DAY 2: Animals, Tiles & Polynomials

Materials

Copies:	2.1 Adding Animals 2.2 How Much is That Worth? 2.3 Building Polynomials Ticket Out the Door Day 2
Supplies:	Algebra Tiles (1 set per student) Colored Pencils for each student 2.4 Polynomials Cards- Positive (1 set per student) copied on cardstock and cut out
Word-Wall Words:	Zero Pair Standard Form

Objective
Students will look at adding animals to come to the understanding of adding "common" things. Students will learn the value of algebra tiles and understand zero pairs and apply this by building polynomials with tiles and in expanded notation.

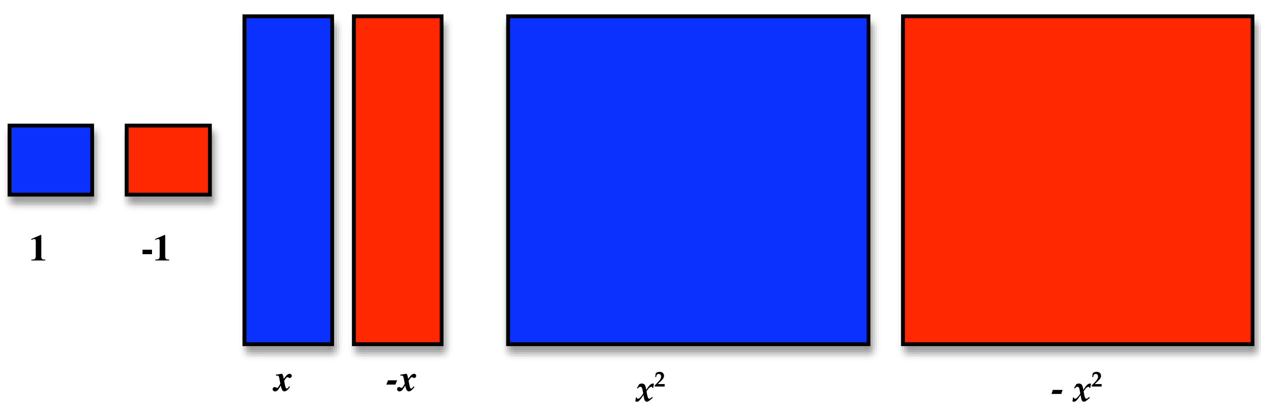
Student Talk Strategy
Round Table for 2.1 #'s 7 & 8
Think-Pair -Share for learning the value of tiles
Report to a partner for Building Polynomials

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.
Standard Form: An equation is in standard form when written with the term in descending order with the highest degree (power) first and a constant last.

Activity Notes
15 minutes: Adding Animals
Pass out activity sheet 2.1. Explain to the students that you are working on learning when you can combine (add) things and when you can't and that you'll learn this by using something they are familiar with: animals. Go through the first problem together, by asking the students to read #1, think silently for 15 seconds about if they can or cannot add the kangaroos to the pandas and then have the class vote- thumbs up if they can add the "numbers", thumbs down if they cannot and sideways thumb if they are

not sure. Call on a few students to share their reasoning and conclude that the answer is still 3 kangaroos + 2 pandas, so they would write "can NOT combine". Set the timer for 5 minutes and have the students solve problems 2-6 on their own. Then use random selection to have students share their answers and reasoning.
Direct the students' attention to problems 7 & 8. Make sure they understand the task and then set the timer for 2 minutes in which they need to create their own problems. At the end of 2 minutes, have students get into groups of 4. Use Roundtable to have each student share their "problem" for #7 and then go around again to have each student share their "problem" for #8. If you have time, select students to share. Finish this section by setting the timer for 2 minutes to have students complete #9. Select students to share their conclusions.

10 minutes: Introduction to Algebra Tiles & Zero Pairs
Pass out the algebra tiles and allow students a few minutes of exploration time. Students need nothing out at this time. Ask them what they think they are used for. (Hopefully a few of the students will have used them before.) Let them know that each one is "worth" something and we are going to assign them a particular value. Explain that we assign values based upon area and the sign. Show the class the small blue square and explain that is measures 1 inch by 1 inch and so we call it +1. Show them the small red square and tell the students we call this -1. Now put up the blue rectangle and ask the students to predict what this is called. They should see it has a dimension of 1 and the other dimension is in between 3 and 4, so let them know we'll call the length "x". Now bring out the red rectangle and see if the class can chorale reply the name of this tile ($-x$). Lastly, bring out the large blue square. Again, have the students use the other tiles to "discover" what this tile is- they should see it has a length and width of x, so we call it x^2. Then take out the large red square and ask the students the value of this- it should be $-x^2$.



Zero Pairs
Ask the students to model on their desks a few expressions. Say, "Use your tiles to show positive $2x + 3$." Have them turn to an elbow partner to verify if they have the same tiles out. Then say, "Show me what $-x^2 + 2x + (-2)$ looks like." Again, have them check with their elbow partner. Once the students are comfortable with this, it's time to introduce the "zero pair." Put up 1 red and 1 blue (+1, -1) and ask them to think silently about what the value of those two together might be. Ask them to discuss with their partner. Call on a few groups/partners randomly to solicit thoughts. (Think-Pair-

Share). If they are having trouble grasping the concept that the two tiles represent a value of zero, you can use some real-life scenarios to help with understanding, i.e., in football you gain one yard, then lose one yard; with money you have a dollar and then spend a dollar. Formally discuss the word "zero pair" and add this word, along with a visual, to the word wall. Do the same for x and $-x$ as well as for x^2 and $-x^2$. Make sure the students understand that 1 red and 1 blue of the same shape equals zero. To do this, give them a quick chorale-style quiz by putting up 2 big blue squares and asking for the value of the pile. Then put up 1 red rectangle and 1 blue rectangle and ask the value of that pile. Do as many as you need until you feel the class understands.

10 minutes: Activity Sheet 2.2

Pass out activity sheet 2.2 How Much is that Worth? Give students 7 minutes to complete this independently. While students are working on this, circulate to assess how well the students are understanding. Use the remaining 3 minutes to have the class state the answers to each in a Chorale fashion (ask, "What is the value of the pile in #1?" and have everyone say the answer together).

20 minutes: Building Polynomials

Note: In an attempt to help students understand the terms of a polynomial as well as to have a concrete object to use when combining like terms later in this unit, we want the students to become familiar with the polynomial cards.

Pass out a set of Polynomial Cards to each student. Give the students a few minutes to explore the cards and then call on a few students to share what they think the cards are used for. If they don't notice, point out to them that there are positive ones (constants), x's, x^2's, x^3's and x^4's. Write the expression $2x^2 + 3x + 1$ on the board and ask each student to take out the cards to represent that expression. Walk around to ensure each student has it built. (If the class seems to struggle, do a few more examples like that.) Then, ask the students to use the cards to model each expression from activity sheet 2.2. Have them report to a partner to share the cards used for each expression. Circulate to ensure the students are modeling the expressions correctly with the cards.

Pass out activity sheet 2.3. Have students work with a partner on problems 1-3, by first having each student use their cards to make the expression and then having the partners compare expressions. When you get to problem #4, put up the following ways to represent the expression: $4x^2 + 3 + 6x^3 + 2x$, $3 + 4x^2 + 2x + 6x^3$, and $6x^3 + 4x^2 + 2x + 3$. Ask the students what is the same about the 3 expressions and what is different. Then introduce the word "Standard Form" by explaining that we typically write expressions beginning with the variable with the highest exponent and then going in descending order. Note: The cards are designed so that students have to put the highest degree term on the left, but we want them to understand why (you can relate this to place value and expanded notation if it helps). Put the word "Standard Form" up on the word wall along with a visual. Ask the students which of your three options would be in standard form. Have them build this on the paper and then have them complete #5 with their partner. If they finish early, allow them to work on the challenge problems (and try not to teach them how to solve this as we'll get to that in a few days!!!).

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).