

Unit 6.4 Finding the GCF & Factoring it Out

Finding (and Factoring out) the GCF (of a polynomial)

- **factoring (a polynomial)** → REVERSES the multiplication process (which were the Distributive Property and the "Box" method) and the first step of factoring is to find a GCF of the polynomial. * 1st Rule of Factoring: Always check to see if a GCF can be factored out.

- **gcf** → stands for Greatest Common Factor which is the GREATEST/LARGEST factor that EVENLY divides into each of the TERMS of a polynomial

Prime #'s: 2, 3, 5, 7, 11, 13...
(only 2 factors, 1 and itself)

Composite #'s: 4, 6, 9, 10, 12, 14, 15, ...
(has more than two factors).

Example 1: Determine the GCF of each polynomial.

a.) $15d + 21 \rightarrow$ GCF: 3

15d: 1·15, 3·5, (d) ← Not part of GCF bc 21 does not have a "d".
21: 1·21, 3·7
What is the largest # they have in common?

b.) $x^4 + 5x^3 - 4x^2 \rightarrow$ GCF: x^2

The GCF of variables with exponents is the smallest power.

$x^4: x \cdot x \cdot x \cdot x \rightarrow x \cdot x \rightarrow x^2$
 $5x^3: 1 \cdot 5 \cdot x \cdot x \cdot x$
 $4x^2: 1 \cdot 4 \cdot 2 \cdot 2 \cdot x \cdot x$

c.) $12a^3 + 6a^5 \rightarrow$ GCF: $6a^3$

$12a^3: 1 \cdot 12, 2 \cdot 6, 3 \cdot 4, a \cdot a \cdot a$
 $6a^5: 1 \cdot 6, 2 \cdot 3, a \cdot a \cdot a \cdot a \cdot a$
 $6 \cdot a \cdot a \cdot a \rightarrow 6a^3$

d.) $9x^4 - 6x^3 + 12x^2 - 21x \rightarrow$ GCF: $3x$

$9x^4: 1 \cdot 9, 3 \cdot 3, x \cdot x \cdot x \cdot x$
 $6x^3: 1 \cdot 6, 2 \cdot 3, x \cdot x \cdot x$
 $12x^2: 1 \cdot 12, 2 \cdot 6, 3 \cdot 4, x \cdot x$
 $21x: 1 \cdot 21, 3 \cdot 7, x$

Example 2: Factor out the GCF to each polynomial.

- a.) $36x + 24$ b.) $6a^2 - 8a + 2$ c.) $10x^3 - 25x^2$ d.) $6h^6 + 24h^5 + 18h^3$

SEE BACK FOR WORK AND ANSWERS

- 1) Find GCF
- 2) Factor out the GCF
- 3) Write the answer
GCF (Polynomial)

Ex. 2

a) $36x + 24$

1) Find GCF

$36x$: 1·36, 2·18, 3·12, 4·9, 6·6 x

24 : 1·24, 2·12, 3·8, 4·6

GCF: 12

* The GCF WILL NOT have a variable, b/c the term 24 does not have a x.

2) Factor Out GCF

$36x + 24$

$12(3x + 2)$

What did I distribute the 12 into to get the binomial?

3) Write answer

$12(3x + 2)$

↑
This is factor!

b) $6a^2 - 8a + 2$

1) Find GCF

$6a^2$: 1·6, 2·3, a a

$8a$: 1·8, 2·4, a GCF: 2

2 : 1·2

↑ No "a", so not part of GCF!

2) Factor Out GCF

$6a^2 - 8a + 2$

$2(3a^2 - 4a + 1)$

$2(3a^2 - 4a + 1)$

c) $10x^3 - 25x^2$

$10x^3$: 1·10, 2·5, x x x

$25x^2$: 1·25, 5·5, x x

GCF: $5x^2$

$10x^3 - 25x^2$

$5x^2(2x - 5)$

$5x^2(2x - 5)$

d) $6h^6 + 24h^5 + 18h^3$

$6h^6$: 1·6, 2·3, h h h h h h

$24h^5$: 1·24, 2·12, 3·8, 4·6, h h h h h GCF: $6h^3$

$18h^3$: 1·18, 2·9, 3·6, h h h

$6h^6 + 24h^5 + 18h^3$

$6h^3(h^3 + 4h^2 + 3)$

$6h^3(h^3 + 4h^2 + 3)$