



NEW YORK

NEXT GENERATION MATHEMATICS

Algebra 1

Program Overview and Sampler



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Algebra 1

Preparing for College and Career

The **Next Generation Mathematics** 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 New York Regents Examination. 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
<ul style="list-style-type: none">• Guided Instruction• Guided Practice• Connect to Testing	<ul style="list-style-type: none">• Concepts in the Real World• Extension and Interactive Activities• Authentic Regents Practice
Personalized Practice	Direct Instruction
<ul style="list-style-type: none">• <i>i-Practice</i> Personalized Assignments (Digital)• Video Model Problems (QR Codes, Digital)• Multiple Problem Help Options (Digital)	<ul style="list-style-type: none">• Lesson Introduction• Words to Know• Remediation Activities



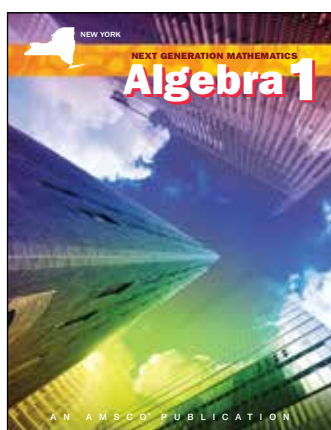
Student-Centered Approach to Algebra 1

The ***Next Generation Mathematics*** 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.

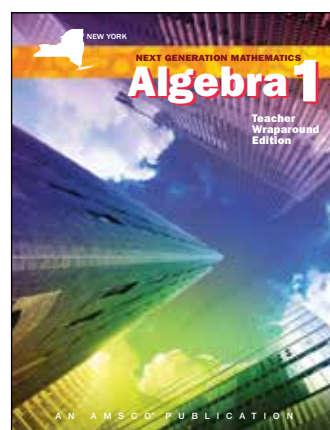
Prepare Students for Success

Designed specifically for the New York Next Generation Math standards, the curriculum ensures that students will have the knowledge and skills that matter for both the Regents examination and their college and career paths.

Program Components



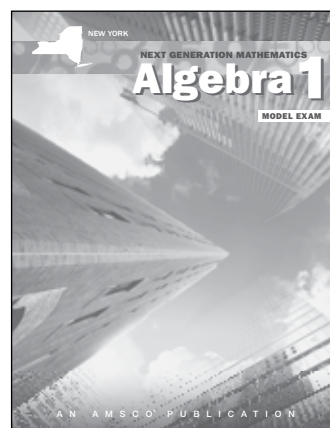
Student Worktext



Teacher Wraparound Edition



New York 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 New York Regents Examination as well as other complex tasks and projects.

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

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

C. $x - 3y = 21$

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

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 New York Regents Examination.

- Connect to Testing
- independent practice
- chapter-level and comprehensive Regents 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
- Regents practice
- technology-enhanced items (equation editor, multi-select, matching, and much more)
- multiple attempts allowed for homework and *i-Practice*
- print capability for offline assignments

The screenshot shows the i-Practice interface. At the top, there's a navigation bar with 'Assignment' and 'i-Practice'. On the right, a summary box shows 'Remaining: 5', 'Mastered: 0', and 'Needs Work: 0', with a 'Submit Assignment' button. The main area displays 'Question No: 1' with the instruction 'Solve.' and the equation $7a - 10 = 5a + 6$. Below the equation is an input field for 'a ='. To the right, a 'Step by Step Help' box shows the solution process: 'Solving equations with a variable on each side', followed by the steps: $4x = 15 - x$, $+x \quad +x$, $5x = 15$, $\frac{5x}{5} = \frac{15}{5}$, and finally $x = 3$. Below this, the 'Step by Step Help' section shows the steps for solving the equation: 'Collect like terms' ($7a - 10 = 5a + 6$), 'Combine like terms' ($7a - 5a - 10 = 0 + 6$), 'Remove the constant' ($2a - 10 + 10 = 6 + 10$), and 'Add' ($2a + 0 =$).

CLASS AND STUDENT ANALYTICS

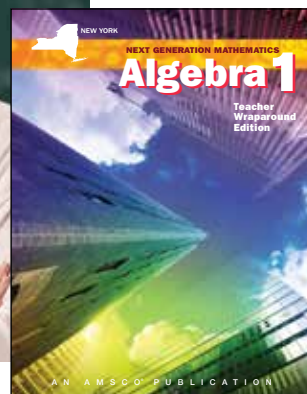
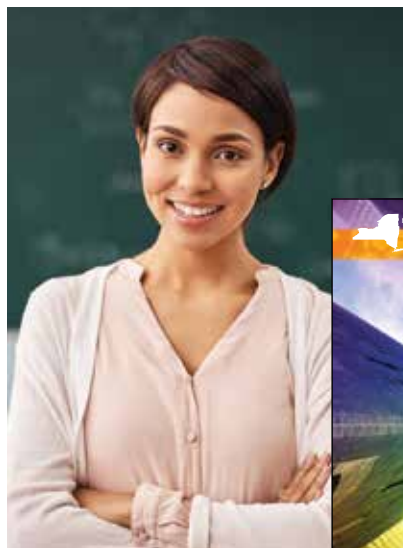
- performance measures by skill and New York Next Generation Math standard
- extensive drill down capabilities (class, student, item)
- visual highlighting of strengths and performance gaps



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 New York Regents-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-CED.A.3, A-REI.C.6a)	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-REI.C.6)	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-CED.A.3, A-REI.C.6, A-SSE.A.2, A-REI.C.5)	Teach this lesson after demonstrating all methods of solving systems of linear equations.
Lesson 4 Systems of Linear Inequalities in the xy -Plane (A-CED.A.3, A-REI.D.12)	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

- Select the point(s) in the table that are solution(s) to the system of equations: $\begin{cases} 6x - 4y = 12 \\ y = \frac{3}{2}x - 3 \end{cases}$
- 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?
- Edita and Janina are buying school supplies. Edita buys 5 notebooks and 6 binders for a total of \$25.45. Janina buys 4 notebooks and 8 binders for \$30.60. Boipelo later goes to the same store and buys 3 notebooks and 2 binders. What is his total?

x	-3	0	2	4	6
y	-7.5	-3	0	3	6

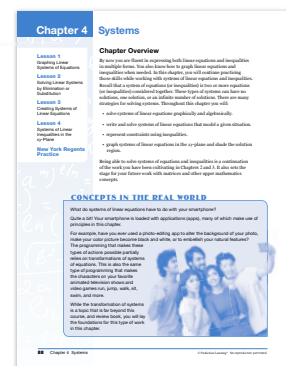
Introduction

Chapter 4 Systems

Chapter Goals:

At the end of this chapter, students will 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 equations in the xy -plane and shade the solution region.



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

(DOK 3)

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

Nieve has enough time in her schedule to work, at most, 8 hours per week. She is employed at a grocery store earning \$6 per hour and at a restaurant where she earns \$8 an hour. Nieve needs to earn at least \$40. Let x be the hours Nieve works at the grocery store and y be the hours she works at the restaurant.

- Write a system of linear inequalities to model the situation.
- Nieve believes if she works 3 hours at the grocery store and 4 hours at the restaurant, she can reach her goal. Is this true? Justify your response.

Understand It: For this problem, you must write and solve a system of two linear inequalities.

Visualize It: Once you have written the inequalities, visualize the boundary lines using their intercepts and slopes, whether they are solid or dashed, and where the shading should be.

Solve It: Start by writing the system using the framework below.

- | | |
|--|---|
| • One equality should give the relationship between the total number of hours Nieve can work at both jobs. | Inequality #1
$x + y \leq 8$ |
| • The second inequality should relate the amount of money she earns at each job to her goal. | Inequality #2
$6x + 8y \geq 40$ |
| • The final inequalities should reflect the boundary conditions of the number of hours Nieve can work. For example, can Nieve work negative hours? | Inequalities #3 and #4
$x \geq 0$ and $y \geq 0$ |

Determine whether Nieve can reach her goal of \$40 earned if she works 3 hours at the grocery store and 4 hours at the restaurant. Write your answer and justification in the space below.

Student answers will vary. One possible answer: Yes, Nieve will reach her goal. If she works three hours at the grocery store she will earn \$18, and four hours at the restaurant will earn her \$32, the sum of which is \$50. Alternatively, the point (3, 4) is contained within the shaded region; therefore, it is a part of the solution.

WORDS TO KNOW

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

CONNECT TO TESTING

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

1. Ask students to summarize the information given in the question. Why is it important to do this?

Summary:

- Nieve can work up to 8 hours per week
- Nieve earns \$6 per hour at the grocery store
- Nieve earns \$8 per hour at the restaurant
- Nieve needs to earn a minimum of \$40 per week

Student answers will vary. It is important to summarize the given information so you can define the variables and keep track of what you know.

2. Suppose that x = the number of hours Nieve works at the grocery store and y = the number of hours Nieve works at the restaurant. Sort the summarized information into two lists: what you need to write for inequality #1 and what you need for inequality #2.

What You Need to Write Inequality #1

- Nieve can work up to 8 hours per week

What You Need to Write Inequality #2

- Nieve earns \$6 per hour at the grocery store
- Nieve earns \$8 per hour at the restaurant
- Nieve needs to earn a minimum of \$40 per week

3. For inequalities #3 and #4, ask students if there are any numbers that need to be excluded from the domain of these inequalities. Then have them write these inequalities.

Student answers will vary. Generally, yes, you must exclude negative values from the domain.

4. Ask student pairs to write a plan that details how they will answer whether or not the point (3, 4) is part of the solution set.

Student plans will vary. One possible plan: Graph each of the inequalities in the system, shade, and then check to see if the point is in the overlapping shaded area. Alternatively, substitute the point into all inequalities to check if they are true.

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.

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?

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

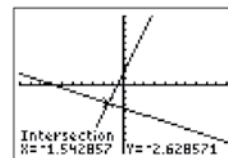
Solving Linear Systems by Elimination or Substitution

INTRODUCTION Elimination and Substitution

Sometimes it is hard to find the solution to a system by graphing. Consider

$$\begin{cases} y = 3x + 2 \\ y = -\frac{1}{2}x - 3\frac{2}{5} \end{cases}$$

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: <ul style="list-style-type: none"> Add the two equations together so that one variable is eliminated. 	Main Idea: <ul style="list-style-type: none"> Substitute an expression for one variable into the other equation.
When to Use: <ul style="list-style-type: none"> Often easiest to use when the equations are in standard form, $Ax + By = C$. 	When to Use: <ul style="list-style-type: none"> 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 $\begin{cases} 2x - 5y = 7 \\ 3x + 5y = 13 \end{cases}$	$\begin{cases} 2x - 5y = 7 \\ 3x + 5y = 13 \end{cases}$		
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.	$5x + 0y = 20$		
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.	<table> <tr> <td>$2x - 5y = 7$ $2(4) - 5y = 7$ $8 - 5y = 7$ $-5y = -1$ $y = \frac{1}{5}$</td><td>$3x + 5y = 13$ $3(4) + 5y = 13$ $12 + 5y = 13$ $5y = 1$ $y = \frac{1}{5}$</td></tr> </table>	$2x - 5y = 7$ $2(4) - 5y = 7$ $8 - 5y = 7$ $-5y = -1$ $y = \frac{1}{5}$	$3x + 5y = 13$ $3(4) + 5y = 13$ $12 + 5y = 13$ $5y = 1$ $y = \frac{1}{5}$
$2x - 5y = 7$ $2(4) - 5y = 7$ $8 - 5y = 7$ $-5y = -1$ $y = \frac{1}{5}$	$3x + 5y = 13$ $3(4) + 5y = 13$ $12 + 5y = 13$ $5y = 1$ $y = \frac{1}{5}$		
The solution is the coordinate point $(4, \frac{1}{5})$.			

EXTENSION ACTIVITIES

Activity

Solving Linear Systems Algebraically

In this activity, students will solve linear systems algebraically and then drag the solution point to the intersection, if any, of the graph. (Approximately 20 minutes)

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

LESSON: GUIDED INSTRUCTION

A-REI.C.6a

LESSON 2

Instruction

Now, consider an example using substitution.

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

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

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.

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Lesson 2 Solving Linear Systems by Elimination or Substitution 97

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

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

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

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

Question 2 Remediation: Table Activity

Purpose

This activity gives students more practice with solving by elimination.

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 or you can lead the class in solving each of them, discussing why certain methods are 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 .

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

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

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

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)

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

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

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

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

Step 3 Add the equations and solve for the variable in the space below.

$$\begin{array}{r} -10x + 15y = 25 \\ +10x + 10y = 50 \\ \hline 25y = 75 \\ y = 3 \end{array}$$

Step 4 Substitute the variable value into either original equation to solve for the other variable.

$$\begin{array}{r} -2x + 3(3) = 5 \\ -2x + 9 = 5 \\ -2x = -4 \\ x = 2 \end{array}$$

Step 5 Write the solution as a coordinate point. $(2, 3)$

3. Hamburgers cost \$1.79 and an order of fries costs \$0.99. A couple orders 5 items and spends \$7.35. The

solution to the system $\begin{cases} 1.79x + 0.99y = 7.35 \\ x + y = 5 \end{cases}$ is $(3, 2)$. Match the number in the solution with the correct description. (DOK 1)

$x = 3$ represents **Number of Hamburgers**

$y = 2$ represents **Number of Fries**

Number of Hamburgers	Cost of Hamburgers	Total Items
Number of Fries	Cost of Fries	Total Cost

Step 1 Consider what each variable means in the system. When you solve for x , what are you solving for in context of the problem? What about y ? Answer these questions below.

x represents the number of hamburgers and y represents the number of fries.

ELL VOCABULARY

- For Guided Practice #3, use images or sketches to explain the words: *hamburgers, fries*.

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.

2. Use the substitution method. Solution steps are shown.

$$2(2y + 8) - 3y = 18$$

$$4y + 16 - 3y = 18$$

$$y = 2$$

$$\text{Then } x = 2(2) + 8 = 12.$$

3. Eliminate answer choice A as the lines are parallel. Check answer choice B:

$$3x + 2\left(-\frac{3}{2}x + 4\right) = 8$$

$$8 = 8$$

A true statement results so this system has infinitely many solutions. Do the same for answer choice C:

$$-8\left(-\frac{1}{4}y + \frac{3}{4}\right) - 2y = -6$$

$$-6 = -6$$

Again, this system has infinitely many solutions.

For answer choice D,

$$4x - 6\left(\frac{2}{3}x - 3\right) = 9$$

$$18 \neq 9$$

This is a false statement, so this system has no solution and is not a correct choice.

4. Rewrite the equation $3x - 4y = 8$ in slope-intercept form: $y = \frac{3}{4}x + 2$. Any equation with the same slope but different y -intercept will have no solution when paired with it in a system.

5. Use the elimination method. Solution steps are shown.

$$2[x - y = 9] \rightarrow 2x - 2y = 18$$

$$+3x + 2y = 7 \rightarrow +3x + 2y = 7$$

$$5x = 25$$

$$x = 5$$

LESSON 2 Solving Linear Systems by Elimination or Substitution

PRACTICE

Multiple-Choice Questions

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

1. Solve $\begin{cases} y = 3x + 2 \\ y = \frac{1}{2}x - 3 \end{cases}$. (DOK 2)

A. $\left(\frac{2}{5}, -\frac{14}{5}\right)$

☒ C. $(-2, -4)$

B. $(0, -3)$

D. No solution

3. Which of the following systems has infinitely many solutions? Select all that apply. (DOK 2)

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

☒ C. $\begin{cases} x = \frac{1}{4}y + \frac{3}{4} \\ -8x - 2y = -6 \end{cases}$

☒ B. $\begin{cases} 3x + 2y = 8 \\ y = -\frac{3}{2}x + 4 \end{cases}$

D. $\begin{cases} y = \frac{2}{3}x - 3 \\ 4x - 6y = 9 \end{cases}$

2. Solve the system $\begin{cases} 2x - 3y = 18 \\ x = 2y + 8 \end{cases}$. (DOK 2)

A. Infinitely many solutions

☒ B. $(12, 2)$

C. $(2, 12)$

D. No solution

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. 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? (DOK 3)

Student answers will vary. See below.

5. Solve the system $\begin{cases} x - y = 9 \\ 3x + 2y = 7 \end{cases}$. (DOK 2)

$(5, -4)$

6. Solve the system: $\begin{cases} 4x - 5y = 10 \\ y = \frac{2}{5}x - 4 \end{cases}$. (DOK 2)

$(-5, -6)$

Solve for y .

$$5 - y = 9$$

$$y = -4$$

6. Use the substitution method. Solution steps are shown.

$$4x - 5\left(\frac{2}{5}x - 4\right) = 10$$

$$2x = -10$$

$$x = -5$$

Solve for y .

$$y = \frac{2}{5}(-5) - 5$$

$$y = -6$$

7. Suppose that each of the given equations, below, were individually placed in a system with the equation $2x + 5y = 5$. What would be the solution for each system? Match each equation with its system solution.

i. $-6x - 15y = -15$ b.

a. No solution (DOK 3)

ii. $3x - y = 16$ d.

b. Infinitely many solutions

iii. $y = -\frac{2}{5}x + 4$ a.

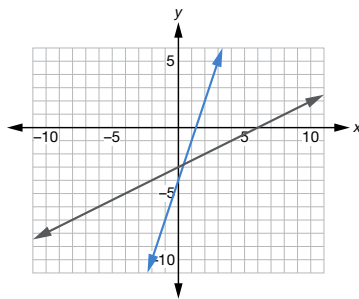
c. $(0, 1)$

iv. $3x - 4y = -4$ c.

d. $(5, -1)$

8. Find the exact coordinates of the solution to the system graphed below. Express your final coordinates as fractions. (Hint: You will need to start by finding the slope-intercept form of each line graphed.) (DOK 3)

The system is $\begin{cases} y = 3x - 4 \\ y = \frac{1}{2}x - 3 \end{cases}$; solution: $(\frac{2}{5}, -\frac{14}{5})$



9. Kweku solved the system $\begin{cases} 2x + 4y = 9 \\ -3x - 6y = 2 \end{cases}$, but made a mistake. His work is shown below. At which step did he make a mistake? What is the actual answer? (DOK 2)

Step 1: $\begin{cases} -3(2x + 4y = 9) \\ 2(-3x - 6y = 2) \end{cases}$	Step 4: $y = \frac{23}{24}$
Step 2: $\begin{cases} 6x - 12y = -27 \\ -6x - 12y = 4 \end{cases}$	$2x + 4(\frac{23}{24}) = 9$
Step 3: $-24y = -23$	$2x + \frac{23}{6} = 9$
	Step 5: $2x = \frac{31}{6}$
	$x = \frac{31}{12}$

The mistake is in Step 1. There is no solution to this system.



Substitute this value for x in either equation and solve for y :

$$y = 3\left(\frac{2}{5}\right) - 4 = \frac{-14}{5}.$$

9. If Kweku wanted to eliminate the x -variable, he should have multiplied the equations by $+3$ and $+2$, since the x terms already had opposite signs. If he had, the system would have become $\begin{cases} 6x + 12y = 27 \\ -6x - 12y = 4 \end{cases}$. Summing these equations eliminates both x and y , resulting in $0 = 31$, which is not true. The system has no solution.

Review

7. Consider each potential system.

$\begin{cases} 2x + 5y = 5 \\ -6x - 15y = -15 \end{cases}$	$\begin{cases} 2x + 5y = 5 \\ 3x - y = 16 \end{cases}$
These equations are the same; the second is equivalent to the first equation multiplied through by a factor of -3 .	Use elimination to solve. $2x + 5y = 5$ $15 - 5y = 80$ $17x = 85$ $x = 5$ There is only one answer choice with an x -value of 5.
Infinitely Many Solutions (b)	$(5, -1)$ (d)
$\begin{cases} 2x + 5y = 5 \\ y = -\frac{2}{5}x + 4 \end{cases}$	$\begin{cases} 2x + 5y = 5 \\ 3x - 4y = -4 \end{cases}$
Use substitution to solve. $2x + 5\left(-\frac{2}{5}x + 4\right) = 5$ $2x - 2x + 20 = 5$ $20 \neq 5$ This is a false statement.	Use elimination to solve. Multiply the first equation by -2 and the second by 3 . Then $-6x + 8y = 8$ $6x + 15y = 15$ $23y = 23$ $y = 1$ There is only one answer choice with a y -value of 1.
No Solution (a)	$(0, 1)$ (c)

8. Write the system using the y -intercepts and a second point on each line. The system is

$$\begin{cases} y = 3x - 4 \\ y = \frac{1}{2}x - 3 \end{cases}$$

Solve by substitution.

$$\begin{aligned} \frac{1}{2}x - 3 &= 3x - 4 \\ x &= \frac{2}{5} \end{aligned}$$

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

Give an example of a problem that could be solved using a system of linear equations.

Student answers will vary. Any situation that relates two variables using two linear equations is appropriate.

Explain how to write a system of equations from a word problem.

Student answers will vary. One possible answer: To write a system of equations from a word problem, I must first determine how many variables are in the problem. The number of unknown variables tells me how many equations I will need in order to solve my unknowns. Then I need to look at the context for clues, breaking down the problem sentence by sentence.

GUIDED INSTRUCTION

How can you determine if two given systems of equations are equivalent?

Student answers will vary. One possible answer: I can determine if two systems of equations are equivalent by transforming each equation into slope-intercept form. If they are equivalent, the equations will be the same for both systems.

LESSON 3

Creating Systems of Linear Equations

INTRODUCTION Writing Linear Systems

- A gym sells day passes for use of the pool and use of the racquetball courts. Passes for the pool cost \$3.50 per day and passes for the racquetball court cost \$4.00 per day. In one month, Alida spends \$53.50 on passes and goes to the gym 14 times. How many times did Alida go to the pool and to the racquetball court? Write and solve a system of equations.

Determine what is being asked. In this case, you are being asked, "How many times did Alida go to the pool and to the racquetball court?"	x = number of visits to the pool
Define two variables for the two unknowns in the box to the right.	y = number of visits to the racquetball court
There is information about the cost and about the number of passes in the sentence, "In one month, Alida spends \$53.50 on passes and goes to the gym 14 times."	Write an equation regarding the cost of the passes: $3.5x + 4y = 53.50$
Use x and y and the information in the sentence to write two equations.	Write an equation regarding the number of passes: $x + y = 14$
Solve the system.	Solve the equation $x + y = 14$ for y . $y = 14 - x$
The equation $x + y = 14$ can be easily solved for y . Solve this equation to the right.	
Solve the system using substitution in the space below. $3.5x + 4(14 - x) = 53.5$ $3.5x + 56 - 4x = 53.5$ $-0.5x + 56 = 53.5$	$-0.5x = -2.5$ $x = 5$ $5 + y = 14$ $y = 9$
Answer the following questions in the box to the right.	Pool visits: 5
How many times did Alida go to the pool?	Racquetball court visits: 9
How many times did Alida go to the racquetball court?	

GUIDED INSTRUCTION Choosing the Correct System

Prasad is 5 years older than Jamal. Jamal is twice the age of Menuha. Together, the ages of Prasad, Jamal, and Menuha sum to 50. How old are Prasad, Jamal, and Menuha?

Consider the systems of equations shown in the table at the top of the next page. To choose the correct system, check the following.

- Does the system have the correct number of variables?
- Do the equations match the given information?
- Solve the system. Does the answer make sense given the information in the problem?

EXTENSION ACTIVITIES

Activities

Linear Systems: Gym Membership

This is an extension you can use after students are comfortable creating linear equations. (Approximately 40 minutes)

<https://teacher.desmos.com/activitybuilder/custom/561d6a790784861e06c3a6dc#>

Systems of Linear Equations

Here students will write systems of equations from word problems and then graph the equations on the xy -plane. (Approximately 20 minutes)

<https://www.geogebra.org/m/Vtd7Xaas>

Instruction

System 1	System 2	System 3
$P + J + M = 50$	$P + J + M = 50$	$P = J + 5$
$J = P + 5$	$P = J + 5$	$J = 2M$
$M = 2J$	$J = 2M$	

The ages of Prasad, Jamal, and Menuha are unknown. In the systems above, how are the variables defined?

- P = Prasad's age
- J = Jamal's Age
- M = Menuha's Age

Consider the first sentence: "Prasad is 5 years older than Jamal." Which equation listed above best describes this relationship?

$$P = J + 5$$

Consider the second sentence: "Jamal is twice the age of Menuha." Which equation listed above best describes this relationship?

$$J = 2M$$

Consider the third sentence: "Together, the ages of Prasad, Jamal, and Menuha sum to 50." What equation can be written to show this sum?

$$P + J + M = 50$$

Which is the correct system? System 2

Solve the correct system in the box below, checking your answer as shown.

$P + J + M = 50$ $P = J + 5$ $J = 2M$ Substitute $2M$ for J in the second equation. $P = 2M + 5$ Write the first equation in terms of M . Let $P = 2M + 5$ and $J = 2M$. $P + J + M = 50$ $(2M + 5) + 2M + M = 50$	Solution continued... Simplify and solve for M . $5M + 5 = 50$ $5M = 45$ $M = 9$ If $M = 9$, then $J = 2(9)$, $J = 18$. If $J = 18$, then $P = 18 + 5$, $P = 23$. Check: Is Prasad 5 years older than Jamal? Yes Is Jamal twice the age of Menuha? Yes Is the sum of the ages 50? Yes
---	---

- If there are two unknown variables, there will be two equations in the system. If there are three unknown variables, there will be three equations.

RECAP

- Generally, which part of a problem helps you to determine what the variables are? Use examples from the lesson to explain your answer.

Student answers will vary. Generally, the question at the end of a problem tells what is unknown, such as the ages of people, or the number of times visited to the pool or court.

ELL VOCABULARY

- For the introduction problem, use images or sketches to explain the words: *gym*, *pool*, *racquetball*, *passes*.
- Ask students to record the following academic vocabulary and definitions in their Vocabulary Notebook: *real world* (in life, not just in the classroom), *make sense* (to be clear or correct), *justify** (give reasons for), *verbal* (with words), *corresponding** (matching, being the same as), *interpret** (to explain, to figure out), *exceed** (to be greater or more than, to go over), *state* (to say).
- Have students review the following math vocabulary from Chapter 4: Lesson 1: *system of equations** Lesson 2: *substitution**, *elimination** Chapter 2: Lesson 1: *coordinates** Chapter 1: Lesson 1: *sum** Lesson 2: *equation**, *variable**, *multiplying**, *equivalent* Lesson 4: *solution**.

Video

Systems of Linear Equations in Two Variables

Reiterates the importance of the intersection point. Walks students through a problem and solution. (Length: 6:37)

<https://www.youtube.com/watch?v=75m6oSxFfJg&t=190s>

VISUALIZATION AND MODELING

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

GUIDED PRACTICE

Question 1: Visual Summary

Purpose

In this activity, students create their own visual summary of a process to help them translate word problems into systems of equations.

Implementation

- Divide students into pairs or have them complete this task individually.
- Consider providing a framework for the visual summary, or allow students to create their own. A sample is shown below.
- Once students have completed their visual summary, select a few to share, or complete a class visual summary to be displayed on the classroom wall for reference.

LESSON 3 Creating Systems of Linear Equations

GUIDED PRACTICE

- Two numbers have a sum of 34 and a difference of 18. What are the numbers? Write a system of equations and solve the problem using elimination. (DOK 2)

Step 1 Define the variables.

- Let x = the first number
- Let y = the second number

Step 2 Write one of the equations using the statement, "Two numbers have a sum of 34".

- $x + y = 34$

Step 3 Write the second equation using the statement "and a difference of 18."

- $x - y = 18$

Step 4 Use the elimination method to solve the system in the space below.

$$\begin{array}{rcl} x + y = 34 & 26 + y = 34 & \\ x - y = 18 & y = 8 & \\ \hline 2x = 52 & & \\ x = 26 & & \end{array}$$

Step 5 Check your answer below. Do your two numbers have a sum of 34 and a difference of 18?

Yes
 $26 + 8 = 34$ and $26 - 8 = 18$

- Recall that equivalent equations are equations that have the same solutions. Are the two systems of equations below equivalent? How do you know? (DOK 3)

System 1	System 2
$3x + 2y = 12$	$-3x - 2y = -12$
$y = x + 1$	$2x + 3y = 13$

Step 1 Examine the equations in the systems.

- What similarities are there between the equations in System 1 and System 2?
 The first equations in each system are different only by a multiple of -1 .

Step 2 Can you produce any of the equations in System 2 by multiplying any of the equations in System 1 by a constant? Justify your answer below.

Yes, multiplying $3x + 2y = 12$ by -1 results in $-3x - 2y = -12$.

Writing Systems of Equations Using the Given Information

Step 1

- Carefully read the problem. Underline important information.

Step 2

- Define variables. Write down what they mean. For example: Let $x =$ _____ and let $y =$ _____.
- Be as specific as possible.

Step 3

- Use the underlined information and the defined variables to write the equations.
- Check to make sure the equations make sense!

CHAPTER 4 New York Regents Practice

Multiple-Choice Questions

- 1 Which of the following is a solution to $\begin{cases} 3x - 4y \leq 9 \\ y > -2x + 1 \end{cases}$? (DOK 1)

(1) $(4, -2)$

(3) $(0, 1)$

(2) $(\frac{3}{2}, 1)$

(4) $(-\frac{1}{2}, 2)$

- 2 Consider the system of equations $y = -\frac{1}{2}x + 4$ and $y = 3x - 10$. What is the x -coordinate of the solution to the system? (DOK 1)

(1) 2

(3) 4

(2) 3

(4) 5

- 3 Given the system $\begin{cases} 3x + 2y = 20 \\ -4x + 3y = -21 \end{cases}$, which of the following has the same solution? (DOK 2)

(1) $\begin{cases} -3x + 2y = -20 \\ 4x + 3y = 21 \end{cases}$

(3) $\begin{cases} 2x + 2y = 14 \\ 3x + y = 20 \end{cases}$

(2) $\begin{cases} 5x + 4y = 22 \\ -2x + 5y = -19 \end{cases}$

(4) $\begin{cases} 12x + 8y = 80 \\ \frac{4}{3}x - y = 7 \end{cases}$

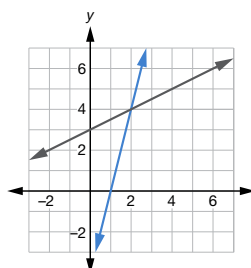
- 4 Select the solution to the system of equations shown in the graph: (DOK 1)

(1) $(4, 2)$

(3) $(2, 4)$

(2) $(4, 3)$

(4) $(0, 3)$



- 5 Solve $\begin{cases} -3x + y = 18 \\ 2x - 2y = -16 \end{cases}$. (DOK 2)

(1) $(-5, -3)$

(3) $(-5, 3)$

(2) $(-6, 0)$

(4) $(1, 9)$

- Each chapter concludes with Regents exam practice.
- Each chapter test item is tagged with a DOK level.
- Two full-length Regents exams are included in the student worktext.

NEW YORK REGENTS PRACTICE

1. For a point to be part of the solution set it must make each inequality true. Test each point in the system. The work for the first point is shown.

(1) $(4, -2)$

$$3(4) - 4(-2) \leq 9$$

$$20 \leq 9$$

This is a false statement.

This is not the solution.

2. Solve the system by substitution. You only need to find the x -value of the solution.

$$-\frac{1}{2}x + 4 = 3x - 10$$

$$-x + 8 = 6x - 20$$

$$-7x = -28$$

$$x = 4$$

Open-Response Questions

- 6 Tamra goes to the movie with a group of her friends. The cost of 2 tickets and 4 candy bars is \$22.50. The cost of 3 tickets and 2 candy bars is \$27.75. She wants to know how much each ticket and each candy bar costs. Use the space below to write a system of equations that models the situation. (DOK 3)

The system is $\begin{cases} 2x + 4y = 22.50 \\ 3x + 2y = 27.75 \end{cases}$

Tamra would like to plan another trip to the movies with herself and six friends. How much money should Tamra save if she wants to buy everyone, including herself, one ticket and one candy bar?

Tamra should save \$68.25.

- 7 Gratian and Fay both buy cars. Gratian decides to buy a new car, which costs \$19,000. Fay decides to buy a used car that costs \$12,000. They both finance each of their cars on a 36-month interest free loan. Gratian makes payments of \$600 a month and Fay makes payments of \$250 a month. Write a system of equations in the space below that models the amount owed on the car, y , in terms of the number of monthly payments made, x . (DOK 3)

The system is $\begin{cases} y = 19,000 - 600x \\ y = 12,000 - 250x \end{cases}$

Gratian makes the statement, "Both Fay and I will have our cars paid off before 36 months interest free period is over." Is this statement true or false? Justify your response in the space below.

Gratian's car will be paid off; Fay will still owe \$3000 on her car after 36 months.

- 8 Paz solves a linear system of equations by graphing each equation in her graphing calculator. She sees that the lines lie on top of each other. She concludes, "You can pick any x -value and any y -value and it will be a solution to this system." Is she correct or incorrect? Explain your reasoning. (DOK 2)

Paz is incorrect. See below, right, for explanation.

Student Application

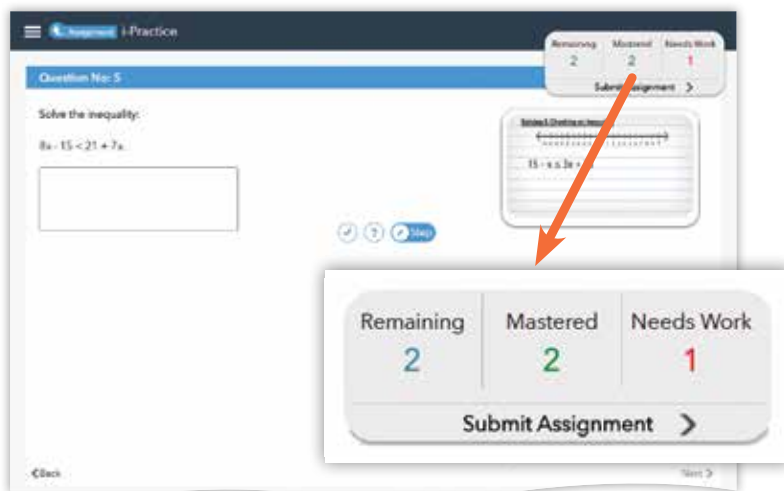
Driven by the powerful *Math^x* personalized practice and assessment system, the student application provides a full range of assignments and practice aligned with *New York Next Generation Mathematics: Algebra 1*, including

- *i-Practice* personalized assignments
- online homework assignments
- quizzes and chapter tests
- diagnostic tests
- New York Regents 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.

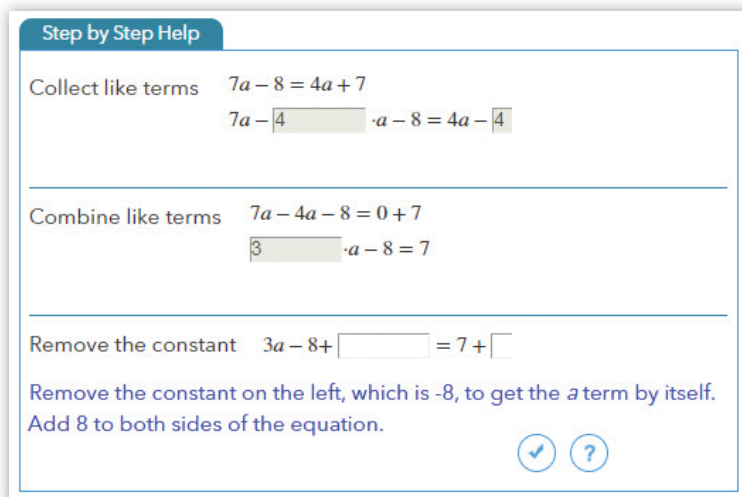
- Incorrect answers automatically generate new problems for students to attempt.
- A scoring counter shows progress on the assignment.
- Guided practice provides point-of-use help.
- Students have the option to stop and return to the assignment at any time.



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.



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.

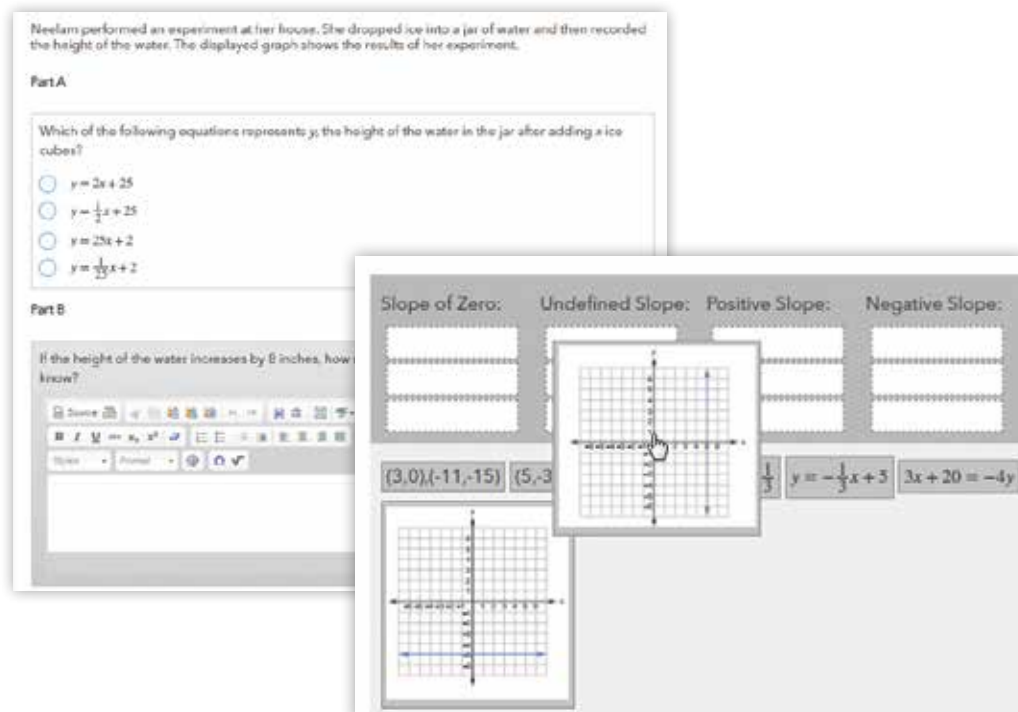
- Homework parameters set by the teacher allow multiple tries.
- Help functions (videos, hints/tips, step-by-step) appear for homework.
- Quizzes and tests eliminate the help functions automatically. Tests allow one try. Quizzes allow for one or more tries as set by the teacher.
- Assignment due dates,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



TECHNOLOGY-ENHANCED ITEMS

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

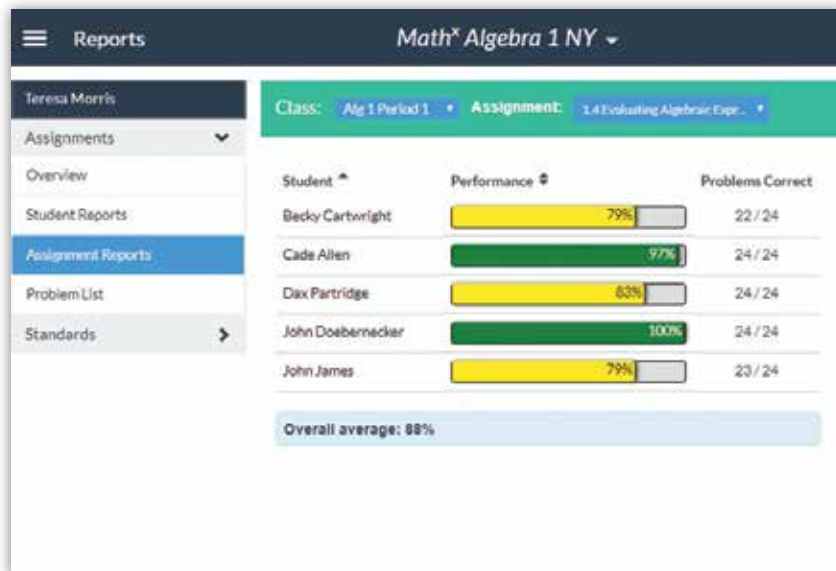
- multi-part problems
- equation input
- graphing
- drag and drop
- multi-select
- open response
- and much more...



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



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





NEXT GENERATION MATHEMATICS Algebra 1

The **Next Generation Mathematics** program provides the foundation for Algebra 1 success. Designed specifically for New York, each standards-based lesson helps students identify areas of weakness, receive targeted instructional support and practice, and prepare for the Regents 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 Regents practice

Sales Consultants

NYC EDUCATIONAL CONSULTANT

Pat DiPietropolo

pdipietropolo@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1114

LONG ISLAND, NASSAU & SUFFOLK COUNTIES

Grace Andresini

gandresini@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1170

BRONX, MANHATTAN & QUEENS (DISTRICTS 25, 26 & 29)

Barbara Shutt

bshutt@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1180

UPSTATE NEW YORK

Philip Bohman

pbohman@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1215

BROOKLYN, STATEN ISLAND & QUEENS (DISTRICTS 24, 27, 28 & 30)

Robert Renner

rrenner@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1194

REGIONAL SALES MANAGER

John DeAngelis

jdeangelis@perfectionlearning.com
Toll-Free: (866) 252-6580 ext 1119

For more information on the Next Generation Mathematics program, visit perfectionlearning.com/new-york-algebra-1