Factors that are shared by two or more numbers are called **common factors**. The greatest of the common factors is called the **greatest common factor** (GCF). One way to find the GCF of two or more numbers is by listing factors.

EXAMPLE 1 | **Finding the GCF Using Lists of Factors**

Find the GCF of 24 and 40.

List the factors of each number.

Factors of 24: ①,②, 3,④, 6,⑧, 12, 24

Factors of 40: ①,②,④, 5,⑧, 10, 20, 40

Circle the common factors.

The common factors of 24 and 40 are 1, 2, 4, and 8. The greatest of these common factors is 8.

▶ So, the GCF of 24 and 40 is 8.

Try It Find the GCF of the numbers using lists of factors.

1. 8, 36   **2.** 18, 72   **3.** 14, 28, 49

Another way to find the GCF of two or more numbers is by using prime factors. The GCF is the product of the common prime factors of the numbers.

EXAMPLE 2 | **Finding the GCF Using Prime Factorizations**

Find the GCF of 12 and 56.

Make a factor tree for each number.

```
   12              56
  2 · 6          7 · 8
    2 · 3          2 · 4
                     2 · 2
```
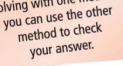
Write the prime factorization of each number.

$12 = 2 \cdot 2 \cdot 3$

$56 = 2 \cdot 2 \cdot 2 \cdot 7$

Circle the common prime factors.

$2 \cdot 2 = 4$ Find the product of the common prime factors.

▶ So, the GCF of 12 and 56 is 4.

Examples 1 and 2 show two different methods for finding the GCF. After solving with one method, you can use the other method to check your answer.

Try It Find the GCF of the numbers using prime factorizations.

4. 20, 45   **5.** 32, 90   **6.** 45, 75, 120

EXAMPLE 3 **Finding Two Numbers with a Given GCF** ────────

Which pair of numbers has a GCF of 15?

A. 10, 15 **B.** 30, 60 **C.** 21, 45 **D.** 45, 75

The number 15 cannot be a factor of the lesser number 10. So, you can eliminate Choice A.

The number 15 cannot be a factor of a number that does not have a 0 or 5 in the ones place. So, you can eliminate Choice C.

List the factors for Choices B and D. Then identify the GCF for each.

Choice B: **Factors of 30:** ①, ②, ③, ⑤, ⑥, ⑩, ⑮, ㉚

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

 The GCF of 30 and 60 is 30.

Choice D: **Factors of 45:** ①, ③, ⑤, 9, ⑮, 45

 Factors of 75: ①, ③, ⑤, ⑮, 25, 75

 The GCF of 45 and 75 is 15.

▶ The correct answer is **D**.

Try It

7. Write a pair of numbers whose greatest common factor is 10.

Self-Assessment *for Concepts & Skills*

Solve each exercise. Then rate your understanding of the success criteria in your journal.

FINDING THE GCF **Find the GCF of the numbers.**

8. 16, 40

9. 35, 63

10. 18, 72, 144

11. MULTIPLE CHOICE Which number is *not* a factor of 10? Explain.

A. 1

B. 2

C. 4

D. 5

12. DIFFERENT WORDS, SAME QUESTION Which is different? Find "both" answers.

What is the greatest common factor of 24 and 32?

What is the greatest common divisor of 24 and 32?

What is the greatest common prime factor of 24 and 32?

What is the product of the common prime factors of 24 and 32?

EXAMPLE 4 **Modeling Real Life**

You are filling piñatas for your friend's birthday party. The list shows the gifts you are putting into the piñatas. You want identical groups of gifts in each piñata with no gifts left over. What is the greatest number of piñatas you can make?

* 18 kazoos

* 24 mints

* 42 lollipops

The GCF of the numbers of gifts represents the greatest number of identical groups of gifts you can make with no gifts left over. So, to find the number of piñatas, find the GCF.

Write the prime factorization of each number.

$18 = 2 \cdot 3 \cdot 3$

$24 = 2 \cdot 3 \cdot 2 \cdot 2$ Circle the common prime factors.

$42 = 2 \cdot 3 \cdot 7$

$2 \cdot 3 = 6$ Find the product of the common prime factors.

The GCF of 18, 24, and 42 is 6.

▶ So, you can make at most 6 piñatas.

Check Verify that 6 identical piñatas will use all of the gifts.

18 kazoos ÷ 6 piñatas = 3 kazoos per piñata

24 mints ÷ 6 piñatas = 4 mints per piñata

42 lollipops ÷ 6 piñatas = 7 lollipops per piñata ✓

Solve each exercise. Then rate your understanding of the success criteria in your journal.

13. You use 30 sandwiches and 42 granola bars to make identical picnic baskets. You make the greatest number of picnic baskets with no food left over. How many sandwiches and how many granola bars are in each basket?

14. You fill bags with cookies to give to your friends. You bake 45 chocolate chip cookies, 30 peanut butter cookies, and 15 oatmeal cookies. You want identical groups of cookies in each bag with no cookies left over. What is the greatest number of bags you can make?