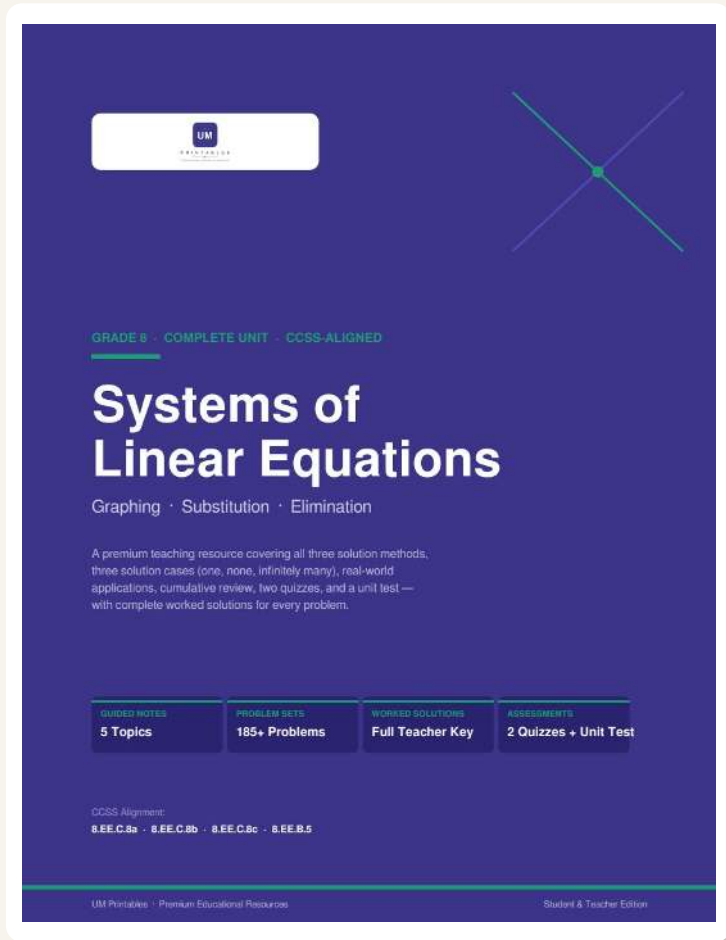




THE COMPLETE UNIT · 88 PAGES

GRADE 8 MATHEMATICS

Systems of Linear Equations

Graphing · Substitution · Elimination

88 PAGES

185+ PROBLEMS

5 TOPICS

CCSS-ALIGNED

8.EE.C.8a/b/c · 8.EE.B.5

WHAT THIS PREVIEW CONTAINS

- 1 **Topic 1**
Guided Notes
- 2 **Comparison**
3-Method Table
- 3 **Real-World**
Applications
- 4 **Answer Key**
Sample Solutions

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185+ problems · 2 quizzes + unit test · complete teacher answer key
Premium Educational Resources



TOPIC 1 OF 5

Understanding Systems of Linear Equations

CCSS 8.EE.C.8a

What a system is, what a solution means, and the three possible cases.

1.1 What Is a System of Linear Equations?

A **system of linear equations** is a set of two or more linear equations that all use the same variables. In Grade 8 we work almost entirely with systems of **two** equations in **two** variables (usually x and y). The two equations together describe a relationship between those variables, and solving the system means finding every ordered pair (x, y) that satisfies *both* equations at the same time.

For example, the system below shows two linear relationships. Each equation could describe a real-world situation on its own — perhaps one represents the cost of Plan A and the other the cost of Plan B — but together they let us ask a much richer question: "For what value of x do both plans cost the same?"

Example 1 A simple system

$$y = 2x + 1 \text{ (Equation 1)}$$

$$y = -x + 4 \text{ (Equation 2)}$$

Both equations involve the variables x and y . Solving the system means finding every (x, y) pair that makes BOTH equations true at the same time.

Systems can also be written in **standard form** as $Ax + By = C$. The same system can appear in many equivalent forms, and one of the first skills we develop is recognizing when two equations are equivalent and choosing which form is most useful for a given problem.

KEY VOCABULARY

System of equations: two or more equations with the same variables.

Solution of a system: an ordered pair (x, y) that makes every equation in the system true.

Linear system: a system in which every equation is linear (no x^2 , no xy , no fractions with x in the denominator).

1.2 What Does a Solution Mean?

A solution to a system is an **ordered pair (x, y)** that makes *every* equation in the system true when substituted back in. If even one equation fails, the pair is not a solution. This "must work for both" requirement is what makes systems different from single equations — and it is the reason we always **check our answer in both original equations**.

Example 2 Verifying a solution

Is $(2, 5)$ a solution of: $y = 2x + 1$ and $y = -x + 7$?

VISUAL GUIDED NOTES

Three-Method Comparison & Decision Guide

CCSS 8.EE.C.8b ·
8.EE.C.8c

A side-by-side reference to help you choose the right method for any system.

Feature	Graphing	Substitution	Elimination
When to use	When you want a visual; for quick estimates; to verify an algebraic answer	When one variable is easy to isolate (coeff. 1 or -1); when one equation is already solved for a variable	When both equations are in standard form; when coefficients are close to matching; to avoid fractions
Step 1	Rewrite both in $y = mx + b$ form	Isolate one variable in one equation	Write both in standard form $Ax + By = C$
Step 2	Graph both lines on the same axes	Substitute expression into the OTHER equation	Multiply one/both equations to match a coefficient pair
Step 3	Find the intersection point	Solve the resulting one-variable equation	Add or subtract to eliminate one variable
Step 4	Read the (x, y) coordinates	Back-substitute to find the other variable	Solve the resulting one-variable equation
Step 5	Check by substituting into both originals	Write solution as (x, y); check in both originals	Back-substitute; check in both originals
Strengths	Visual; great for understanding; catches parallel/coincident cases immediately	Clean for "y = ..." systems; handles fractions well; natural for real-world setups	Fast for standard-form systems; avoids fractions entirely when coefficients cooperate
Limitations	Imprecise for non-integer solutions; requires accurate graphing	Can create messy fractions if no variable is easy to isolate	Multiplication step can introduce arithmetic errors; choose the right variable to eliminate
Best for real-world	Cost-comparison visuals (break-even graphs)	When one quantity is naturally expressed in terms of another	Mixture problems; coin problems; ticket-revenue problems
Detects no-solution?	Yes — lines are parallel	Yes — produces a false statement (e.g., $5 = 7$)	Yes — produces $0 = \text{non-zero}$ (e.g., $0 = 5$)
Detects infinite solutions?	Yes — lines coincide	Yes — produces a true statement (e.g., $4 = 4$)	Yes — produces $0 = 0$

STUDENT PRACTICE

Topic 5 — Real-World Applications: 20-Problem Activity

CCSS 8.EE.C.8c

For each problem: (1) define your variables, (2) write a system of two linear equations, (3) choose the most efficient method, (4) solve, and (5) interpret your answer in the context of the problem with units.

1. Rate

Car A leaves a rest stop traveling east at 50 mph. Two hours later, Car B leaves the same rest stop traveling east on the same highway at 70 mph. How long does it take Car B to catch up to Car A, and how far from the rest stop does the catch-up happen?

Define variables:

Write the system:

Solve:

Interpret in context:

2. Rate

Two trains are 400 miles apart on parallel tracks, traveling toward each other. Train A travels at 60 mph and Train B travels at 40 mph. If they start at the same time, how long until they meet, and how far from Train A's starting point do they meet?

Define variables:

Write the system:

Solve:

Interpret in context:

Solutions: 30 Graphing Problems

1 $y = 2x + 1$; $y = -x + 4$
 Set equations equal: $2x + 1 = -x + 4$
 Add x to both sides: $3x + 1 = 4$
 Subtract 1: $3x = 3$
 Divide by 3: $x = 1$
 Back-substitute: $y = 2(1) + 1 = 3$
 Solution: (1, 3)
 Check eq1: $3 = 2(1) + 1 = 3$ ✓
 Check eq2: $3 = -(1) + 4 = 3$ ✓
 Solution: (1, 3)

2 $y = x - 2$; $y = -2x + 7$
 Set equations equal: $x - 2 = -2x + 7$
 Add $2x$: $3x - 2 = 7$
 Add 2: $3x = 9$
 Divide by 3: $x = 3$
 Back-substitute: $y = (3) - 2 = 1$
 Solution: (3, 1)
 Check eq1: $1 = 3 - 2 = 1$ ✓
 Check eq2: $1 = -2(3) + 7 = 1$ ✓
 Solution: (3, 1)

3 $y = 3x - 5$; $y = x + 1$
 Set equations equal: $3x - 5 = x + 1$
 Subtract x : $2x - 5 = 1$
 Add 5: $2x = 6$
 Divide by 2: $x = 3$
 Back-substitute: $y = (3) + 1 = 4$
 Solution: (3, 4)
 Check eq1: $4 = 3(3) - 5 = 4$ ✓
 Check eq2: $4 = 3 + 1 = 4$ ✓
 Solution: (3, 4)

4 $y = -x + 6$; $y = 2x - 3$
 Set equations equal: $-x + 6 = 2x - 3$
 Add x : $6 = 3x - 3$
 Add 3: $9 = 3x$
 Divide by 3: $x = 3$
 Back-substitute: $y = 2(3) - 3 = 3$
 Solution: (3, 3)
 Check eq1: $3 = -3 + 6 = 3$ ✓
 Check eq2: $3 = 2(3) - 3 = 3$ ✓
 Solution: (3, 3)

5 $y = x + 3$; $y = -3x + 7$
 Set equations equal: $x + 3 = -3x + 7$
 Add $3x$: $4x + 3 = 7$
 Subtract 3: $4x = 4$
 Divide by 4: $x = 1$
 Back-substitute: $y = (1) + 3 = 4$
 Solution: (1, 4)
 Check eq1: $4 = 1 + 3 = 4$ ✓
 Check eq2: $4 = -3(1) + 7 = 4$ ✓
 Solution: (1, 4)

6 $y = 2x - 4$; $y = -x + 5$
 Set equations equal: $2x - 4 = -x + 5$
 Add x : $3x - 4 = 5$
 Add 4: $3x = 9$
 Divide by 3: $x = 3$
 Back-substitute: $y = 2(3) - 4 = 2$
 Solution: (3, 2)
 Check eq1: $2 = 2(3) - 4 = 2$ ✓
 Check eq2: $2 = -3 + 5 = 2$ ✓
 Solution: (3, 2)

7 $y = -2x + 8$; $y = x + 2$
 Set equations equal: $-2x + 8 = x + 2$
 Add $2x$: $8 = 3x + 2$
 Subtract 2: $6 = 3x$
 Divide by 3: $x = 2$
 Back-substitute: $y = (2) + 2 = 4$
 Solution: (2, 4)
 Check eq1: $4 = -2(2) + 8 = 4$ ✓
 Check eq2: $4 = 2 + 2 = 4$ ✓
 Solution: (2, 4)

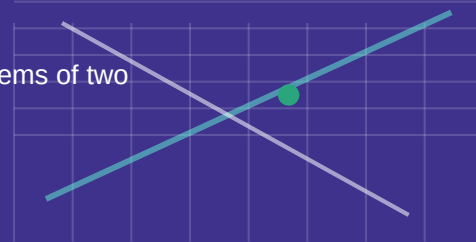
8 $y = 4x - 1$; $y = x + 8$
 Set equations equal: $4x - 1 = x + 8$
 Subtract x : $3x - 1 = 8$
 Add 1: $3x = 9$
 Divide by 3: $x = 3$
 Back-substitute: $y = 4(3) - 1 = 11$
 Solution: (3, 11)
 Check eq1: $11 = 4(3) - 1 = 11$ ✓
 Check eq2: $11 = 3 + 8 = 11$ ✓
 Solution: (3, 11)

Systems of Linear Equations

Grade 8 Complete Unit

A structured unit for understanding, solving, practicing, and applying systems of two linear equations.

CCSS ALIGNMENT 8.EE.C.8a · 8.EE.C.8b · 8.EE.C.8c



79

PAGES

185

PROBLEMS

5

TOPICS

3

ASSESSMENTS

WHAT THE FULL RESOURCE CONTAINS

1 TOPIC 1 · UNDERSTANDING SYSTEMS

Guided notes covering what a system is, what a solution means, the three cases (one/no/infinite), slope and y-intercept classification, plus a STEM connection.

5 TOPIC 5 · REAL-WORLD · 20 PROBLEMS

A 20-problem application activity built around rate, mixture, break-even, age, and geometry contexts, with variables, systems, solutions, and contextual interpretations.

2 TOPIC 2 · GRAPHING · 30 PROBLEMS

Five-step graphing method, worked examples, and a 30-problem student set with coordinate grids; includes one-solution, no-solution, and infinitely-many-solution cases.

6 CUMULATIVE REVIEW · 25 PROBLEMS

Mixed review across the five topics: concept classification, graphing, substitution, elimination, and real-world systems.

3 TOPIC 3 · SUBSTITUTION · 35 PROBLEMS

Method notes, worked examples, and a scaffolded 35-problem drill progressing through isolated variables, isolate-first work, fractional cases, and special cases.

7 ASSESSMENTS · 3 TOTAL

Quiz 1 covers Topics 1–3; Quiz 2 covers Topics 4–5; the Comprehensive Unit Test contains 20 questions.

4 TOPIC 4 · ELIMINATION · 35 PROBLEMS

Method notes, worked examples, and a 35-problem drill covering add/subtract, multiply-one-equation, multiply-both, and special cases.

8 TEACHER SUPPORT & ANSWER KEY

Includes a suggested 2-week pacing guide, CCSS alignment, “I Can” statements, a three-method comparison and decision guide, and a complete teacher answer key with worked solutions.

CORE METHODS

Graphing · Substitution · Elimination

RESOURCE WEBSITE

UMPrintables.com