Name: _____

Using the Greatest Common Factor (GCF) to Divide

Dividing polynomials by a monomial, like multiplying them, requires distribution. The only way to do it correctly is to make sure that every term in the numerator is divided by the **same value** that you use to divide the denominator. Sometimes the denominator can be divided from all parts as it is, but sometimes it can't. When you can't divide the whole denominator as-is, you have to ask yourself two questions:

1. "What is the biggest number that I can divide out of the <u>every term's</u> coefficient (front number)? (including the denominator's)
2. What is the most multiplied variables (based on their exponents) that I can divide from everything? (Another way to ask this question: "Which term has the lowest variable exponent? Use that variable amount.)

Answering these questions tells you the **greatest common factor** (GCF).

For each fraction, determine the GCF (use the questions listed above), and then divide all terms (including the denominator) by that amount.

EXAMPLE

$$\frac{-6x^5 + 12x^3 - 18x^2}{15x^3}$$

What is the <u>biggest</u> number that can divide out of $-6, +12, -18$ *(top)*	*& 15? (bottom)*
The only thing that can divide from all of them is 3. $-6 \div 3 = -2,$ $+12 \div 3 = 4,$ $-18 \div 3 = -6$	$15 \div 3 = 5$

What is the variable with the lowest exponent? $-6x^5 + 12x^3 - 18x^2$ *(top)*	*& $15x^3$? (bottom)*
x^2	

Because the biggest number I can divide out is 3, and the lowest variable is x^2 (which can be taken from them all), my GCF is $\boxed{3x^2}$.

Now, divide it from everything:

$$\frac{-6x^5 \div 3x^2 \;+ 12x^3 \div 3x^2 \;- 18x^2 \div 3x^2}{15x^3 \div 3x^2}$$

$$\frac{-2x^3 + 4x^1 - 6x^0}{5x^1} = \frac{-2x^3 + 4x - 6(1)}{5x}$$

$$\boxed{\frac{-2x^3 + 4x - 6}{5x}}$$

1.

$$\frac{4x^4 - 8x^3 + 6x^2}{2x}$$

What is the <u>biggest</u> number that can divide out of $4, -8, +6$ *(top)*	*& 2? (bottom)*

What is the variable with the lowest exponent? $4x^4 - 8x^3 + 6x^2$	*& $2x$?*

GCF is: _____

$$\frac{4x^4 \div \quad -8x^3 \div \quad +6x^2 \div}{2x \div}$$

2.

$$\frac{12x^5 - 16x^3 + 8x^2}{20x^3}$$

What is the <u>biggest</u> number that can divide out of *(top)*	*(bottom)*

What is the variable with the lowest exponent?

GCF is: _____

$$\frac{12x^5 \div \quad -16x^3 \div \quad +8x^2 \div}{20x^3 \div}$$

3.

$$\frac{-24x^5 - 16x^4 + 32x^2}{32x^5}$$

GCF is: _____

$$\frac{-24x^5 \div \quad -16x^4 \div \quad +32x^2 \div}{32x^5 \div}$$

4.

$$\frac{-12x^5 + 6x^4 + 14x^3}{12x}$$

GCF is: _____

$$\frac{\div \qquad \div \qquad \div}{\div}$$

Simplify each fraction by dividing out the GCF.

5. $\frac{-10x^2-20x+80}{30x}$	6. $\frac{-10x^5-20x^4+80x^3}{15x^2}$	7. $\frac{-10x^5-20x^4+80x^3}{10x^3}$
8. $\frac{-21x^3+33x^2-6x}{8x}$	9. $\frac{12x^4-9x^3+6x^2}{3x}$	10. $\frac{-4x^5-8x^4+80x^3}{8x^2}$

Factoring is dividing from every term **without** canceling anything. It's basically backwards distribution: whatever you divide by goes out to the front, and what remains after you divide is left in the parentheses. Use the GCF to factor each as much as possible. ***Tip: The GCF that you factor out should always keep the sign of the front term.***

EXAMPLE Factor as much as possible.

$-6x^5+12x^3$

The GCF is negative, because the first number is negative. Both terms can be divided by 6, & the lowest exponent is x³.

GCF = $-6x^3$

$GCF(divided\ out)$:

$-6x^3(-6x^5 \div -6x^3 \quad +12x^3 \div -6x^3)$

$\boxed{-6x^3(x^2-2)}$

EXAMPLE Factor as much as possible.

$15x^2-18x$

The GCF is positive, because the first number is positive. Both terms can be divided by 3, & the lowest exponent is x.

GCF = $3x$

$GCF(divided\ out)$:

$3x(15x^2 \div 3x \quad -18x \div 3x)$

$\boxed{3x(5x-6)}$

11. $-4x^2+8x$	12. $3x-6$	13. $5x^2-45$
14. $2x^2+14x$	15. $-5x-35$	16. $7x^2-28$

Answers

1. GCF is $2x$, $\boxed{2x^2-4x+3}$	2. GCF is $4x^2$, $\boxed{\frac{3x^3-4x+2}{5x}}$	3. GCF is $8x^2$, $\boxed{\frac{-3x^3-2x^2+4}{4x^3}}$	4. GCF is $2x$, $\boxed{\frac{-6x^4+3x^3+7x^2}{6x}}$
5. GCF is 10, $\boxed{\frac{-x^2-2x+8}{3x}}$	6. GCF is $5x^2$, $\boxed{\frac{-2x^3-4x^2+16x}{3x}}$	7. GCF is $10x^3$, $\boxed{-x^2-2x+8}$	8. GCF is x, $\boxed{\frac{-21x^2+33x-6}{8}}$
9. GCF is $3x$, $\boxed{4x^3-3x^2+2x}$	10. GCF is $4x^2$, $\boxed{\frac{-x^3-2x^2+20x}{2}}$	11. $-4x(x-2)$	12. $3(x-2)$
13. $5(x^2-9)$ $=5(x+3)(x-3)$	14. $2x(x+7)$	15. $-5(x+7)$	16. $7(x^2-4)$ $=7(x+2)(x-2)$