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Reteaching

Factoring by Grouping

You can factor some higher-degree polynomials by grouping terms and factoring out the GCF to find the common binomial factor. Make sure to factor out a common GCF from all terms first before grouping.

Problem

What is the factored form of $2b^4 - 8b^3 + 10b^2 - 40b$?

$$2b^4 - 8b^3 + 10b^2 - 40b = 2b(b^3 - 4b^2 + 5b - 20)$$

$$= 2b[b^2(b - 4) + 5(b - 4)]$$

$$= 2b(b^2 + 5)(b - 4)$$

$2b$ is the GCF of all four terms. Factor out $2b$ from each term.

Group terms into pairs and look for the GCF of each pair. b^2 is the GCF of the first pair, and 5 is the GCF of the second pair.

$b - 4$ is the common binomial factor.

Use the Distributive Property to rewrite the expression.

Multiply to check your answer.

$$2b(b^2 + 5)(b - 4) = 2b(b^3 + 5b - 4b^2 - 20)$$

$$= 2b^4 + 10b^2 - 8b^3 - 40b$$

$$= 2b^4 - 8b^3 + 10b^2 - 40b \checkmark$$

Multiply $b^2 + 5$ and $b - 4$.

Multiply by $2b$.

Reorder the terms by degree.

The factored form of $2b^4 - 8b^3 + 10b^2 - 40b$ is $2b(b^2 + 5)(b - 4)$.

Exercises

Factor completely. Show your steps.

1. $4x^4 + 8x^3 + 12x^2 + 24x$

2. $24y^4 + 6y^3 + 36y^2 + 9y$

3. $72z^4 + 48z^3 + 126z^2 + 84z$

4. $2e^4 - 8e^3 + 18e^2 - 72e$

5. $12f^3 - 36f^2 + 60f - 180$

6. $16g^4 - 56g^3 + 64g^2 - 224g$

7. $56m^3 - 28m^2 - 42m + 21$

8. $40n^4 - 60n^3 - 50n^2 + 75n$

9. $60x^3 - 90x^2 - 30x + 45$

10. $12p^5 + 8p^4 + 18p^3 + 12p^2$

11. $6r^3 + 9r^2 - 60r$

12. $20s^6 - 50s^5 - 30s^4$

8-8

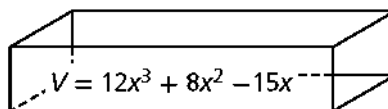
Reteaching (continued)

Factoring by Grouping

Polynomials can be used to express the volume of a rectangular prism. They can sometimes be factored into 3 expressions to represent possible dimensions of the prism. The three factors are the length, width, and height.

Problem

The plastic storage container to the right has a volume of $12x^3 + 8x^2 - 15x$. What linear expressions could represent possible dimensions of the storage container?



$$\begin{aligned} 12x^3 + 8x^2 - 15x &= x(12x^2 + 8x - 15) \\ &= x(12x^2 + 18x - 10x - 15) \\ &= x[6x(2x + 3) - 5(2x + 3)] \\ &= x(6x - 5)(2x + 3) \end{aligned}$$

Factor out x , the GCF for all three terms.

ac is -180 and b is 8 . Break $8x$ into two terms that have a sum of $8x$ and a product of $-180x^2$.

Group the terms into pairs and factor out the GCF from each pair. The GCF of the first pair is $6x$. The GCF of the second pair is -5 .

$2x + 3$ is the common binomial term. Use the Distributive Property to reorganize the factors.

Multiply to check your answer.

$$\begin{aligned} x(6x - 5)(2x + 3) &= x(12x^2 + 18x - 10x - 15) \\ &= x(12x^2 + 8x - 15) \\ &= 12x^3 + 8x^2 - 15x \checkmark \end{aligned}$$

Multiply $6x - 5$ and $2x + 3$.

Combine like terms.

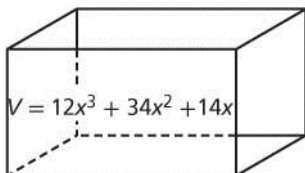
Multiply by x .

Possible dimensions of the storage container are x , $6x - 5$, and $2x + 3$.

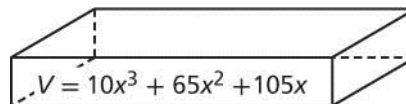
Exercises

Find linear expressions for the possible dimensions of each rectangular prism.

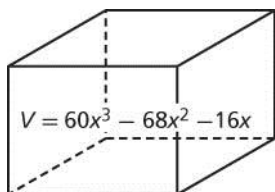
13.



14.



15.



16.

