



People think of factoring by several names. They expect different results depending on how they are thinking about factoring. This can make for confusion when someone just says factor.

Let's take a look at some situations.



Polynomials

Math people like to factor polynomials. Meaning....they want to take a polynomial, which is a sum of terms, and get an equivalent expression that is totally a product of terms.

Below is a polynomial as a sum of three terms.

$$\square x^2 + 10x + 21$$

Here is the same polynomial as the product of two terms.

$$\square x^2 + 10x + 21$$

$$\triangle x^2 + 10x + 21 = (x + 7)(x + 3) \quad \text{Factor}$$

To factor a polynomial highlight the whole expression and then click on the factor

button  in the palette.



Factor out a common term

Instead of converting the whole expression to a product you may wish to work on just several terms within the expression.

In the expression

$$x + 3y - xy + x^2$$

the last two terms

$$xy + x^2$$

have an x factor in common. We can convert just these two terms into a product or "factor out the x".

$$\square x + 3y \square xy + x^2$$

$$\triangle x + 3y \square xy + x^2 = x + 3y \square (\square x + y)x \quad \text{Factor}$$

Highlight just these terms and click on the factor button.

We might also notice that the first term has an x and could be included in this factoring out process. If we highlight the whole expression however and ask LiveMath to convert the whole expression. It does not know that you only want to grab the terms with an x.

$$\square x + 3y \square xy + x^2$$

$$\triangle x + 3y \square xy + x^2 = \left(\frac{1}{2}\sqrt{[\square y + 1]^2 \square 12y} + x \square \frac{1}{2}y + \frac{1}{2}\right)\left(\square \frac{1}{2}\sqrt{[\square y + 1]^2 \square 12y} + x \square \frac{1}{2}\right)$$

$y + \frac{1}{2}$) Factor



Instead you might think to highlight only the first, third, and fourth terms by holding down the SHIFT key and then factor. Try it:

$$\square x + 3y \square xy + x^2$$



LiveMath is not falling for that. If you want to factor out a common term then gather the like terms and then factor. That means you need to move the x from the first term position to a position with the other x 's and leave $3y$ in the first position.

You can move a term within an expression just as you were moving terms across equal signs.

Highlight just that term. Press and hold CONTROL or COMMAND. Click and hold the (left) mouse button. Start moving. LiveMath will highlight possible positions to drop the term. Release the mouse button.

Here the x term has been moved from the first position to the second position.

$$\square x + 3y \square xy + x^2$$

$$\triangle x + 3y \square xy + x^2 = 3y + x \square xy + x^2 \quad \text{Commute}$$



Now all of the terms with an x in common are gathered together. Highlight these last three terms and factor.

$$\square x + 3y \square xy + x^2$$

$$\triangle x + 3y \square xy + x^2 = 3y + x \square xy + x^2 \quad \text{Commute}$$

$$\triangle x + 3y \square xy + x^2 = 3y + (x \square y + 1)x \quad \text{Factor}$$



Numbers

You might also have no algebra in mind. You might have a number and you want to factor it into its prime factors.

$$\square 24$$

$$\triangle 24 = 2^3 \cdot 3 \quad \text{Factor}$$



LiveMath may make decisions that only get you partially to your desired result.

$$\square 24x^2 + 240x + 504$$

$$\triangle 24x^2 + 240x + 504 = 24(x + 7)(x + 3) \quad \text{Factor}$$



You may have wanted the polynomial factored and the 24 factored. You will have to take over and direct LiveMath.

$$\square 24x^2 + 240x + 504$$

$$\triangle 24x^2 + 240x + 504 = 24(x + 7)(x + 3) \quad \text{Factor}$$

$$\triangle 24x^2 + 240x + 504 = (2^3 \cdot 3)(x + 7)(x + 3) \quad \text{Factor}$$



Or, maybe you had a different factorization in mind.

$$\square 24x^2 + 240x + 504$$

$$\triangle 24x^2 + 240x + 504 = 24(x + 7)(x + 3) \quad \text{Factor}$$

$$\triangle 24x^2 + 240x + 504 = (2^3 \cdot 3)(x + 7)(x + 3) \quad \text{Factor}$$

$$\square 2^3(x + 7) \cdot 3(x + 3)$$

$$\triangle 2^3(x + 7) \cdot 3(x + 3) = 2^3(x + 7)(3x + 9) \quad \text{Expand}$$

$$\triangle 2^3(x + 7) \cdot 3(x + 3) = (8x + 56)(3x + 9) \quad \text{Expand}$$



Now It's Your Turn... Follow the directions below to get hands on experience.



1.

Factor $x^2 + 3x$



2.

Create a statement with the expression

$$x^3 + 4yz + 3x + 5z$$

Gather terms that contain like terms and then factor out the like terms.