

Vertex Form by Completing the Square

Apr. 22/2016

Recall:

$$\text{Vertex form: } y = a(x - h)^2 + k$$

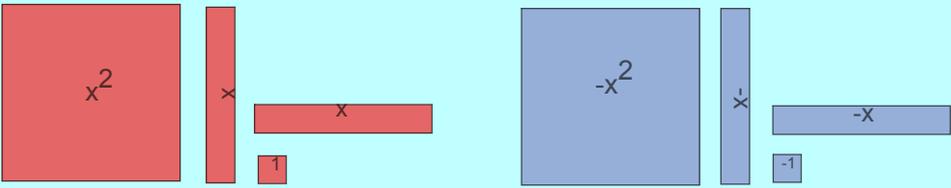
Note that $(x - h)^2$ is a perfect square.

In general, for perfect square trinomials,

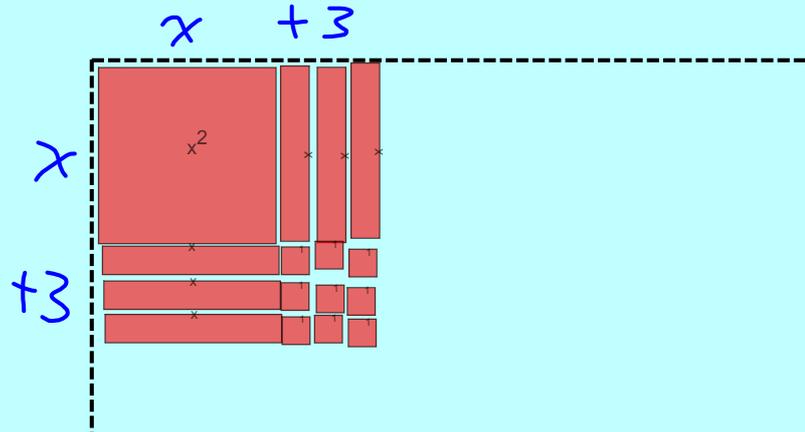
$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

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Identify the missing constant so that the trinomial is a perfect square trinomial, then factor it.

$$x^2 + 6x + \underline{9} = (x+3)^2$$


Mar 25-8:02 AM

Identify the missing constant so that the trinomial is a perfect square trinomial, then factor it.

$x^2 - 4x + \underline{4} = (x-2)^2$

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Ex.1 What is missing from these perfect squares?

(a) $x^2 + 10x + \underline{25} = (x+5)^2$

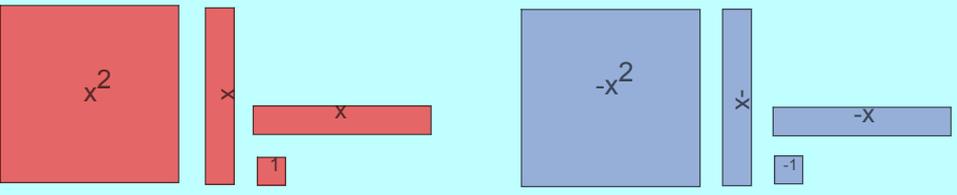
$\frac{+10}{2} = 5 \rightarrow (5)^2 = 25$

(b) $x^2 - 18x + \underline{81} = (x-9)^2$

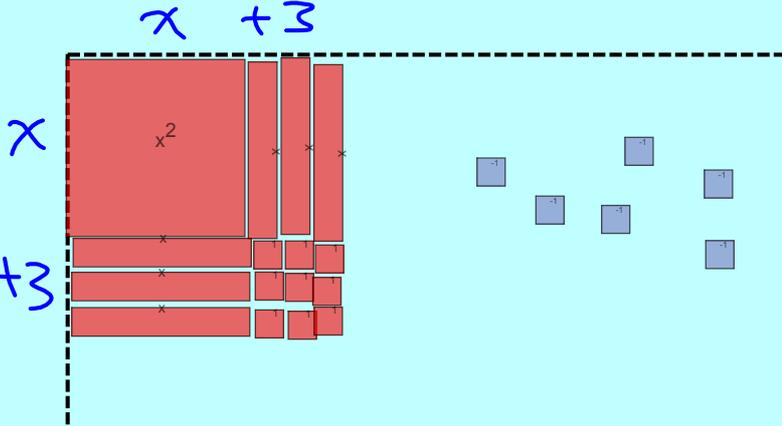
$\frac{-18}{2} = -9 \quad (-9)^2 = 81$

	x	-9
x	x^2	$-9x$
-9	$-9x$	81

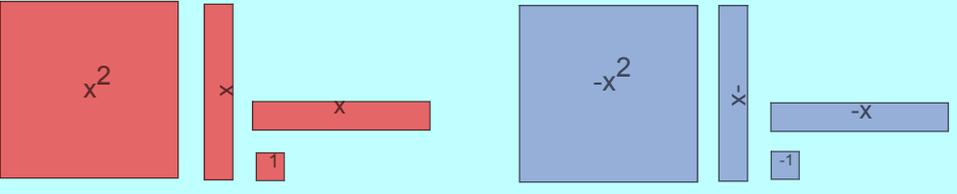
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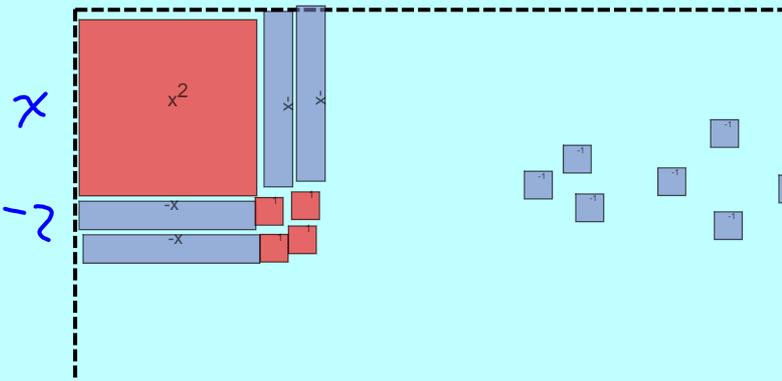
Identify the missing constant so that the trinomial is a perfect square trinomial. You will have some tiles "left over".

$$x^2 + 6x + 3 = (x + 3)^2 \underline{-6}$$


Mar 25-8:02 AM



Identify the missing constant so that the trinomial is a perfect square trinomial. You will have some tiles "left over".

$$x^2 - 4x - 3 = (x - 2)^2 \underline{-7}$$


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Steps:

- 1) Factor out 'a' from the first two terms.
- 2) Force a perfect square for the factored first two terms.
- 3) Collect the constants.

Ex.2 Complete the square for each of the following

a) $y = x^2 + 12x - 7$

$$y = (x+6)^2 - 43$$

OR

$$y = x^2 + 12x - 7$$

$$y = \underbrace{x^2 + 12x + 36}_{(x+6)^2} - 36 - 7$$

$$y = (x+6)^2 - 43$$

	x	$+6$	
x	x^2	$+6x$	
$+6$	$+6x$	36	

-7
 -36

$\frac{+12}{2} = 6$
 $6^2 = 36$

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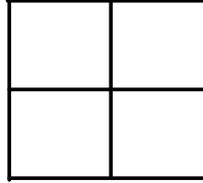
b) $y = x^2 - 20x + 15$

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$$c) y = 3x^2 + 12x + 11$$

$$y = 3(x^2 + 4x) + 11$$

$$\frac{4}{2} = 2 \quad 2^2 = 4$$



$$y = 3(x^2 + 4x + 4 - 4) + 11$$

↓ factor

$$x^2 + 4x + 4$$

$$y = 3((x+2)^2 - 4) + 11$$

$$y = 3(x+2)^2 - 12 + 11$$

$$y = 3(x+2)^2 - 1$$

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$$d) y = -x^2 + 6x + 13$$



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Assigned Work:

p. 331 # 2, 3, 4, 5ace, 7bde, 9, 11, 16

$$5(e) \quad y = \underline{-4.9x^2 - 19.6x} + 0.5$$

$$y = -4.9[x^2 + 4x] + 0.5$$

$$y = -4.9[x^2 + 4x + 4 - 4] + 0.5$$

$$y = -4.9[(x+2)^2 - 4] + 0.5$$

$$y = -4.9(x+2)^2 + 19.6 + 0.5$$

$$y = -4.9(x+2)^2 + 20.1$$

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$$7(b) \quad y = x^2 + 12x + 36$$

$$y = x^2 + 12x + 36 \underline{-36 + 36}$$

$$y = (x+6)^2 + 0$$

$$y = 1(x+6)^2$$

$$V(-6, 0)$$

① h. shift left by 6

$$\frac{12}{2} = 6$$

$$6^2 = 36$$

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$$9. \quad P = -15x^2 + 240x - 640 \quad \begin{array}{l} \frac{-16}{2} = -8 \\ (-8)^2 = 64 \end{array}$$

$$P = -15[x^2 - 16x] - 640$$

$$P = -15[x^2 - 16x + 64 - 64] - 640$$

$$P = -15[(x-8)^2 - 64] - 640$$

$$P = -15(x-8)^2 + 960 - 640$$

$$P = -15(x-8)^2 + 320$$

$$V(8, 320)$$

$x \quad P$

\therefore 8 clients to maximize profit

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