

**Content and Language Objective:**

Students will begin to explore the ideas behind the Greatest Common Factor (GCF) and the different areas of math that the Greatest Common Factors are used.

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**Warm-Up**

1.  $\frac{5}{12} \div \frac{3}{8}$

$$\frac{5}{12} \times \frac{8}{3} = \frac{40}{36} \xrightarrow{\div 4} \boxed{\frac{10}{9}}$$

2.  $\frac{13}{7} \div \frac{9}{21}$

$$\frac{\textcircled{13}}{\cancel{7}} \cdot \frac{\cancel{21}^3}{\underset{\textcircled{3}}{9}} = \frac{273}{63} \div 3 = \frac{91}{21} \div 7 = \boxed{\frac{13}{3}}$$

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**DEFINITION:**

**Greatest Common Factor**

The highest number that divides exactly into two or more numbers.

- It is the "greatest" thing for simplifying fractions!
- It can be used in various Algebra topics

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So ... what is a "Factor" ?

Factors are the numbers you multiply together to get another number:

$$\begin{array}{ccc} & 2 \times 3 = 6 & \\ \text{Factor} \swarrow & & \nwarrow \text{Factor} \\ & & \end{array}$$
$$\begin{array}{l} -2 \times -3 \\ -1 \times -6 \\ 1 \times 6 \end{array}$$

A number can have many factors, they can be both positive and negative numbers.

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What is a "Common Factor" ?

Example: Factors of 12 and 30

Factors of 12 are 1, 2, 3, 4, 6 and 12      Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30  
Then the common factors are those that are found in both lists:

Notice that 1, 2, 3 and 6 appear in both lists?

So, the common factors of 12 and 30 are: 1, 2, 3 and 6

It is a common factor when it is a factor of two or more numbers.

(It is then "common to" those numbers.)

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Here is another example with three numbers:

Example: The common factors of 15, 30 and 105

Factors of 15 are 1, 3, 5, and 15

Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30

Factors of 105 are 1, 3, 5, 7, 15, 21, 35 and 105

The factors that are common to all three numbers are 1, 3, 5 and 15

In other words, the common factors of 15, 30 and 105 are 1, 3, 5 and 15

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**What is the "Greatest Common Factor" ?**

**It is simply the largest of the common factors.**

**In our previous example, the largest of the common factors is 15, so the Greatest Common Factor of 15, 30 and 105 is 15**

**The "Greatest Common Factor" is the largest of the common factors (of two or more numbers)**

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#### Why is this Useful?

One of the most useful things is when we want to simplify a fraction:

Example: How could we simplify  $\frac{12}{30}$  ?

Earlier we found that the Common Factors of 12 and 30 were 1, 2, 3 and 6, and so the **Greatest Common Factor is 6**.

So the **largest** number we can divide both 12 and 30 evenly by is **6**, like this:

$$\begin{array}{ccc} & \div 6 & \\ \text{↻} & & \text{↻} \\ \frac{12}{30} & = & \frac{2}{5} \\ \text{↻} & & \text{↻} \\ & \div 6 & \end{array}$$

The Greatest Common Factor of 12 and 30 is **6**.

And so  $\frac{12}{30}$  can be simplified to  $\frac{2}{5}$

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## FINDING THE GREATEST COMMON FACTOR

### 1. You can:

- Find all **FACTORS** of both numbers
- Then select the ones that are **COMMON** to both, and
- Then choose the **GREATEST**.

Two Numbers	Factors	Common Factors	Greatest Common Factor	Example Simplified Fraction
6 and 18	<b>6:</b> 1,2,3,6 <b>18:</b> 1,2,3,6,9,18	1,2,3,6	<b>6</b>	$\frac{6}{18} = \frac{1}{3}$



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## FINDING THE GREATEST COMMON FACTOR

2. You can find the PRIME FACTORS and combine the common ones together

Two Numbers	Thinking ...	Greatest Common Factor	Example Simplified Fraction
24 and 108	$2 \times \boxed{2 \times 2 \times 3} = 24,$ and $\boxed{2 \times 2 \times 3} \times 3 \times 3 = 108$	$2 \times 2 \times 3 = 12$	$\frac{24}{108} = \frac{2}{9}$



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## FINDING THE GREATEST COMMON FACTOR

3. Sometimes you can just **PLAY AROUND** with the factors until you discover it:

Two Numbers	Thinking ...	Greatest Common Factor	Example Simplified Fraction
9 and 12	$3 \times 3 = 9$ and $3 \times 4 = 12$	3	$\frac{9}{12} = \frac{3}{4}$

But in that case you had better be careful you have found the **greatest** common factor.

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#### Greatest Common Factor of 12 and 16

- Find all the **Factors** of each number,
- Circle the **Common** factors,
- Choose the **Greatest** of those



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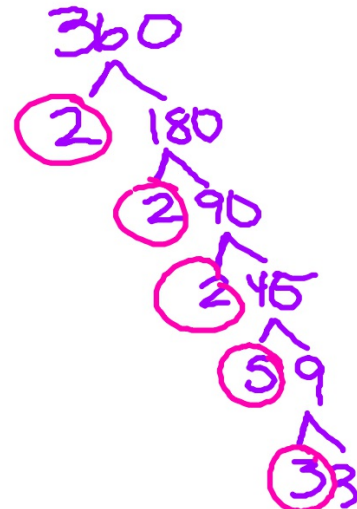
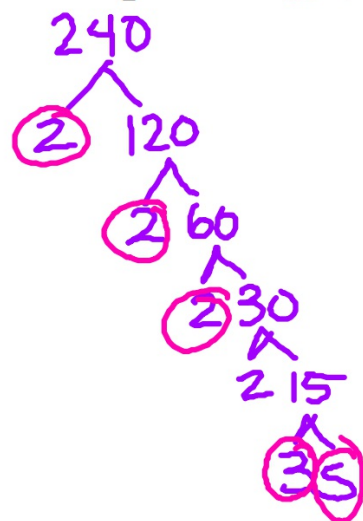
Students will use what they learned about Greatest Common Factors and apply it to situations involving variables and numbers.

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**Warm - Up**

Find the GCF of the following terms.  $2 \times 2 \times 2 \times 3 \times 5 = 120$

1. 240 and 360



2. 18 and 99

$9: \text{GCF}$

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The other day we looked at situations that only involved numbers.

What would you do if we included variables into the situation?

$15x^2y$  and  $60xy$

15: 1, 3, 5, (15)

60: 1, 2, 3, 4, 5, 6, 10, 12, (15), 20, 30, 60

$x^2y$ : (x)(x)(y)

$xy$ : (x)(y)

$15xy$

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$$24x^2y^3 \text{ and } 54xy^2$$

$$6xy^2$$



$$(a+b)^2 \text{ and } (a+b)^5$$

$$(a+b)^2$$



