

## Standard(s)


**MGSE9–12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

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**Day 1 – Factor by GCF**

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Standard(s): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



What do you already know about the standards?

## Factoring

**What is Factoring?**

**Factoring**

- Finding out which two expressions you multiplied together to get one single expression.
- Is like "splitting" an expression into a product of simpler expressions.
- The opposite of expanding or distributing.

Numbers have factors:  
 $2 \times 3 = 6$   
 Factor      Factor

Expressions have factors too:  
 $(x+3)(x+1) = x^2 + 4x + 3$   
 Factor      Factor

## Greatest Common Factor

**Common Factors**

- Factors that are shared by two or more numbers are called common factors.

**Greatest Common Factor (GCF)**

- The greatest of the common factors is called the **Greatest Common Factor (GCF)**.
- To find the greatest common factor, you can make a factor tree and complete the prime factorization of both numbers. The GCF is the product of the common prime factors.
- You can also do a factor T-chart for each number and find the largest common factor.

**Example:** Find the GCF of 56 and 104

|   |    |
|---|----|
| 1 | 56 |
| 2 | 28 |
| 4 | 14 |
| 7 | 8  |

|   |     |
|---|-----|
| 1 | 104 |
| 2 | 52  |
| 4 | 26  |
| 8 | 13  |

56 = 2 · 2 · 2 · 7  
 104 = 2 · 2 · 2 · 13  
 So, the GCF of 56 and 104 is 2 · 2 · 2 = 8.

So, the GCF of 56 and 104 is 8.

## Finding the GCF of Numbers

**Practice:** Find the GCF of the following numbers.

a. 30, 45      GCF = 15      b. 12, 54      GCF = 6

|        |
|--------|
| 30     |
| 1   30 |
| 2   15 |
| 3   10 |
| 5   6  |

|        |
|--------|
| 45     |
| 1   45 |
| 3   15 |
| 5   9  |

|        |
|--------|
| 12     |
| 1   12 |
| 2   6  |
| 3   4  |

|        |
|--------|
| 54     |
| 1   54 |
| 2   27 |
| 3   18 |
| 6   9  |

## Finding the GCF of Two Expressions

To find the GCF of two expressions, you will complete the prime factorization of the two numbers or factor chart of the two numbers AND expand the variables. Circle what is common to both.

**Example:** Find the GCF of  $36x^2y$  and  $16xy$ .

$$\text{GCF} = 4x^1y^1$$

|   |    |
|---|----|
|   | 36 |
| 1 | 36 |
| 2 | 18 |
| 3 | 12 |
| 4 | 9  |
| 6 | 6  |

|   |    |
|---|----|
|   | 16 |
| 1 | 16 |
| 2 | 8  |
| 4 | 4  |

## Finding the GCF of Two Expressions

To find the GCF of two expressions, you will complete the prime factorization of the two numbers or factor chart of the two numbers AND expand the variables. Circle what is common to both.

**Example:** Find the GCF of  $36x^2y$  and  $16xy$

## GCF of Expressions

Find the GCF of the following pairs of expressions.

1) 100 and 60

2)  $15x^3$  and  $9x^2$

|    |     |
|----|-----|
|    | 100 |
| 1  | 100 |
| 2  | 50  |
| 4  | 25  |
| 5  | 20  |
| 10 | 10  |

|   |    |
|---|----|
|   | 60 |
| 1 | 60 |
| 2 | 30 |
| 3 | 20 |
| 4 | 15 |
| 5 | 12 |
| 6 | 10 |

$$\text{GCF} = 20$$

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

## GCF of Expressions

Find the GCF of the following pairs of expressions.

3)  $9a^2b^2$ ,  $6ab^3$ , and  $12b$

$$\text{GCF} = 3b$$

4)  $8x^2$  and  $7y^3$

$$\text{GCF} = 1$$

## Factoring Polynomials

What is the GCF of  $15x^2$  and  $20x$  ?

$$\text{GCF} = 5x$$

How would you factor  $\frac{15x^2}{5x} + \frac{20x}{5x}$  using the GCF?

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

## Factoring by GCF

### Steps for Factoring by GCF

1. Find the greatest common factor of all the terms.
2. The GCF of the terms goes on the outside of the expression and what is leftover goes in parenthesis after the GCF.
3. After "factoring out" the GCF, the only that number that divides into each term should be 1.

## Factoring BY GCF

Factor the polynomials using the GCF.

$$1) \quad \frac{x^2}{x} + \frac{5x}{x} \quad \text{GCF} = x$$

$$x(x + 5)$$

$$2) \quad \frac{x^2}{x} - \frac{8x}{x} \quad \text{GCF} = x$$

$$x(x - 8)$$

## Factoring BY GCF

Factor the polynomials using the GCF.

$$4) \quad \frac{28x}{7} - \frac{63}{7} \quad \text{GCF} = 7$$

$$7(4x - 9)$$

|        |        |
|--------|--------|
| 28     | 63     |
| 1   28 | 1   63 |
| 2   14 | 3   21 |
| 4   7  | 7   9  |

$$5) \quad \frac{18x^2}{6x} - \frac{6x}{6x} \quad \text{GCF} = 6x$$

$$6x(3x - 1)$$

|        |       |
|--------|-------|
| 18     | 6     |
| 1   18 | 1   6 |
| 2   9  | 2   3 |
| 3   6  |       |

## Factoring BY GCF

Factor the polynomials using the GCF.

$$8) \quad \frac{-9a^2}{-a} - \frac{a}{-a} \quad \text{GCF} = -a$$

$$-a(9a+1)$$

$$10) \quad \frac{6x^3}{3x} - \frac{9x^2}{3x} + \frac{12x}{3x} \quad \text{GCF} = 3x$$

$$3x(2x^2 - 3x + 4)$$

## Factoring BY GCF

Factor the polynomials using the GCF.

$$11) \quad \frac{4x^3}{2x} + \frac{6x^2}{2x} - \frac{8x}{2x} \quad \text{GCF} = 2x$$

$$2x(2x^2 + 3x - 4)$$

$$12) \quad \frac{15x^3y^2}{5x^2y^2} + \frac{10x^2y^4}{5x^2y^2} \quad \text{GCF} = 5x^2y^2$$

$$5x^2y^2(3x + 2y^2)$$