TOPIC 1 OVERVIEW

Solving Linear Equations and Inequalities

How are the key concepts *Solving Linear Equations and Inequalities* organized?

In *Solving Linear Equations and Inequalities*, students expand their ability to solve one-variable linear equations. In previous lessons, students used the properties of equality to rewrite algebraic expressions. Students have also solved single variable one-step and two-step equations and inequalities.

prior skill sets

In this topic, students are introduced to solving more complex equations that include variables on both sides. They review previously learned strategies for solving equations and learn new strategies to make solving equations more efficient. Students write and solve equations to represent real-world situations. They then interpret the solutions to these equations.

Math Representation

An equation with variables on both sides of the equation can be solved by moving all the variable terms to one side of the equation and all the constants to the other side of the equation.

Ethan

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

Samuel

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

Next, students engage in peer work analysis of the solutions to equations that have no solution or infinitely many solutions. They develop an understanding of the conditions that lead to equations with one solution, no solution, or infinitely many solutions. Students then model given situations with one-variable inequalities, including those with variables on both sides of the inequality symbol. They write possible scenarios that could be represented by a given inequality with variables on both sides of the inequality symbol.

What is the entry point for students?

Students have solved word problems leading to equations of the forms $px + q = r$ and $p(x + q) = r$, where p, q, and r are rational numbers. They have also used the distributive property to factor and expand algebraic expressions. In this topic, students use the properties of equality to build and solve equations of the form $ax + b = cx + d$, where a, b, c, and d are integers. Students use strategies to make solving such equations more efficient. For example, they learn that they can multiply both sides of an equation by a power of 10 in order to eliminate decimals. This allows students to work with only integers, so calculations become easier when solving for the unknown.

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 $x = 3\frac{1}{2}$.

Why is *Solving Linear Equations and Inequalities* important?

Solving Linear Equations and Inequalities provides the bridge from solving two-step equations to solving systems of linear equations or inequalities algebraically in future courses. This topic allows students to review and practice equation-solving skills developed in prior grades and to apply them to equations with variables on both sides of the equation. In future courses, students will solve equations or inequalities with variables on both sides when solving systems of equations or inequalities by substitution. Solving equations that have no solution or infinitely many solutions prepares students to solve systems of linear equations that have no solution or infinitely many solutions.

Math Representation

A linear equation in the form $y = ax + b$ can have *one solution*, *infinitely many solutions*, or *no solution*.

Linear equations with **infinitely many solutions** are created by equating two equivalent expressions.

$$2x + 6 = 2(x + 3)$$
$$= (2 \cdot x) + (2 \cdot 3)$$
$$2x + 6 = 2x + 6$$

Linear equations with **no solution** are created by equating expressions of the form $ax + b$ with the same value for a and different values for b.

$$4x + 2 = 4x + 5$$
$$4x - 4x + 2 = 4x - 4x + 5$$
$$2 \neq 5$$

possibly model for sts

How does a student demonstrate understanding?

Students will demonstrate understanding of the standards in this topic when they can:

- Use properties of equality to write equivalent expressions.
- Write one-variable equations or inequalities with variables on both sides of the equal sign or inequality symbol that represent real-world problem situations.
- Write a corresponding real-world problem when given a one-variable equation or inequality with variables on both sides of the equal sign or inequality symbol.
- Solve one-variable equations with variables on both sides of the equal sign.
- Give examples of linear equations in one variable that have one solution, no solution, or infinitely many solutions.
- Solve one-variable inequalities with variables on both sides of the inequality symbol.

possible Learning objectives

How do the activities in *Solving Linear Equations and Inequalities* promote student expertise in the mathematical process standards?

Every topic is written with the goal of creating mathematical thinkers who are active participants in class discourse, so elements of the TEKS mathematical process standards should be evident in all lessons. Students are expected to make sense of problems and work toward solutions, reason using concrete and abstract ideas, and communicate their thinking while providing a critical ear to the thinking of others.

class Discourse is crucial

NEW KEY TERMS

- one solution [una solución]
- no solution [sin solución]
- infinitely many solutions [soluciones infinitas]
- solution set of an inequality

cognates for EB learners

Because students already possess the essential skills and knowledge for solving linear equations with one variable, the focus for this topic is to reason abstractly and quantitatively and attend to precision. Students are expected to use their knowledge of equations, number properties, and number sense to understand the strategies for solving linear equations with efficiency. They decontextualize and recontextualize real-world problems as they use given information to write expressions, equations, and inequalities to answer questions (TEKS 8.1A). Students are also expected to reason abstractly and look for the structure of equations that lead to no solution, one solution, or infinitely many solutions (TEKS 8.1F). They should understand why equations of the form $a = a$ have infinitely many solutions and why equations of the form $a = b$ have no solution. Throughout this topic, students have opportunities to develop fluency and precision with solving linear equations (TEKS 8.1G).

How can you use cognates to support EB students?

EB supports to consider

Cognates are provided for new key terms when applicable. Strategically grouping students with varying language proficiencies and factoring in group members' shared languages helps foster a collaborative learning environment. Peer discourse enables students to explain concepts to each other in both languages and build off of each other's language, enhancing understanding and language skills simultaneously.

MODULE 4, TOPIC 1 PACING GUIDE

~~165 Day Pacing~~

150 Day PACING

4 Modeling Linear Equations

TOPIC 1: Solving Linear Equations and Inequalities

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: 8.1A, 8.1B, 8.1C, 8.1D, 8.1E, 8.1F, 8.1G

ELPS: 1.A, 2.D, 2.G, 4.E, 4.I, 4.K, 5.G

Topic Pacing: 8 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing
1	Equations with Variables on Both Sides	Students solve equations with the same variable on both sides of the equal sign. They use the properties of equality, the additive inverse, and the distributive property to solve equations. In addition, students consider different strategies to solve the same equation based on its given structure. They divide out a number from both sides of an equation, multiply both sides of an equation by the least common denominator of fractional terms to rewrite fractions as integers, and multiply both sides of an equation by a power of 10 to rewrite decimals as integers. These strategies help simplify equations for students to make calculations easier as students solve for an unknown. The lesson begins and ends with students building their own equations. **Materials Needed:** Algebra Tiles (located at the end of the lesson), Scissors, Problem-Solving Model Graphic Organizer	8.8A **8.8C**	2
2	Analyzing and Solving Linear Equations	Students write algebraic expressions within the context of different situations. They then use the expressions to write equations and solve the equations for unknown values. Students interpret solutions and determine when equations have *one solution*, *no solution*, or *infinitely many solutions*. **Materials Needed:** Problem-Solving Model Graphic Organizer	8.8A 8.8B **8.8C**	2
3	Solving Linear Inequalities	Students review writing and solving two-step equations and inequalities within the context of a movie theater selling tickets. They then then solve inequalities with variables on both sides of the inequality symbol. Students model given situations with inequalities and write possible scenarios that could be represented by a given inequality. **Materials Needed:** None	8.8A 8.8B **8.8C**	1
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				2

*Bold TEKS = Readiness Standard

MODULE 4, TOPIC 1 PACING GUIDE

~~165-Day Pacing~~

150 DAY PACING

1 DAY PACING = 45-MINUTE SESSION

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: 8.8A, **8.8C** **LESSON 1** Equations with Variables on Both sides GETTING STARTED ACTIVITY 1	**LESSON 1** continued ACTIVITY 2 ACTIVITY 3 TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: 8.8A, 8.8B, **8.8C** **LESSON 2** Analyzing and Solving Linear Equations GETTING STARTED ACTIVITY 1 ACTIVITY 2	**LESSON 2** continued ACTIVITY 3 ACTIVITY 4 TALK THE TALK
Day 6	**Day 7**	**Day 8**		
TEKS: 8.8A, 8.8B, **8.8C** **LESSON 3** Solving Linear Inequalities GETTING STARTED ACTIVITY 1 ACTIVITY 2 TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**		

*Bold TEKS = Readiness Standard

Skills Prac. can be flexible

Spaced prac. = spiral prac.

Interleaved prac - multiple skill sets.

How can you incorporate Skills Practice with students?

There are two Learning Individually days scheduled within this topic. The placement of these days within the topic is flexible. The intent is to distribute spaced and interleaved practice throughout a topic and throughout the year. It is not necessary for students to complete all Skills Practice for the topic and different students may complete different problem sets. You should use data to strategically assign problem sets aligned to individual student needs. You should analyze student responses from the following embedded assessment opportunities to help assess individual needs: Essential Questions, Talk the Talks, Student Self-Reflections, and End of Topic Assessments. For students who are building their proficiency, you can assign problem sets to target specific skills. For students who have demonstrated proficiency, there are extension problems of varied levels of challenge.

use data to strategically assign problems to individual sts.

How can you identify whether students are ready for new learning?

The Prepare section of the Lesson Assignments and the Spaced Practice set of Skills Practice can serve as diagnostic tools. Depending on available time, you can assign the Prepare section of the Lesson Assignments as homework or as a warm-up to identify students' prior knowledge for the upcoming lesson's activities. You can also use the Spaced Practice sets of Skills Practice to analyze individual students' level of proficiency on standards from previous topics.