

Before This Module

Grade 6 Module 4

In grade 6, students apply properties of operations to solve one-step equations of the forms $x + p = q$ and $px = q$ for cases in which p , q , and x are nonnegative rational numbers. In this module, students extend this work to negative rational numbers and to the forms $px + q = r$ and $p(x + q) = r$. In grade 6, students write inequalities of the form $x > c$ or $x < c$ to represent a constraint in a problem. Such inequalities have infinitely many solutions that can be represented on a number line. In this module, students extend that learning to include solving inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Students solve inequalities that are less than or equal to and greater than or equal to and interpret the solution set in the context of the problem.

Overview

Expressions, Equations, and Inequalities

Topic A

Equivalent Expressions

Topic A centers on writing expressions in equivalent forms. Students move from doing familiar work with numerical expressions to determining when algebraic expressions are equivalent. Through the application of properties of operations—namely the distributive property—as well as the use of the tabular model, students multiply and factor expressions with rational and negative numbers.

Modeling the Distributive Property with the Tabular Model

	l	-2
8	$8l$	-16

$$8(l - 2) = 8l - 16$$

Showing Factoring with the Tabular Model

	$5x$	-4
3	$15x$	-12

$$15x - 12 = 3(5x - 4)$$

Topic B

Unknown Angle Measurements

In topic B, students use familiar and new angle relationships to write and solve equations that help determine unknown angle measures. Students continue to use properties of operations and visual models to solve equations. They are introduced to a new strategy for solving equations: if-then moves.

If-Then Moves

Assume a , b , and c are numbers.

If $a = b$, then $a + c = b + c$.

If $a = b$, then $a - c = b - c$.

If $a = b$, then $a \cdot c = b \cdot c$.

If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.

Topic C

Solving Equations

Students continue to use if-then moves in topic C to fluently solve equations of the forms $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Students engage in historical mathematics to determine the advantages and disadvantages of presenting problems rhetorically and symbolically. Later, students use the structure of an equation to make a simpler problem. Throughout this topic, students participate in activities and puzzles to simulate play when fluently solving equations. They end the topic by exploring a new type of equation, $\frac{x}{p} = \frac{q}{r}$, to foreshadow work with proportional reasoning in module 5.

Topic D

Inequalities

In topic D, students apply what they know about solving equations to solve inequalities. They begin by graphing boundary numbers and testing numbers to determine the correct region on the number line to shade. Students determine whether solving by using if-then moves is more efficient. Through experimentation, students notice that when both sides of an inequality are multiplied or divided by a negative number, the inequality sign must be reversed to maintain a true number sentence. This discovery necessitates additional if-then moves for inequalities.

If-Then Statements for Inequalities
Let a , b , and c represent numbers.
If $a < b$, then $a + c < b + c$.
If $a < b$, then $a - c < b - c$.
If $a < b$ and c is a positive number, then $a \cdot c < b \cdot c$.
If $a < b$ and c is a negative number, then $a \cdot c > b \cdot c$.
If $a < b$ and c is a positive number, then $a \div c < b \div c$.
If $a < b$ and c is a negative number, then $a \div c > b \div c$.
<i>Versions of these statements can be written to begin with $>$, \leq, or \geq instead of $<$.</i>

After This Module

Grade 7 Modules 4 and 5

In module 4, students extend solving equations to applying formulas to determine area, circumference, and surface area. Students solve percent equations in module 5.

Grade 8

If-then moves are formalized as the properties of equality in grade 8 and are used to solve more rigorous equations throughout high school.

The work done in this module supports work with linear equations in one and two variables in grade 8. Students also extend their understanding of equivalent expressions when they solve systems of linear equations in grade 8.