

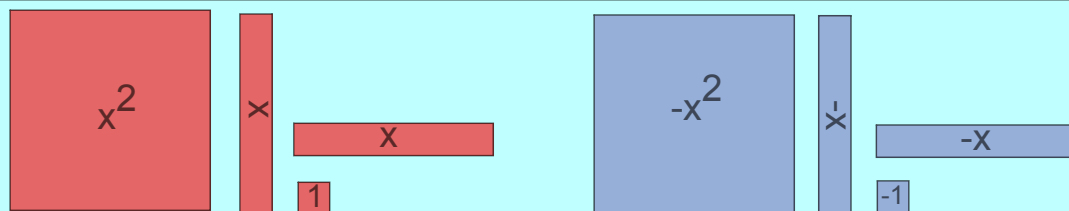
Standard Form to Vertex Form - Completing the Square

Lets look at the vertex form again: $y = a(x - h)^2 + k$

Apr. 18/
2011

The first part: $a(x - h)^2$ originates from
a perfect square trinomial (PST)

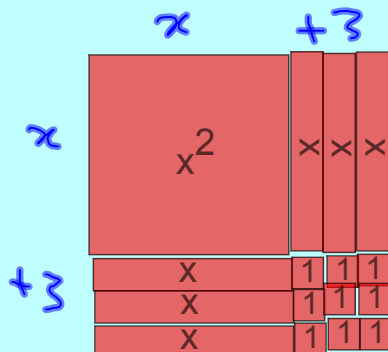
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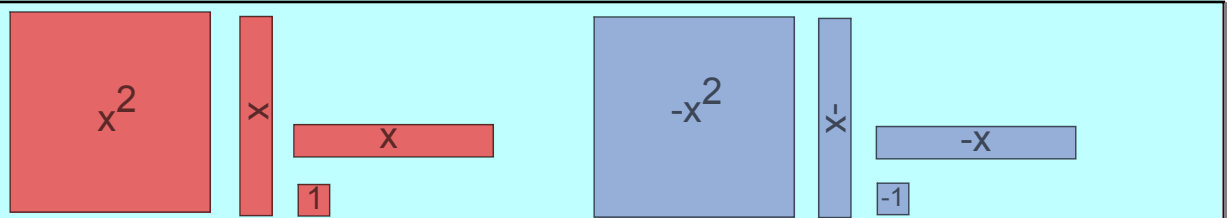
Identify the missing constant so that the trinomial is a PST.
Then factor it.

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

$$(x + 3)(x + 3)$$

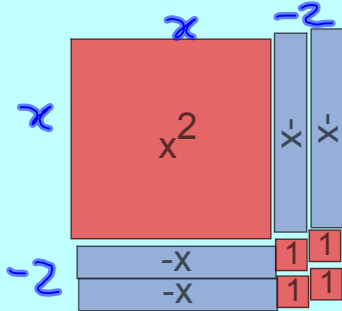


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Identify the missing constant so that the trinomial is a PST.
Then factor it.

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



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Ex: Identify the missing constant so that the trinomial is a PST. Then factor it.

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

Handwritten red arrows and calculations: $\frac{10}{2} = 5$ and $5^2 = 25$.

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

Handwritten red arrows and calculations: $-\frac{18}{2} = -9$ and $(-9)^2 = 81$.

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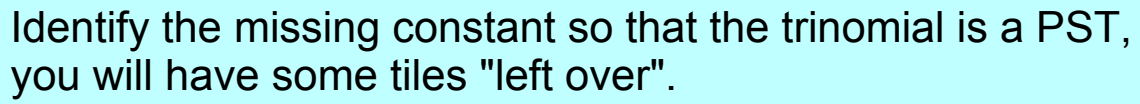
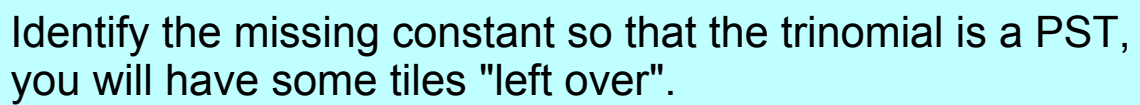
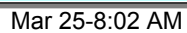


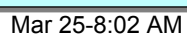
Diagram illustrating the area model for the expansion of $(x+3)^2$. The large square is divided into four regions:

- Top-left: A square with side length x and area x^2 .
- Top-right: A rectangle with width 3 and height x , with area $3x$.
- Bottom-left: A rectangle with width x and height 3 , with area $3x$.
- Bottom-right: A square with side length 3 and area 9 .

The total area is the sum of these regions: $x^2 + 3x + 3x + 9 = x^2 + 6x + 9$.



x	x^2	x	x
-2	$-x$	1	1
	$-x$	1	1



Method 3: Complete the square

- 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: Complete the square for each of the following

a) $y = x^2 + 12x - 7$ $b = 12$ $\frac{12}{2} = 6$ $6^2 = 36$

$$= \underbrace{x^2 + 12x + 36}_{(x+6)^2} - 36 - 7$$
$$= (x+6)^2 - 43$$

b) $y = x^2 - 20x + 15$ $-\frac{20}{2} = -10$ $(-10)^2 = 100$

$$y = \underbrace{x^2 - 20x + 100}_{(x-10)^2} - 100 + 15$$
$$y = (x-10)^2 - 85$$

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

① factor $a = 3$

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

$$y = 3(\underbrace{x^2 + 4x + 4}_{(x+2)^2} - 4) + 11$$

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

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

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

d) $y = -x^2 + 6x + 13$
 $a = -1$

$$y = (-1)(x^2 - 6x) + 13$$

$$y = (-1)[\underbrace{x^2 - 6x + 9}_{(x-3)^2} - 9] + 13$$

$$y = (-1)[(x-3)^2 - 9] + 13$$

$$y = -(x-3)^2 + 9 + 13$$

$$y = -(x-3)^2 + 22$$

(3,4)

(3,22)

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Assigned Work:

PST practice: p.230 #3bef, 4ad, 6

p. 331 # 1, 2, 3, 4, 5abcf, 7ade,

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