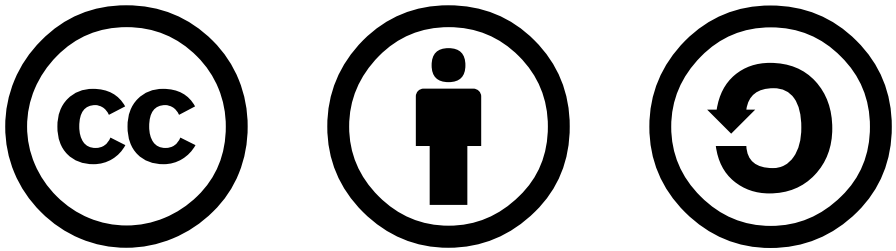


Algebra Lecture 14

Crista Moreno

December 19, 2016

Topics

Last Time

- Polynomial Functions & Models of real data
- Factoring

A Polynomial Function is a function of the form

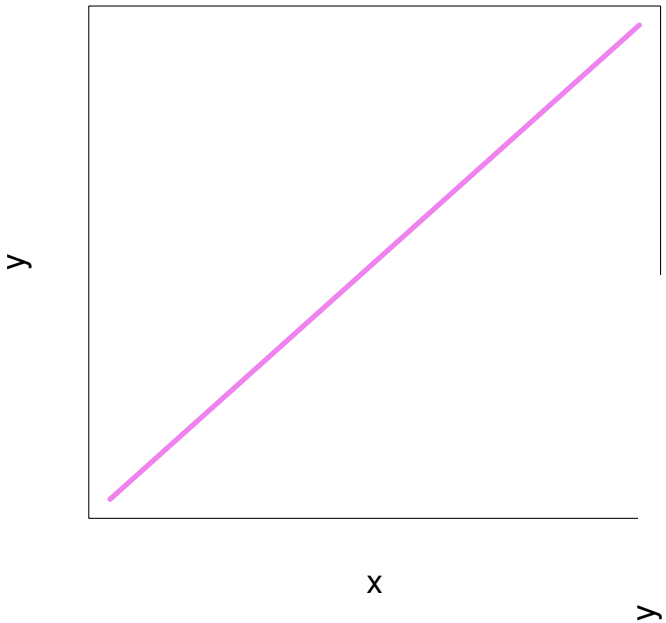
$$y = f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_2 x^2 + a_1 x^1 + a_0$$

Examples

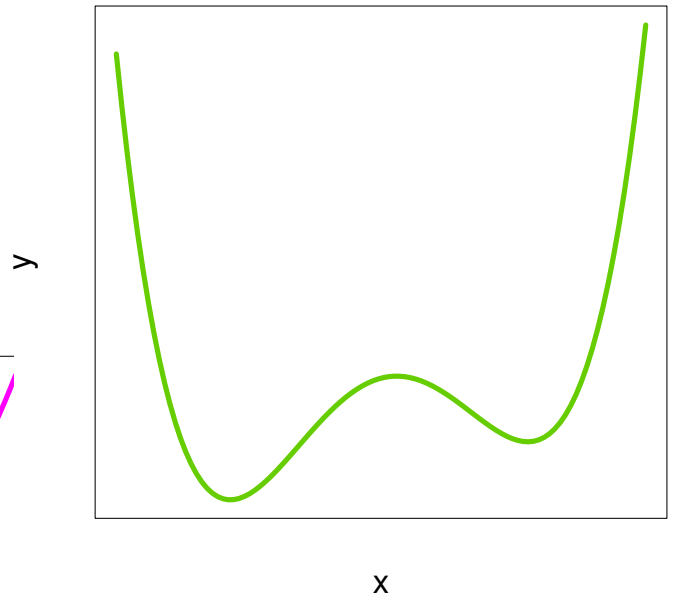
Examples of Polynomial Functions

$y = a_0$	Constant Function
$y = a_1x + a_0$	Linear Function
$y = a_2x^2 + a_1x + a_0$	Quadratic Function
$y = a_3x^3 + a_2x^2 + a_1x + a_0$	Cubic Function
$y = a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$	Quartic Function

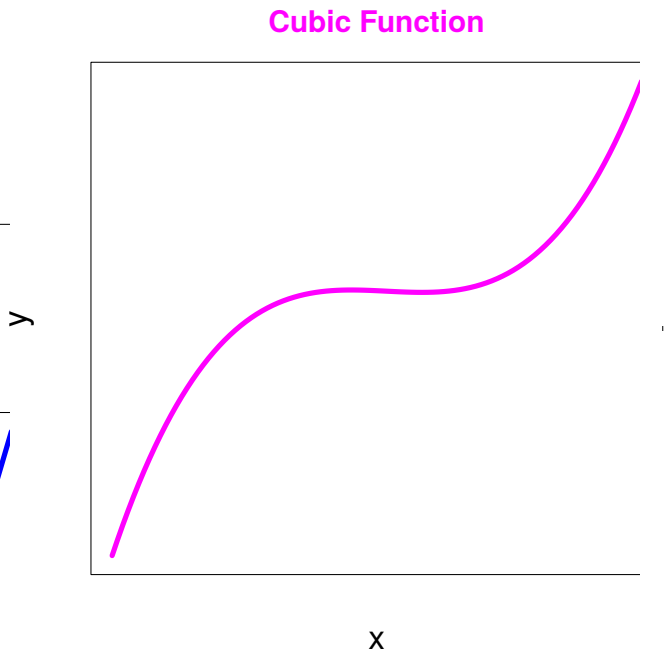
Linear Function



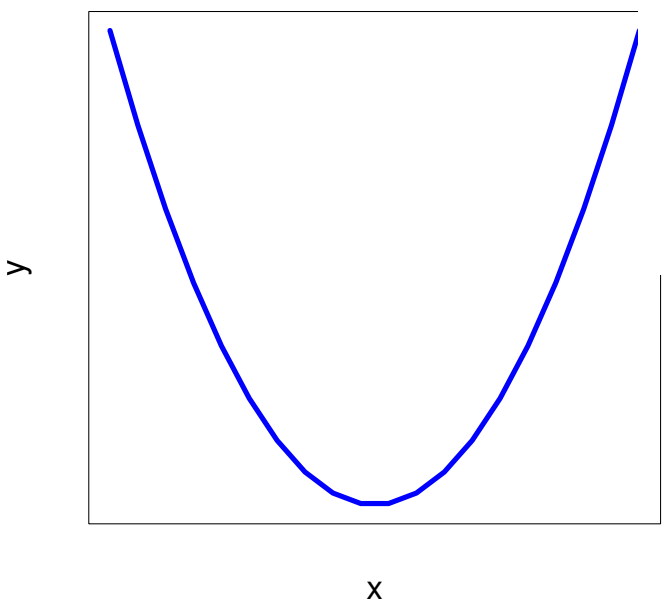
Quartic Function



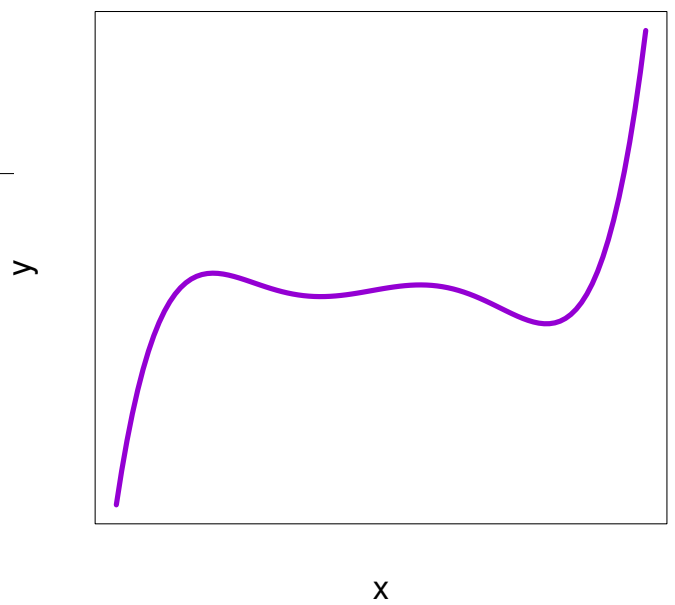
Cubic Function



Quadratic Function

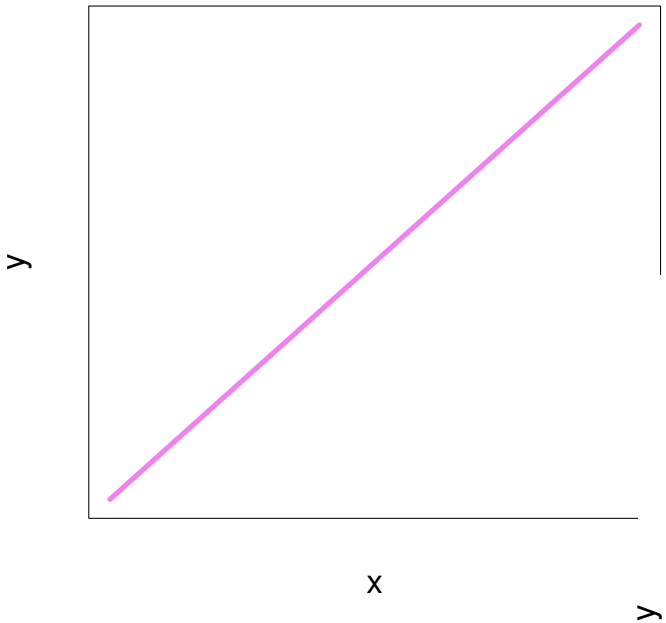


Quintic Function

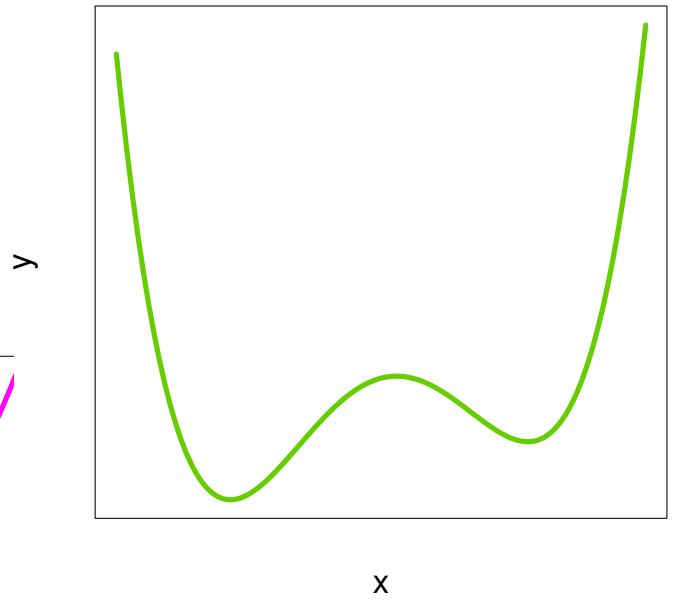


See any patterns...?

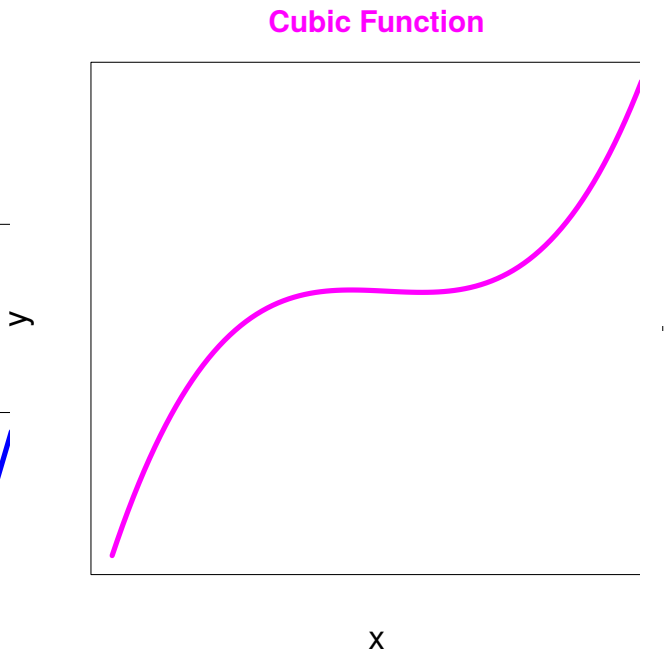
Linear Function



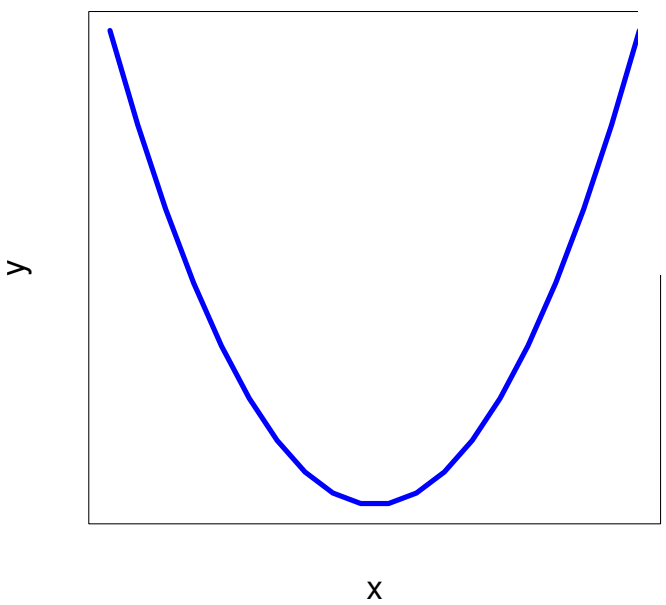
Quartic Function



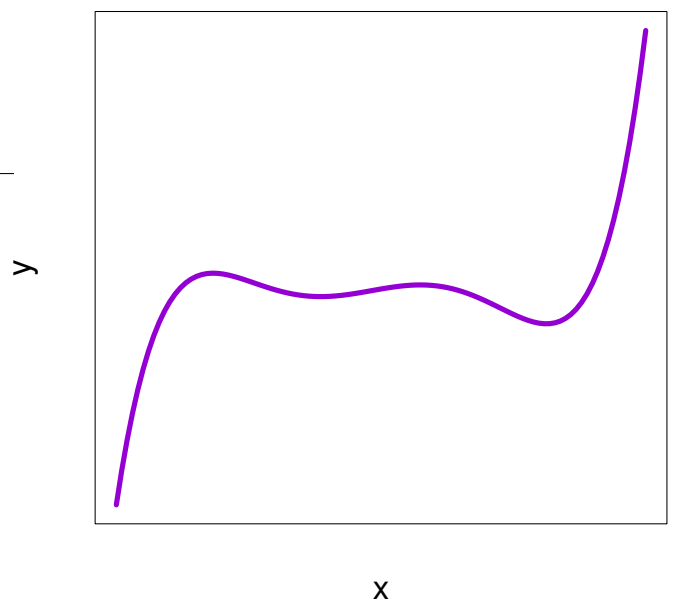
Cubic Function



Quadratic Function



Quintic Function



Topics for Today

Factoring Trinomials

Recall what it means to multiply two quantities.

Geometrically, we think of multiplication as the **area** of some rectangle.

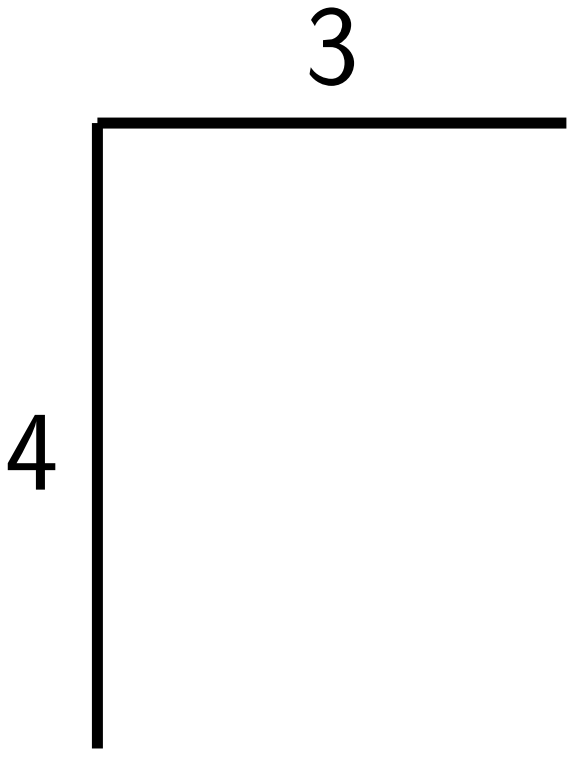
What does the multiplication $3 * 4$ mean geometrically?

Multiplication $3 * 4$

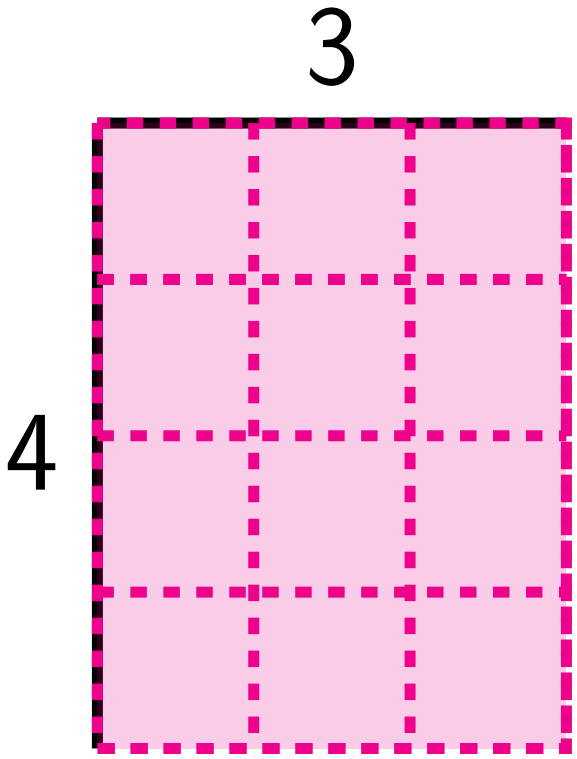
Multiplication $3 * 4$

$$\begin{array}{r} 3 \\ \hline \end{array}$$

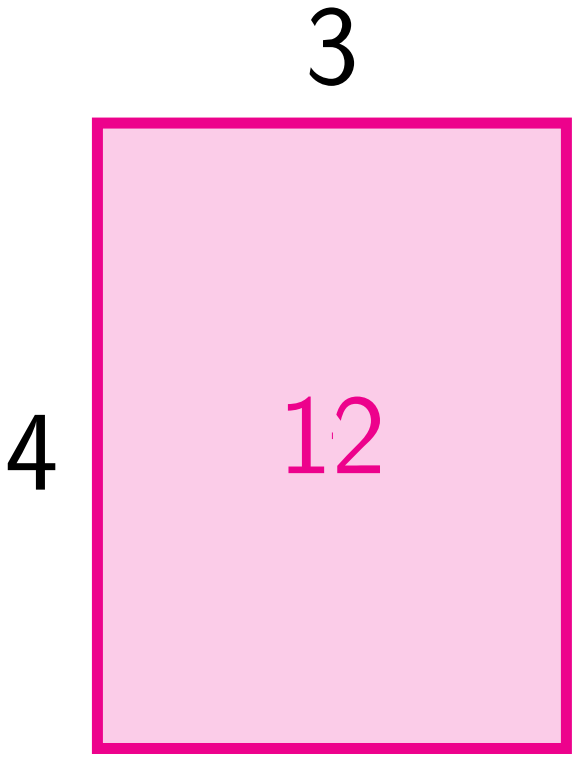
Multiplication $3 * 4$



Multiplication $3 * 4$



Multiplication $3 * 4$



What does the multiplication

$(2 + x) * 3$ mean geometrically?

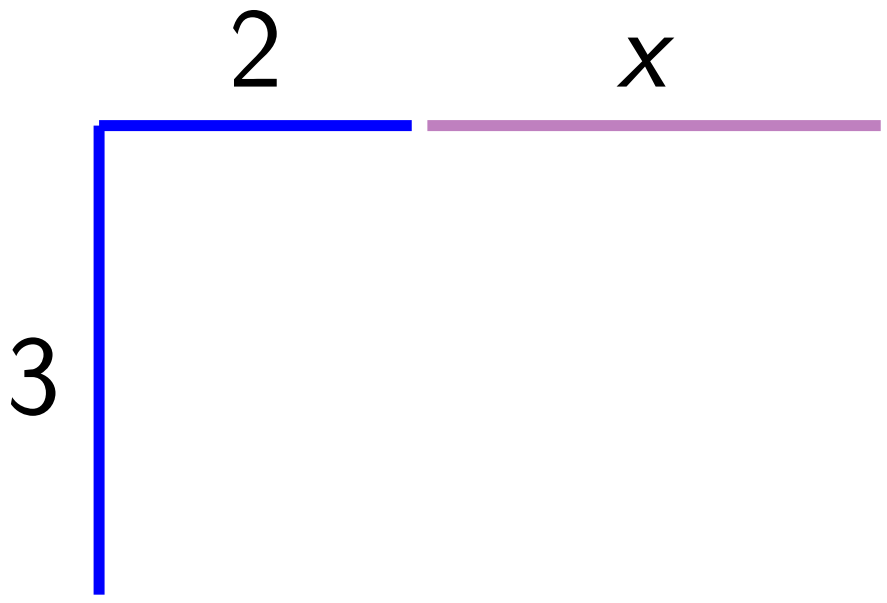
Multiplication $3 * (2 + x)$

Multiplication $3 * (2 + x)$

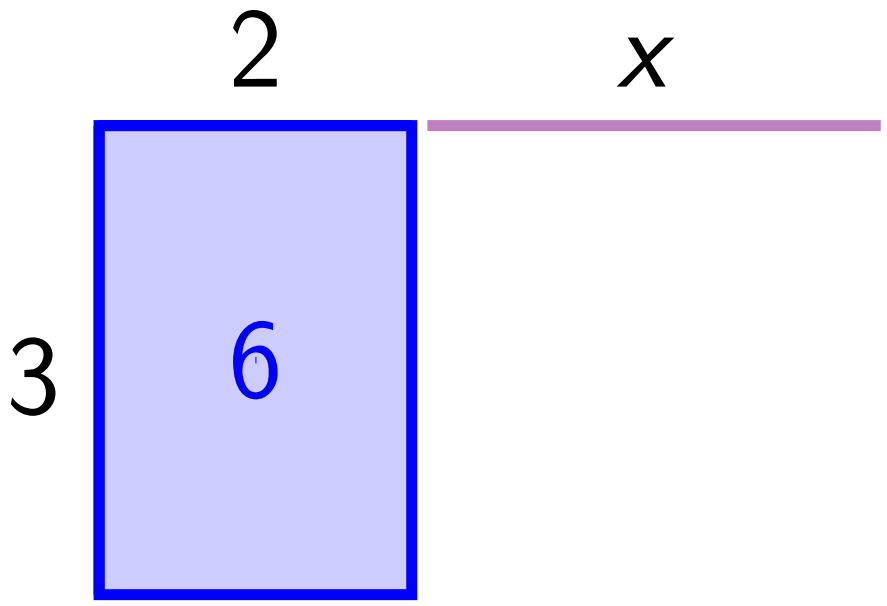
$$\underline{\qquad 2 \qquad}$$

Multiplication $3 * (2 + x)$

Multiplication $3 * (2 + x)$



Multiplication $3 * (2 + x)$



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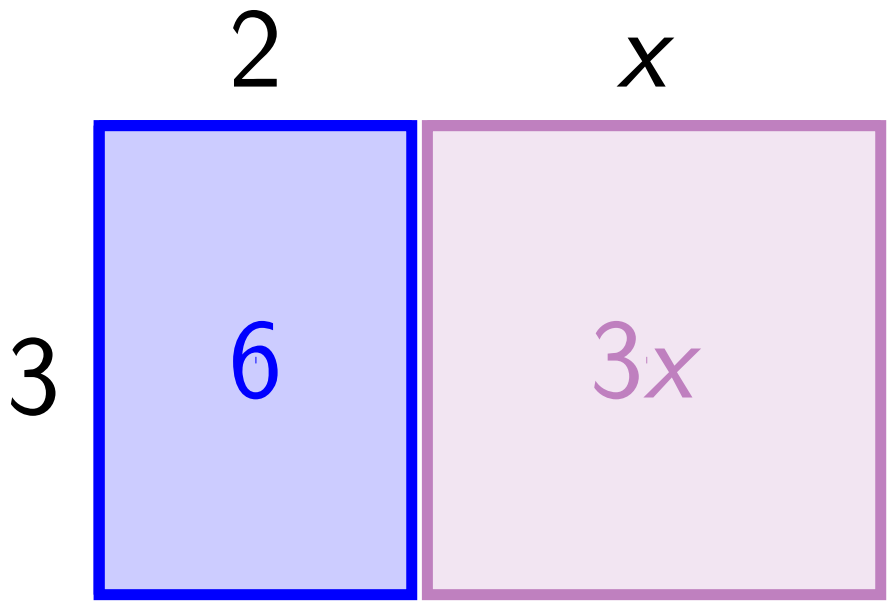
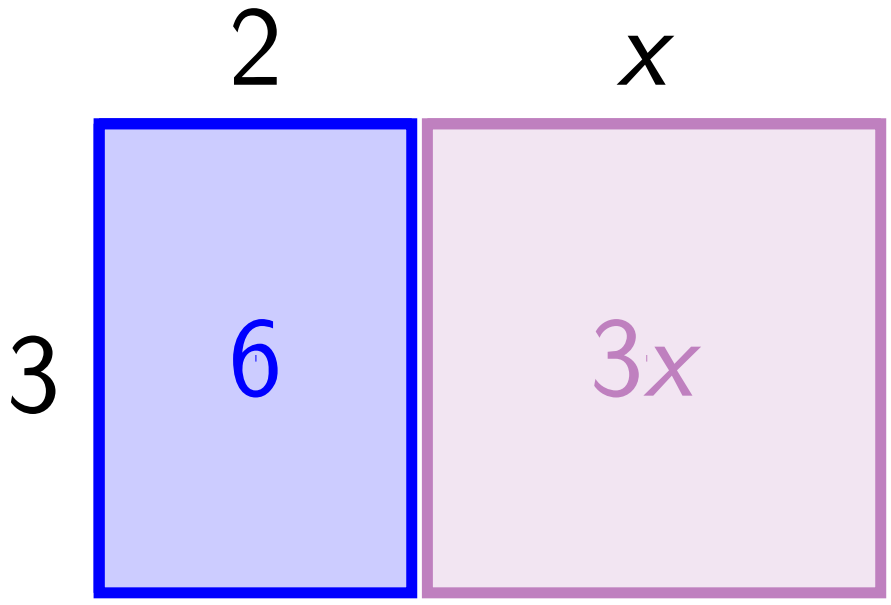


Multiplication $3 * (2 + x)$



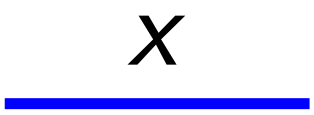
This gives the area $3 * 2 + 3 * x$ or $6 + 3x$, which is what the distributive property would give.

Draw a picture for the multiplication

$$(x + 2) * (x + 4).$$

Multiplication $(x + 2)(x + 4)$

Multiplication $(x + 2)(x + 4)$



Multiplication $(x+2)(x+4)$

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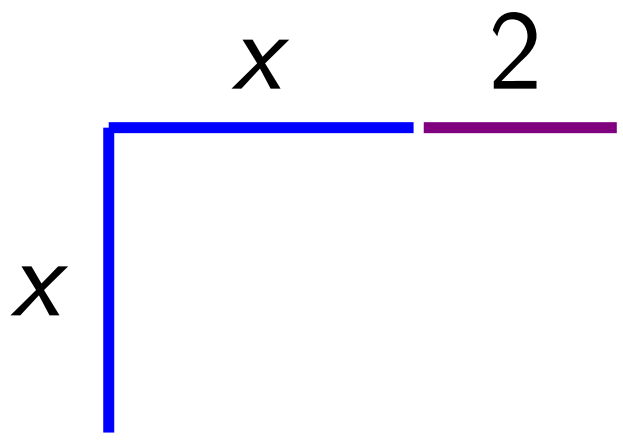
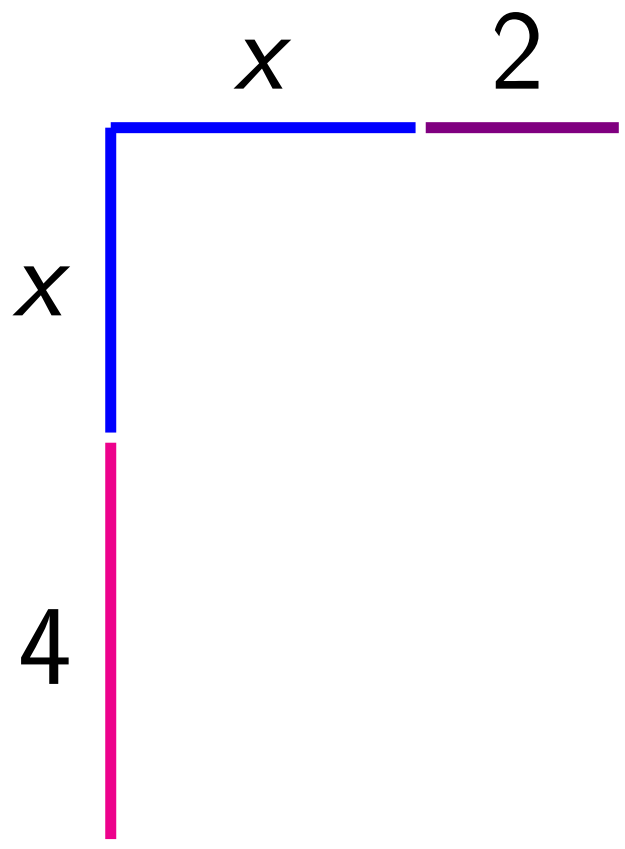
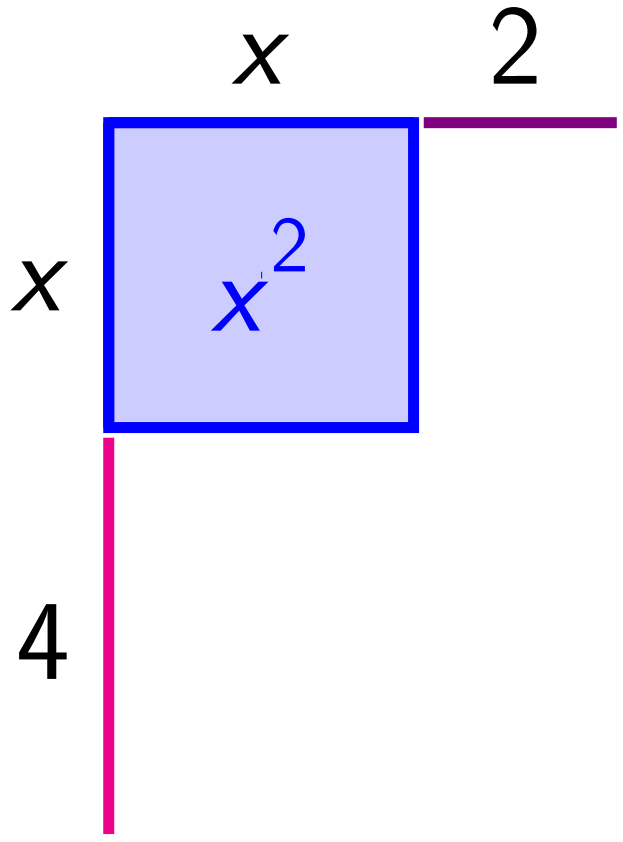


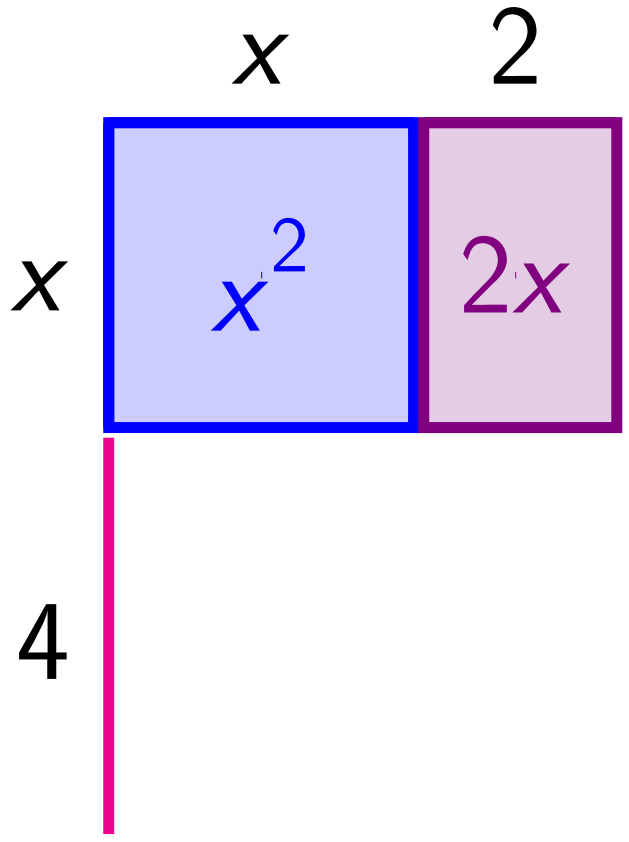
Multiplication $(x + 2)(x + 4)$



Multiplication $(x + 2)(x + 4)$



Multiplication $(x + 2)(x + 4)$



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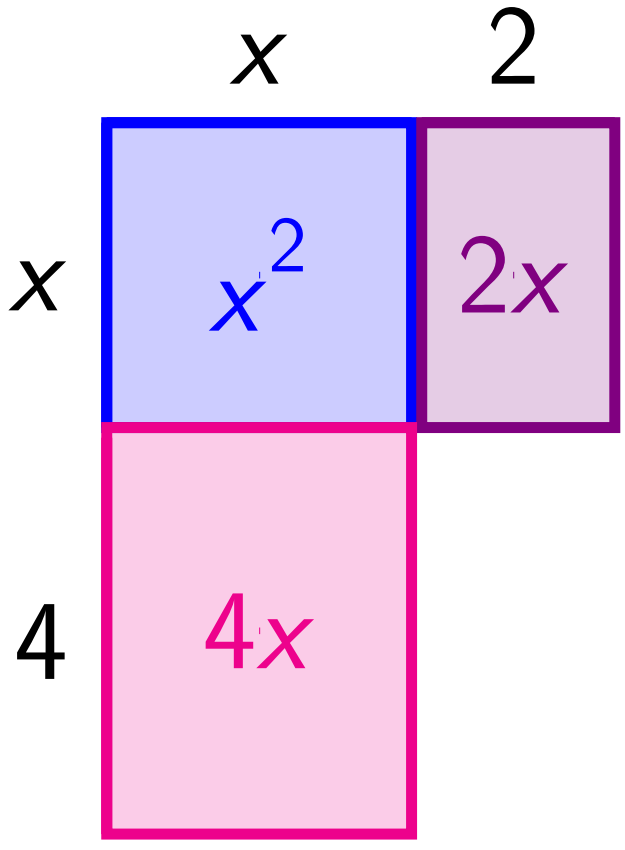

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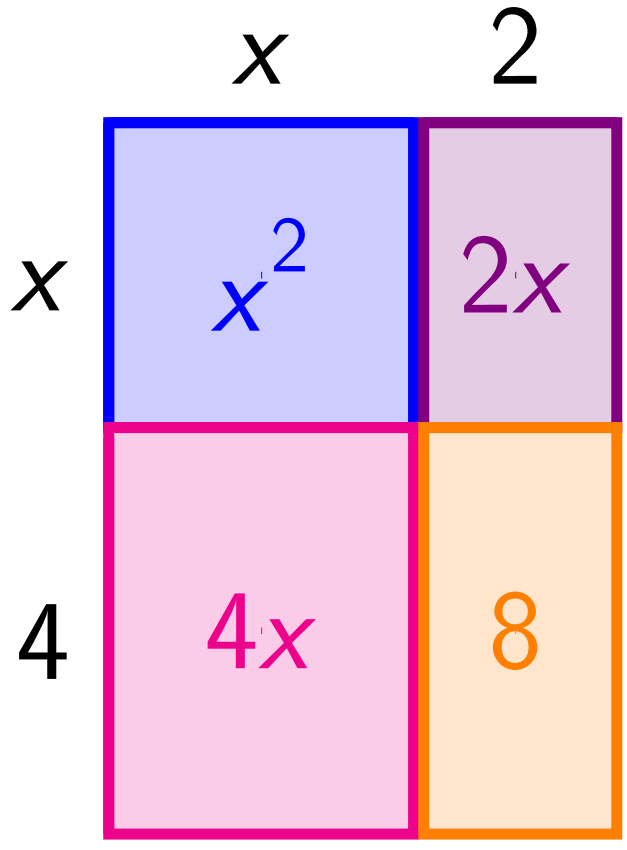
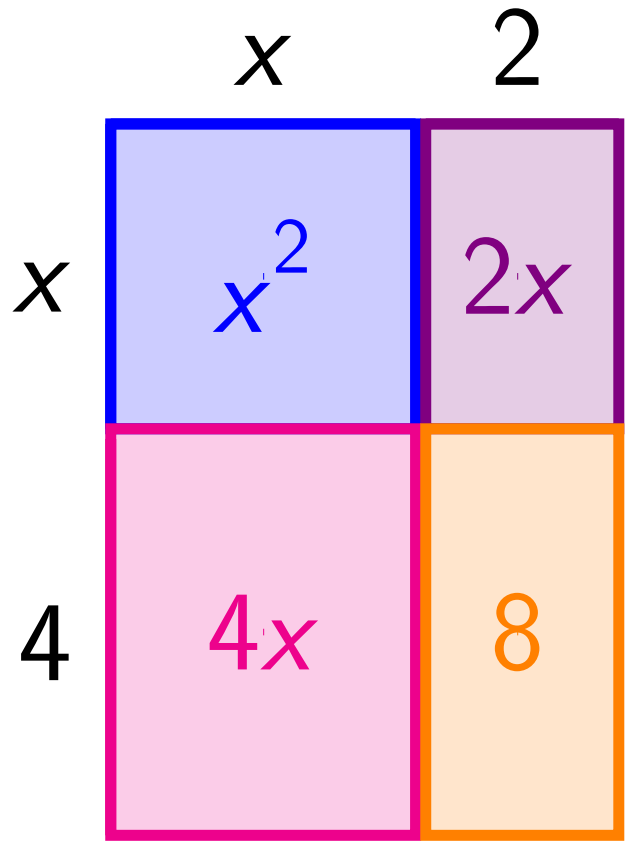


Multiplication $(x + 2)(x + 4)$



This gives the area $x^2 + 2x + 4x + 4 * 2$, or $x^2 + 6x + 8$, which is what the distributive property would give.

Draw a picture for

$$(x + 3)(x + 7)$$

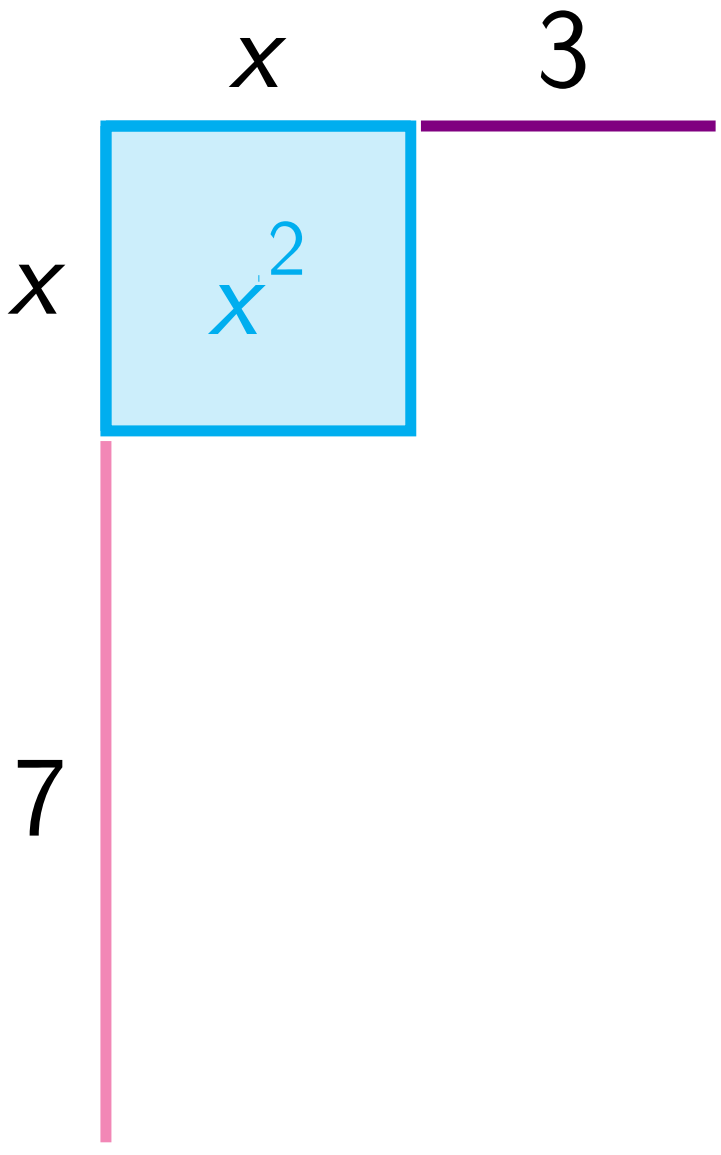
and confirm that the areas match with the multiplication.

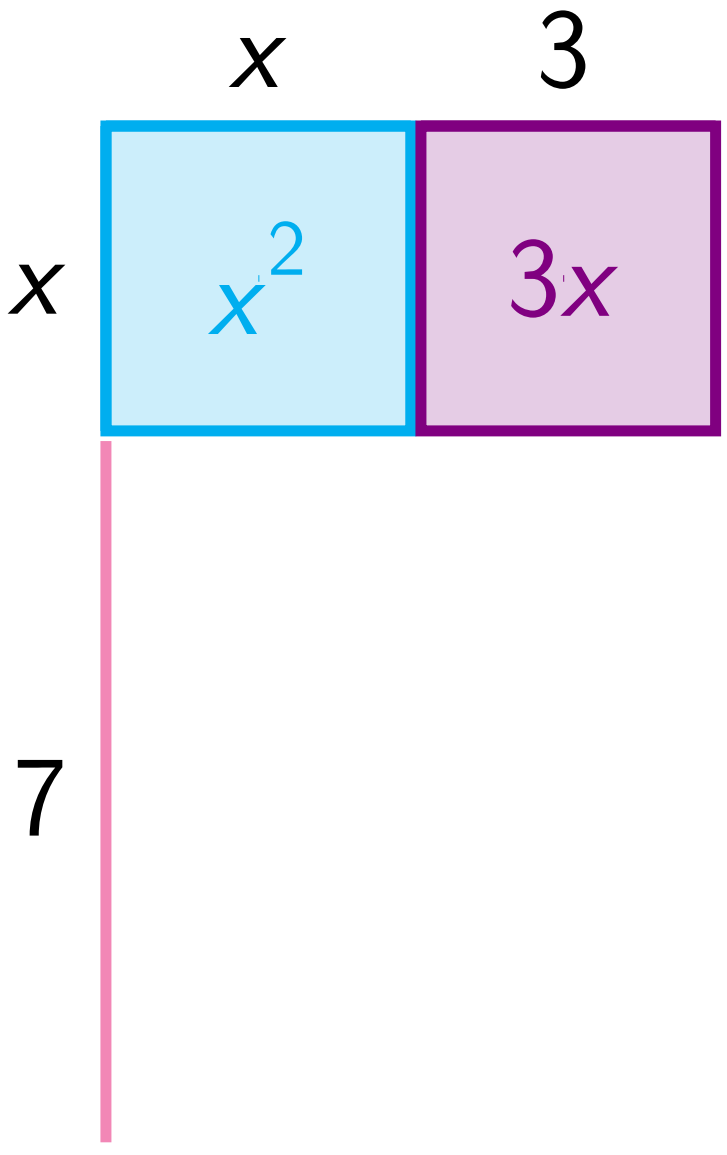

X

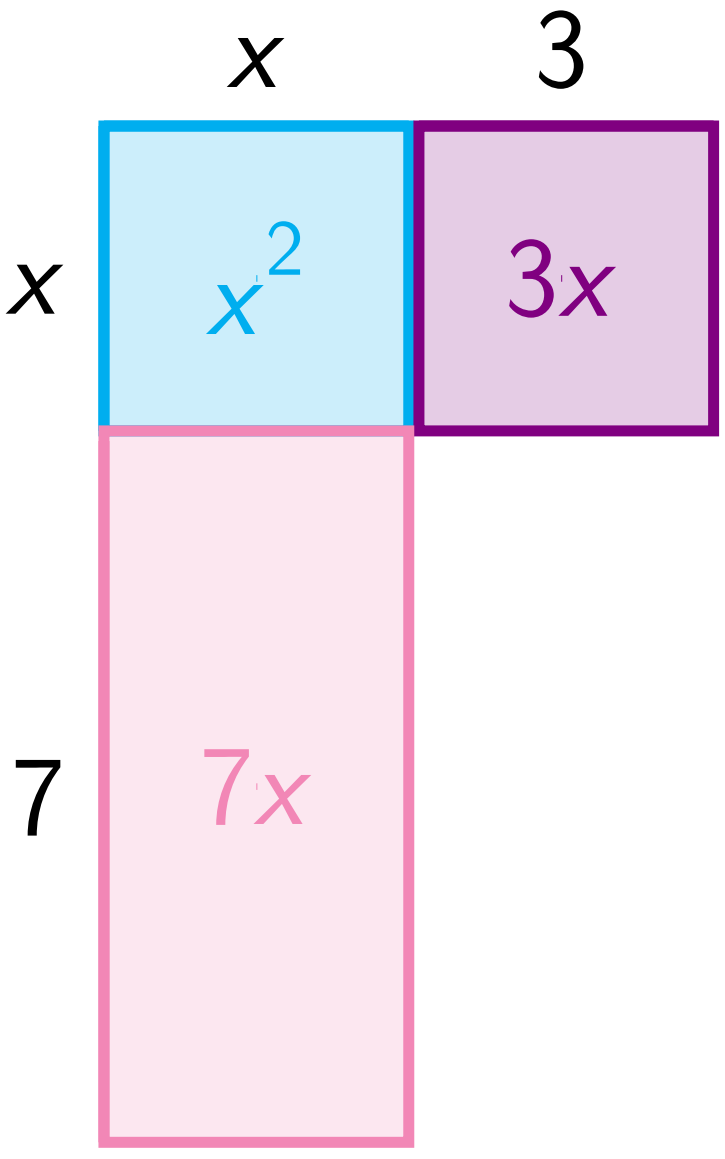

x
3

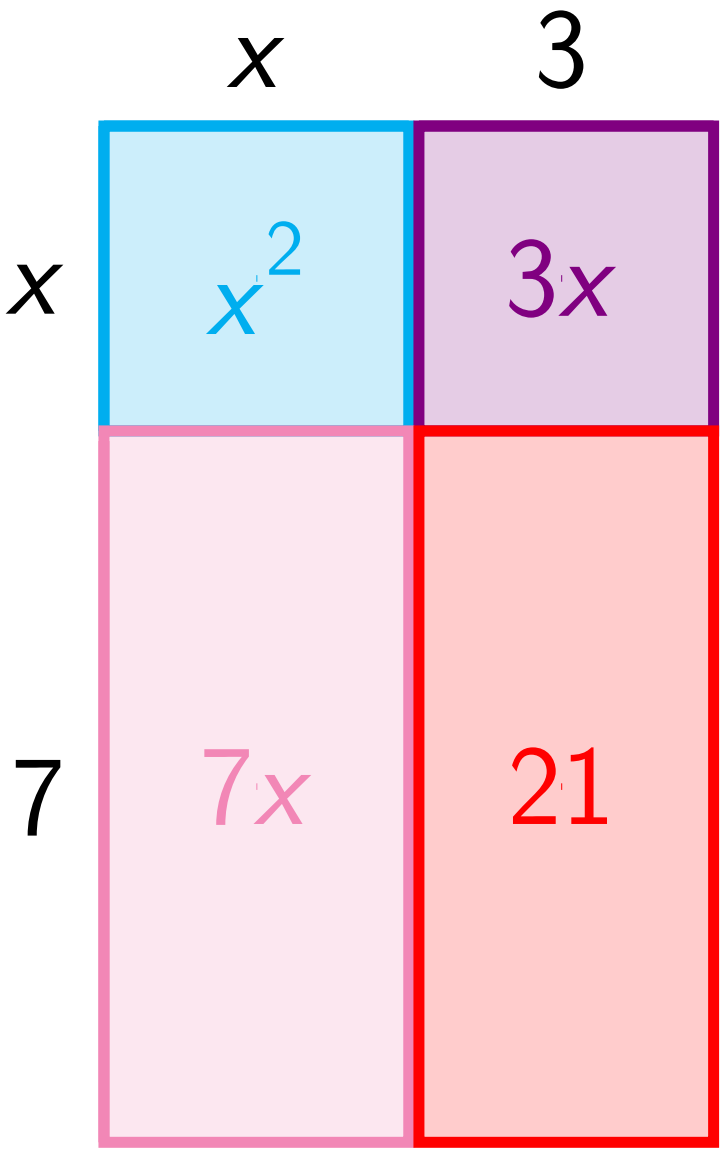

x
3
x


x
3
x
7


x
3
x
x^2
7


x
3
x
x^2
3x
7


x
3
x
x^2
3x
7
7x


x
3
x
7
x^2
3x
7x
21

Factoring is the reverse process of multiplication.

Factor the following expression and draw the picture

$$x^2 - 21x - 100$$

Factor the following expression and draw the picture

$$x^2 - 21x - 100$$

Solution: $(x - 25)(x + 4)$

Factor the following expression and draw the picture

$$2x^2 - 5x - 3$$

Factor the following expression and draw the picture

$$2x^2 - 5x - 3$$

Solution: $(2x + 1)(x - 3)$

Factor the following expression and draw the picture

$$t^3 - 11t^2 + 24t$$

Factor the following expression and draw the picture

$$t^3 - 11t^2 + 24t$$

Note, this is the volume of a rectangular box.

Factor the following expression and draw the picture

$$t^3 - 11t^2 + 24t$$

Note, this is the volume of a

rectangular box.
Solution: $t(t-8)(t-3)$

Factor the following expression and draw the picture

$$12x^3 - 8x^2 - 20x$$

Factor the following expression and draw the picture

$$12x^3 - 8x^2 - 20x$$

Solution: $4x(3x - 5)(x + 1)$

Word Problems

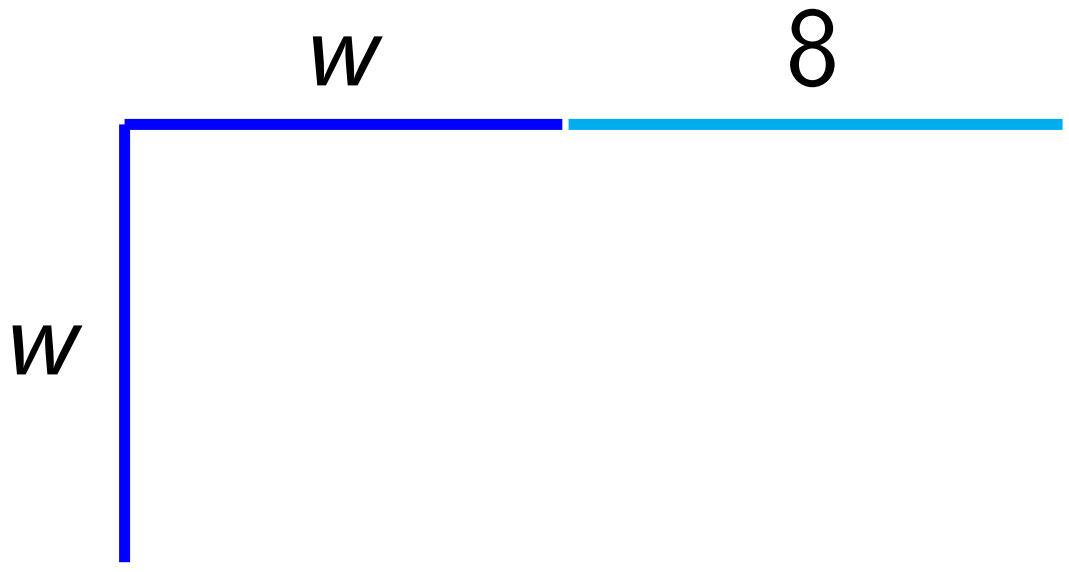
A rectangle has an area of 105 square feet.

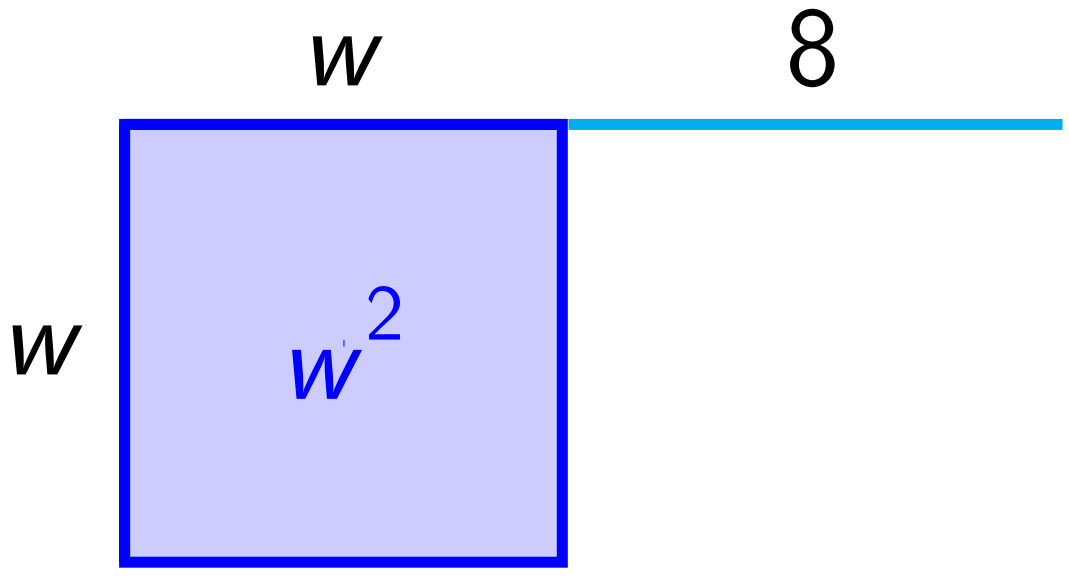
Its length is eight feet more than its width.

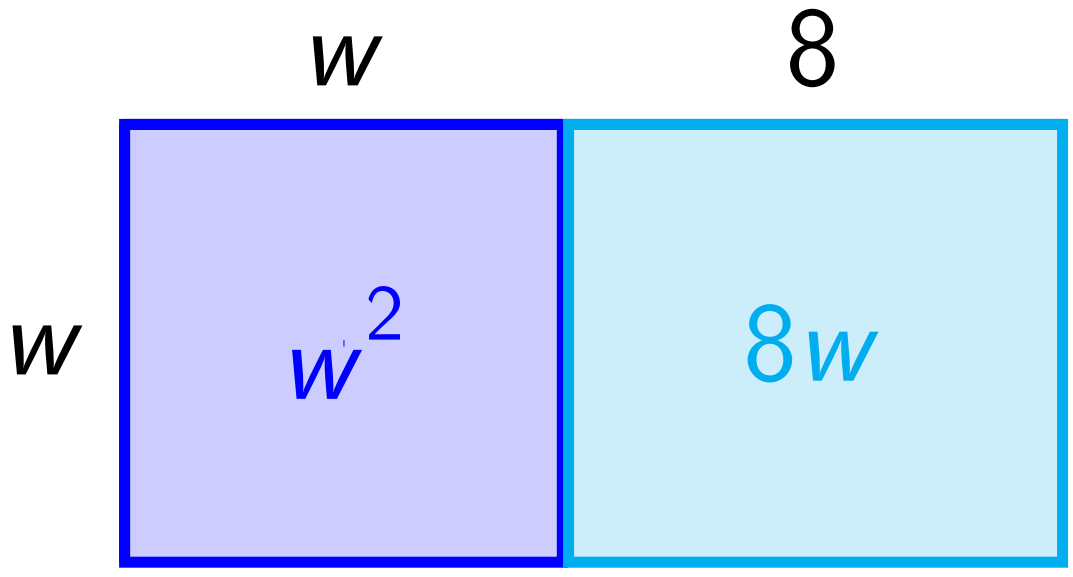
Find the dimensions of the rectangle.


w


w
8


w
8
w


w
8
w
w²


w
8
w
w^2
8w

Find the dimensions of the rectangle.

Find the dimensions of the rectangle.

$$w(w + 8) = 105$$

Find the dimensions of the rectangle.

$$w(w+8) = 105$$

$$w^2 + 8w = 105$$

Find the dimensions of the rectangle.

$$w(w+8) = 105$$

$$w^2 + 8w = 105$$

$$w^2 + 8w - 105 = 0$$

Find the dimensions of the rectangle.

$$w(w+8) = 105$$

$$w^2 + 8w = 105$$

$$w^2 + 8w - 105 = 0$$

$$(w+15)(w-7) = 0$$

Find the dimensions of the rectangle.

$$w(w+8) = 105$$

$$w^2 + 8w = 105$$

$$w^2 + 8w - 105 = 0$$

$$(w+15)(w-7) = 0$$

$$w = -15 \text{ or } w = 7$$

Find the dimensions of the rectangle.

$$w(w+8) = 105$$

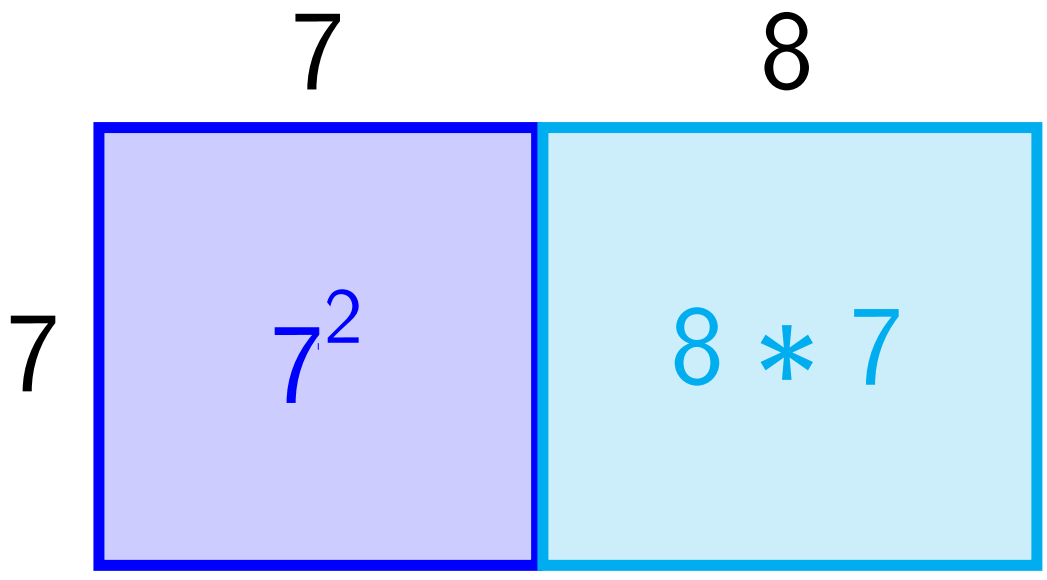
$$w^2 + 8w = 105$$

$$w^2 + 8w - 105 = 0$$

$$(w+15)(w-7) = 0$$

$$w = -15 \text{ or } w = 7$$

$$\text{width} = 7 \implies \text{length} = 7 + 8 = 15$$



Note that $7^2 = 49$ and $8 * 7 = 56$ and $49 + 56 = 105$. The square footage of the rectangle.

Find two consecutive positive integers whose product is 72.

Find the dimensions of the rectangle.

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

$$x^2 + x = 72$$

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

$$x^2 + x = 72$$

$$x^2 + x - 72 = 0$$

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

$$x^2 + x = 72$$

$$x^2 + x - 72 = 0$$

$$(x+9)(x-8) = 0$$

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

$$x^2 + x = 72$$

$$x^2 + x - 72 = 0$$

$$(x+9)(x-8) = 0$$

$$x = -9 \text{ or } x = 8$$

Find the dimensions of the rectangle.

$$x(x+1) = 72$$

$$x^2 + x = 72$$

$$x^2 + x - 72 = 0$$

$$(x+9)(x-8) = 0$$

$$x = -9 \text{ or } x = 8$$

$$\boxed{x = 8}$$

Next Time

Special Factoring &

Polynomial Equations