

Factor 4 Term Polynomials by Grouping

Factoring by Grouping

You can use the Distributive Property to **factor by grouping** if two groups of terms have the same factor.

Steps for Success!

- 1 Make 2 groups \rightarrow $\left(\begin{smallmatrix} 1st \\ 2 \\ terms \end{smallmatrix}\right) \left(\begin{smallmatrix} last \\ 2 \\ terms \end{smallmatrix}\right)$
- 2 Factor out GCF from each group
- 3 Rewrite: $(GCFs)(\text{common group})$
- 4 Check by multiplying FOIL

Factor: $4n^3 + 8n^2 - 5n - 10$

$$\left(\begin{smallmatrix} 4n^3 + 8n^2 \\ \underline{4n^2} \quad \underline{4n^2} \end{smallmatrix}\right) \left(\begin{smallmatrix} -5n - 10 \\ \underline{-5} \quad \underline{-5} \end{smallmatrix}\right)$$

$$4n^2(n+2) - 5(n+2)$$

$$(4n^2 - 5)(n+2)$$

check:
 $4n^3 + 8n^2 - 5n - 10$ ✓

Or you can still use the Box Method

	n	$+2$	
$4n^2$	$4n^3$	$8n^2$	$(4n^2 - 5)(n+2)$
	$-5n$	-10	
-5			

\leftarrow GCF (vertical arrows pointing down from $4n^3$ to $-5n$ and from $8n^2$ to -10)
 \leftarrow GCF (horizontal arrows pointing left from $4n^3$ to $-5n$ and from $8n^2$ to -10)

$$5t^4 + 20t^3 + 6t + 24$$

$$\begin{aligned} & \left(\frac{5t^4 + 20t^3}{5t^3} \right) \left(\frac{6t + 24}{6} \right) \\ & 5t^3(t+4) + 6(t+4) \\ & (5t^3 + 6)(t+4) \end{aligned}$$

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

	$2x + 1$	
$3x^2$	$6x^3$	$3x^2$
-2	$-4x$	-2

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

$$45x^3 + 20x^2 + 9x + 4$$

Try $2w^3 + w^2 - 14w - 7$

$$\begin{aligned} & (2w^3 + w^2)(-14w - 7) \\ & w^2(2w + 1) - 7(2w + 1) \\ & (w^2 - 7)(2w + 1) \end{aligned}$$

$$12p^4 + 10p^3 - 36p^2 - 30p$$

GCF 1st!

$$\begin{aligned} & 2p(6p^3 + 5p^2 - 18p - 15) \\ & \quad (6p^3 + 5p^2)(-18p - 5) \\ & \quad p^2(6p + 5) - 3(6p + 5) \end{aligned}$$

↓

$$2p(p^2 - 3)(6p + 5)$$

$$45m^4 - 9m^3 + 30m^2 - 6m$$

GCF 1st!

$$3m(15m^3 - 3m^2 + 10m - 2)$$

	$5m - 1$	
m^2	$15m^3$	$-3m^2$
2	$10m$	-2

$$3mm(m^2 + 2)(5m - 1)$$

$$6x^3 - 6x^2 + 5x - 5$$

$$9c^3 - 12c^2 + 18c - 24$$

$$8t^4 + 12t^3 + 16t^2 + 24t$$