.
- Describe the solution to the system of equations.

  There are infinitely many solutions. The lines coincide.

RECAP

1. Graphing a system of equations reveals the number of solutions the system has. Describe the three types of solutions a system of two equations can have.

   Student answers will vary. One possible answer: When the graphs of two lines intersect, there is one solution. When the graphs of two lines are parallel, the lines never intersect, so there is no solution to the system. The lines have no points in common. When the graphs of two lines coincide, they are the same line and share all the same points. There are infinitely many solutions to this type of system of equations.

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Instruction

ELL

Provide the following sentence frame to help students respond to the No Solutions question.

- *The lines* _____. (If necessary, provide the following options for the completing the sentence frame: *intersect / are parallel / coincide*.)

Provide the following sentence frames to help students respond to the RECAP question.

- *A system can have lines that* _____. (If necessary, provide the following options for completing the sentence frame: *intersect / are parallel / coincide*.)
- *This means that the lines* _____.
- *Or, a system can have lines that* _____. (If necessary, provide the following options for completing the sentence frame: *intersect / are parallel / coincide*.)
- *This means that the lines* _____.
- *Or, a system can have lines that* _____. (If necessary, provide the following options for the completing the sentence frame: *intersect / are parallel / coincide*.)

Video

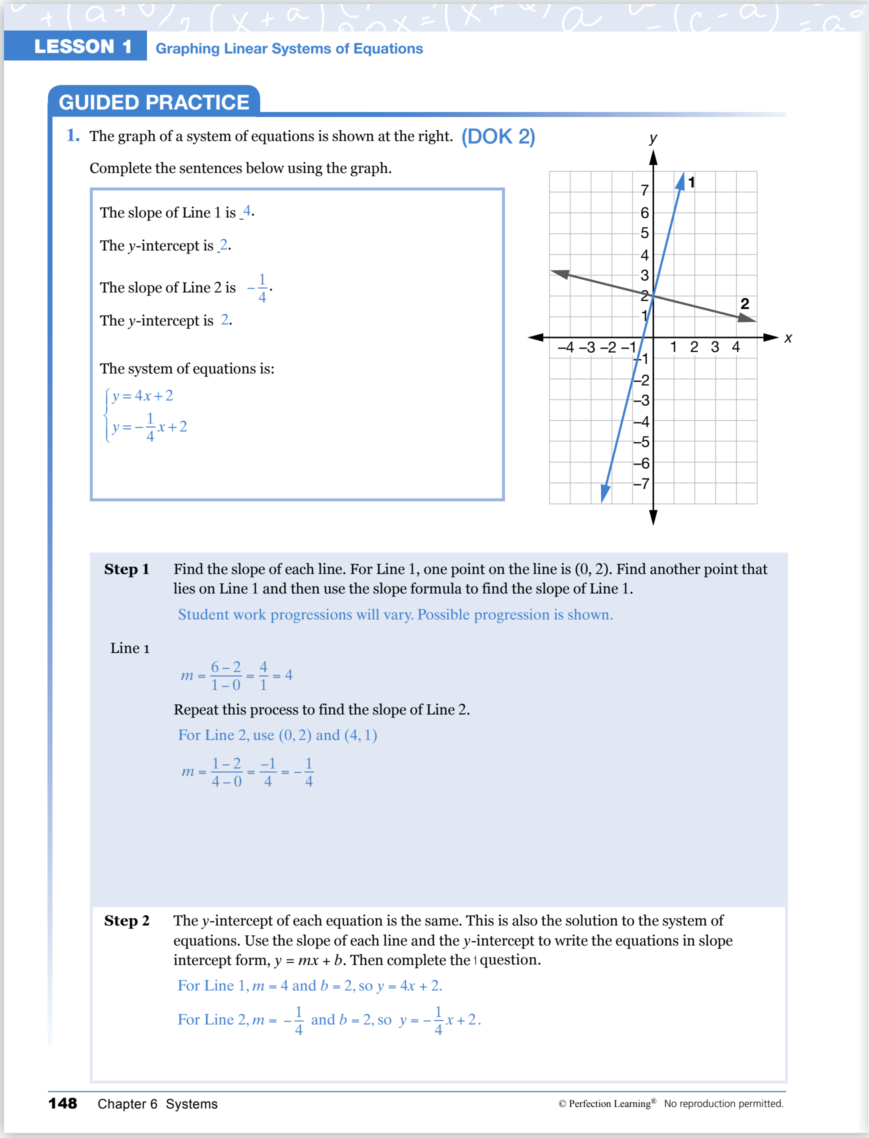
Estimate the Scale of a Graph

This remedial video will strengthen students' graphing skills by outlining the guidelines for proper scale selection when creating a graph (Length: 4:14)

https://www.youtube.com/watch?v=PgNxwOpx4NI

LESSON: GUIDED PRACTICE

- Each problem has a clearly stated purpose and stepped-out support.
- Scaffolded practice provides opportunities for small group and peer-to-peer discussions.
- Remediation activities provide reteaching and reinforcement opportunities.
- All guided practice activities include DOK levels.



GUIDED PRACTICE

1. The graph of a system of equations is shown at the right. (DOK 2)

Complete the sentences below using the graph.

The slope of Line 1 is 4.

The y-intercept is 2.

The slope of Line 2 is $-\frac{1}{4}$.

The y-intercept is 2.

The system of equations is:

$$\begin{cases} y = 4x + 2 \\ y = -\frac{1}{4}x + 2 \end{cases}$$

Step 1 Find the slope of each line. For Line 1, one point on the line is (0, 2). Find another point that lies on Line 1 and then use the slope formula to find the slope of Line 1.

Student work progressions will vary. Possible progression is shown.

Line 1

$$m = \frac{6-2}{1-0} = \frac{4}{1} = 4$$

Repeat this process to find the slope of Line 2.

For Line 2, use (0, 2) and (4, 1)

$$m = \frac{1-2}{4-0} = \frac{-1}{4} = -\frac{1}{4}$$

Step 2 The y-intercept of each equation is the same. This is also the solution to the system of equations. Use the slope of each line and the y-intercept to write the equations in slope intercept form, $y = mx + b$. Then complete the question.

For Line 1, $m = 4$ and $b = 2$, so $y = 4x + 2$.

For Line 2, $m = -\frac{1}{4}$ and $b = 2$, so $y = -\frac{1}{4}x + 2$.

GUIDED PRACTICE

Question 2 Remediation: Task Cards

Purpose

In this activity, students solidify their knowledge of solving and interpreting the solutions of systems of equations by graphing.

Implementation

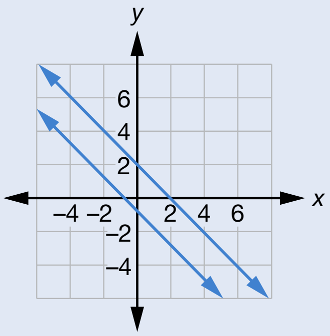
- Prior to the task, create the cards as shown below. You can also display them using projection equipment.
- Divide the class into 6 groups. Ask each group to select a card and solve the question or equation that appears.
- Select one member of each group to explain the solution.

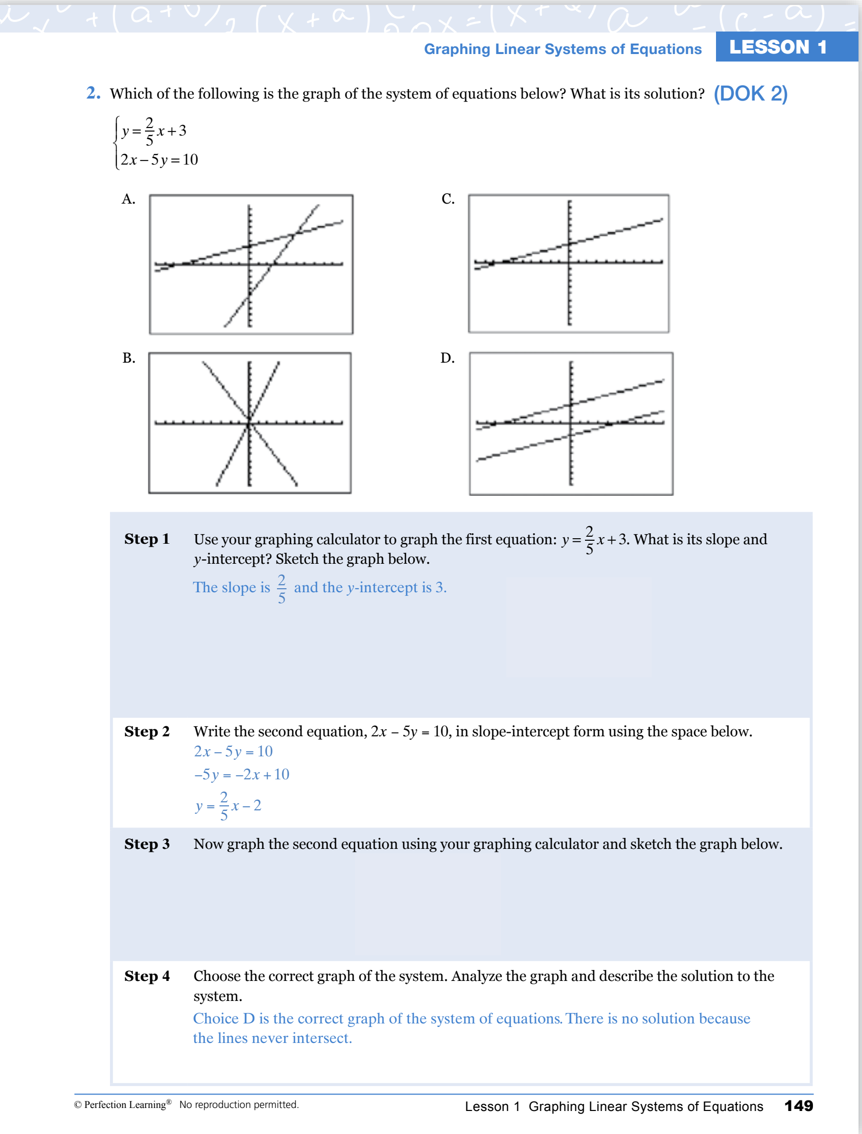
1. What form of linear equation makes it easiest to determine the number of solutions to a system of equations without graphing? Explain.

2. What is the solution to this system?

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

3. What is the solution to the system of equations graphed below? Explain.





2. Which of the following is the graph of the system of equations below? What is its solution? (DOK 2)

$$\begin{cases} y = \frac{2}{5}x + 3 \\ 2x - 5y = 10 \end{cases}$$

A. C.

B. D.

Step 1 Use your graphing calculator to graph the first equation: $y = \frac{2}{5}x + 3$. What is its slope and y-intercept? Sketch the graph below.

The slope is $\frac{2}{5}$ and the y-intercept is 3.

Step 2 Write the second equation, $2x - 5y = 10$, in slope-intercept form using the space below.

$2x - 5y = 10$

$-5y = -2x + 10$

$y = \frac{2}{5}x - 2$

Step 3 Now graph the second equation using your graphing calculator and sketch the graph below.

Step 4 Choose the correct graph of the system. Analyze the graph and describe the solution to the system.

Choice D is the correct graph of the system of equations. There is no solution because the lines never intersect.

Solutions:

1. Slope-intercept form. This is easiest because I can compare the slopes and intercepts to determine if the lines are parallel, coinciding, or intersecting (at a single point).
2. (–4, –6)
3. There is no solution because the lines are parallel.
4. There are infinitely many solutions to this system. For two linear equations to intersect more than once, they must be coinciding lines.
5. These lines are coinciding and there are infinitely many solutions for this system.
6. Intersection; student sketches will vary.

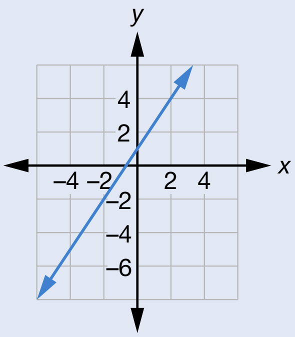
ELL

For Step 4, provide the following sentence frames to help students respond to the question.

- *The system has lines that _____.* (If necessary, provide the following options for completing the sentence frame: *intersect / are parallel / coincide*.)
- *This means that the lines _____.*

4. Suppose that a graph shows two lines that intersect at more than one point. What is the solution to the system? Explain.

5. The following graph represents two equations. What does it indicate?



6. The solution to a system of equations is the ____________ point of the two lines in the graph. Sketch an example.

LESSON: PRACTICE

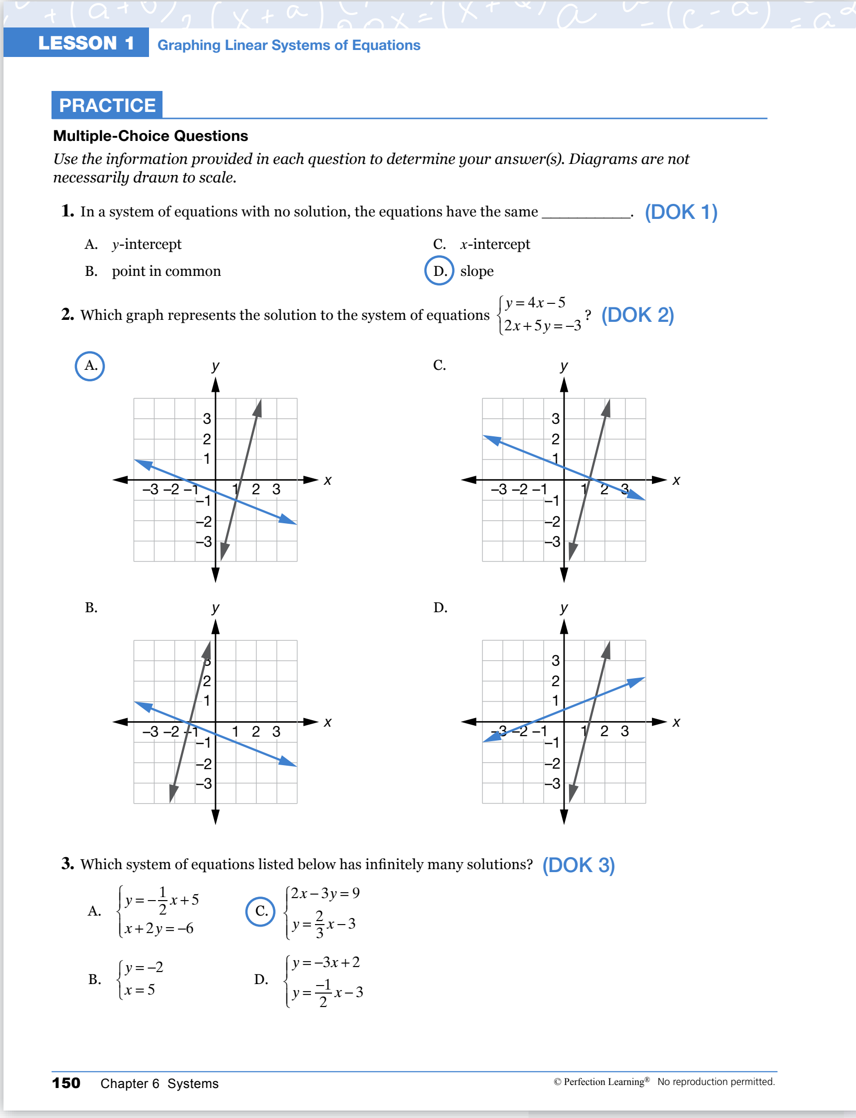
- Practice activities cover a range of DOK levels.
- QR codes link to instructional videos supporting the assignment.
- Full solution explanations are provided at point of use.

PRACTICE

1. Two lines will not intersect if they have the same slope.

2. The graph of $y = 4x - 5$ has a y-intercept of -5 and a slope of 4, so eliminate answer choice B. The intercepts of $2x + 5y = -3$ are $x = -\frac{3}{2}$ and $y = -\frac{3}{5}$. This line is shown in choice A, which is the correct answer. The solution of the system is $(1, -1)$.

3. Lines that have infinitely many solutions coincide. Convert each set of systems to slope-intercept form, and compare the equations to see which have the same equation listed twice. Choice A contains parallel lines, and you can eliminate answer choice B, as these are horizontal and vertical lines. Moving to choice C; converting the first given equation to slope-intercept form reveals that this is the correct answer.



LESSON 1 Graphing Linear Systems of Equations

PRACTICE

Multiple-Choice Questions

Use the information provided in each question to determine your answer(s). Diagrams are not necessarily drawn to scale.

1. In a system of equations with no solution, the equations have the same ___________. (DOK 1)

A. y-intercept
B. point in common
C. x-intercept
[✓ D.] slope

2. Which graph represents the solution to the system of equations $\begin{cases} y = 4x - 5 \\ 2x + 5y = -3 \end{cases}$? (DOK 2)

[✓ A.]
B.
C.
D.

3. Which system of equations listed below has infinitely many solutions? (DOK 3)

A. $\begin{cases} y = -\frac{1}{2}x + 5 \\ x + 2y = -6 \end{cases}$

[✓ C.] $\begin{cases} 2x - 3y = 9 \\ y = \frac{2}{3}x - 3 \end{cases}$

B. $\begin{cases} y = -2 \\ x = 5 \end{cases}$

D. $\begin{cases} y = -3x + 2 \\ y = \frac{-1}{2}x - 3 \end{cases}$

150 Chapter 6 Systems

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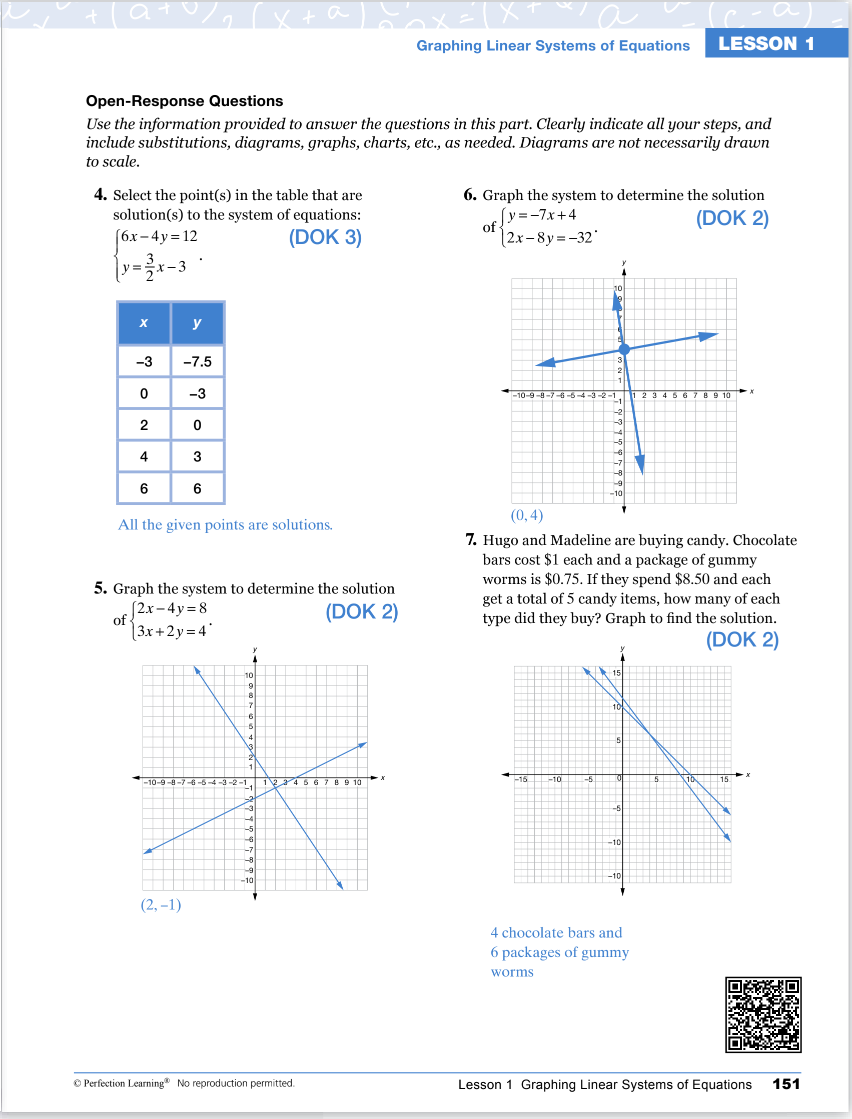


Graphing Linear Systems of Equations **LESSON 1**

Open-Response Questions

Use the information provided to answer the questions in this part. Clearly indicate all your steps, and include substitutions, diagrams, graphs, charts, etc., as needed. Diagrams are not necessarily drawn to scale.

4. Select the point(s) in the table that are solution(s) to the system of equations: $\begin{cases} 6x-4y=12 \\ y=\frac{3}{2}x-3 \end{cases}$. (DOK 3)

x	y
–3	–7.5
0	–3
2	0
4	3
6	6

All the given points are solutions.

5. Graph the system to determine the solution of $\begin{cases} 2x-4y=8 \\ 3x+2y=4 \end{cases}$. (DOK 2)

(2, –1)

6. Graph the system to determine the solution of $\begin{cases} y=-7x+4 \\ 2x-8y=-32 \end{cases}$. (DOK 2)

(0, 4)

7. Hugo and Madeline are buying candy. Chocolate bars cost \$1 each and a package of gummy worms is \$0.75. If they spend \$8.50 and each get a total of 5 candy items, how many of each type did they buy? Graph to find the solution. (DOK 2)

4 chocolate bars and 6 packages of gummy worms

Review

4. Rewrite the first equation in slope-intercept form.

$$6x - 4y = 12$$
$$-4y = -6x + 12$$
$$y = \frac{3}{2}x - 3$$

These equations are equivalent. Graph the line to see which points lay on it or algebraically determine that all the given points are on the line.

5. Rewrite the equations using slope-intercept form and then graph. Read the intersection point from the graph.

6. Rewrite the second equation in slope-intercept form, $y = \frac{1}{4}x + 4$, and then graph both lines. They intersect at the point (0, 4).

7. Define the variables as x = number of chocolate bars purchased and y = number of packages of gummy worms purchased. Now write the equations, which are $1x + 0.75y = 8.5$ and $x + y = 10$. Rewrite in slope-intercept form so you can graph them. The lines intersect at the point (4, 6), which means that they bought 4 chocolate bars and 6 packages of gummy worms.

OPEN EDUCATIONAL RESOURCES

- Save time with carefully curated open resources.
- Open resources include interactive activities, simulations, videos, and digital tools.
- Time estimates and activity synopses are provided to assist in planning and usage.

INTRODUCTION

How do you determine when to use substitution and when to use elimination to solve a system of equations?

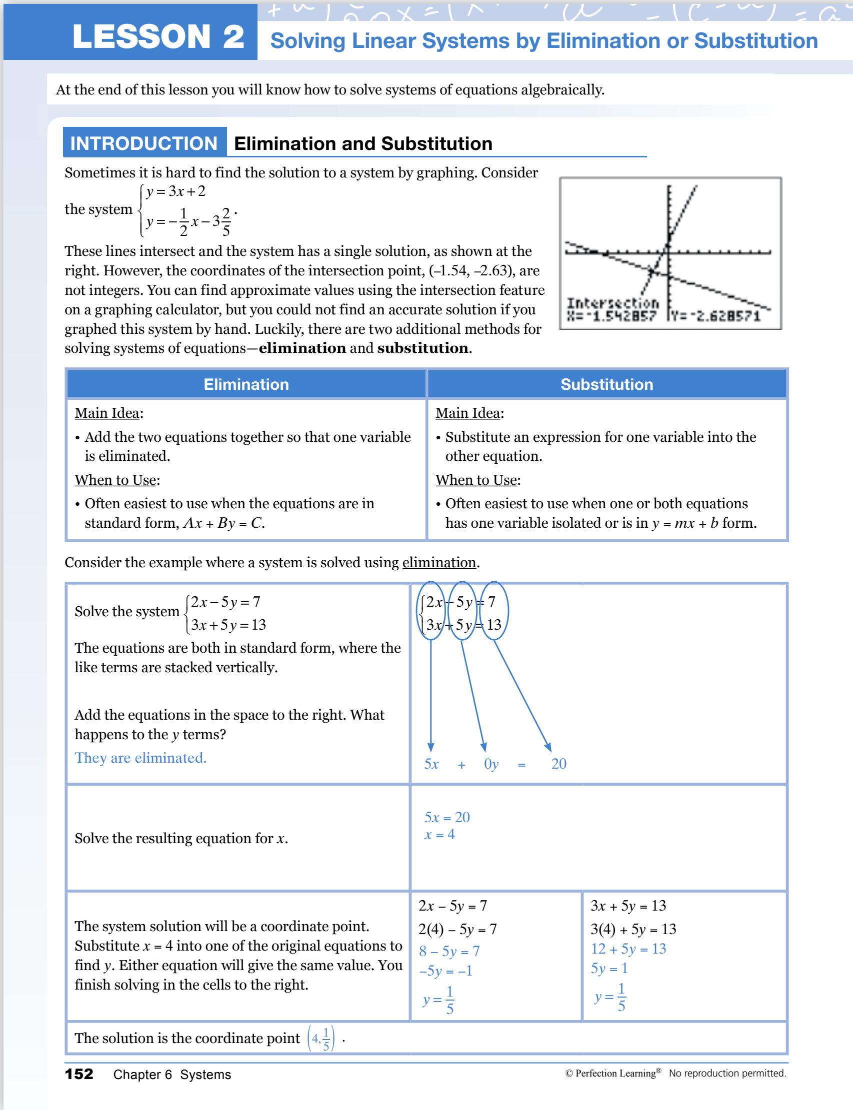
Student answers will vary. One possible answer: Examine how the system is presented. If both equations are in slope-intercept form and don't have any fractions or decimals, I would use the substitution method. I would also use this method if one of the equations was solved for x or y. If both equations were in standard form, I would use the elimination method.

How does solving by elimination compare with solving by the substitution method?

The elimination method is used when both equations are in standard form. In this method you eliminate either the x or the y variable by first adding the equations. In the substitution method, you substitute one equation into the other in order to solve for one of the variables.

Why is it sometimes important to use the elimination or substitution method rather than the graphing method to solve a system of equations?

Student answers may vary. One possible answer: It is not always easy to graph systems of equations accurately by hand. Additionally, if the solution is fractional, it can be difficult to read from the graph.



LESSON 2 Solving Linear Systems by Elimination or Substitution

At the end of this lesson you will know how to solve systems of equations algebraically.

INTRODUCTION Elimination and Substitution

Sometimes it is hard to find the solution to a system by graphing. Consider the system $\begin{cases} y = 3x + 2 \\ y = -\frac{1}{2}x - 3\frac{2}{5} \end{cases}$.

These lines intersect and the system has a single solution, as shown at the right. However, the coordinates of the intersection point, (–1.54, –2.63), are not integers. You can find approximate values using the intersection feature on a graphing calculator, but you could not find an accurate solution if you graphed this system by hand. Luckily, there are two additional methods for solving systems of equations—**elimination** and **substitution**.

Elimination	Substitution
Main Idea: • Add the two equations together so that one variable is eliminated. When to Use: • Often easiest to use when the equations are in standard form, $Ax + By = C$.	Main Idea: • Substitute an expression for one variable into the other equation. When to Use: • Often easiest to use when one or both equations has one variable isolated or is in $y = mx + b$ form.

Consider the example where a system is solved using elimination.

Solve the system $\begin{cases} 2x - 5y = 7 \\ 3x + 5y = 13 \end{cases}$ The equations are both in standard form, where the like terms are stacked vertically. Add the equations in the space to the right. What happens to the y terms? They are eliminated.	$\begin{cases} 2x - 5y = 7 \\ 3x + 5y = 13 \end{cases}$ $5x \quad + \quad 0y \quad = \quad 20$	
Solve the resulting equation for x.	$5x = 20$ $x = 4$	
The system solution will be a coordinate point. Substitute $x = 4$ into one of the original equations to find y. Either equation will give the same value. You finish solving in the cells to the right.	$2x - 5y = 7$ $2(4) - 5y = 7$ $8 - 5y = 7$ $-5y = -1$ $y = \frac{1}{5}$	$3x + 5y = 13$ $3(4) + 5y = 13$ $12 + 5y = 13$ $5y = 1$ $y = \frac{1}{5}$
The solution is the coordinate point $\left(4, \frac{1}{5}\right)$.		

152 Chapter 6 Systems

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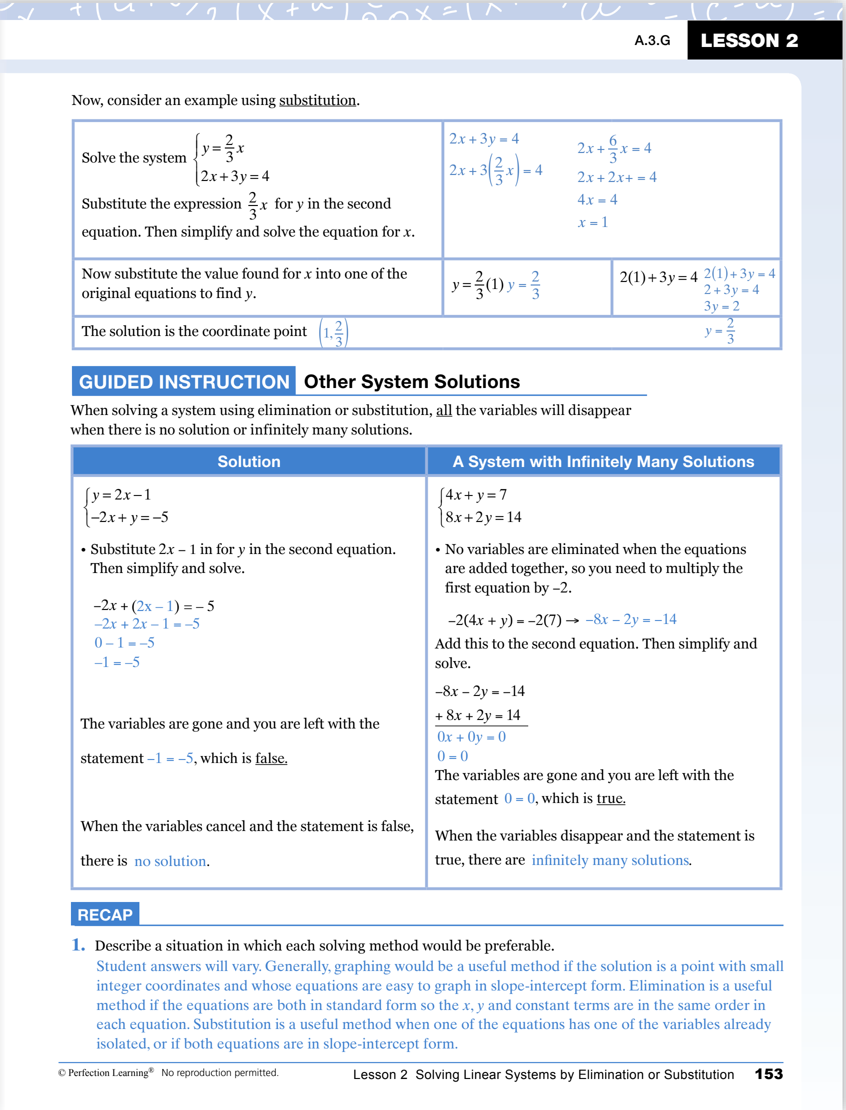
EXTENSION ACTIVITIES

Activity

Solving Linear Systems Algebraically

In this activity, students will algebraically solve linear systems of equations. If there is one ordered pair solution, they will then drag the point to the intersection on the graph. (Approximately 20 minutes)

https://www.geogebra.org/m/NHYqDPnS



A.3.G **LESSON 2**

Now, consider an example using substitution.

Solve the system $\begin{cases} y=\frac{2}{3}x \\ 2x+3y=4 \end{cases}$ Substitute the expression $\frac{2}{3}x$ for y in the second equation. Then simplify and solve the equation for x.	$2x+3y=4$ $2x+3\left(\frac{2}{3}x\right)=4$	$2x+\frac{6}{3}x=4$ $2x+2x+=4$ $4x=4$ $x=1$
Now substitute the value found for x into one of the original equations to find y.	$y=\frac{2}{3}(1)$ $y=\frac{2}{3}$	$2(1)+3y=4$ $2(1)+3y=4$ $2+3y=4$ $3y=2$
The solution is the coordinate point $\left(1,\frac{2}{3}\right)$		$y=\frac{2}{3}$

GUIDED INSTRUCTION Other System Solutions

When solving a system using elimination or substitution, all the variables will disappear when there is no solution or infinitely many solutions.

Solution	A System with Infinitely Many Solutions
$\begin{cases} y=2x-1 \\ -2x+y=-5 \end{cases}$	$\begin{cases} 4x+y=7 \\ 8x+2y=14 \end{cases}$
• Substitute $2x-1$ in for y in the second equation. Then simplify and solve.	• No variables are eliminated when the equations are added together, so you need to multiply the first equation by –2.
$-2x+(2x-1)=-5$ $-2x+2x-1=-5$ $0-1=-5$ $-1=-5$	$-2(4x+y)=-2(7) \rightarrow -8x-2y=-14$ Add this to the second equation. Then simplify and solve. $-8x-2y=-14$ $+\ 8x+2y=14$ $0x+0y=0$ $0=0$
The variables are gone and you are left with the statement $-1=-5$, which is false.	The variables are gone and you are left with the statement $0=0$, which is true.
When the variables cancel and the statement is false, there is no solution.	When the variables disappear and the statement is true, there are infinitely many solutions.

RECAP

1. Describe a situation in which each solving method would be preferable.
   Student answers will vary. Generally, graphing would be a useful method if the solution is a point with small integer coordinates and whose equations are easy to graph in slope-intercept form. Elimination is a useful method if the equations are both in standard form so the x, y and constant terms are in the same order in each equation. Substitution is a useful method when one of the equations has one of the variables already isolated, or if both equations are in slope-intercept form.

Lesson 2 Solving Linear Systems by Elimination or Substitution **153**

Instruction

ELL VOCABULARY

- Ask students to record the following academic vocabulary and definitions in their Vocabulary Notebook: *additional** (another), *stacked* (placed on top of each other), *either* (one or another), *neither* (not one or the other), *description* (a statement/sentence that tells what something is like), *paired* (joined in groups of two), *individually* (one at a time, alone), *exact* (fully or completely accurate, correct).

ELL

Provide the following sentence frames to help students respond to the RECAP question.

Beginning/Intermediate:

- *Graphing is better when* ____.
- *Elimination is better when* ____.
- *Substitution is better when* ____.

Video

Solving Systems of Equations Using Elimination By Addition

This video explains how to solve systems of linear equations using the elimination method. (Length: 9:59)

https://www.youtube.com/watch?v=ej25myhYcSg

VISUALIZATION AND MODELING

- Modeling and visualization activities help students deepen understanding.
- Comparing models promotes discovery and stimulates active discourse.

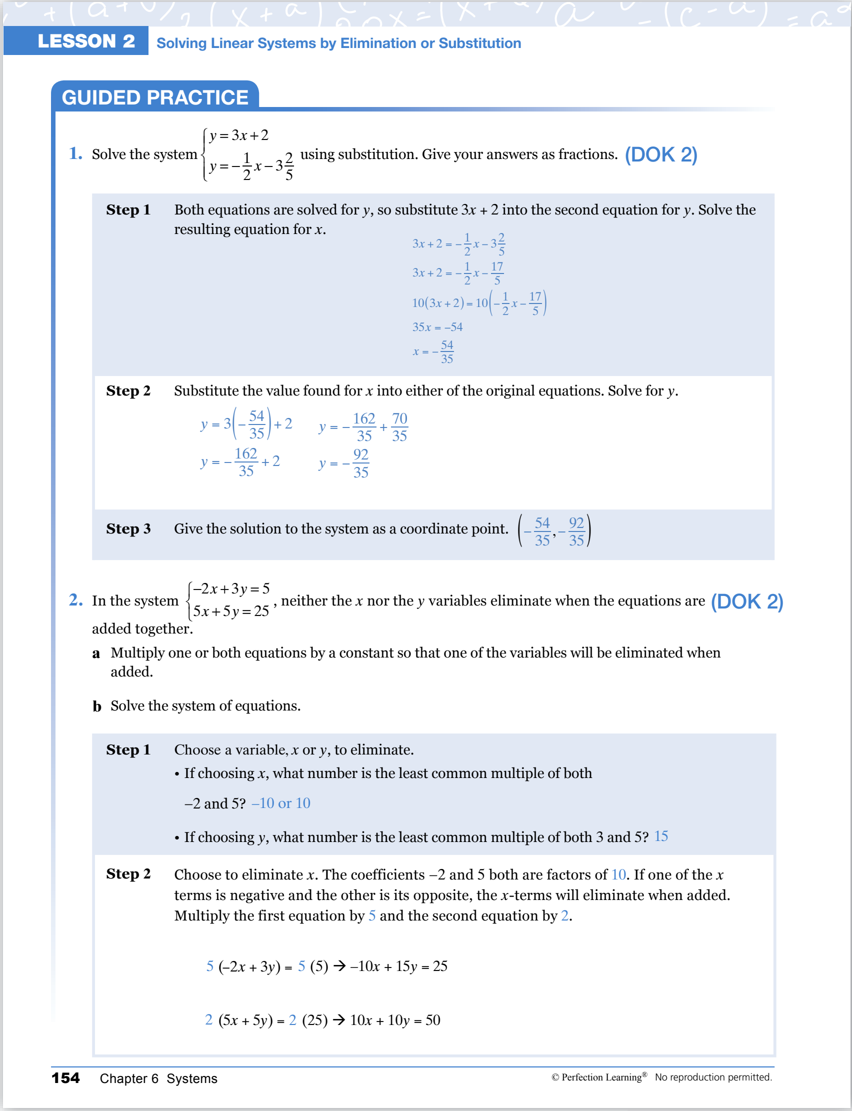
Question 2 Remediation: Table Activity

Purpose

This activity gives students more practice with solving algebraically.

Implementation

- Copy the table below, without answers, onto the board or display using projection equipment with the answers covered.
- Have the students complete the chart individually or in pairs, placing a check mark in the column "Elimination" or "Substitution" to show which method would be best for solving the given system.
- Students can solve the systems independently or you can lead the class. Discuss why elimination or substitution is preferable.



LESSON 2 Solving Linear Systems by Elimination or Substitution

GUIDED PRACTICE

1. Solve the system $\begin{cases} y = 3x + 2 \\ y = -\frac{1}{2}x - 3\frac{2}{5} \end{cases}$ using substitution. Give your answers as fractions. (DOK 2)

Step 1 Both equations are solved for y, so substitute $3x + 2$ into the second equation for y. Solve the resulting equation for x.

$$3x + 2 = -\frac{1}{2}x - 3\frac{2}{5}$$
$$3x + 2 = -\frac{1}{2}x - \frac{17}{5}$$
$$10(3x + 2) = 10\left(-\frac{1}{2}x - \frac{17}{5}\right)$$
$$35x = -54$$
$$x = -\frac{54}{35}$$

Step 2 Substitute the value found for x into either of the original equations. Solve for y.

$$y = 3\left(-\frac{54}{35}\right) + 2 \qquad y = -\frac{162}{35} + \frac{70}{35}$$
$$y = -\frac{162}{35} + 2 \qquad y = -\frac{92}{35}$$

Step 3 Give the solution to the system as a coordinate point. $\left(-\frac{54}{35}, -\frac{92}{35}\right)$

2. In the system $\begin{cases} -2x + 3y = 5 \\ 5x + 5y = 25 \end{cases}$, neither the x nor the y variables eliminate when the equations are added together. (DOK 2)

a Multiply one or both equations by a constant so that one of the variables will be eliminated when added.

b Solve the system of equations.

Step 1 Choose a variable, x or y, to eliminate.

- If choosing x, what number is the least common multiple of both

  –2 and 5? –10 or 10

- If choosing y, what number is the least common multiple of both 3 and 5? 15

Step 2 Choose to eliminate x. The coefficients –2 and 5 both are factors of 10. If one of the x terms is negative and the other is its opposite, the x-terms will eliminate when added. Multiply the first equation by 5 and the second equation by 2.

$$5\ (-2x + 3y) = 5\ (5) \rightarrow -10x + 15y = 25$$

$$2\ (5x + 5y) = 2\ (25) \rightarrow 10x + 10y = 50$$

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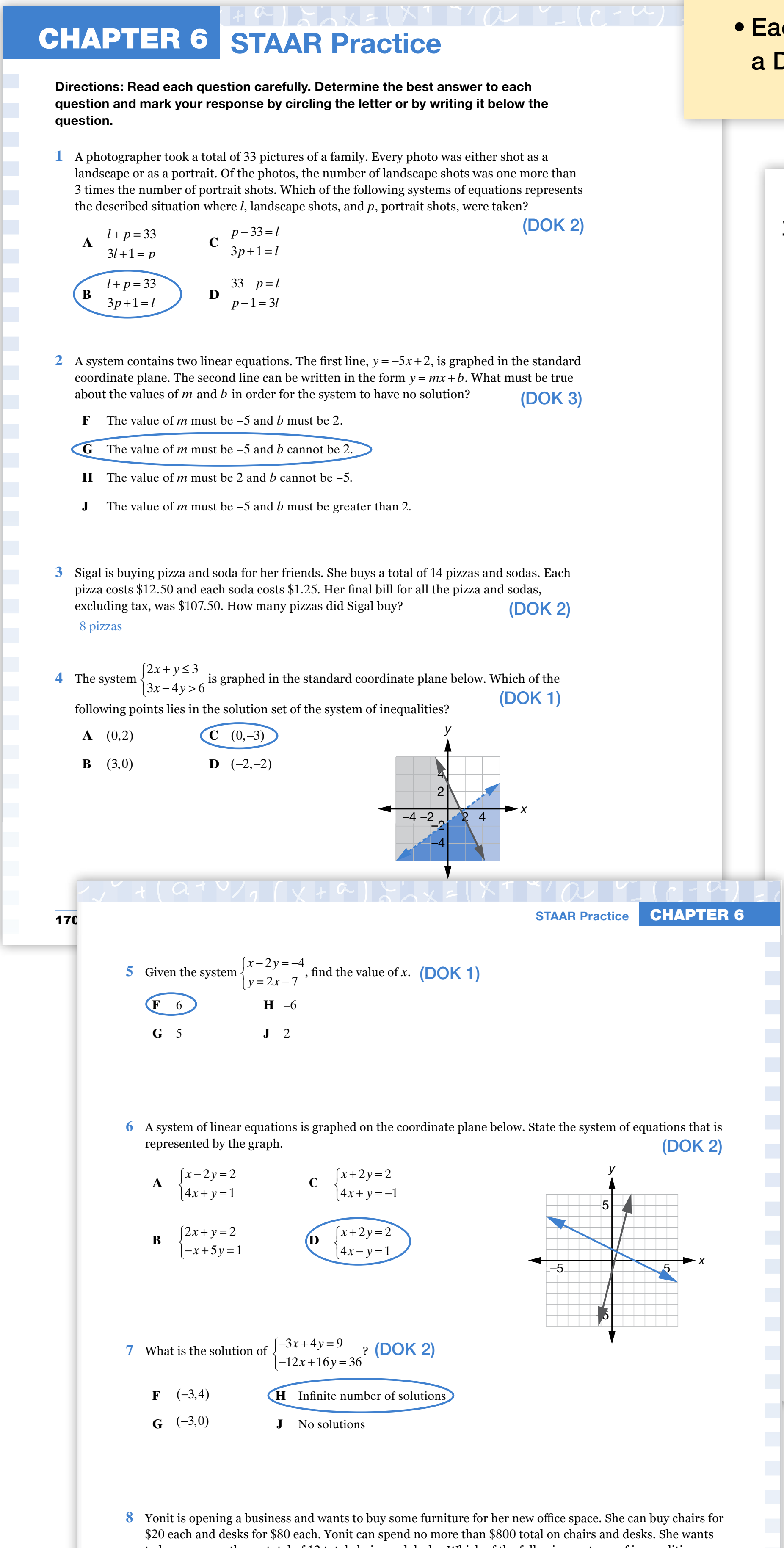
System	Elimination	Substitution	Solution
$\begin{cases} 2x + 3y = 12 \\ 2x - 3y = -6 \end{cases}$	✓		$\left(\frac{3}{2}, 3\right)$
$\begin{cases} 6x - 2y = 14 \\ y = -\frac{1}{2}x \end{cases}$		✓	$(2, -1)$
$\begin{cases} 5x + 3y = 14 \\ 3x - 3y = 18 \end{cases}$	✓		$(4, -2)$
$\begin{cases} 4x - 3y = 19 \\ 5x + 3y = 17 \end{cases}$	✓		$(4, -1)$

STAAR PRACTICE

- Each chapter concludes with STAAR exam practice.
- Each chapter test item is tagged with a DOK level.



CHAPTER 6 STAAR Practice

Directions: Read each question carefully. Determine the best answer to each question and mark your response by circling the letter or by writing it below the question.

1 A photographer took a total of 33 pictures of a family. Every photo was either shot as a landscape or as a portrait. Of the photos, the number of landscape shots was one more than 3 times the number of portrait shots. Which of the following systems of equations represents the described situation where *l*, landscape shots, and *p*, portrait shots, were taken? (DOK 2)

A $l+p=33$, $3l+1=p$ **C** $p-33=l$, $3p+1=l$

[✓ **B** $l+p=33$, $3p+1=l$] **D** $33-p=l$, $p-1=3l$

2 A system contains two linear equations. The first line, $y=-5x+2$, is graphed in the standard coordinate plane. The second line can be written in the form $y=mx+b$. What must be true about the values of m and b in order for the system to have no solution? (DOK 3)

F The value of m must be -5 and b must be 2.

[✓ **G** The value of m must be -5 and b cannot be 2.]

H The value of m must be 2 and b cannot be -5.

J The value of m must be -5 and b must be greater than 2.

3 Sigal is buying pizza and soda for her friends. She buys a total of 14 pizzas and sodas. Each pizza costs \$12.50 and each soda costs \$1.25. Her final bill for all the pizza and sodas, excluding tax, was \$107.50. How many pizzas did Sigal buy? (DOK 2)

8 pizzas

4 The system $\begin{cases}2x+y\le 3\\3x-4y>6\end{cases}$ is graphed in the standard coordinate plane below. Which of the following points lies in the solution set of the system of inequalities? (DOK 1)

A (0,2) [✓ **C** (0,–3)]

B (3,0) **D** (–2,–2)

170

STAAR Practice CHAPTER 6

5 Given the system $\begin{cases}x-2y=-4\\y=2x-7\end{cases}$, find the value of x. (DOK 1)

[✓ **F** 6] **H** –6

G 5 **J** 2

6 A system of linear equations is graphed on the coordinate plane below. State the system of equations that is represented by the graph. (DOK 2)

A $\begin{cases}x-2y=2\\4x+y=1\end{cases}$ **C** $\begin{cases}x+2y=2\\4x+y=-1\end{cases}$

B $\begin{cases}2x+y=2\\-x+5y=1\end{cases}$ [✓ **D** $\begin{cases}x+2y=2\\4x-y=1\end{cases}$]

7 What is the solution of $\begin{cases}-3x+4y=9\\-12x+16y=36\end{cases}$? (DOK 2)

F (–3,4) [✓ **H** Infinite number of solutions]

G (–3,0) **J** No solutions

8 Yonit is opening a business and wants to buy some furniture for her new office space. She can buy chairs for \$20 each and desks for \$80 each. Yonit can spend no more than \$800 total on chairs and desks. She wants

STAAR PRACTICE

1. The photographer took a total of 33 pictures. The pictures were either landscape or portrait. Represent this using the equation $l + p = 33$. Next, consider the sentence, "The number of landscape shots was one more than 3 times the number of portrait shots." Represent this sentence using the equation $l = 3p + 1$. The correct answer is B.

2. For a linear system of equations to have no solution, the two lines must have the same slope. The slope of the first line is –5; therefore, the value of m must be –5. Eliminate answer choice H. If the y-intercepts are also the same, then it is the same line and there are infinite solutions. Eliminate answer choice F. In this case, the y-intercept for the second line, cannot be 2. It can be any other value. The correct answer is G.

3. Write a system of linear equations to represent this scenario. Let x be the number of pizzas and let y be the number of sodas Sigal buys. She purchases a total of 14 pizza and sodas, so $x + y = 14$. Each pizza costs \$12.50 and each soda costs \$1.25. Sigal spends a total of \$107.50. This gives the equation $12.50x + 1.25y = 107.50$. Solve the system using any method. By substitution,

   $y = 14 - x$

   $12.50x + 1.25(14 - x) = 107.50$

   $12.50x + 17.50 - 1.25x = 107.50$

   $11.25x = 90$

   $x = 8$

TEXAS ALGEBRA 1 DIGITAL

Student Application

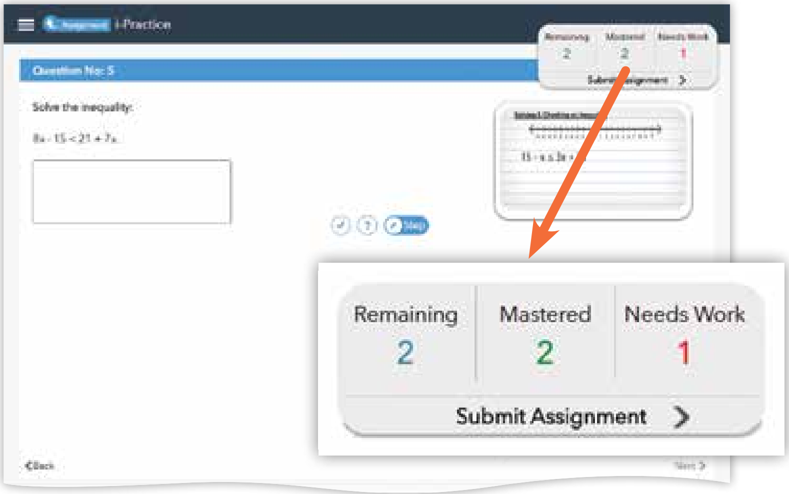
Driven by the powerful *Math*^{X} personalized practice and assessment system, the student application provides a full range of assignments and practice aligned with *Texas Essential Knowledge and Skills Algebra 1,* including

- *i-Practice* personalized assignments
- online homework assignments
- quizzes and chapter tests
- diagnostic tests
- STAAR Exam practice

i-PRACTICE PERSONALIZED PRACTICE

Each *i-Practice* assignment can be customized to small groups or individual students. By focusing on specific skill areas, students can practice their way to success.

- Incorrect answers automatically generate new problems for students to attempt.
- A scoring counter shows progress on the assignment.
- Guided practice provides point-of-use help.
- Students have the option to stop and return to the assignment at any time.



i-Practice

Question No: 5

Solve the inequality:

$8a - 15 < 21 + 7a$

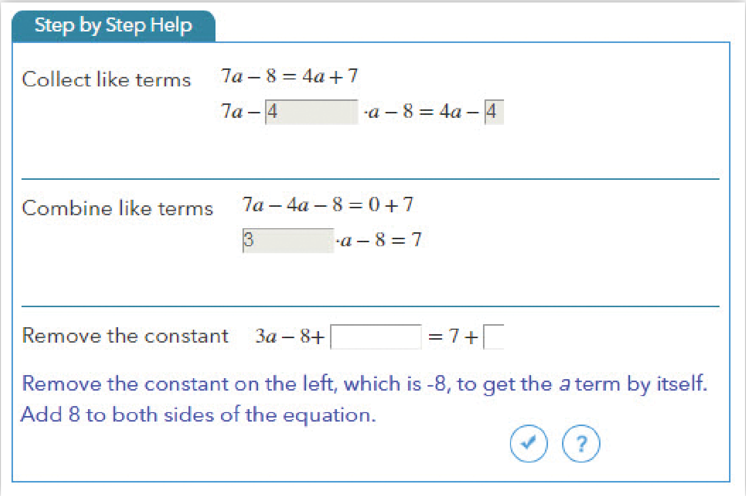
Remaining	Mastered	Needs Work
2	2	1

Submit Assignment

GUIDED PRACTICE ASSISTANCE

For *i-Practice* and homework assignments, students have a wealth of help accessible next to the problem. By providing multiple help options, the program addresses different learning styles and ability levels.

- Video provides step-by-step instruction for a similar problem.
- Step-by-Step Help guides students through each step of a multi-step problem.
- A help button gives problem hints and tips.
- Smart feedback responds to students' incorrect answers with suggestions.



Step by Step Help

Collect like terms $7a - 8 = 4a + 7$

$7a - \boxed{4} \cdot a - 8 = 4a - \boxed{4}$

Combine like terms $7a - 4a - 8 = 0 + 7$

$\boxed{3} \cdot a - 8 = 7$

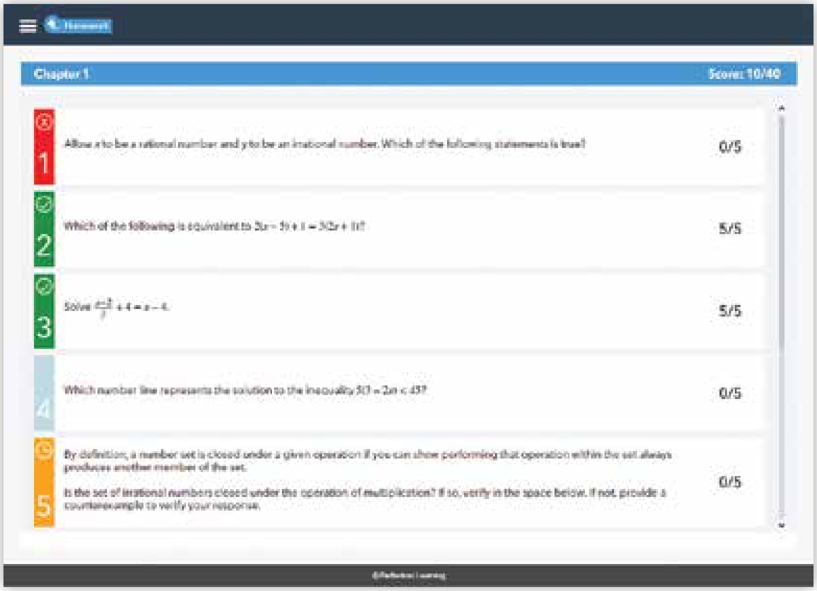
Remove the constant $3a - 8 + \boxed{} = 7 + \boxed{}$

Remove the constant on the left, which is -8, to get the *a* term by itself. Add 8 to both sides of the equation.

ONLINE HOMEWORK, QUIZZES, AND TESTS

Assignments allow students the flexibility to answer questions in any order and give immediate feedback once an answer is submitted.

- Homework parameters set by the teacher allow multiple tries.
- Help functions (videos, hints/tips, step-by-step) appear for homework.
- Quizzes and tests eliminate the help functions automatically. Tests allow only one try. Quizzes allow for one or more tries, as set by the teacher.
- Assignment due dates, grades, and teacher communications are all easily visible from the student dashboard.



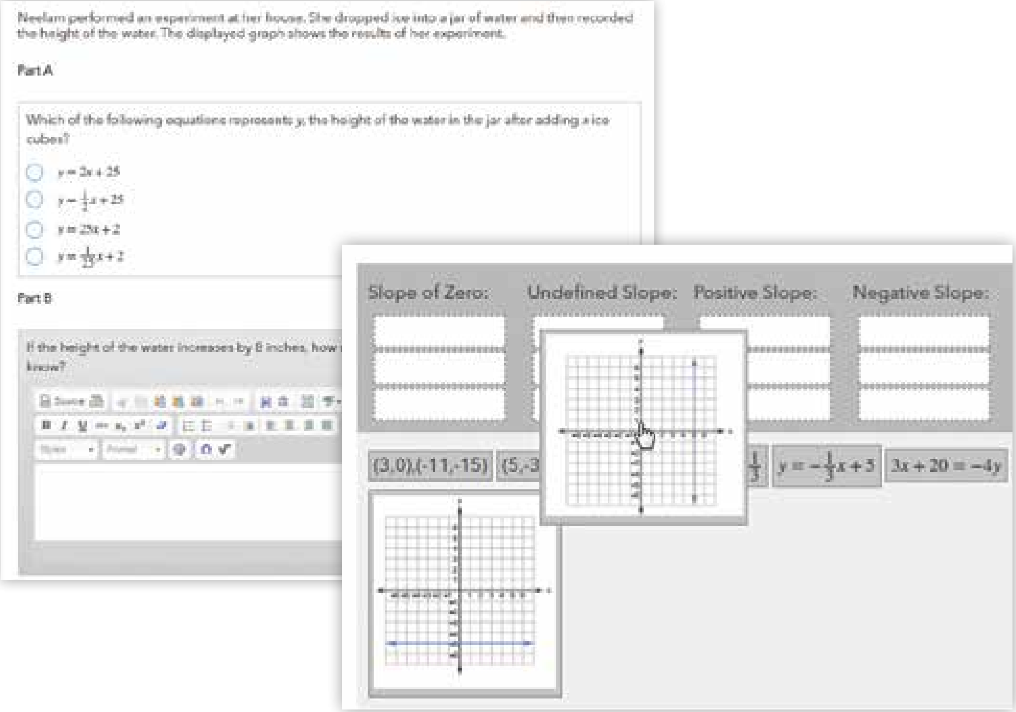
Chapter 1 Score: 10/40

1	Allow x to be a rational number and y to be an irrational number. Which of the following statements is true?	0/5
2	Which of the following is equivalent to $3x - 5(x + 1) = 3(2x + 1)$?	5/5
3	Solve $\frac{x+3}{7} + 4 = x - 4$.	5/5
4	Which number line represents the solution to the inequality $5(3 - 2x) < 45$?	0/5
5	By definition, a number set is closed under a given operation if you can show performing that operation within the set always produces another member of the set. Is the set of irrational numbers closed under the operation of multiplication? If so, verify in the space below. If not, provide a counterexample to verify your response.	0/5

TECHNOLOGY-ENHANCED ITEMS

Research shows that content mastery requires the ability to respond to a wide range of problem formats. Problem types include

- multi-part problems
- equation input
- graphing
- drag and drop
- multi-select
- open response
- *and much more...*



Neelam performed an experiment at her house. She dropped ice into a jar of water and then recorded the height of the water. The displayed graph shows the results of her experiment.

Part A

Which of the following equations represents y, the height of the water in the jar after adding x ice cubes?

○ $y = 2x + 25$

○ $y = \frac{1}{2}x + 25$

○ $y = 25x + 2$

○ $y = \frac{1}{25}x + 2$

Part B

If the height of the water increases by 8 inches, how

know?

TEXAS ALGEBRA 1 DIGITAL

Teacher Application

Driven by the powerful *Math*^{X} personalized practice and assessment system, the teacher application provides a full range of assignment, reporting, and grading functions. Comprehensive alignment with the *Texas Essential Knowledge and Skills Algebra 1* standards provides teachers the ability to monitor student progress in real time and customize assignments based on performance.

PRE-BUILT ASSIGNMENTS

Each assignment is aligned with the *Texas Essentials Knowledge and Skills Algebra 1* lessons. Pre-built assignments include

- *i-Practice*, homework, quizzes, chapter tests, STAAR model exams, and diagnostic tests
- one-click due date assignment
- standards covered by each lesson with rollover explanations for the standards
- easy assignment modification functionality

Math^X Algebra 1 TEKS

Assignments for Algebra I Period 3

Assignment	Assigned	Due
Algebra 1 Standards Test	Unassigned	
Chapter 1 Pre-Assessment	Unassigned	
1.1 Writing and Translating Algebraic Expressions	Unassigned	
1.2 Translating and Writing Formulas	Unassigned	
1.3 Simple Algebraic Inequalities	Unassigned	
1.4 Evaluating Algebraic Expressions and Formulas	Unassigned	
1.5 Algebraic Properties	Unassigned	
1.6 Exponents	Unassigned	
1.7 Roots and Radicals	Unassigned	
1.8 Scientific Notation,		

CUSTOMIZABLE ASSIGNMENTS AND TESTS

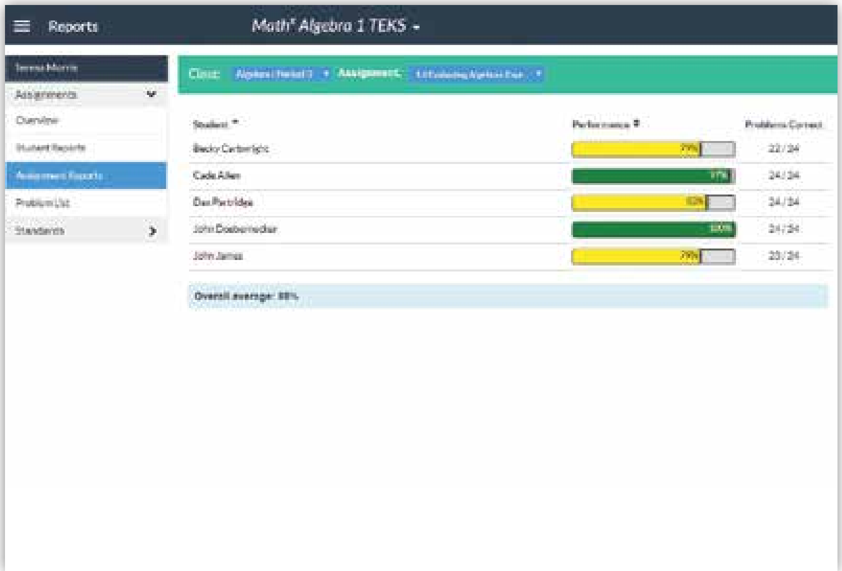
Modify the pre-built assignments or create your own.

- Choose from thousands of items by standard or by lesson.
- Differentiate assignments for small groups or individuals.
- Create unique assignments for each student using “vary the parameter” technology.
- Print assignments for pencil and paper exercises.

REAL-TIME PROGRESS MONITORING

Grade book functions allow teachers to monitor student progress in real time.

- assignments are automatically graded at time of submission
- at-a-glance look at student and class performance across homework, quizzes, and tests
- one-click access to individual student performance
- manage due dates and late assignments for individual students
- add/drop grades
- export function for district grade books



Student	Performance	Problems Correct
Becky Cartwright	79%	22 / 24
Cade Allen	97%	24 / 24
Dax Partridge	82%	24 / 24
John Doebernedar	100%	24 / 24
John James	79%	23 / 24

Overall average: 88%

EXTENSIVE REPORTING CAPABILITY

Reporting and drill-down functions allow teachers to

- assess class and student performance by standard or lesson
- identify students and topics for reteaching and remediation
- group students by ability and performance levels
- evaluate item-level performance by class and by student

Standard	Performance	Problems	Average
2A	7 15	5	69%
2B	4 18	1	82%
2C	4 18	2	82%
2D	10 2 10	12	75%
3A	4 17	7	83%
3C	22	1	100%
	4 14 4	3	75%
	6 6 10	1	0%
	9 5 8	6	66%

Average 77%
Excelling 10 students
Passing 6 students
Failing 6 students

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS

Algebra 1

The ***Texas Essential Knowledge and Skills*** program provides the foundation for Algebra 1 success. Designed specifically for Texas, each standards-based lesson helps students identify areas of weakness, receive targeted instructional support and practice, and prepare for the STAAR Exam.

Students engage in active discourse to build math literacy through

- discovery-based learning
- direct instruction
- personalized practice
- real-world application, extension activities, and authentic STAAR practice

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For more information on the Texas Essential Knowledge and Skills program, visit perfectionlearning.com/tx-algebra-1

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