Module 2: Exploring Constant Change

TOPIC 2: SOLVING LINEAR EQUATIONS AND INEQUALITIES

In this topic, students analyze linear functions and the key characteristics that define linear functions. They solve equations in one variable, examining the structure of each equation to predict whether the equation has one solution, no solutions, or infinite solutions. Students use the Properties of Equality and basic number properties to construct a viable argument to justify a solution method. They generalize their knowledge of solving equations in one variable to solve literal equations for given variables. Students then graph linear inequalities and explore solving an inequality with a negative slope, which affects the sign of the inequality. Finally, students solve compound inequalities and represent the solutions of a conjunction and a disjunction on a number line.

Where have we been?

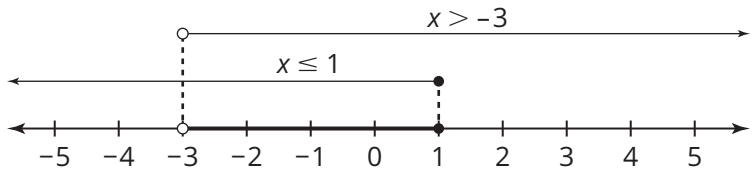
Throughout middle school, students gained proficiency in solving increasingly complex linear equations, and students solved two-step inequalities and graphed the solutions on a number line. Coming into this course, students have solved two-step equations with variables on both sides. They understand the underpinnings of solving equations by maintaining equality. From this intuitive understanding, students use properties to justify each step in the equation-solving process.

Where are we going?

Students will use their knowledge of equations and inequalities to solve linear absolute value equations. By recognizing the connections between algebraic and graphical solutions to an equation or inequality, students are preparing to solve linear absolute value equations and inequalities, exponential equations, and quadratic equations and inequalities.

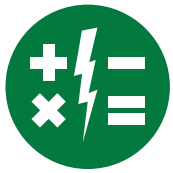
Compound Inequalities

The compound inequality shown involves *and*, and is a conjunction: $x \leq 1$ and $x > -3$.



The solution is the region that satisfies both inequalities: $-3 < x \leq 1$. Graphically, the solution is the overlapping, or the intersection, of the separate inequalities.

$E = mc^2$



Quite possibly the most famous equation ever is Albert Einstein's equation from his theory of general relativity which shows the relationship of energy to mass. The energy of an object at rest is equal to its mass (m) times the speed of light (c) squared.

But this is only for objects at rest. The full equation, for moving objects with momentum (p) is $E^2 = (mc^2)^2 + (pc)^2$.

You may recognize the form of this equation, which is identical to another famous equation: $a^2 + b^2 = c^2$.

Talking Points

Inequalities can be an important topic to know about for college admissions tests.

Here is a sample question:

Solve for x in the inequality $\frac{x}{2} - 3 < 2y$.

To solve for x, isolate the variable x.

$$\frac{x}{2} - 3 < 2y$$
$$\frac{x}{2} - 3 + 3 < 2y + 3$$
$$\frac{x}{2} < 2y + 3$$
$$2\left(\frac{x}{2}\right) < 2(2y + 3)$$
$$x < 4y + 6$$

Key Terms

infinite solutions

A linear equation with infinite solutions means that any value for the variable makes the equation true.

literal equation

Literal equations are equations in which the variables represent specific measures.

solve an inequality

To solve an inequality means to determine the values of the variable that make the inequality true.

disjunction

A compound inequality in the form $x < a$ or $x > b$, where a and b are any real numbers, is a disjunction.