LESSON 4.2

Name _____ Date _____

Activity Master

For use before Lesson 4.2

Goal
Find greatest common factors using beads.

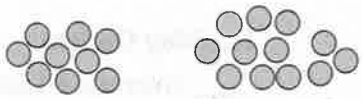
Materials
- beads (or coins)
- pencil and paper

Investigating Greatest Common Factors

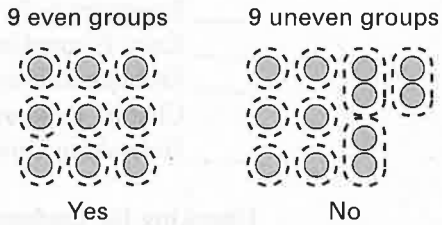
In this activity, you will use beads to explore greatest common factors.

EXPLORE **Find the largest number of groups that you can divide both 9 and 12 into evenly.**

1. Count out 21 beads. Form a pile of 9 beads and a pile of 12 beads.

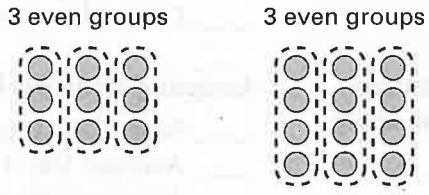


2. Start with the smaller of the two numbers, 9, and attempt to divide the piles into 9 even groups. Can each pile be divided into 9 groups evenly?



3. If you answered 'no', try to divide each pile into 8 (then 7, 6, . . .) groups evenly.

4. Continue in this manner until you can divide each pile evenly into the same number of groups.



Answer: The largest number of groups that both 9 and 12 can be divided into evenly is 3.

Your turn now **Use beads to find the largest number of groups that can divide each of the two numbers evenly.**

1. 12, 14 **2.** 10, 15 **3.** 8, 20 **4.** 18, 27

5. Explain how you would find the largest number of groups that can divide 12, 24, and 30 evenly. Then find your answer.

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Study Guide

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GOAL **Find the greatest common factor of two or more numbers.**

VOCABULARY

A whole number that is a factor of two or more nonzero whole numbers is called a **common factor.**

The greatest of the common factors is called the **greatest common factor (GCF).**

Two or more numbers are **relatively prime** if their greatest common factor is 1.

EXAMPLE 1 Making a List to Find the GCF

You are making teams for a Metro Baseball League from the schools in a city. The schools are divided into 3 regions: Eastern, Central, and Western. There are 112 players in the Eastern Region, 126 players in the Central Region, and 98 players in the Western Region. Each region will send the same number of players to each team. What is the greatest number of teams that can be formed? How many players from the Eastern Region, the Central Region, and the Western Region will be on each team?

Factors of 112: **1**, **2**, 4, **7**, 8, **14**, 16, 28, 56, 112

Factors of 126: **1**, **2**, 3, 6, **7**, 9, **14**, 18, 21, 42, 63, 126

Factors of 98: **1**, **2**, **7**, **14**, 49, 98

The common factors are 1, 2, 7, and 14. The GCF is 14.

Answer: The greatest common factor is 14. So, the greatest number of teams that can be formed is 14. Then each team will have 8 players from the Eastern Region, 9 players from the Central Region, and 7 players from the Western Region.

Exercises for Example 1

Find the greatest common factor of the numbers by listing factors.

1. 42, 57 **2.** 63, 114 **3.** 70, 80, 90

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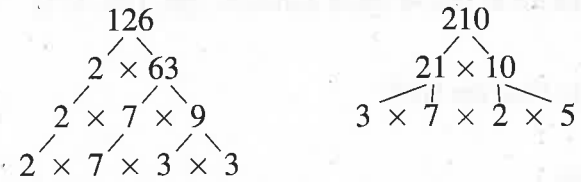
EXAMPLE 2 Using Prime Factorization to Find the GCF

Find the greatest common factor of 126 and 210 using prime factorization.

Begin by writing the prime factorization of each number.



$126 = 2 \times 3 \times 3 \times 7$

$210 = 2 \times 3 \times 5 \times 7$

Answer: The common prime factors of 126 and 210 are 2, 3, and 7. So, the greatest common factor is $2 \times 3 \times 7 = 42$.

Exercises for Example 2

Find the greatest common factor of the numbers using prime factorization.

4. 108, 132 **5.** 204, 280 **6.** 315, 450

EXAMPLE 3 Identifying Relatively Prime Numbers

Tell whether the numbers are relatively prime.

a. 16, 40 Factors of 16: **1**, **2**, **4**, **8**, 16 The GCF is 8.

Factors of 40: **1**, **2**, **4**, 5, **8**, 10, 20, 40

Answer: Because the GCF is 8, 16 and 40 are not relatively prime.

b. 27, 49 Factors of 27: **1**, 3, 9, 27 The GCF is 1.

Factors of 49: **1**, 7, 49

Answer: Because the GCF is 1, 27 and 49 are relatively prime.

Exercises for Example 3

Tell whether the numbers are relatively prime.

7. 34, 39 **8.** 55, 62 **9.** 52, 65

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Practice A

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Write all the factors of the number.

1. 15 **2.** 28 **3.** 100

Use a factor tree to write the prime factorization of the number.

4. 54 **5.** 45 **6.** 63

Complete the statement.

7. When finding the greatest common factor of two numbers by using prime factorization, the greatest common factor is the __?__ of the common prime factors.

8. Two or more numbers are __?__ if their greatest common factor is 1.

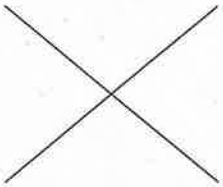
Find the greatest common factor of the numbers by listing factors.

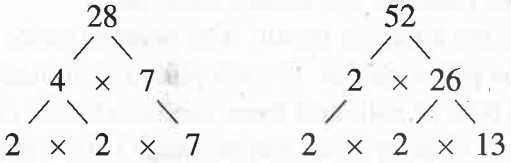
9. 48, 51 **10.** 20, 36 **11.** 15, 35, 40

Find the greatest common factor of the numbers using prime factorization. Then tell whether the numbers are relatively prime.

12. 24, 60 **13.** 28, 75 **14.** 39, 42, 72

15. Describe and correct the error in finding the greatest common factor of 28 and 52.





The greatest common factor of 28 and 52 is 2.

16. You made 48 rye dinner rolls and 60 wheat dinner rolls for a family picnic. You want to make up plates of rolls to set on the picnic tables. If each plate is to contain the same number of rye rolls and the same number of wheat rolls, and there are no leftover rolls, what is the greatest number of plates that can be made? How many rye dinner rolls and wheat dinner rolls are on each plate?

17. A college class with 18 juniors and 27 seniors is divided into project groups where each group has the same number of juniors and seniors. What is the greatest number of groups that can be formed? How many juniors and seniors are in each project group?

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Practice B

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Find the greatest common factor of the numbers by listing factors.

1. 42, 90 **2.** 34, 68 **3.** 56, 150

4. 28, 45 **5.** 60, 350 **6.** 40, 68

Find the greatest common factor of the numbers using prime factorization. Then tell whether the numbers are relatively prime.

7. 30, 135 **8.** 45, 56 **9.** 99, 165

10. 132, 198 **11.** 20, 88, 165 **12.** 168, 180, 450

13. Which numbers are relatively prime?

A. 180, 231 **B.** 120, 147 **C.** 75, 112 **D.** 75, 360

14. Describe and correct the error in finding the greatest common factor of 60 and 126.

Factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
Factors of 126: 1, 2, 3, 6, 7, 9, 14, 18, 21, 42, 63, 126

The greatest common factor of 60 and 126 is $2 \times 3 \times 6 = 36$.

15. The greatest common factor of two numbers is 5. What could the two numbers be?

16. You made 63 wheat dinner rolls, 45 rye dinner rolls, and 54 sourdough dinner rolls for a family picnic. You want to make up plates of rolls to set on the picnic tables. If each plate is to contain the same amount of each type of roll, and there are no leftover rolls, what is the greatest number of plates that can be made? How many wheat dinner rolls, rye dinner rolls, and sourdough dinner rolls are on each plate?

17. A college class with 30 sophomores, 18 juniors, and 12 seniors is divided into project groups where each group has the same number of sophomores, juniors, and seniors. What is the greatest number of groups that can be formed? How many sophomores, juniors, and seniors are in each project group?

18. A piece of paper is 280 millimeters long and 200 millimeters wide. You want to draw a grid on the paper so that there is a whole number of squares on the paper. What are the possible sizes of the squares? What is the largest possible square?

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