

MODULE 4 OVERVIEW

TEKS* Addressed:

8.8A, 8.8B, **8.8C**, 8.5B, **8.5I**, 8.9A

Key SKIN sets

*Bold TEKS = Readiness Standard

Modeling Linear Equations

Sessions: 18

- Apply eq solving strats.
- write Express & Eqs.
- use Eqs to model scenarios to solve problems
- use systems of linear Eqs

Why is this module named *Modeling Linear Equations*?

Modeling Linear Equations engages students in using linear equations to model real-world situations. Situating equation-solving as a tool to solve everyday problems helps students see the value of solving equations, judge the reasonableness of their solutions, and prevent them from seeing equation-solving as a

meaningless algorithm. In this module, students review equation-solving strategies, apply those strategies as they write expressions and equations to model a scenario, and then solve the equations to answer questions. Students also use systems of linear equations to answer questions about everyday situations.

The Research Shows . . .

“It is advantageous for students to develop fluency in the use of multiple strategies for solving equations and to develop the ability to select the most appropriate strategy for a given problem.”

(Developing Essential Understanding of Expressions, Equations, and Functions: Grades 6–8, p. 71)

What is the mathematics of *Modeling Linear Equations*?

Modeling Linear Equations contains two topics: *Solving Linear Equations and Inequalities* and *Systems of Linear Equations*. This module addresses the standards for analyzing and solving linear equations and systems of linear equations.

possible learning objectives

8 SESSIONS
7 LEARNING • 1 ASSESSMENT

TOPIC 1 Solving Linear Equations and Inequalities

Learning Together: 5 Sessions

TEKS: 8.8A, 8.8B, 8.8C

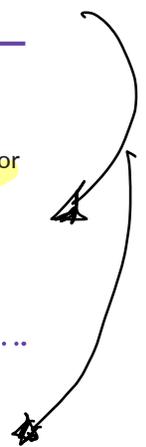
Students build on their prior knowledge of solving equations to solve linear equations with variables on both sides.

- Students apply number properties as strategies to write equations in equivalent forms.
- Students use place value and common multiples to explore efficient strategies for solving equations with decimals or fractions.
- Students learn that some linear equations have no solution and others have infinitely many solutions.

Learning Individually: 2 Sessions

Targeted Skills Practice for Solving Linear Equations

- Students determine the solution of an equation with variables on both sides of the equal sign.
- Students write and solve equations that represent real-world situations.
- Students use the slope formula to determine the slope of a line.
- Students determine whether a system of equations has one solution, no solution, or infinite solutions.
- Students solve inequalities with variables on both sides of the inequality symbol.



10 SESSIONS
9 LEARNING • 1 ASSESSMENT

TOPIC 2 Systems of Linear Equations

possible learning objectives

Learning Together: 6 Sessions

TEKS: 8.5B, 8.5I, 8.9A

Students formalize the process of solving systems of linear equations using inspection or graphing.

- Students write equations to represent situations, such as income and cost, and identify the values that satisfy the system of equations.
- Students learn that the point of intersection of the lines representing the linear equations is the point that satisfies both equations and is, therefore, the solution to the system.
- Students determine the characteristics of the graphs of systems that have no solution or infinite solutions.
- Students model real-world scenarios and use equations and graphs to answer questions about the scenarios.

Learning Individually: 3 Sessions

Targeted Skills Practice for Systems of Linear Equations

- Students complete tables of values to identify when the production cost and income are equivalent.
- Students identify the point of intersection and break-even point on a graph of a system of linear equations in context.
- Students use the graphs of systems of linear equations to determine the solution to the system of equations, including systems that have one solution, no solution, and infinite solutions.
- Students interpret the solution of a system of linear equations in terms of a problem situation.



How is Modeling Linear Equations connected to prior learning?

In prior courses, students learned the meaning of a solution to an equation and built a conceptual understanding of what it means to solve an equation through practice with one-step equations. Students have solved equations that could be written as two-step equations: $px + q = r$ and $p(x + q) = r$, where p , q , and r are rational numbers. The problems in this module include more complex problems, as students rewrite expressions using the distributive property and properties of equality. In Systems of Linear Equations, students are expected to construct linear equations from the given information in order to write and solve the system of equations.

Prior content
Knowledge &
Skill sets

Current knowledge
& Skill sets
in this module

Math Representation

A two-step equation requires two inverse operations, or applying two properties of equality, to isolate the variable.

For example, here is one way to solve the equation $2x + 6 = 13$.

Subtract 6 from each side of the equation.

$$2x + 6 - 6 = 13 - 6$$

Divide both sides of the equation by 2.

$$\frac{2x}{2} = \frac{7}{2}$$

The solution is $x = 3\frac{1}{2}$.

model for
students

When will students use knowledge from Modeling Linear Equations in future learning?

Throughout their study of Algebra, students are expected to construct, solve, and graph equations to represent relationships between two quantities. This module provides students with opportunities to develop strategies focused solely on linear equations. As they continue on their mathematical journeys, they will encounter literal equations, polynomial equations, and trigonometric equations. Students will also solve different types of systems of equations and will learn additional strategies for solving: the substitution method and the elimination, or linear combinations method.

- Future skill sets
- literal Eqs
 - Polynomial Eqs
 - Trig Eqs
 - systems of Eqs
 - Substitution method
 - Elimination method

Math Representation

Consider this system of equations:
$$\begin{cases} 7x + 2y = 24 \\ 4x + y = 15 \end{cases}$$

$$7x + 2y = 24$$

$$-2(4x + y) = -2(15)$$

$$7x + 2y = 24$$

$$+ -8x - 2y = -30$$

$$\hline -x = -6$$

$$x = 6$$

Multiply the second equation by a constant that results in coefficients that are additive inverses for one of the variables.

Now that the y -values are additive inverses, you can add the equations to solve this linear system for x .

You can now substitute $x = 6$ into one of the original equations to get the value $y = -9$. The solution to the system is $(6, -9)$.

Solving systems of Eqs

4 Modeling Linear Equations

MODULE 4 Assessment Summary

Topic	Topic Title	Name	Administered	TEKS*
1	Solving Linear Equations and Inequalities	End of Topic Assessment	After Topic 1	8.8A 8.8B 8.8C
2	Systems of Linear Equations	End of Topic Assessment	After Topic 2	8.5B 8.5I 8.9A

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Readiness
TEKS
8.8C
8.5I