Simplifying Algebraic Expressions Using Properties

Summary

Students will simplify algebraic expressions using the identity properties of addition and multiplication, the commutative and associative properties of addition and multiplication, and the distributive property of multiplication over addition.

Main Core Tie

Mathematics Grade 6
Strand: EXPRESSIONS AND EQUATIONS (6.EE) Standard 6.EE.2

Additional Core Ties

Mathematics Grade 6
Strand: EXPRESSIONS AND EQUATIONS (6.EE) Standard 6.EE.4

Materials

Ti-73' and view screen
Paper for foldable
Algeblocks
Worksheets: Using the TI-73: Simplifying Algebraic Expressions, Distributive Property With Algeblocks

Background for Teachers

Enduring Understanding (Big Ideas):
Properties apply in both numeric and algebraic situations. Properties can expedite simplifying expressions
Essential Questions:

What is the product of any number and 1? What is the sum of any number and 0?
How does applying the commutative or associative properties affect the sum or product?
How can I demonstrate the use of the distributive property of multiplication over addition?
How do properties help me simplify algebraic expressions?

Skill Focus:
Apply properties in simplifying algebraic expressions
Vocabulary Focus:
Commutative property, Associative property, Multiplicative Identity Property, Additive Identity Property, distributive property, 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€¢ 7
8 x 10

Use Mental Math to compute.

3 + (17 + 138)
1(½ + 4 + ½)
5 x 26 x 2
2(13) + 2(7)
5(2 + 10)
231 â€¢ 8 â€¢ 0

Lesson Segment 1: (Accessing prior knowledge) What is the product of any number and 1? What is the sum of any number and 0? How does applying the commutative or associative properties affect the sum or product? How can I demonstrate the use of the distributive property of multiplication over addition?

Team Contest: Use the #1 question on the starter to review properties by asking students to look at property words on the board. Tell them you can compute much faster and easier by using these properties. Have students take out a paper for an assignment activity called "Properties Guess", and number the paper a-f. As you mentally compute each starter problem, have students quietly discuss with their team and write which property or properties they think you applied. Ask students to respond after they have written the property they think you applied. Any team who correctly identified the property(s) earns a point. You may need correct their thinking as you go over each problem. After discussing an expression, have students write the correct property and how it was applied to simplify each expression on their paper.

3 + (17 + 138) Use associative property to regroup adding 3 and 17 first.
1(½ + 4 + ½) Use the commutative property to reorder ½ + ½ + 4 in the parentheses, and then multiply by 1 using the identity property.
5 x 26 x 2 Use the commutative property to reorder 5 x 2 x 26.
2(13) + 2(7) Use the distributive property to multiply the sum of 13 and 7 (20) by 2.
5(2 + 10) Use the distributive property to multiply 5 x 2 (10) and 5 x 10 (50). Add 10 and 50.
231 â€¢ 8 â€¢ 0

Tell students these properties work for addition and multiplication with variables too. If they have their properties foldable from September Lesson 7, they could use it to compare. Make this foldable for properties with variables. Fold both edges toward the center. Clip on the dotted line to the fold to make four shutters. Inside students should write examples of the application of these properties using variables. Work with students to write simple algebraic examples such as:

a + b = b + a
ab = ba
(a + b) + c = a + (b + c)
(ab)c = a(bc)
1a = a
a(b+c) = ab + ac

Lesson Segment 2: How do properties help me simplify algebraic expressions?

Sing or say the Properties Song to review (attached).

Accessing and building background knowledge:

Tell the students when they were finding a simple answer for the operations in the contest, they were "simplifying the expression". Give a brief explanation for the word, simplify such as, "What we mean by "simplifying an expression" is to make the expression more simple to understand or look at without changing the value of the expression.

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.
Ask the following questions and have students record the examples on their Team Contest record 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 â€¢ 6 = 3 â€¢ 4
3(2 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 â€¢ 6 = 3 â€¢ 4
2 â€¢ 6 simplified is 12
3 â€¢ 4 simplified is 12
12 = 12.
So, 2 â€¢ 6 = 3 â€¢ 4
Example 2: 3(2 â€¢ 5) = (3 â€¢ 2)5
3(2 â€¢ 5) is 3(10) =30
(3 â€¢ 2)5 is (6)5 = 30
30 -- 30
So, 3(2 â€¢ 5) = (3 â€¢ 2)5
Example 3: 3(5 + 6) = 3 â€¢ 5 + 3 â€¢ 6
3(11) = 33
3 â€¢ 5 + 3 â€¢ 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. Students will be simplifying algebraic expressions, and then substituting values in the expressions to verify equivalency.
Work with the class to complete the Simplifying Algebraic Expressions worksheet.
Lesson Segment 3: How can the distributive property be applied to algebraic expressions?
Using Algeblocks, work through the attached Distributive Property Using Algeblocks investigation (attached). This is a powerful visualization for applying the distributive property with variables. Make sure students build, draw and represent as instructed.
Discuss their models.
Assign text practice as needed.

Assessment Plan

observation, questioning, writing, mental math, student response cards

Bibliography

This lesson plan was created by Linda Bolin.

Authors

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