

Factoring by Grouping

Factoring by grouping may be used when there are 4 terms in an expression.

Factoring by grouping uses GCF.

Factor: $8x^3 - 64x^2 + x - 8$

$(8x^3 - 64x^2) + (x - 8)$ Group the first and last two #'s together

$8x^2(x - 8) + 1(x - 8)$ Factor the GCF of each group. The first and 2nd parenthesis have to match.

$(x - 8)(8x^2 + 1)$ Factor out the common parenthesis (x-8)

$(8x^2 + 1)(x - 8)$ You normally write the term with the x^2 first.

Factor: $21k^3 + 84k^2 - 15k - 60$

$3(7k^3 + 28k^2 - 5k - 20)$ Factor the GCF of all 4 terms: 3

$3((7k^3 + 28k^2) + (-5k - 20))$ Group the first and last two #'s together

$3(7k^2(k + 4) - 5(k + 4))$ Factor the GCF of each group. The first and 2nd parenthesis have to match.

$3(7k^2 - 5)(k + 4)$ Factor out the common parenthesis (k+4)

Factor: $10y^3 + 8y^2 - 40y - 32$

$2(5y^3 + 4y^2 - 20y - 16)$ Factor the GCF of all 4 terms: 2

$2((5y^3 + 4y^2) + (-20y - 16))$ Group the first and last two #'s together

$2(y^2(5y + 4) - 4(5y + 4))$ Factor the GCF of each group. The first and 2nd parenthesis have to match.

$2(y^2 - 4)(5y + 4)$ Factor out the common parenthesis $(5y+4)$

$2(y + 2)(y - 2)(5y + 4)$ Factor the 1st parenthesis by difference of squares.

Factor: $56xw + 49xk^2 - 24yw - 21yk^2$

$$56xw + 49xk^2 - 24yw - 21yk^2$$

There is no GCF.

$(56xw + 49xk^2) + (-24yw - 21yk^2)$ Group the first and last two #'s together

$$7x(8w + 7k^2) - 3y(8w + 7k^2)$$

Factor the GCF of each group.
The first and 2nd parenthesis have to match.

$$(8w + 7k^2)(7x - 3y)$$

Factor out the common parenthesis $(7x - 3y)$