



The National  
Orthodox School  
Shmaisani

# 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.

$$ex. \ x^3 + x^2 + 2x + 2$$

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

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

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  $2x^2$ .

$$\begin{array}{r} 8x^3 + 2x^2 \mid +12x + 3 \\ 2x^2(4x + 1) \mid +3(4x + 1) \end{array}$$

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

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

**Example (3):**

$$(4x^3 - 6x^2) \overline{) - 6x + 9}$$

*cut*

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

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

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

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

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

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

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

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

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

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

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

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

$$6m(\underline{m^2 - 2n}) + n(\underline{m^2 - 2n})$$

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

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

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

$$s(\underline{4s-1}) + t(\underline{4s-1})$$

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

5

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

$$\begin{aligned} & (y - 2y^2) - 18y + 9 \\ & = y(1 - 2y) + 9(-2y + 1) \\ & = \boxed{(1 - 2y)(y + 9)} \end{aligned}$$

7

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

$$\begin{aligned} & (7m - 3)(2m - 4) \\ & \quad \downarrow \text{factorise} \\ & (7m - 3) 2(m - 2) \\ \Rightarrow & \boxed{2(7m - 3)(m - 2)} \end{aligned}$$

9

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

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

$$\boxed{(r-t)(a-m)}$$

6

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

$$\begin{aligned} & (48ab - 90a) + (32b - 60) \\ & 6a(8b - 15) + 4(8b - 15) \\ & (8b - 15)(6a + 4) \\ & (8b - 15) 2(\cancel{3a + 2}) \end{aligned}$$

8

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

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

$$\begin{aligned} & = 5x(3 - y) + 6y(y - 3) \\ & = \boxed{(3-y)(5x - 6y)} \end{aligned}$$

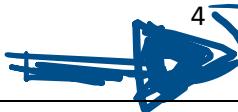
10

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

$$\begin{aligned} & (2t - 14st) + (7st^2 - t^2) \\ & 2t \cancel{(1 - 7s)} + t^2 \cancel{(7s - 1)} \\ & (1 - 7s)(2t - t^2) \end{aligned}$$

factorise

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



4

$$\boxed{t(1 - 7s)(2 - t)}$$