# 8-1 Factors and Greatest Common Factors

Warm Up
Lesson Presentation
Lesson Quiz

 

8-1 Factors and Greatest Common Factors

## Warm Up

**Tell whether the second number is a factor of the first number**

**1.** 50, 6 no **2.** 105, 7 yes

**3.** List the factors of 28. ±1, ±2, ±4, ±7, ±14, ±28

**Tell whether each number is prime or composite. If the number is composite, write it as the product of two numbers.**

**4.** 11 prime **5.** 98 composite; 49 • 2

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## 8-1 Factors and Greatest Common Factors

### Objectives

Write the prime factorization of numbers.

Find the GCF of monomials.

 

8-1 Factors and Greatest Common Factors

### Vocabulary

prime factorization
greatest common factor

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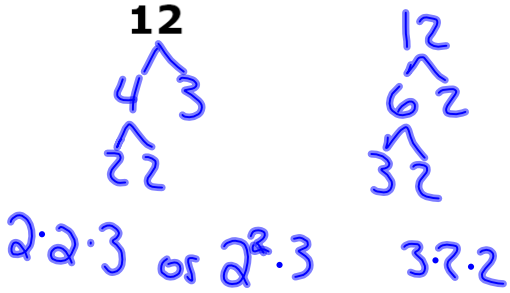
## 8-1 Factors and Greatest Common Factors

The circled factorization is the **prime factorization** because all the factors are prime numbers. The prime factors can be written in any order, and except for changes in the order, there is only one way to write the prime factorization of a number.

**Factorizations of 12**



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**Remember!**

A prime number has exactly two factors, itself and 1. The number 1 is not prime because it only has one factor.

2 = Prime

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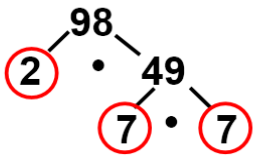
# 8-1 Factors and Greatest Common Factors

## Example 1: Writing Prime Factorizations

**Write the prime factorization of 98.**

Factor tree

*Choose any two factors of 98 to begin. Keep finding factors until each branch ends in a prime factor.*




The prime factorization of 98 is $2 \cdot 7 \cdot 7$ or $2 \cdot 7^2$.

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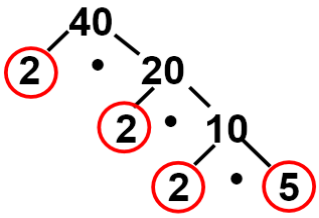
## Check It Out! Example 1

**Write the prime factorization of each number.**

**a. 40**




The prime factorization of 40 is $2 \cdot 2 \cdot 2 \cdot 5$ or $2^3 \cdot 5$.

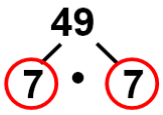
 

## 8-1 Factors and Greatest Common Factors

**Check It Out! Example 1**

**Write the prime factorization of each number.**

**c. 49**




$49 = 7 \cdot 7$

The prime factorization of 49 is $7 \cdot 7$ or $7^2$.




## 8-1 Factors and Greatest Common Factors

Factors that are shared by two or more whole numbers are called common factors. The greatest of these common factors is called the **greatest common factor**, or GCF.

Factors of 12: 1, 2, 3, 4, 6, 12

Factors of 32: 1, 2, 4, 8, 16, 32

Common factors: 1, 2, 4

The greatest of the common factors is 4.

## 8-1 Factors and Greatest Common Factors

### Example 2A: Finding the GCF of Numbers

**Find the GCF of each pair of numbers.**
**100 and 60**

factors of 100: 1, 2, 4, 5, 10, 20, 25, 50, 100

*List all the factors.*

factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

*Circle the GCF.*

The GCF of 100 and 60 is 20.

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### Example 2B: Finding the GCF of Numbers

**Find the GCF of each pair of numbers.**
**26 and 52**

**Method 2** Prime factorization.


$26 = 2 \cdot 13$

$52 = 2 \cdot 2 \cdot 13$

*Write the prime factorization of each number.*

$2 \cdot 13 = 26$

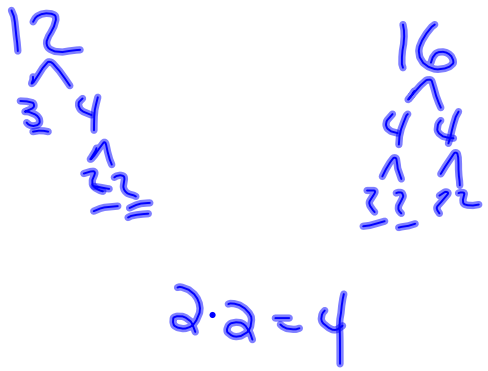
*Align the common factors.*

## 8-1 Factors and Greatest Common Factors

### Check It Out! Example 2a

**Find the GCF of each pair of numbers.**

**12 and 16**




$2 \cdot 2 = 4$

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You can also find the GCF of monomials that include variables. To find the GCF of monomials, write the prime factorization of each coefficient and write all powers of variables as products. Then find the product of the common factors.

 

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## Example 3A: Finding the GCF of Monomials

15 = 3 · 5
9 = 3 · 3

**Find the GCF of each pair of monomials.**

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

$15x^3 = 3 \cdot 5 \cdot x \cdot x \cdot x$
$9x^2 = 3 \cdot 3 \cdot x \cdot x$

*Write the prime factorization of each coefficient and write powers as products.*

*Align the common factors.*

$3 \cdot x \cdot x = 3x^2$ *Find the product of the common factors.*




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**Helpful Hint**

If two terms contain the same variable raised to different powers, the GCF will contain that variable raised to the lower power.

You can only takes as much as the smallest one has.

• 3 friends go to eat they have to go to the restaurant in which the person with the least $ can afford.

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# 8-1 Factors and Greatest Common Factors

## Check It Out! Example 3a

**Find the GCF of each pair of monomials.**

**$18g^2$ and $27g^3$**

$18g^2 = 2 \cdot 3 \cdot 3 \cdot g \cdot g$

$27g^3 = 3 \cdot 3 \cdot 3 \cdot g \cdot g \cdot g$

*Write the prime factorization of each coefficient and write powers as products.*

*Align the common factors.*

$3 \cdot 3 \cdot g \cdot g$

*Find the product of the common factors.*

$9g^2$



# 8-1 Factors and Greatest Common Factors

## Check It Out! Example 3b

**Find the GCF of each pair of monomials.**

**$16a^6$ and $9b$**

$16a^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot a \cdot a \cdot a \cdot a \cdot a \cdot a$

$9b = 3 \cdot 3 \cdot b$

*Write the prime factorization of each coefficient and write powers as products.*

*Align the common factors.*

The GCF of $16a^6$ and $9b$ is 1.

*There are no common factors*

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### Check It Out! Example 3c

**Find the GCF of each pair of monomials.**

**$8x$ and $7v^2$**

$8x =$

$7v^2 =$

*Write the prime factorization of each coefficient and write powers as products.*

*Align the common factors.*

 

## 8-1 Factors and Greatest Common Factors

### Example 4: *Application*

**A cafeteria has 18 chocolate-milk cartons and 24 regular-milk cartons. The cook wants to arrange the cartons with the same number of cartons in each row. Chocolate and regular milk will not be in the same row. How many rows will there be if the cook puts the greatest possible number of cartons in each row?**

The 18 chocolate and 24 regular milk cartons must be divided into groups of equal size. The number of cartons in each row must be a common factor of 18 and 24.

 

## 8-1 Factors and Greatest Common Factors

### Example 4 Continued

Factors of 18: 1, 2, 3, 6, 9, 18

Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

The GCF of 18 and 24

*Find the common factors of 18 and 24.*

 

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Example 4 Continued

$$\frac{\text{18 chocolate milk cartons}}{\text{6 containers per row}} = 3 \text{ rows}$$

$$\frac{\text{24 regular milk cartons}}{\text{6 containers per row}} = 4 \text{ rows}$$

When the greatest possible number of types of milk is in each row, there are 7 rows in total.

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