Name _____ Class _____ Date _____

Reteaching 8-8

Factoring by Grouping

OBJECTIVE: Factoring by grouping

MATERIALS: None

To factor a polynomial with four terms, we can sometimes group pairs of terms together, find the GCD of each pair, then factor a GCD from the resulting terms.

Examples

Factor $2x^3 - 8x^2 + 5x - 20$.

Group pairs of terms together. $\longrightarrow (2x^3 - 8x^2) + (5x - 20)$

Factor the GCD from each pair. $\longrightarrow 2x^2(x - 4) + 5(x - 4)$

(Note: To proceed with this method, both sets of parentheses must contain the same expression.)

Replace the expressions in parentheses with ▲. $\longrightarrow 2x^2 ▲ + 5 ▲$

Now, factor the common factor ▲ from both terms. $\longrightarrow ▲ (2x^2 + 5)$

Lastly, replace the ▲ with the expression it represents. $\longrightarrow (x - 4)(2x^2 + 5)$

So, $2x^3 - 8x^2 + 5x - 20 = (x - 4)(2x^2 + 5)$.

You can check your answer using FOIL.

It is sometimes possible to use this method to factor trinomials by first rewriting the middle term as a sum.

Factor $2x^2 + 13x + 15$.

Find two numbers whose product is *ac* and sum is *b*. $\longrightarrow$ Since $a = 2$ and $c = 15$, $ac = 30$. Since $ac = 30$ and $b = 13$, the numbers are 10 and 13.

Rewrite the middle term as a sum of two terms whose coefficients are the two numbers you just found. $\longrightarrow 13x = 10x + 3x$

Replace the middle term with this sum. $\longrightarrow 2x^2 + (10x + 3x) + 15$

Regroup the terms and proceed as in the first Example. $\longrightarrow (2x^2 + 10x) + (3x + 15)$

Factor the GCD from each pair. $\longrightarrow 2x(x + 5) + 3(x + 5)$

Replace the common expression with ▲. $\longrightarrow 2x ▲ + 3 ▲$

Factor ▲ from both terms. $\longrightarrow ▲(2x + 3)$

Replace the ▲ with the expression. $\longrightarrow (x + 5)(2x + 3)$

So, $2x^2 + 13x + 15 = (x + 5)(2x + 3)$.

Exercises

Factor each polynomial by grouping.

1. $2x^3 + 4x^2 + x + 2$

2. $2x^3 + 6x^2 + 3x + 9$

3. $5x^3 - 25x^2 + 2x - 10$

4. $2x^3 + 12x^2 - 5x - 30$

5. $7x^3 - 4x^2 + 7x - 4$

6. $9x^3 - 12x^2 - 18x + 24$

7. $3x^2 + x - 2$

8. $2x^2 - x - 3$

9. $5x^2 + 34x - 7$

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