## Simplifying Algebraic Expressions

Summary
Students will simplify algebraic expressions using properties
Main Core Tie
Mathematics Grade 6
Strand: EXPRESSIONS AND EQUATIONS (6.EE) Standard 6.EE. 4

## Additional Core Ties

Mathematics Grade 6
Strand: EXPRESSIONS AND EQUATIONS (6.EE) Standard 6.EE. 2
Materials
Algeblocks and Basic Mats
Ti-73' and view screen
Overhead of Properties Song
Worksheet: Simplifying Algebraic Expressions
Background for Teachers
Enduring Understanding (Big Ideas):
The order of operations and properties help us simplifying expressions
Essential Questions:
How do you know when an algebraic expression is in simplest form?
Skill Focus:
Simplify algebraic expressions
Vocabulary Focus:
Order of operations, commutative property, associative property, identity property, distributive property, like terms, algebraic expression, simplify
Ways to Gain/Maintain Attention (Primacy):
Contest, predicting, music, technology, stories, analogy, manipulative, writing, movement, cooperative discussion, journaling

Instructional Procedures
Starter: Accessing prior knowledge
Which of these representations does not tell us to multiply?
3(4)
2m
r/5
6 â€c 7
$8 \times 10$
Use Mental Math to compute. (hint: use properties to make it easier)
$3+(17+138)$
$1(1 / 2+4+1 / 2)$
$5 \times 26 \times 2$
$2(13)+2(7)$
$5(3+10)$
231 â€c 8 â€¢ 0

Compute using the correct order for operations:
$3+5^{2}[9-3(-1+4)]$
When correcting number 2 and 3 on the starter, have students explain their thinking. As they do, review the commutative, associative, identity, 0 , and distributive properties. Have them get out and review their properties foldable from September, Lesson 7. Sing the Properties Song (attached) to review.
Lesson Segment 1: How do the order of operations and properties help me simplify algebraic expressions?
In our language we often simplify expressions. For example, we could say, "Hi there. How are you doing? Or, we could say, "Hey, Sup?" The meaning is the same, but the second expression is much shorter and simpler than the original expression.
In mathematics we want to write expressions as simply as possible, but do not want to change their meaning or value. We want the simplified expression to be equivalent to the original, longer expression.
When we say "simplify the expression" we mean to make the expression more simple to understand or look at without changing the value of the expression. In the problems for \# 2 on the starter you used the properties to simplify the expressions. In problem \# 3, you used the order of operations to simplify the expression.
As you ask the following questions to mobilize student knowledge from past lessons, have student record the problems on Smart Pals or on a paper.
Q. When we say two expressions are equivalent what does that mean? For example when we say 3 +1 is equivalent to 4 (or $3+1=4$ ), what does that mean?
The equal sign tells us one expression is equivalent to the other or in other words, the expressions have the same value.
Q. If two expressions are equivalent, must they always look exactly the same? What makes you think so?
Show examples: $2+6=6+2,3(2 \hat{\text { â€ }} 5)=(3$ â€¢ 2$) 5,3(5+6)=3$ â€¢ $5+3$ â€¢ 6
Q. How can we know whether two expressions are equivalent if they don't look alike?

One way to verify that two expressions are equivalent, is to simplify each expression.
Example 1: $2+6=6+2$
$2+6$ simplified is 8
$6+2$ simplified is 8
$8=8$.
So, $2+6=6+2$
Example 2: $3(2$ â€¢ 5) $=(3$ â€¢ 2) 5
$3(2 \hat{a} \notin ¢ 5)$ is $3(10)=30$
(3 â€¢ 2) 5 is (6) $5=30$
30 -- 30
So, $3(2$ â€ 5 5) $=(3$ â€ 2$) 5$
Example: $3(5+6)=3$ â€ $¢ 5+3$ â€ 6
$3(11)=33$
3 â€¢ $5+3$ â€c 6 is $15+18=33$
$33=33$
So, $3(5+6)=3$ â€ $5+3$ â€ 6
Tell students these ideas about equivalency and simplifying apply with variables as well as numbers.
We use properties to simplify algebraic expressions. When we simplify an algebraic expression using properties, we can compare the original expression with the simplified expression to make sure they are equivalent. A simplified expression is always equivalent to the original. The way to compare the value of two algebraic expressions is to substitute values for the variable(s) and evaluate each as we
did in our lesson a couple of days ago.
Lesson Segment 2: How do you know when an algebraic expression is in simplest form?
Using Algeblocks and the Basic Mat have students go through these steps for each problem on the Simplifying Algebraic Expressions worksheet. As appropriate use the vocabulary such as "like terms" and the names of properties to help them describe what they are doing.

Set up the expression on the Basic Mat
Use zero pairs from the integer rules and simplify the expression to find out the total on the mat after taking away any zero pairs.
Use the TI-73 to check to make sure the original expression is equivalent to the simplified expression
An algebraic expression is simplified when a) parentheses have been multiplied through and b) all like terms and units have been combined through adding or subtracting.
Practice: In order to simplify correctly students must use integer operations rules and must be able to work with decimals and fractions, so assign text practice as needed. When practice is tedious or mundane, I play a game with the students such as the following Boxes Game.

## Boxes Game

Object: Draw the most boxes for your team.
Procedure: Divide class into two teams. Have students all work on a problem. Call on a person to explain how they did the problem. If the student explains correctly, he/she goes to the board and draw two segments, each connecting one point to another. The perimeter of the box may be used as line segments, so one box could be made in any corner using only two line segments. The student puts a letter or number to represent the team in the box. For each box the student draws in that turn, one more line segment must be drawn somewhere on the board.

## Assessment Plan

observation, questioning, writing, mental math, student response cards
Bibliography
This lesson plan was created by Linda Bolin

## Authors

Utah LessonPlans

