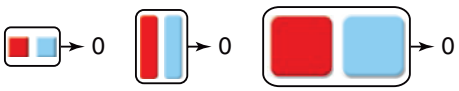
7.1 Like Terms and Unlike Terms

Algebra tiles are integer tiles and variable tiles.

Positive tiles	Negative tiles
represents 1	represents –1
represents x	represents $-x$
represents x^2	represents $-x^2$

Any two opposite tiles add to 0. They form a **zero pair**.



Investigate Using Algebra Tiles to Model Expressions

Use at least 2 different kinds of red tiles. Vary the number and kind of tiles used.

Work with a partner. Repeat each activity 5 times.

- Place some red algebra tiles on your desk.
  Group like tiles together.
  Describe the collection of tiles in words and as an algebraic expression.
- Place some red and blue tiles on your desk.
  Group like tiles together.
  Remove any zero pairs.
  Describe the remaining collection of tiles in words and as an algebraic expression.

Reflect

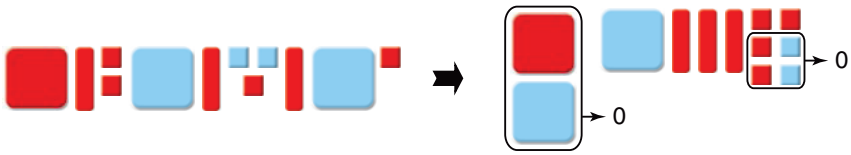
- What are like tiles?
  Why can they be grouped together?
- How would you represent like tiles algebraically?
- Why can you remove zero pairs?
- How do you know you have given the simplest name to a collection of tiles?

Connect the Ideas

To organize a collection of algebra tiles, we group like tiles.

There are two x^2-tiles, three x-tiles, and five 1-tiles.
These tiles represent the expression $2x^2 + 3x + 5$.

When a collection contains red and blue tiles,
we group like tiles and remove zero pairs.



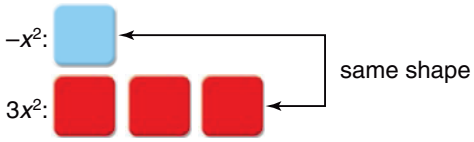
One $-x^2$-tile, three x-tiles, and two 1-tiles are left.
We write $-1x^2 + 3x + 2$.
We could also write $-x^2 + 3x + 2$.

The expression $-x^2 + 3x + 2$ has 3 **terms**: $-x^2$, $3x$, and 2

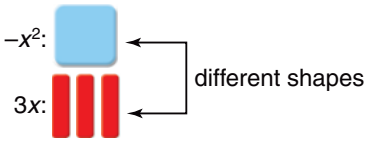
Terms are numbers, variables, or the products of numbers and variables.
Terms that are represented by like tiles are called **like terms**.

The numerical part of a term is its **coefficient.** The coefficient of $3x^2$ is 3. It tells us that there are three x^2-tiles.

$-x^2$ and $3x^2$ are like terms.
Each term is modelled with x^2-tiles.
In each term, the variable x is raised to the exponent 2.

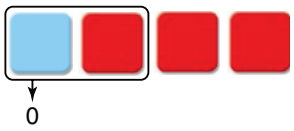


$-x^2$ and $3x$ are unlike terms.
Each term is modelled with different sized tiles.
Each term has the variable x, but the exponents are different.



An expression is simplified when all like terms are combined, and any zero pairs are removed.

$-x^2 + 3x^2$ simplifies to $2x^2$.



$-x^2 + 3x$ cannot be simplified.

Practice

1. Which expression does each group of algebra tiles represent?

a) 

b) 

c) 

d) 

e) 

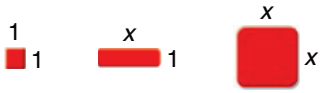
f) 

2. Use algebra tiles to model each expression. Sketch the tiles you used.

a) $x - 5$ b) $2x^2 + 3$ c) $-x + 3$

d) $x^2 - 4x$ e) $4x^2 - 3x + 2$ f) $-2x^2 - x - 5$

3. The diagram shows the length and width of the 1-tile, x-tile, and x^2-tile.



Determine the area of each tile.
Use your answer to explain the name of the tile.

4. Use algebra tiles to show $2x$ and $-4x$.
Sketch the tiles you used.
Are $2x$ and $-4x$ like terms? Explain.

5. Use algebra tiles to show $3x$ and $3x^2$.
Sketch the tiles you used.
Are $3x$ and $3x^2$ like terms? Explain.

6. a) Identify terms that are like $3x$:
$-5x, 3x^2, 3, 4x, -11, 9x^2, -3x, 7x, x^3$

b) Identify terms that are like $-2x^2$:
$2x, -3x^2, 4, -2x, x^2, -2, 5, 3x^2$

c) Explain how you identified like terms in parts a and b.

7. In each part, combine like terms. Write the simplified expression.

a) 

b) 

c) 

d) 

e) 

f) 

8. Combine like terms. Use algebra tiles.

a) $3x + 1 + 2x + 3$ **b)** $3x^2 - 2x + 5x + 4x^2$ **c)** $2x^2 + 3x - 2x + 4 - x^2$

9. Write an expression with 5 terms that has only 2 terms when it is simplified.

When we need many tiles to simplify an expression, it is easier to use paper and pencil.

Example

Simplify.

$15x^2 - 2x + 5 + 10x - 8 - 9x^2$

Visualize algebra tiles.

Solution

$15x^2 - 2x + 5 + 10x - 8 - 9x^2$

$= 15x^2 - 9x^2 - 2x + 10x + 5 - 8$ Group like terms.

$= 6x^2 + 8x - 3$ To combine like terms, add their coefficients.

10. **a)** Simplify each expression.

i) $-2 + 4x - 2x + 3$

ii) $2x^2 - 3x + 4x^2 - 6x$

iii) $3x^2 + 4x + 2 + x^2 + 2x + 1$

iv) $x^2 - 4x + 3 - 2 + 5x - 4x^2$

b) Create an expression that cannot be simplified. Explain why it cannot be simplified.

Which tools could you use to help you?

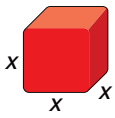
11. **Assessment Focus**

a) Determine the volume of this cube.

b) Use the volume to suggest a name for the cube.

c) Simplify. How can you use cubes to do this?

i) $x^3 + 2x^3 + 5x^3$ **ii)** $3x^3 + 3x + x^3 + 5x$ **iii)** $5 - 2x^3 + 3x^2 + 5x^3$

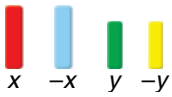


12. **Take It Further** Many kits of algebra tiles contain a second variable tile called a *y*-tile.

a) Why does a *y*-tile have a different length than an *x*-tile?

b) Sketch algebra tiles to represent $2x - 5y - 1 + 4y - 7x + 4$.

c) Write the expression in part b in simplest form. How do you know it is in simplest form?



In Your Own Words

Create a Frayer model for like terms.
Explain how like terms can be used to write an expression in simplest form.
Use diagrams and examples in your explanation.