4.1.2 Is there a faster method?

Factoring with Area Models

Mathematics is often described as the study of patterns, so it is not surprising that area models have many patterns. You saw one important pattern in Lesson 4.1.1 (Casey's pattern from problem 4-4). Today you will continue to use patterns while you develop a method to factor trinomial expressions.

4-12. Examine the area model shown at right.

$-35x$	14
$10x^2$	$-4x$

a. Review what you learned in Lesson 4.1.1 by writing the area of the rectangle at right as a sum and as a product.

b. Does this area model fit Casey's pattern for diagonals? State the pattern and justify your answer.

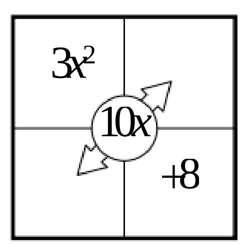
4-13. FACTORING QUADRATIC EXPRESSIONS

A polynomial in the form $ax^2 + bx + c$, with $a \neq 0$, is called a **quadratic expression** in **standard form**. To develop a method for factoring quadratic expressions without using algebra tiles, you will first model how to factor with algebra tiles, and then look for connections within an area model.

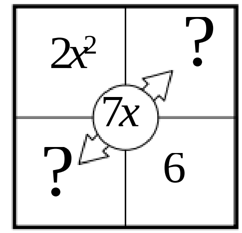
a. Using algebra tiles, factor $2x^2 + 5x + 3$; that is, use the tiles to build a rectangle, and then write its area as a product. Draw and label the algebra tile rectangle.

b. When you factor using tiles, you need to determine how to arrange the tiles to form a rectangle. Using an area model to factor requires a slightly different process.

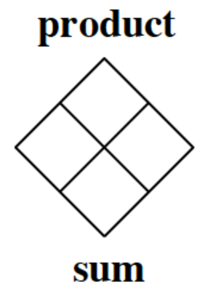
Miguel wants to use an area model to factor $3x^2 + 10x + 8$. He knows that $3x^2$ and 8 go into the rectangle along one of the diagonals, as shown at right. Finish the rectangle by deciding how to split and place the remaining term. Then write the area as a product.



c. Kelly wants to determine a method for factoring $2x^2 + 7x + 6$. She remembers Casey's pattern for diagonals. She places $2x^2$ and 6 into the rectangle in the locations shown at right. Without actually factoring yet, what do you know about the missing two parts of the area model?

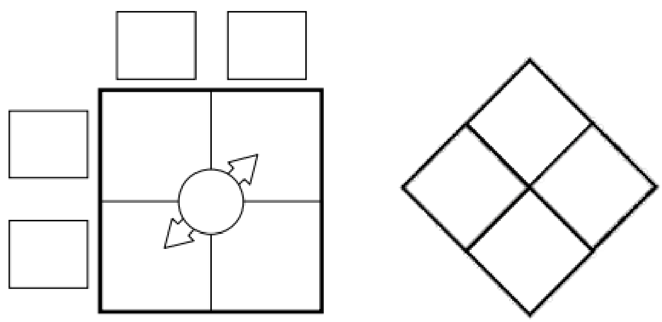


d. To complete Kelly's area model, create and solve a Diamond Problem using the information from part (c).



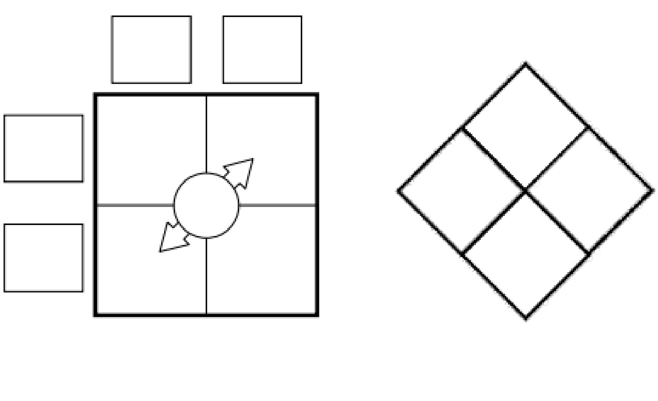
e. Use your results from the Diamond Problem to complete the area model for $2x^2 + 7x + 6$, and then write the area as a product of factors.

4-14. Factoring with an area model is especially convenient when algebra tiles are not available or when the number of necessary tiles becomes too large to manage. Using a Diamond Problem helps avoid guessing and checking, which can at times be challenging. Use the process from problem 4-13 to factor $6x^2 + 17x + 12$.

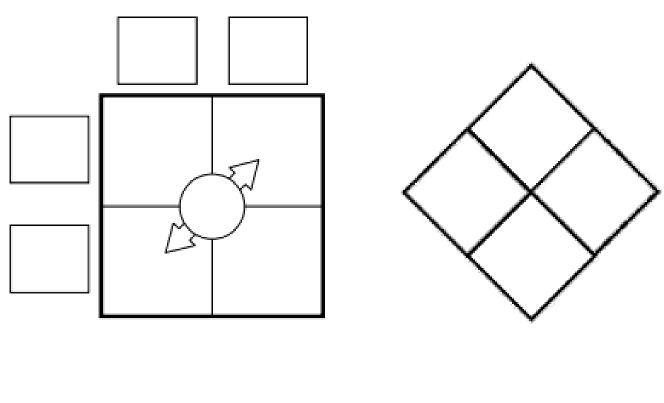


Closure: Now try to factor a few more.

a) $5x^2 + 17x + 6$



b) $8x^2 - 34x - 9$



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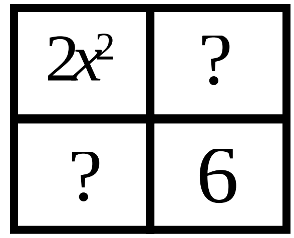
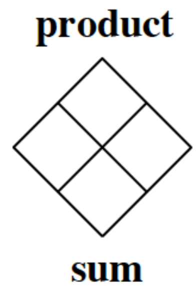
$3x^2$	
	$+8$

c. Kelly wants to determine a method for factoring $2x^2 + 7x + 6$. She remembers Casey's pattern for diagonals. She places $2x^2$ and 6 into the rectangle in the locations shown at right. Without actually factoring yet, what do you know about the missing two parts of the area model?



d. To complete Kelly's area model, create and solve a Diamond Problem using the information from part (c).



e. Use your results from the Diamond Problem to complete the area model for $2x^2 + 7x + 6$, and then write the area as a product of factors.

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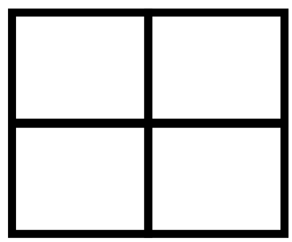

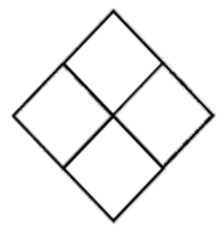

Closure: Now try to factor a few more.

a) $5x^2 + 17x + 6$

b) $8x^2 - 34x - 9$