

"Teacher"

Name _____

Date 3/16/18

Section 2P3

Factoring Polynomial Expressions by the Greatest Common Factor

Imagine you are hosting a raffle of gift baskets for a fundraiser...

You want all the baskets to have the same contents. You want to use up your entire inventory, which includes 24 chocolate bars, 40 movie passes, and 16 stuffed toys. What is the maximum number of gift baskets you can make? (Why? How many of each item will be in a gift basket?)

24 = 1, 2, 3, 4, 6, 8, 12, 24
 40 = 1, 2, 4, 5, 8, 10, 40
 16 = 1, 2, 4, 8, 16

8 because that is all 3 numbers
 Greatest common factor
 8 baskets

$\frac{24}{8}$	$\frac{40}{8}$	$\frac{16}{8}$
3	5	2 toys
Chocolate bars	Movie passes	

What is the Greatest Common Factor (GCF) of a polynomial?

- coefficient: **highest** number that divides into ALL coefficients of your polynomial
- variable: **lowest** exponent for each power of the same base that is in ALL terms of your polynomial

Find the GCF of each polynomial. (Prove it by showing the prime factorization.)

1) $4x^3y - 6x^4y^3$
 Coeff: 4, 6 → 2
 Vars: $x^3, x^4 \rightarrow x^3$
 $y, y^3 \rightarrow y$

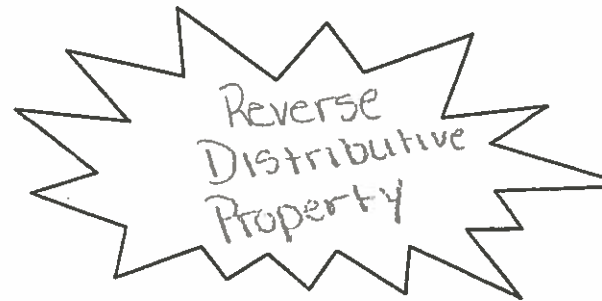
GCF: $2x^3y$

2) $14ab^2c + 21ac$
 $14ab^2c \rightarrow 7 \cdot 2ab^2c$
 $21ac \rightarrow 7 \cdot 3ac$
 GCF: $7ac$

3) $36m^4n^3 + 9m^2n$
 Coeff: 36, 9 → 9
 Vars: $m^4, m^2 \rightarrow m^2$
 $n^3, n \rightarrow n$
 GCF: $9m^2n$

How do you factor out the GCF of your polynomial?

- Find the GCF.
- Divide each term in the expression by the GCF.
- Write the GCF out front of your expression.
- Multiply the GCF by the sum of what you have left over.



Factor out the GCF of the polynomial.

4) $6x^3y^3 - 15xy^2$
 $3xy^2 | 6x^3y^3 - 15xy^2$
 $3xy^2(2x^2y - 5)$
 Coeff: 6, 15 → 3
 Vars: $x^3, x \rightarrow x$
 $y^3, y^2 \rightarrow y^2$
 GCF: $3xy^2$

$4ab^2 + 12a^3$
 $4a | 4ab^2 + 12a^3$
 $4a(b^2 + 3a^2)$
 Coeff: 4, 12 → 4
 Vars: $a, a^3 \rightarrow a$
 GCF: $4a$

6) $2mn^2p^2(8m^2n^5p^8 + 4m^9n^2p^3 - 2mn^2p^2)$
 $2mn^2p^2(4mn^3p^6 + 2m^8p - 1)$
 GCF: $2mn^2p^2$

7) $6ab | 24abc - 6ab^2c^4 + 18ab$
 $6ab(4c - 1bc^4 + 3)$
 GCF: $6ab$

What does it mean for a polynomial to be prime?

- The only factors of the polynomial are the polynomial itself and 1.

Factor out the GCF of the polynomial. If the polynomial is prime, write PRIME.

* 8)

$$2x^3 + 4x^2 + 8x$$

9)

$$3x^3 + 2x - 5$$

NO Common factor
of 3, 2, 5. No variable
in -5.

Prime

What if figuring out the GCF is a little tricky?

- Just factor out a number and a variable you **know** divides into all terms.
- When you write your answer, look inside the parentheses to see if you find more common factors.
- Just pull out that factor too (don't forget to multiply it outside the parentheses!).

Factor out the GCF of the polynomial.

10) $20x^3y$ $80x^9y^4 - 160x^5y^2 + 200x^3y$ *11)

$$150a^2b + 225ab - 375a^3b^2$$

multiply
2 $4x^6y^3 - 8x^2y + 10$

$$20x^3y (2x^6y^3 - 4x^2y + 5)$$

$$\text{GCF: } 40x^3y$$



**Last note: If (-1) is a factor, pull it out as part of the GCF.

$$\text{GCF: } -5abc$$

* 12) $-3x^3y^3 - 9x^2y^2 - 12xy$

13) $-5abc$ $-30a^2bc - 15ab^2c - 5abc^2$

$$-5abc (6a + 3b + 1c)$$