Name _____ Date _____ Class _____

TEKS 2A.5.E

LESSON 5-4

Algebra Lab

Complete the Square

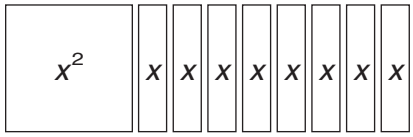
Use with Lesson 5-4

Materials: algebra tiles

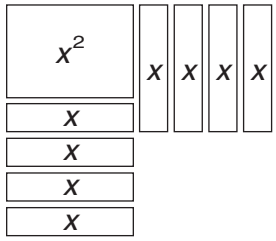
Activity

In this lab you and a partner will be exploring the concept of completing the square by using algebra tiles. To do so, you will find the value of c that makes the trinomial $x^2 + bx + c$ a perfect square.

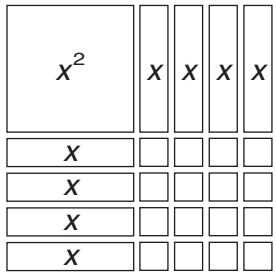
Step 1 Use algebra tiles to model the expression $x^2 + 8x$.



Step 2 Arrange the tiles in a square. Your arrangement will be incomplete in one corner.



Step 3 Determine the number of unit tiles needed to complete the square.



You can see that $x^2 + 4x + [16] = (x + 4)^2$.

Try This

Using algebra tiles, complete the table below.

1.

Completing the Square		
Expression	**Number of unit tiles needed to complete the square**	**Expression written as the square of a binomial**
$x^2 + 2x +$ ___		
$x^2 + 4x +$ ___		
$x^2 + 6x +$ ___		
$x^2 + 8x +$ ___	16	$x^2 + 8x + 16 = (x + 4)^2$

Look for the pattern in the last column of the table. Consider $x^2 + bx + c = (x + d)^2$.

2. How is d related to b in each case? _____

3. How is c related to d in each case? _____

4. How can you determine the number of unit tiles needed to complete the square from b in your given expression?

_____

4. *s* is a vertical stretch of *f,* which means that the second arch is narrower than the first arch but that both arches reach the same maximum height.

5. Yes; possible answer: The function rules for *f*, *s*, and *t* are identical except for the value of the parameter *a.* The graphs of *f* and *s* show that an increase in the absolute value of *a* results in a narrower arch. Because the absolute value of *a* in *t* is greater than the absolute values of *a* in *f* and *s*, the arch modeled by *t* will be narrower than the arches modeled by *f* and *s*.

LAB 5-4

Try This

1.

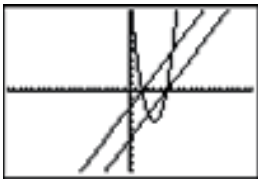
Completing the Square		
Expression	Number of unit tiles needed to complete the square	Expression written as the square of a binomial
$x^2 + 2x +$ ___	1	$x^2 + 2x + 1 = (x + 1)^2$
$x^2 + 4x +$ ___	4	$x^2 + 4x + 4 = (x + 2)^2$
$x^2 + 6x +$ ___	9	$x^2 + 6x + 9 = (x + 3)^2$
$x^2 + 8x +$ ___	16	$x^2 + 8x + 16 = (x + 4)^2$

2. d = half of b

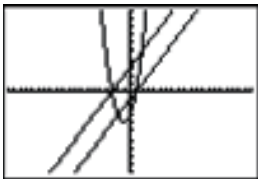
3. $c = d^2$

4. Find the square of half the coefficient *b*.

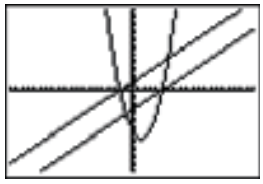
TECH LAB 5-4

1. 

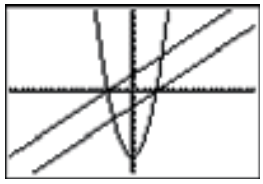
   2, 6; $x = 4$

2. 

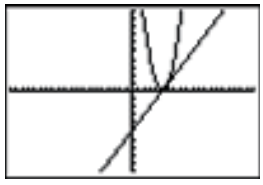
   −3, 1; $x = -1$

3. 

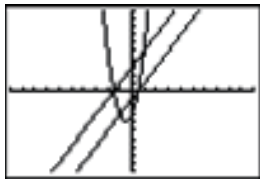
   −3, 1; $x = -1$

4. 

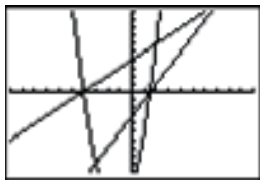
   −3, 1; $x = -1$

5. 

   5; $x = 5$

6. 

   $\frac{1}{2}, -\frac{3}{2}; x = -\frac{1}{2}$

7. 

   Yes, because the graphs cross the *x*-axis at the same points.

8. Possible answer: The *x*-intercepts of a quadratic function are the same as the *x*-intercepts of its linear factors. The axis of symmetry is located halfway between the *x*-intercepts.