

4.2 Adding and Subtracting Polynomials
(pp. 116-123)

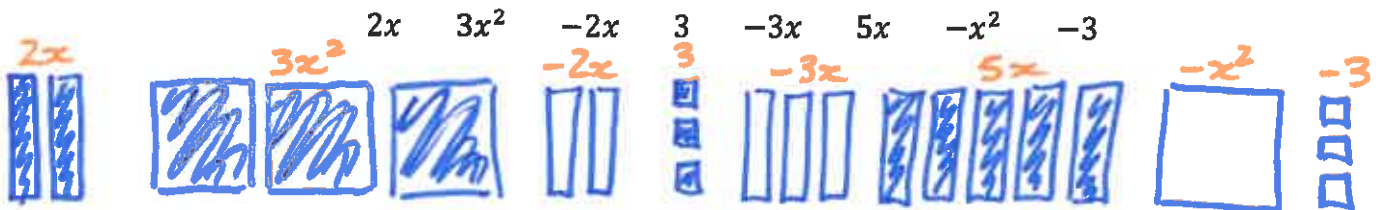
Name: _____
Date: Apr. 13 / 14

Learning Goals: *I will learn to*

- apply mathematical understanding of like terms in algebraic expressions
- model and record the processes of adding and subtracting polynomial expressions
- solve problems using the addition and subtraction of polynomials

Explore and Analyze

1. Lay out or draw tiles to represent each of the following terms:



a) Look at the tiles. What do you notice about the colours, shapes, and sizes? Compare your answers with a partner?

group by colour
all positives shaded
all negatives empty

group by shape
big squares $\rightarrow x^2$
rectangles $\rightarrow x$
little squares $\rightarrow 1$

b) What terms can be combined by adding to form a new term? Why?

\rightarrow terms represented by the same shape of tile can be combined
 $3x^2 + (-x^2) = 2x^2$
 $2x + (-2x) + (-3x) + 5x = 2x$
 $3 + (-3) = 0$

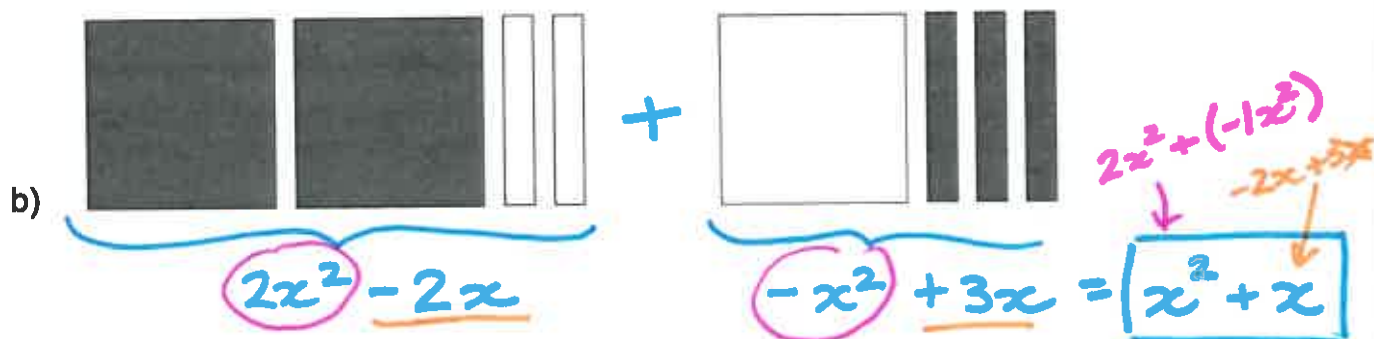
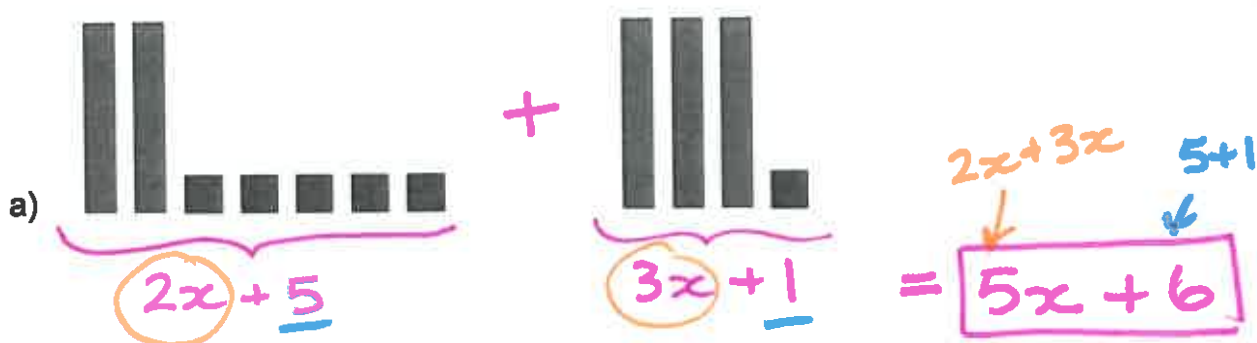
c) The terms you listed in part b) are considered like terms. How would you define like terms?

\rightarrow have the same shape algebra tile
 \rightarrow have the same exponent with the same variable

2. Which pairs in #1 could be added to get 0? How do you know?

zero pairs are opposites
 $2x + (-2x) = 0$
 $3 + (-3) = 0$

3. What two algebraic expressions does each model illustrate? What is the expression after the like tiles are combined by adding?



4. Describe a method for adding like terms without using a model (algebra tiles).

** add the coefficients of the like terms*

Develop Understanding

Example 1: Add Polynomials (p. 117)

What is the sum of each pair of polynomials?

a) $3x + 6$ and $2x + 1$

$$\begin{aligned} & (3x + 6) + (2x + 1) \\ &= \underbrace{3x + 2x} + \underbrace{6 + 1} \\ &= 5x + 7 \end{aligned}$$

b) $x^2 - 5x + 2$ and $2x^2 + 5x - 3$

$$\begin{aligned} & (x^2 - 5x + 2) + (2x^2 + 5x - 3) \\ &= 3x^2 - 1 \end{aligned}$$

- ① *rearrange or circles/underline* collect like terms
- ② add coefficients of like terms

Show You Know

Add each pair of polynomials

a) $(2x + 3) + (4x - 3)$

$$= \underbrace{2x + 4x} + \underbrace{3 - 3}_0$$
$$= 6x$$

b) $(2x^2 - 2x + 3) + (3x^2 + 2x + 4)$

$$= 5x^2 + 7$$

Example 2: Subtract Polynomials (p. 118)
Simplify.

a) $(4x + 3) - (x - 1)$

$$= (4x + 3) + (-x + 1)$$
$$= 3x + 4$$

to subtract,
we need to ADD
the opposite

b) $(2x^2 - 2x + 3) - (3x^2 - 4x + 4)$

$$= (2x^2 - 2x + 3) + (-3x^2 + 4x - 4)$$
$$= \underbrace{2x^2 - 3x^2} + \underbrace{-2x + 4x} + \underbrace{3 - 4}$$
$$= -x^2 + 2x - 1$$

Show You Know

Use your choice of methods to simplify each expression.

a) $(5x + 4) - (2x + 1)$

$$= (5x + 4) + (-2x - 1)$$
$$= 3x + 3$$

b) $(x - 3) - (6x - 5)$

$$= (x - 3) + (-6x + 5)$$
$$= -5x + 2$$

c) $(3x^2 + 4x - 2) - (2x^2 + 6x + 2)$

$$= (3x^2 + 4x - 2) + (-2x^2 - 6x - 2)$$
$$= x^2 - 2x - 4$$

d) $(2x^2 - 5x + 3) - (5x^2 + x - 1)$

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

Example 3: Model and Solve Problems with Polynomials (p. 121)

The table shows the costs involved to rent a banquet hall.

Charge Type	Fixed Cost (\$)	Cost Per Person (\$)
Banquet hall	1500	0
Service charges	0	5
Food costs	500	45
Drink costs	100	20



a) What is the cost to hold a banquet for 200 people?

$$\begin{aligned}
 C &= 1500 + 5(200) + 500 + 45(200) + 100 + 20(200) \\
 &= 1500 + 1000 + 500 + 9000 + 100 + 4000 \\
 &= 16100 \quad \boxed{\$16100}
 \end{aligned}$$

Handwritten notes: "hall" under 1500, "service charges" under 5(200), "food" under 500, "drinks" under 20(200).

b) Write an expression to represent the total cost to rent the banquet hall for n people. Simplify the polynomial.

$$\begin{aligned}
 C &= 1500 + 5n + 500 + 45n + 100 + 20n \\
 &= \boxed{2100 + 70n}
 \end{aligned}$$

Handwritten note: "Number of people" with an arrow pointing to n .

c) Verify that your expression works by using it to determine the cost of a banquet for 200 people.

check Evaluate $2100 + 70n$ when $n=200$

$$\begin{aligned}
 &2100 + 70(200) \\
 &= 2100 + 14000 \\
 &= 16100 \rightarrow \boxed{\$16100} \checkmark
 \end{aligned}$$

Key Ideas

- Like terms have the same variable(s) and the same corresponding exponents.
- You can combine like terms. You cannot combine unlike terms.
- You can use algebra tiles to model adding and subtracting of polynomials.
- Adding a zero pair to any expression does not change the value of the expression.
- To add polynomials, remove the brackets and add like terms.
- To find the opposite of a polynomial, take the opposite of each of its terms.
To subtract a polynomial, add the opposite terms.