DAY 3: Adding Polynomials with Tiles

Materials

Copies: 3.1 Adding Polynomials with Tiles
3.2 The Distributive Property
Ticket Out the Door Day 3

Supplies: Algebra Tiles (1 set per student)

Objective

Students will use algebra tiles to represent and add algebraic expressions and record the simplified expression.

Student Talk Strategy

Report to a Partner for opening
Think-Pair-Share for opening

Academic Language Use

Expression: An expression is a mathematical term or a sum or difference of mathematical terms that may use numbers, variables, or both.
Variable: A symbol standing in for an unknown numeric quantity.
Term: a term is either a single number or a variable, or numbers and variables multiplied together.
Like/Common Terms: Terms with the same variable raised to the same power.
Polynomial: An expression made up of two or more terms.
Distributive Property: states that the product of a number and a sum is equal to the sum of the individual products of the addends and the number. That is, $a(b + c) = ab + ac$.

Activity Notes

20 minutes: Adding Polynomials with Algebra Tiles

Begin today by referring back to the summaries from 2.1, adding with animals. Ask the class, "What has to be true to be able to combine things?" Have the students report to a partner and then use random selection to have students share. To help them share, use a sentence starter: To decide if I can combine two things, I _____.

Put up an x^2 tile and ask the class to chorale response what this represents. Now put up two more x^2 tiles and ask the class what you have now (you are looking for $3x^2$). Finally, put up two x tiles. Ask the class what you have now and use Think-Pair-Share (30 seconds to think silently, followed by 30 seconds to share with a partner and then selecting students to share with the class). Once a student shares, ask the class to vote if they agree (thumbs up), disagree (thumbs down) or are not sure (sideways thumb). Call on students to defend their thinking until all students agree the final expression is $3x^2 + 2x$. Ask the students which tiles they "combined" and which ones they could not combine. Record this on the board as two columns (and leave space as students will add to this during the lesson)

Combined	Could NOT Combine
x^2 and $2x^2$	$3x^2$ and $2x$

Pass out algebra tiles and activity sheet 3.1 to each pair of students. Go through problem #1 as a class, ensuring each pair gets out tiles to represent $3x^2 + 4$ and then gets out the tiles to represent $x + 3$. Set the timer for 90 seconds and ask each pair to combine any tiles they can to write a final expression. Use random selection to have a pair come show which tiles they combined and write their final expression. Ask the pairs to solve the remaining problems while you circulate to assess and ask guiding questions, such as "What do a positive two x's and a negative two x's make?" "Can you combine an x with a 5? Are they the same size?" Set the timer for 10 minutes for the pairs to finish activity sheet 3.1. Have pairs who finish early go up to the board and add another example to the "combined and could NOT combine" chart. While you are circulating, use purposeful selection to find pairs to come share their work. Use the last 10 minutes to have pairs show how they combined their tiles and what their final expressions were.

35 minutes: The Distributive Property

Put up the problem: 3(4+6) and give students 30 seconds to come up with an answer. Call on a few students, at random, to explain their answer and how they solved it (model this on the board). Then write up 3(x+6). Allow 30 seconds to come up with an answer. Call on any student who has an "answer" to explain. Then ask the class what is different about these problems. Explain that when there is a variable involved, we will need to use the distributive property to simplify or to get rid of the parentheses (which we always have to do first with the order of operations). This next section will help them understand how to do this.

Pass out activity sheet 3.2. Have students work with a partner on Scenario A. Set the timer for 3 minutes to allow them to study the two models and answer questions 1-3. Circulate to assist students who need guiding questions. At the end of the 3 minutes, use random selection to have students share their answers for the 3 questions. To make sure they understand the models, ask "How is Model 1 a picture of 2(3+4)?" and have volunteers share their responses (you want the students to see it is 2 "groups of" or "rows" of "3+4". If they struggle seeing this, begin scenario B with the same question before having them study it and solve the 3 problems. Then, set the timer for 9 minutes and have the pairs complete scenarios B-D.

Come back together as a class to study scenario E. Begin by asking them how Model 1 shows 3(x+2) and again, get at the idea that it is 3 "groups of" or "rows" of x + 2 (as this is how they first learned multiplication in grade 2). Give the pairs 10 minutes to complete Scenarios E-G AND the summary questions. Come back together to have a few students share their answers to summary questions 1-3.

Now it is time to move on to practice. Before starting this, you need to define subtraction as adding the opposite. To do this, write the problem 4 - (-6) and use Think-Pair-Share to have students think silently for 30 seconds about how they would solve, followed by 20 seconds to share, and then select volunteers to share until you agree you can change 4 - (-6) to 4 + (+6). Write up the sentence frame "We can change subtraction to adding the _____." Give the class 15 seconds to think and then give a chorale response to say "opposite". Direct their attention to the "note" by the practice time heading. Explain that for the remainder of this unit, subtraction will always be changed

to “add the opposite”. Write this and hang it in a place all can see for the remainder of the unit: “We change subtraction to adding the opposite.”
Have students try the practice on their own. Give them 1 minute to try practice #1 and then have a volunteer come show how they solved it. If it seems most students are okay with this, set the timer for 3 minutes and have them work on #’s 2-4. Bring the class back together to discuss #4. Ask for volunteers who were able to do this correctly to share their methods. Here are some methods to help students understand how to simplify -(4x+2): a) the “-“ is read as “opposite”, so the 4x becomes -4x and the +2 becomes -2; b) the “-“ is really a “-1”, so they can multiply 4x by -1 and 2 by -1; c) pass out (distribute) the negative sign to each term.
Set the timer for 5 minutes to have the students finish the practice. If students finish early, have them write up their work on the board for others to use to check and/or try the challenge problems.

5 minutes: Ticket out the Door
Pass out the Ticket out the Door and collect it as soon as each student finishes (so that you can discuss mistakes with students as they turn it in).