



The National  
Orthodox School  
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Key Answer



Name:

Worksheet(3)

Grade:8(A, B)

**Subject: (Math)**

**(Factoring by grouping )**

**Date :**

- Goal: To be able to factor polynomials with 4 terms by grouping

Steps for factoring by grouping:

1. A polynomial must have 4 terms to factor by grouping.

$$\text{ex. } x^3 + x^2 + 2x + 2$$

2. We factor the first two terms and the second two terms separately. Use the rules for GCF to factor these.

$$\begin{array}{l} \text{The GCF of } (x^3 + x^2) + (2x + 2) \\ x^3 + x^2 \text{ is } x^2. \quad x^2(x+1) \quad +2(x+1) \quad \text{The GCF of } \\ 2x+2 \text{ is } 2 \end{array}$$

3. Finally, we factor out the "common factor" from both terms.

This means we write the  $(x+1)$  term in front and the 2 terms left over,  $x^2+2$ , in a separate set of parentheses.

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

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## 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  $2x^2$ .

$$(8x^3 + 2x^2) + (12x + 3)$$
$$2x^2(4x + 1) + 3(4x + 1)$$

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

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

Example (3):

$$4x^3 - 6x^2 - 6x + 9$$

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

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

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

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

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

$$4x^3 - 6x^2 - 6x + 9$$

$$(4x^3 - 6x^2) + (9 - 6x)$$

$$\frac{2x^2(2x - 3)}{(2x - 3)} + \frac{3(3 - 2x)}{(2x - 3)}$$

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

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

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

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

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

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

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

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

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

↓ factorise

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

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