

Unit 7: Equations and Inequalities

Dear Parents/Guardians,

Unit 7 investigates solving equations and inequalities. In Lesson 1, students use mental math strategies to solve equations. In Lesson 2, students reinforce the properties of equality through a balance model, and cups and counters. Students use these properties of equality (as well as other properties) to justify their steps using symbolic notation. In Lesson 3, students write, solve, and graph inequalities. Students use inequalities and equations to express and solve real world situations involving rational numbers in Lesson 4.

Solving Equations using Cups and Counters

Students will solve for the unknown (the “cup”, sketched as a V, as in the word “variable”) in equations while recording their steps using algebraic notation and in words. The goal is to figure out what each cup holds (all cups must hold the same amount for a particular problem). Below is an example.

Visual Representation		Symbolic Notation
$2x + 4$	-2	$2x + 4 = -2$
V V + + + +	- -	$2x + 4 = -2$
- - - -	- - - -	$-4 -4$ Add -4 (or subtract 4)
VV	- - - - -	$2x = -6$
V V	- - - - - -	$\frac{2x}{2} < \frac{-6}{2}$ Take half (or divide by 2) $x = -3$

To Flip or Not to Flip...

Students will operate on inequalities and determine when the inequality symbol should change direction to keep the inequality true.

Begin each operation with this inequality...	...then do this to both sides...	Steps		New inequality (make sure this is true)
		Left	Right	
$4 < 10$	Multiply by 8	$4 \times 8 = 32$	$10 \times 8 = 80$	$32 < 80$
	Multiply by -8	$4 \times (-8) = -32$	$10 \times (-8) = -80$	$-32 > -80$
	Divide by 2	$4 \div 2 = 2$	$10 \div 2 = 5$	$2 < 5$
	Divide by -2	$4 \div (-2) = -2$	$10 \div (-2) = -5$	$-2 > -5$

Notice when the original inequality was **multiplied or divided by a negative value**, the inequality symbol **changed direction** to keep the inequality true.

Students will solve inequalities, noting when to keep or reverse the inequality symbol.

Example:

1. Add 6 to both expressions.

$$\begin{array}{r} -3x - 6 < 12 \\ +6 \quad +6 \\ \hline -3x < 18 \end{array}$$

2. Divide each expression by -3.

$$\begin{array}{r} -3x < 18 \\ \div -3 \quad \div -3 \\ \hline x > -6 \end{array}$$

3. Reverse the inequality symbol to keep the statement true (see above).



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By the end of the unit, your student should know...

- How to use substitution as a mental math strategy to solve equations [Lesson 7.1]
- How to solve equations using the cups and counters model [Lesson 7.2]
- How to solve equations algebraically [Lessons 7.2, 7.4]
- How to solve and graph inequalities [Lessons 7.3, 7.4]
- How to solve equations and inequality problems using rational numbers [Lesson 7.4]

Additional Resources

- For definitions and additional notes please refer to Student Resources at the end of this unit
- To graph inequalities in one variable:
<https://youtu.be/nif2PKA9bXA>