Name: _____
Date: _____

Math 9
Lesson P1: Modelling Polynomials & Combining Like Terms

Modelling Expressions

We can use algebra tiles to model an expression.
One ▪ represents +1. One ■ represents −1.

One ▬ represents any variable, such as x or n.

One ■ represents $-x$ or $-n$.

There are 2 ▬. They represent $2x$.

There is 1 ■. It represents −1.

So, the tiles represent the expression $2x - 1$.

We can use any letter as the variable.

There are 3 ■. They represent $-3a$.

There are 2 ▪. They represent +2.

So, the tiles represent the expression $-3a + 2$.

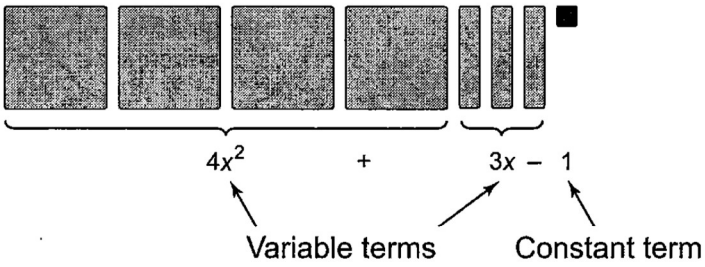
Some expressions contain x^2 terms.

We use  to represent x^2.

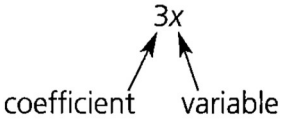
When the variable is n, the tile is called the n^2-tile.

We use  to represent $-x^2$.

For the expression $4x^2 + 3x - 1$:



In the term $3x$, the **variable** is x and the **coefficient of the variable** is 3.

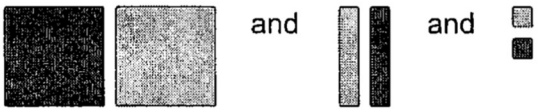


An algebraic expression like this one is also called a **polynomial**.

Example #1: Use algebra tiles to model each polynomial

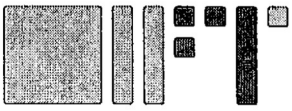
a) $-4t^2$ **b)** $2n - 5$

These are all zero pairs:

 and and

We can use zero pairs to simplify algebraic expressions.

Example #2: Simplify this tile model. Write the polynomial that the remaining tiles represent.



Terms that can be represented by matching tiles are called **like terms**.

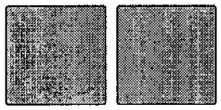
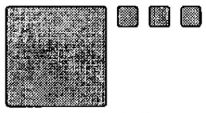
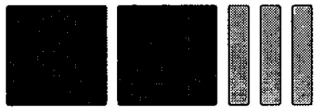
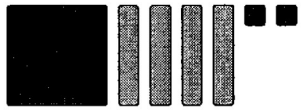
Like terms:	x^2 and $-2x^2$	$4s$ and $-s$	6 and -2	$5w$ and w
Unlike terms:	$3s$ and s^2	$2x$ and -5	$3d^2$ and 7	

We can **simplify a polynomial** by adding the coefficients of like terms.
To simplify $-5x + 2x$, add the integers: $-5 + 2 = -3$
So, $-5x + 2x = -3x$

Example #3: Simplify:

a) $3a + 6 + a - 4$ **b)** $-x^2 + 4x - 5 + 3x^2 - 4x + 1$

There are different **types** of polynomials, depending on the number of terms.
The **degree of a polynomial** tells you the greatest exponent of any term.

Type	Number of Terms	Example	Model	Degree
Monomial	1	$2s^2$		2
		$-2n$		1
		4		2
Binomial	2	$x^2 + 3$		2
		$2a - 1$		1
		$-2b^2 + 3b$		2
Trinomial	3	$-c^2 + 4c - 2$		2

A monomial has 1 type of tile.

A constant term has degree 0.

A binomial has 2 different types of tiles.

A trinomial has 3 different types of tiles.

An algebraic expression that contains a term with a variable in the denominator, such as $\frac{5}{n}$, or the square root of a variable, such as $\sqrt{n}$, is not a polynomial.

Practice

1. Sketch algebra tiles to model each polynomial.

a) $a^2 + 6$

b) $y^2 - y + 3$

c) $-2m^2 + 3m - 4$

d) $2x^2 + 5x + 4$

2. Is the polynomial a monomial, binomial, or trinomial?

a) $-7t$ The polynomial has ___ term, so it is a _____.

b) $8d^2 + 7$ The polynomial has ___ terms, so it is a _____.

c) $s^2 + 5s - 6$ The polynomial has ___ terms, so it is a _____.

d) $4t - 12$ The polynomial has ___ terms, so it is a _____.

e) -15 The polynomial has ___ term, so it is a _____.

3. Name the degree of each polynomial.

a) $5a^2 - 3a + 6$ The term with the greatest exponent is $5a^2$.
It has exponent _____.
So, the polynomial has degree _____.

b) $4b - 6$ The term with the greatest exponent is _____.
It has exponent _____.
So, the polynomial has degree _____.

c) $4d^2 - 3d$ The term with the greatest exponent is _____.
It has exponent _____.
So, the polynomial has degree _____.

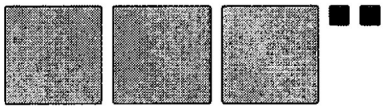
d) -4 -4 can be written as $-4x$—.
So, the polynomial has degree _____.

4. Write the polynomial represented by each set of tiles.

a) Use the variable f.

_____

b) Use the variable n.



_____

c) Use the variable p.

_____

5. Choose a set of tiles from question 4.
Write another polynomial that can be represented by the same set of tiles.

_____

_____

6. Identify the polynomials that can be represented by the same set of algebra tiles.

a) $x^2 + 3x - 1$ 1  , ____  , and ____ 

b) $4r^2 - 5r + 9$ _____

c) $9 + 4z^2 - 5z$ _____

d) $3s + 1 + s^2$ _____

Parts ____ and ____ use the same algebra tiles.
So, _____ and _____ both represent the same polynomial.

Practice

1. What is the coefficient of each term?

a) $2x^2$ _____ **b)** $6w$ _____ **c)** $-3x$ _____

d) $7t$ _____ **e)** b _____ **f)** $-s$ _____

2. a) Which of these terms are like $3z^2$?

$5z$ $-z^2$ -9 $-6z$ $2z^2$ -11 $-4z^2$

$3z^2$ has variable _____ and exponent _____.

Find all terms with the same variable and exponent: _____

b) Which of these terms are like $-5x$?

$-4x$ $-3x^2$ -2 $7x$ $5x^2$ 8 $-x$ $-5t$

$-5x$ has variable _____ and exponent _____.

Find all terms with the same variable and exponent: _____

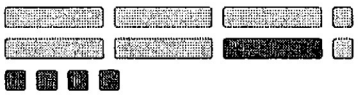
3. Simplify each tile model.

Write the polynomial that the remaining tiles represent.

a)

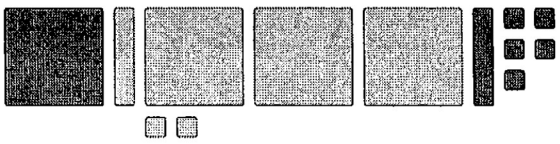
Remaining tiles: _____ Polynomial: _____

b)



Remaining tiles: _____ Polynomial: _____

c)



Remaining tiles: _____ Polynomial: _____

4. Add integers to combine like terms.

a) $-3c + 5c$ $-3 + 5 =$ _____ $-3c + 5c =$ _____

b) $4s - s$ $4 + (-1) =$ _____ $4s - s =$ _____

c) $-2x^2 + 7x^2$ _____ + _____ = _____ _____

d) $8e^2 - 8e^2$ _____ _____

5. Simplify each polynomial.

a) $5m + 7 - 2m + 1$

Group like terms.

= _____

Add the coefficients of like terms.

= _____

b) $7c^2 - 6c - 4c^2 + c$

Group like terms.

= _____

Add the coefficients of like terms.

= _____

c) $11 - 9v + v^2 + 2 - v$

= _____

= _____

_____

We usually write a polynomial so the exponents of the variable decrease from left to right.

d) $-7f^2 + 12f - 2 \; -3f^2 - 3f + 5$

= _____

= _____

A polynomial in simplified form is equal to the original polynomial.

6. Identify and explain any errors you find.

a) $3x + 2 = 5x$ _____ _____

b) $5s + 3s = 8s^2$ _____ _____ _____ _____

c) $x^2 - x^2 = 0$ _____ _____