Name

5-4

LESSON Reading Strategy

Use a Model

 $(x+2)^2 = x^2 + 4x + 4$

Just as some numbers are perfect squares, some quadratic expressions are perfect squares. Perfect square

You can model this expression with the area of algebra tiles. You can use three types of tiles

tillee types of thes.					
Algebraic Term	Type of Tile	Model			
x ²	Square with sides <i>x</i>	×	$(x+2)^2 = x^2$	$x^{2} + 4x +$	4
			x ²	x	x
X	Rectangle with sides <i>x</i> and 1	1			
		x	x	1	1
1	Square with				
	sides 1		x	1	1

You can make a quadratic expression $x^2 + bx$ into a perfect square.



Answer each question.

1. Circle the expressions that are perfect squares.

 $(4x-5)^2$ x^2+6x+9 x^2+x+1 x^2 $(x-1)^2$ x^2+2x+2

- 2. a. What would you add to the expression $x^2 - 4x$ to make it a perfect square?
 - **b.** Write this expression as a perfect square.
- 3. a. Use algebra tiles to draw a model for the expression $x^2 + 2x + 1$.
 - b. Write this expression as a perfect square. What are the sides of the square created in the model?

_____ Date _____ Class _____

	Oballanaa				
5-4 Completing the Square (continued)					
You can use a process called completing the square to rewrite	The ancient Greeks constructed rectangles called golden rectangles				
a quadratic of the form $x^2 + bx$ as a perfect square trinomial.	because they were thought to be pleasing to the eye. A rectangle is				
To complete the Think: Multiply the	considered golden if the dimensions of the rectangle are in a certain ratio. I = I + w				
square of $x^2 + bx$, coefficient of x by (b) ² 1 $x^2 + bx + (b)^2 - (x + b)^2$	$\overline{W} = -\frac{1}{I}$ The ratio $\frac{1}{I}$ is called the golden ratio A golden rectangle				
add $\left(\frac{b}{2}\right)$. $\frac{1}{2}$. Then square it. $x + bx + (\frac{1}{2}) - (x + \frac{1}{2})$	with length / and width w has the property that if it is joined				
Complete the square: $x^2 - 8x + ?$.	to a square of side length / to form a larger rectangle, the				
Step 1 Identify <i>b</i> , the coefficient of $x: b = -8$.	that of the original rectangle.				
Step 2 Find $\left(\frac{b}{2}\right)^2$: $\left(\frac{b}{2}\right)^2 = \left(\frac{-8}{2}\right)^2 = (-4)^2 = 16$	Solve				
$(2) (2) (2) (2)$ Stop 2 Add $(b)^2$, x^2 8x 1 16	1. a. Clear the equation of fractions and collect all the terms that contain				
Step 5 Add $(\overline{2})$. $x = 6x + 10$	variables on the left side of the equation.				
Step 4 Factor: $x^2 - 8x + 16 = (x - 4)^2$	$l^{2} = wl + w^{2}, l^{2} - wl - w^{2} = 0$				
Check: $(x - 4)^2 = (x - 4)(x - 4)$ Use $\frac{b}{2}$ as a factor.	b. Complete the square and solve for <i>I</i> in terms of <i>w</i> . Ignore the negative solution since <i>I</i> must be a positive number. Use the result to find both the				
$= x^2 - 8x + 16 \checkmark$	exact value of $\frac{1}{2}$ and a decimal approximation.				
Complete each square and factor.	W^{2} and W^{2} W^{2} W^{2}				
5. $x^2 + 9x + ?$ 6. $x^2 - 4x + ?$	$I - WI = W, I - WI + \left(\frac{W}{2}\right) = W + \left(\frac{W}{2}\right),$				
$b = 9 \cos \frac{b}{2} = \frac{9}{2}$ $b = -4 \sin \frac{b}{2} = -2$	$(I - \frac{W}{2})^2 = \frac{5W^2}{2}, I - \frac{W}{2} = \frac{\sqrt{5}W}{2}, I = \frac{1 + \sqrt{5}}{2}W, I \cong 1.618W$				
8 - 3, 30 2 - <u>2</u>					
$(\underline{b})^2 = \frac{0}{4}$ $(\underline{b})^2 = 4$	2. Measure the length and width of a credit card Possible answer: The ratio of				
(2) (2)	and calculate the ratio of the length and width. length to width is about 1.588, a				
$x^2 + 9x + \frac{4}{4}$ $x^2 - 4x + 4$	Does this closely approximate the golden ratio? IITTLE LESS TRAIN THE GOLDEN RATIO.				
0	3. a. In the Fibonacci Sequence, {1, 1, 2, 3, 5, 8, 13, 21, 34,}, each term from the third term on is the sum of the previous two terms. Make a list of				
$\left(\begin{array}{c} \left(\begin{array}{c} \frac{y}{2}\end{array}\right)^2 & (x-2)^2 \end{array}\right)$	values of the ratio of a term and it predecessor.				
	$1, 2, \frac{5}{2}, \frac{5}{3}, \frac{6}{5}, \frac{13}{8}, \frac{21}{13}, \frac{54}{21}, \frac{55}{34}, \dots$				
7 $y^2 = 10y \pm 2$ 8 $y^2 \pm 3y \pm 2$	b. What decimal value do these ratios approximate				
0	as the list is continued?				
$x^2 - 10x + 25$ $x^2 + 3x + \frac{9}{4}$	4. Consider the continued fraction $1 + \frac{1}{1 $				
	$1 + \frac{1}{1 + \dots}$				
$(x-5)^2$ $(x+\frac{3}{2})^2$	Make a table of decimal values for this fraction when 1 fraction is used, then 2, then 3, and so on. Round the values to the nearest thousandth. What value do the fractions seem to approach?				
\Z/	2, 1.5, 1.667, 1.6, 1.625, 1.615, 1.619, 1.618; they seem to approach the				
	golden ratio.				
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	Reading Strategy				
5-4 Completing the Square	5-4 Use a Model				
Sean and Mason run out of gas while fishing from their boat in the					
	Just as some numbers are perfect squares, some quadratic expressions				
of 30 meters per second. The height of the flare in meters can be	Just as some numbers are perfect squares, some quadratic expressions are perfect squares.				
Last, they set on an energency hate with an initial vertical velocity of 30 meters per second. The height of the flare in meters can be modeled by $h(t) = -5t^2 + 30t$, where t represents the number of seconds after launch.	Just as some numbers are perfect squares, some quadratic expressions are perfect squares. $(x + 2)^2 = x^2 + 4x + 4$ Perfect square				
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