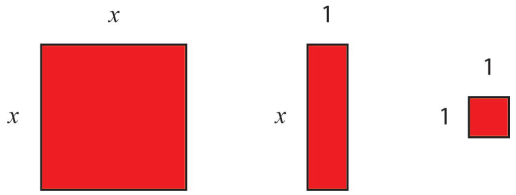
8: Modelling Polynomials with Algebra Tiles

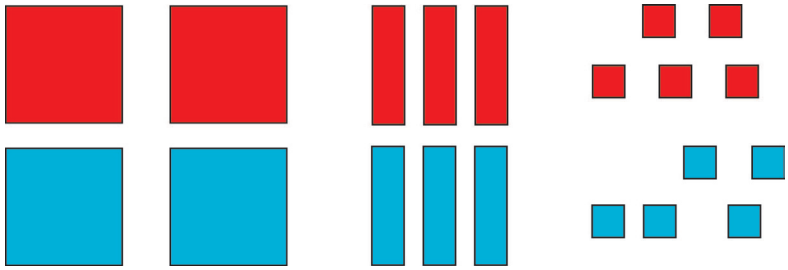
Use the full set of algebra tiles for the work on polynomials. The sets of tiles can be used to model polynomials of the form $ax^2 + bx + c$ or of the form $ax^2 + bxy + cy^2$, where a, b, and c are constants.
Note: Model only polynomials of the form $ax^2 + bx + c$ to establish the appropriate concepts. Students will make the extension to more complex examples at the abstract level, once the concepts are clearly understood.

Show that each large square has a length of x units and a width of x units, each rectangle has a length of x units and a width of one unit, and each small square has a length of one unit and a width of one unit.
Note: no integral number of unit lengths generates a measure equal to the x measure.



Since the three shapes have different sizes, consider what symbolic forms would be consistent with the measurements of the shapes. When we compare two-dimensional shapes, we refer to the area of the shape when we say that one shape is larger than another. The area of each large square is $(x)(x)$ or x^2; the area of each rectangle is $(x)(1)$ or x; the area of each small square is $(1)(1)$ or 1. It would be reasonable, to let each large square model a term of size x^2, each rectangle a term of size x, and each small square a term of size 1.

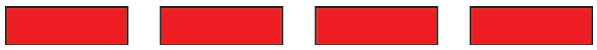
Recall the zero principle and extend it to all three shapes. Each of the following combinations of tiles would give a result that is neither red nor blue. Therefore, each of these combinations is a model for zero.



As with the integer tiles, we have both red and blue tiles in each of the three sizes. Recall that if we combine more red than blue tiles of the same size together, our result is red. If we combine more blue than red tiles, our result is blue.

8: Modelling Polynomials (continued)

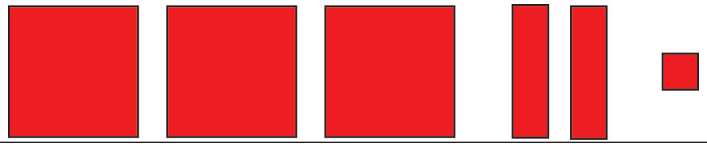
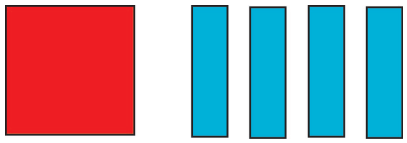
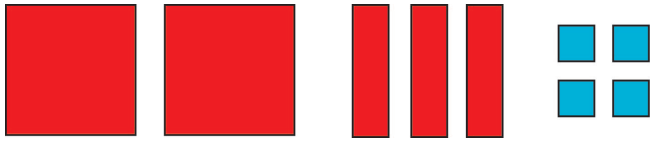
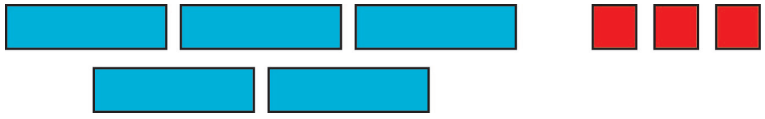
Work through a series of examples involving the concrete, pictorial, and verbal stages suggested:

Pictorial Form	Result by Number and Colour and Size
i) 	2 red small squares
ii) 	3 red large squares
iii) 	3 blue large squares
iv) 	4 red rectangles

Guiding Question

- How could you record the results symbolically? i) 2 ii) $3x^2$ iii) $-3x^2$ iv) $4x$)

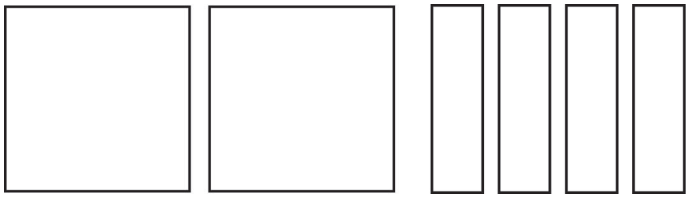
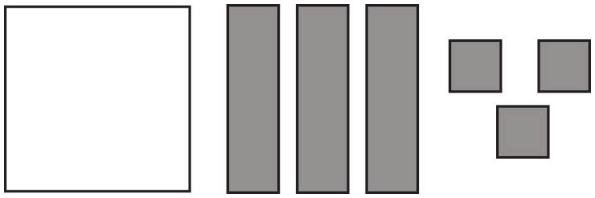
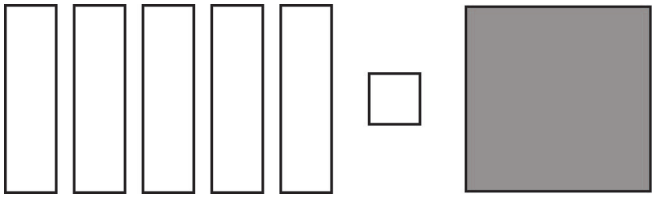
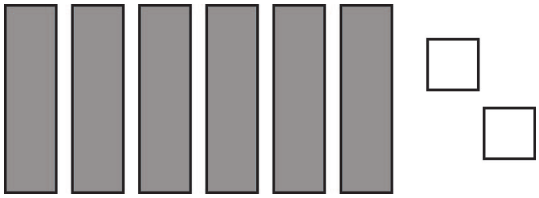
Once students are ready, advance to examples such as:

Pictorial Form	Symbolic Form
	$3x^2 + 2x + 1$
	$x^2 - 4x$
	$2x^2 + 3x - 4$
	$-5x + 3$

Once students are comfortable modelling polynomials, small groups complete the Worksheet, using manipulatives.

Worksheet: Modelling Polynomials

1. Complete the chart:

Pictorial Form	Symbolic Form
a) 	$2x^2 + 4x$
b) 	
c) 	
d) 	
e)	$5 - 6x$
f)	$x^2 + 3x - 1$
g)	$x - 3x^2$
h)	$-2x^2 + 8$

Worksheet: Modelling Polynomials (continued)

2. a) What is the minimum number of tiles that could be used to model $x^2 + 3x - 1$? Show your model.

b) Add two tiles to your model in a) so that you are still modelling $x^2 + 3x - 1$.

c) Show six different models of $x^2 + 3x - 1$ that use nine tiles each.