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Adding and Subtracting Polynomials

Overview:

Students will compare addition and subtraction of algebraic expressions in a manner that unites symbolic manipulation with **Algebraic Bossé Tiles**. They will create equivalent representations of equations in two forms. The activity can be done as a whole class with students working independently or with students working in small groups.

Materials:

Blue and red **Bossé Tiles** and an Adding and Subtracting Polynomials worksheet for each student or group. Blue and red pencils for each student are optional.

Teacher Notes:

Provide some direct instruction prior to students attempting this activity, or allow students to attack the problems independently or in collaborative groups. Once students become familiar with the shapes and name of each tile, they quickly recognize the comparison between symbolic and physical or diagrammatic representations.

To complete this activity students must understand the notion of zero pairs; for instance, $1 + (-1) = 0$ and $10 + (-10) = 0$. They must understand that zero pairs exist in every place value. Students must understand and use the distributive properties of multiplication over addition and subtraction. Students should know that any subtraction problem, $a - b$, can be rewritten as an addition problem, $a + (-b)$.

Directions:

1. Give an Adding and Subtracting Polynomials worksheet to each student or group.
2. Explain that students will use **Bossé Tiles** to create a physical model of each equation that appears in the left column of the worksheet.
3. Each student or group will then draw the model in the middle column of the worksheet.
4. Students will write the sum or difference in the space provided in the far right column of the worksheet.
5. Ask students to compare their results with others and discuss why they selected the matches.

Extensions:

- Ask students to develop their own examples and have other students verify their work.
- Add some more or less challenging examples of your own to adapt the activity to the range of student abilities in the class.

Name: _____

Adding and Subtracting Polynomials

Draw a diagram of the **Algebraic Bossé Tiles** that represent the problem in the middle column. Then write the simplified sum or difference in the far right column.

Problem	Model	Sum/Difference
1. $(3x^2 - 2x + 1) + (x^2 + 4x - 3)$		
2. $(2y^2 - 4) + (-2y^2 + 9)$		
3. $(4x + 5xy + 3y) - (3y + 3x + 4xy)$		

Problem	Model	Sum/Difference
4. $(z + 5) + (2z + 4x - 2)$		
5. $(8 + z) - (3 - 6z)$		
6. $(3x^2 + 8x + 4) - (5x^2 - 4)$		

Animals

Overview:

Students will use **Algebraic Bossé Tiles** to model and solve algebraic expressions involving addition and subtraction of polynomials.

Materials:

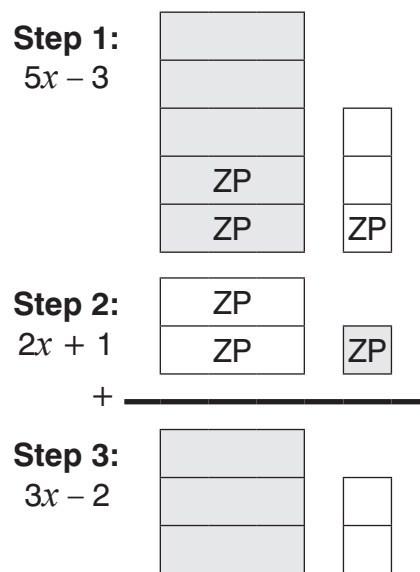
Blue and red **Bossé Tiles**, an Animals worksheet, and one red and one blue pen or pencil per student.

Teacher Notes:

After completing the Adding and Subtracting Polynomials activity, students should have little difficulty with this lesson. Students will need to understand and use the distributive properties of multiplication over addition and subtraction. Students should know that any subtraction problem, $a - b$, can be rewritten as an addition problem, $a + (-b)$.

Directions:

- Provide each student with a copy of the Animals worksheet and a set of blue and red **Bossé Tiles**. Each student will also need a blue and a red pencil or pen.
- Explain that students will complete the worksheet by modeling each expression using **Bossé Tiles**. They will solve each expression to discover an animal that has an eye larger than its brain.
- Begin by demonstrating the first expression on the worksheet as students follow along to model the steps to solving the problem at their desks. Ask students to draw their model on a blank piece of paper and number the model to correspond with the problem being solved. Begin by writing the expression on the board.
- Model $5x - 3$ by placing five blue x pieces and three red units side-by-side (see Step 1).
- Place two red x pieces and one blue unit piece below the first model (see Step 2).
- Now you need to simplify the expression to find the answer. Ask students if they can find zero pairs. Point out the pieces marked as “ZP” in the figure to the right. Remind students to label zero pairs.
- Look at what you are left with after removing zero pairs. Build the model of $3x - 2$ below the line and write the answer on the board (see Step 3).
- Instruct students to complete the rest of the worksheet by creating models using **Bossé Tiles** to find the simplified expressions. They will sketch their diagrams on the separate piece of paper and write the simplified algebraic expression on the worksheet.
- Ask students to record their answers in the blank following the equals sign on their worksheets.
- After students complete all of the models and record the simplified expressions, they will find the answer in the following list and place the corresponding letter matching the answer in the blank above the problem number. This will answer the prompt, “Name an animal whose eye is larger than its brain.”



Animals

Create models using **Algebraic Bossé Tiles** to simplify each expression below. Draw diagrams of the models on a separate piece of paper. Be sure to number each diagram and mark zero pairs. Write the simplified expressions below your diagrams and on this worksheet. Then find the answers in the list below and place the correct letters in the blanks at the bottom of the page above the corresponding problem numbers. This will be the answer to the prompt.

1. $(5x - 3) + (-2x + 1) =$ _____

2. $(-4y + 7) - (-7y + 8) =$ _____

3. $(6x^2 - 7xy - 4y^2) - (2x^2 + 5xy + 6y^2) =$ _____

4. $(-7x^2 + 4xy - 6y^2) + (-5x^2 + 12xy + 3y^2) =$ _____

5. $(9x^2 - 11xy - 3y^2) - (x^2 - 16xy + 12y^2) =$ _____

6. $(3x^2 + 5) + (4x^2 - 1) =$ _____

7. $(6y + 2) - (9y + 3) =$ _____

Answers

A. $-3x - 2$

H. $-3y - 1$

R. $-12x^2 + 16xy - 3y^2$

C. $7x^2 + 4$

I. $8x^2 + 5xy - 15y^2$

S. $3y - 1$

E. $-4x^2 - 2xy + 2y^2$

M. $-7x + 4$

T. $4x^2 - 12xy - 10y^2$

G. $10x^2 + 10xy - 3y^2$

O. $3x - 2$

Name an animal that has an eye larger than its brain.

1 2 3 4 5 6 7