DAY 8: Combine Polynomials with X,Y&Z

Materials

Copies: 8.1 Distribute and Combine Polynomials II
8.2 Find your Partner
8.3 Find your Partner Cards (copied and cut on cardstock)
8.4 Combining Polynomials with X, Y &Z
Ticket Out the Door Day 8

Supplies: 8.3 cards (1 set per group of 8).
(Optional) 4.5 Polynomial Cards (Negative coefficients)- 1 set per student
(Optional) 2.4 Polynomial Cards (Positive) - 1 set per student

Objective
Students will add and subtract polynomials, including problems with the distributive property, by lining up like terms vertically. Students will draw letters to combine like terms with multiple variables.

Student Talk Strategy
Three-Way Interview for opening review
Three-Way Interview for 8.4

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, $a(b + c) = ab + ac$.
Degree: The value of the exponent of a term.

Activity Notes
5 minutes: Review Day 7 big ideas
Write up the following sentence frames.
1) If the operation is subtraction, I need to _____.
2) If there is something to distribute, I need to do this _____ (before or after) I combine like terms.
3) I can only combine terms that have the same _____ and the same _____.
Give students 2 minutes to fill these in on their own, and then have them conduct a three-way interview. Have partners interview each other and call on students to share

what their partner recorded. Note: answers are 1) change to add the opposite; 2)before; 3) letter and degree.

15 minutes: Combine Polynomials II
Pass out activity sheet 8.1 (you can make the polynomial cards (2.4 and 4.5) available if you see students not lining up like terms). Explain to the class that today they will be solving without algebra tiles or cards. Remind them that they must line up like terms vertically to add and they must answer the questions BEFORE they combine. Go through the first problem as a class. Begin by asking the first questions:
1) What is the operation? Use Chorale response for this.
2) Do I need to change? Have the students vote Thumbs up for yes, thumbs down for no.
3) Do I need to distribute? Have the students vote Thumbs up for yes, thumbs down for no.
4) If yes, have the students write down the new expression and select a student to share. Ask the students to tell you what to write in each box of the first row of the table. Select students to quickly tell you each term/step until you complete the problem. Set the timer for 10 minutes for students to work alone, silently, on the problems. Circulate to assess and ask guiding questions, such as, "Can you combine an x^2 with an x?" If students are not recording the terms in order of descending degree, have the use the polynomials cards. Give them 5 minutes to then work with a partner or group of three to finish any problems or to get help. Put up an answer key for the last 2 minutes.

15 minutes: Find your Partner
Pass out activity sheet 8.2 and go over the directions.
Explain to the class that you will putting them into groups of 8 and giving each group 8 cards. The 8 cards represent 4 expressions which are NOT simplified and then the same 4 expressions simplified. Each person will get a card at random. When you say go, each person must find their "partner" within the group (the person who has an equivalent expression.) Once all 8 students have their partner, the group members will all raise their hands. If the partners are correct, have each pair record the equivalent expressions on the recording sheet (8.2) as well as show "how they know". The first group to have correctly made partners earns a point. Note: other students may help group members find their partner, but NO ONE can hold MORE than 1 card in their hand (i.e., 1 person can't collect the cards, do the work and then pass them back out). Ask the class a few questions to make sure they understand. "Can you give your card to someone else? How do you know who your partner is? What do you do when everyone in your group has their partner?"
Put the class in groups of 8 and have a representative come get the cards for their group (make sure to shuffle the cards!), pass them out and begin. Once each group finishes, have them record their equivalent expressions on the recording sheet. Collect the cards from each group and then have the group representatives come up again to get a new set of cards and repeat the process. If you have time, do a 3rd round of this.

20 minutes: Combining Like Terms with x, y & z.
Pass out activity sheet 8.4. Give the students 3 minutes to think about and record their ideas for part 1. Then have the students interview a partner about what they wrote down and finally, call on students to share what their partner wrote (Three-Way interview). Conclude, as a class, that "To combine like terms, they must have the same

letter or variable and the same degree. Write this up on the board for all to see for the rest of the lesson. Direct the students' attention to Part 2. Walk the class through the example problem, asking questions along the way, such as "Why are there 4x's drawn?" "Why are the x²'s drawn to the left of the x's and not below them?" "Which letters are lined up?" "What is 2y + 3y equal to?" Give the class 5 minutes to begin working with a partner. While they work, circulate to assess and ask guiding questions. Ensure students are drawing out each term and lining up the like terms. At the end of 5 minutes, select a student who did #1 well to explain their work to the class. Allow the students to continue working with a partner to finish as many more problems as they can. If any pairs finish early, have them write up their work for a problem on the white board.

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).