

Intermediate Algebra
Skill-Builder # PF - 2
Factoring by Grouping I

When a polynomial has 4 or more terms, try grouping terms and factoring out the GCF from each group.

Examples

1. $ax + ay + 8x + 8y$

Solution:

$$\begin{aligned} & ax + ay + 8x + 8y \\ &= (\boxed{a} \cdot x + \boxed{a} \cdot y) + (\boxed{8} \cdot x + \boxed{8} \cdot y) \\ &= a(\boxed{x + y}) + 8(\boxed{x + y}) \\ &= (x + y)(a + 8) \end{aligned}$$

2. $8ab + 4ac - 6bd - 3cd$

Solution:

$$\begin{aligned} & 8ab + 4ac - 6bd - 3cd \\ &= (8ab + 4ac) + (-6bd - 3cd) \\ &= (\boxed{4a} \cdot 2b + \boxed{4a} \cdot c) + (\boxed{-3d} \cdot 2b + \boxed{-3d} \cdot c) \\ &= 4a(\boxed{2b + c}) - 3d(\boxed{2b + c}) \\ &= (2b + c)(4a - 3d) \end{aligned}$$

3. $x^2 - xyz - 4x + 4yz$

Solution:

$$\begin{aligned} & x^2 - xyz - 4x + 4yz \\ &= (x^2 - xyz) + (-4x + 4yz) \\ &= (\boxed{x} \cdot x - \boxed{x} \cdot yz) + (\boxed{-4} \cdot x - \boxed{-4} \cdot yz) \\ &= x(\boxed{x - yz}) - 4(\boxed{x - yz}) \\ &= (x - yz)(x - 4) \end{aligned}$$

4. $9 + 2ab - 18a - b$

Solution:

$$\begin{aligned} & 9 + 2ab - 18a - b \\ &= 2ab - b + 9 - 18a \\ &= (2ab - b) + (9 - 18a) \\ &= (2a \cdot \boxed{b} - 1 \cdot \boxed{b}) + (\boxed{9} \cdot 1 - \boxed{9} \cdot 2a) \\ &= b(2a - 1) + 9(1 - 2a) \\ &= b(\boxed{2a - 1}) - 9(\boxed{2a - 1}) \\ &= (2a - 1)(b - 9) \end{aligned}$$

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Factor by grouping.

1. $2ax - 2bx + 3ay - 3by$

2. $7xy - 14y + 8nx - 16n$

3. $12x^3 - 14x^2 - 30x + 35$

4. $10a^2b + 2ac - 5abd - cd$

5. $an + 2bn - ap - 2pb + ay + 2by$

6. $4x^2y^2 + 4x^2y + 12x^2 - 7y^2 - 7y - 21$

7. $12x^3 - 60x - 18x^2y + 90y$

8.
 $24a^2bx - 20a^2by - 4a^2b - 48ab^2x + 40ab^2y + 8ab^2$

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Answers

1. $(a - b)(2x + 3y)$

2. $(x - 2)(7y + 8n)$

3. $(2x^2 - 5)(6x - 7)$

4. $(2a - d)(5ab + c)$

5. $(a + 2b)(n - p + y)$

6. $(4x^2 - 7)(y^2 + y + 3)$

7. $6(2x - 3)(x^2 - 5)$

8. $4ab(a - 2b)(6x - 5y - 1)$

Prepared by: Dr. Teresa V. Sutcliffe, Winter 2010