Factoring Rules

Divide out common factors first.

EXAMPLES

$6x^2 + 9x \Rightarrow 3x(2x + 3)$

$5a^2b^3 - 15a^2b + 35a^3b^2 \Rightarrow 5a^2b(b - 3 + 7ab)$

Two terms:

Difference of two squares
$a^2 - b^2 = (a + b)(a - b)$

$x^2 - 16 = (x + 4)(x - 4)$

Sum of two squares
$a^2 + b^2$ = Prime = Can't factor

$x^2 + 16$ = Can't factor

Difference of two cubes
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

$x^3 - 64 = (x - 4)(x^2 + 4x + 16)$

Sum of two cubes
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$x^3 + 27 = (x + 3)(x^2 - 3x + 9)$

Three terms (x^2 in front):

a. Write (x) (x).
b. Find two numbers that multiply to make the back number and add to make the middle.

$x^2 + 7x + 12$
(x) (x)
(x + 3)(x + 4)

Three terms (number in front):

a. Multiply the first number by the last number.
b. List the factors of the product.
c. Find the two factors that add to make the middle number.
d. Split the middle number into these two factors.
e. Draw a line between the first two and the last two terms.
f. Factor out a common monomial from the front terms.
g. Factor out a common monomial from the back terms.
   If the 3rd term is negative make sure your factor is negative.
h. Factor out the common factors from both sides.

$3x^2 - 16x - 12$
$(3)(-12) = -36$
Factors of -36:

36	
1	-36
2	- 18

$3x^2 + 2x - 18x - 12$
$3x^2 + 2x \,/\, - 18x - 12$
$x(3x + 2) \,/\, - 6(3x + 2)$
$(3x + 2)(x - 6)$

Four terms:

a. Draw a line between the first two and the last two terms.
b. Factor out a common monomial from the front terms.
c. Factor out a common monomial from the back terms.
   If the 3rd term is negative make sure your factor is negative.
d. Factor out the common factors from both sides.

$2x^3 - 10x^2 + 3x - 15$
$2x^3 - 10x^2 \,/\, + 3x - 15$
$2x^2(x - 5) \,/\, + 3(x - 5)$
$(2x^2 + 3)(x - 5)$