

8-5 Using the Distributive Property

I can... factor polynomials.

↳ divide

$$4^8 2$$



Erase for definitions

Greatest Common Factor (GCF):

The largest value that will divide evenly into the given values.

Erase for definitions

Ex: GCF of 12 and 32

List Method: List all the factors of each value, and then find the largest common factor.

12- 1, 2, 3, 4, 6, 12

32- 1, 2, 4, 8, 16, 32

The GCF of 12 and 32 is 4.

Erase for definitions

Factor Tree Method: Make a factor tree for each value, list the prime factors for each, and then find all the common prime factors and multiply them together.

12

32

Prime Factors of 12

Prime Factors of 32

Each number has two 2's in common, so multiply 2 times 2.
The GCF of 12 and 32 is 4.

Erase for definitions

The same methods can be used even when variables are a part of the given values. **Ex: GCF of $12a^2$ and $32a^3$**

GCF of 12 and 32 we already know is 4.

The GCF of a^2 and a^3 is found the same way.

$$a^2 = a \cdot a$$

$$a^3 = a \cdot a \cdot a$$

They each have two a's in common, so their GCF is a^2

So the GCF of $12a^2$ and $32a^3$ is $4a^2$.

You Try:

Erase below for answers

1. 16 and 24

 8

2. 28 and 63

 7

3. 18 and 42

 6

4. $8a^2$ and $12a^3$

 $4a^2$

5. $3x^3y$ and $9x^2y^3$

 $3x^2y$

6. $36g^4h^2$ and $48g^2h^5$

 $12g^2h^2$

7. $42x^3y^4$ and $56xy$

 $14x^3y$

$$3x^3y \text{ and } 9x^2y^3$$

$$\begin{array}{c} \diagup \\ 3 \\ \textcircled{3} \textcircled{x} \textcircled{x} \textcircled{x} \textcircled{y} \end{array} \quad \begin{array}{c} \diagup \quad \diagup \\ 3 \quad 3 \\ \textcircled{3} \cdot \textcircled{3} \textcircled{x} \textcircled{x} \textcircled{y} \textcircled{y} \textcircled{y} \end{array}$$

$$\text{GCF} = 3x^2y$$

$$16 \text{ and } 24$$

$$\begin{array}{c} \diagup \\ 2 \\ 8 \\ \diagup \quad \diagdown \\ 2 \quad 4 \\ \diagup \quad \diagdown \\ 2 \quad 2 \end{array} \quad \begin{array}{c} \diagup \\ 2 \\ 12 \\ \diagup \quad \diagdown \\ 2 \quad 6 \\ \diagup \quad \diagdown \\ 2 \quad 3 \end{array}$$

$$\textcircled{2 \cdot 2 \cdot 2 \cdot 2} \quad \textcircled{2 \cdot 2 \cdot 2 \cdot 3}$$

$$\text{GCF} = 2 \cdot 2 \cdot 2 = 8$$

Erase for definitions

Distributive Property:
multiplying a common factor into a polynomial.

Ex: Simplify $6a(a + 3)$ distribute (multiply) $3a$ into the binomial

$$6a \cdot a + 6a(3)$$

$$6a^2 + 18a$$

You Try: Simplify $7x(x - 5)$

$$7x(x) + 7x(-5)$$

$$7x^2 - 35x$$

Erase for definitions

Factoring a Polynomial:

Remove the GCF from each term of the polynomial; write polynomial as the product of the GCF and the “leftovers” or remaining factors of each term of the polynomial.

Ex: Factor $6a^2 + 18a$

$$\begin{array}{c}
 \begin{array}{c} 18 \\ \swarrow \searrow \\ 2 \quad 9 \\ \swarrow \searrow \\ 3 \quad 3 \end{array} \\
 \underline{2 \cdot 3 \cdot a \cdot a} + \underline{2 \cdot 3 \cdot 3 \cdot a} \\
 6a \cdot a + 6a \cdot 3 \\
 6a(a + 3)
 \end{array}$$

1. Find the GCF

$$2 \cdot 3 \cdot a \quad (6a)$$

2. Rewrite the polynomial by "factoring out" the GCF

3. Now, take the GCF out "front" leaving the "leftovers" inside the parentheses together.

Ex: Factor $12x^3 - 4x^2 + 8x$

$$\begin{array}{c}
 \begin{array}{c} 12 \\ \swarrow \searrow \\ 2 \quad 6 \\ \swarrow \searrow \\ 2 \quad 3 \end{array} \quad \begin{array}{c} 4 \\ \swarrow \searrow \\ 2 \quad 2 \\ \swarrow \searrow \\ 2 \quad 2 \end{array} \\
 \underline{2 \cdot 2 \cdot 3 \cdot x \cdot x \cdot x} - \underline{2 \cdot 2 \cdot x \cdot x} + \underline{2 \cdot 2 \cdot 2 \cdot x} \\
 4x \cdot 3x^2 - 4x \cdot x + 4x \cdot 2 \\
 4x(3x^2 - x + 2)
 \end{array}$$

1. Find the GCF

$$4x$$

2. Rewrite the polynomial by "factoring out" the GCF

3. Now, take the GCF out "front" leaving the "leftovers" inside the parentheses together.

$$\begin{array}{c}
 4x(3x^2 - x + 2) \\
 12x^3 - 4x^2 + 8x \quad \checkmark
 \end{array}$$

You Try

Erase below for answers

Factor the following polynomials.

1. $16x^2 + 24$

$8(2x^2 + 3)$

2. $28x^3 - 63x$

$7x(4x^2 - 9)$

3. $18xy^3 + 42x^4y^2$

$6xy^2(3y + 7x^3)$

1. Find the GCF

2. Rewrite the polynomial by
“factoring out” the GCF3. Now, take the GCF out “front”
leaving the “leftovers” inside the
parentheses together.

You Try!!

4. $\frac{3ab^2}{3ab^2} + \frac{15a^2b^2}{3ab^2} + \frac{27ab^3}{3ab^2}$

GCF $3ab^2$

$3ab^2(1 + 5a + 9b)$



Watch

$$\begin{aligned} & (6ax + 3ay) + (2bx + by) \\ & (2 \cdot 3ax + 3ay) + (2bx + by) \\ & 3a(2x + y) + b(2x + y) \\ & (3a + b)(2x + y) \end{aligned}$$

Note Guide

Factor By Grouping

- Pair up terms
- Find GCF of each pair
- Rewrite each pair with GCF outside and "leftovers" inside

$$\begin{aligned} & (xy - 2x) + (2 - y) \\ & x(y - 2) + (2 - y) \\ & x(y - 2) + (-y + 2) \\ & x(y - 2) - 1(y - 2) \\ & (y - 2)(x - 1) \end{aligned}$$

Note Guide

Factor By Grouping

$$2 - y = -y + 2$$

$$\begin{array}{r} +y \\ \hline +1 \end{array}$$

$$(4xy - 20x) + (3y - 15)$$
$$(\cancel{20}xy - \cancel{20} \cdot 5x) + (3y - 3 \cdot 5)$$

$$\underline{4x}(y - 5) + 3(y - 5)$$

$$(y - 5)(4x + 3)$$

Homework 8.5

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