

6.3 Factoring Trinomials

Factoring a trinomial where x² coefficient is 1

$$x^2 + (\overset{\text{coefficient of } x}{a+b})x + \overset{\text{final constant}}{ab} = (x + a)(x + b)$$

1. The coefficient of x² is 1.
2. The final constant is the product of the constants a and b in the factors, and
3. The coefficient of x is the sum of a and b.

$$x^2 \text{ ___ } (\text{ ___ } a + b \text{ ___ }) x \text{ ___ } ab = (x \text{ ___ } a)(x \text{ ___ } b)$$

examples

$$x^2 + 3x + 2$$

P=2
~~1 2~~
S=3

$$(x + 1)(x + 2)$$

1x
2x

$$x^2 - 5x - 6$$

~~-6 1~~
~~-5~~

$$(x - 6)(x + 1)$$

$$x^2 - 8x + 16$$

~~16~~
~~-4 -4~~
~~-8~~

$$(x - 4)(x - 4)$$

$$x^2 + 3x + 1$$

Prime
~~1~~
~~3~~

examples

$$x^2 + 10x + 25$$

$$\begin{array}{r} 5 \times 5 \\ \hline 10 \end{array} \quad (x+5)(x+5)$$

$$x^2 + 5x - 6$$

$$\begin{array}{r} -1 \times 6 \\ \hline 5 \end{array} \quad (x-1)(x+6)$$

$$x^2 + 14x - 32$$

$$\begin{array}{r} -2 \times 16 \\ \hline -32 \end{array} \quad (x+16)(x-2)$$

$$2ax^2 - 6ax - 8a$$

$$2a(x^2 - 3x - 4)$$

$$\begin{array}{r} 1 \times -4 \\ \hline -3 \end{array} \quad 2a(x+1)(x-4)$$

Factor by Grouping

factor $ax^2 + bx + c$ by grouping

*first factor out any common monomial factor

1. Find two numbers whose product is ac and whose sum is b .
2. Write the trinomial with two x -terms having these numbers as coefficients
3. complete the factorization by grouping

$$2x^2 + 11x + 5$$

~~10~~ ~~10~~

$$2x^2 + 1x + 10x + 5$$

$$x(2x+1) + 5(2x+1)$$

$$(2x+1)(x+5)$$

$$4x^2 + 4x - 3$$

$$4x^2 - 2x + 6x - 3$$

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

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

$$6x^2 - 13xy + 5y^2$$
~~30~~ ~~13~~

$$6x^2 - 10xy - 3xy + 5y^2$$

$$2x(3x-5y) - 1(3x-5y)$$

$$(3x-5y)(2x-y)$$

$$6x^2 + 7x - 20$$
~~15~~ ~~120~~ ~~8~~

$$6x^2 + 15x - 8x - 20$$

$$3x(2x+5) - 4(2x+5)$$

$$(2x+5)(3x-4)$$

$$6x^2 + 19x + 20$$

Prime

~~120~~ ~~19~~ ~~none~~

120	·	1
60	·	2
40	·	3
30	·	4
20	·	6
15	·	8

$$2x^2y - 14xy^2 + 12y^3$$
~~6~~ ~~1~~

$$2y(x^2 - 7xy + 6y^2)$$

$$2y(x-6)(x-1)$$

special grouping

$$\boxed{x^2 - 4xy + 4y^2} - 9$$

$$(x - 2y)^2 - 9$$

$$(x - 2y)^2 - 3^2$$

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

$$(x - 3y)(x - y)$$

$$x^2 - 6xy + 9y^2 - 4z^2$$

$$(x - 3y)^2 - 4z^2$$

$$(x - 3y)^2 - (2z)^2$$

$$((x - 3y) - 2z)((x - 3y) + 2z)$$