

Factoring by Grouping

Use when there are 4 Terms

Example (1):

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

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

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

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

Example (2):

$$8x^3 + 2x^2 + 12x + 3$$

The GCF of
 $8x^3 + 2x^2$ is $2x^2$.

$$\begin{array}{l|l} 8x^3 + 2x^2 & +12x + 3 \\ 2x^2(4x + 1) & +3(4x + 1) \end{array}$$

The GCF of
 $12x + 3$ is 3.

$$= (4x + 1)(2x^2 + 3)$$

Example (3):

$$(4x^3 - 6x^2) \overbrace{-6x + 9}^{\text{cut}}$$

The GCF of $4x^3 - 6x^2$ is $2x^2$.

$$\begin{array}{l} 4x^3 - 6x^2 \mid -6x + 9 \\ 2x^2(2x - 3) \mid -3(2x - 3) \end{array}$$

The GCF of $-6x + 9$ is -3 .

When you factor a negative out of a positive, you will get a negative.

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

EXERCISE :

Factor completely if possible...

1 $5ab + 10a + 7b + 14$

$$(5ab + 10a) + (7b + 14)$$

$$5a(b + 2) + 7(b + 2)$$

$$(b + 2)(5a + 7)$$

2 $6m^3 - 12mn + m^2n - 2n^2$

$$(6m^3 - 12mn) + (m^2n - 2n^2)$$
$$6m(m^2 - 2n) + n(m^2 - 2n)$$

$$(m^2 - 2n)(6m + n)$$

3 $x^3 + 2x^2 + 3x + 6$

$$(x^3 + 2x^2) + (3x + 6)$$

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

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

4 $4s^2 - s + 12st - 3t$

$$(4s^2 - s) + (12st - 3t)$$

$$s(4s - 1) + 3t(4s - 1)$$

$$(4s - 1)(s + 3t)$$

5 $y - 2y^2 - 18y + 9$

$$(y - 2y^2) - 18y + 9$$

$$= y(1 - 2y) + 9(-2y + 1)$$

$$= (1 - 2y)(y + 9)$$

7 $2m(7m - 3) + 4(3 - 7m)$

$$(7m - 3)(2m - 4)$$

↓ factorise

$$(7m - 3)2(m - 2)$$

$$\rightarrow 2(7m - 3)(m - 2)$$

9 $a(r - t) + m(t - r)$

$$(r - t)(a - m)$$

$$(r - t)(a - m)$$

6 $48ab - 90a + 32b - 60$

$$(48ab - 90a) + (32b - 60)$$

$$6a(8b - 15) + 4(8b - 15)$$

$$(8b - 15)(6a + 4)$$

$$(8b - 15)2(3a + 2)$$

↓ factorise

$$\rightarrow 2(8b - 15)(3a + 2)$$

8 $15x - 5xy + 6y^2 - 18y$

$$(15x - 5xy) + (6y^2 - 18y)$$

$$= 5x(3 - y) + 6y(y - 3)$$

$$= (3 - y)(5x - 6y)$$

10 $2t - 14st + 7st^2 - t^2$

$$(2t - 14st) + (7st^2 - t^2)$$

$$2t(\cancel{1 - 7s}) + t^2(\cancel{7s - 1})$$

(1-7s) (1-7s)

$$(1 - 7s)(2t - t^2)$$

↓ factorise

$$(1 - 7s)t(2 - t)$$

$$\rightarrow t(1 - 7s)(2 - t)$$