Prime Factorization

Find the prime factorization of a given number.

Definition: Prime factorization is a way to represent a number as a product of prime factors **ONLY**.

NOTE: Factor trees are not acceptable. The method to be used to find the prime factorization of a number is ***subsequent division***.

Ex. Find the prime factorization of 150.

2	150
3	75
5	25
5	5
	1

Prime Factorization: $2^1 \cdot 3^1 \cdot 5^2$

OR

$2 \cdot 3 \cdot 5^2$

Procedure:

1. Start with the smallest prime number that divides evenly into the number without a remainder. Continue dividing by that prime number until it is no longer possible.
2. Divide by the next possible prime number in sequential order that divides evenly into the number without a remainder. Continue dividing by that prime number until it is no longer possible.
3. Repeat step #2 until the number left to be divided equals 1.

NOTE: Although it is not necessary to record the value of 1 as an exponent, it is recommended that you do so.

Prime Factorization

Find the prime factorization of each number.

1. 20
2. 70
3. 24
4. 64
5. 41
6. 55
7. 42
8. 112
9. 48

10. 50	*11.* 125	*12.* 80
13. 37	*14.* 90	*15.* 75
16. 105	*17.* 36	*18.* 81
19. 104	*20.* 68	*21.* 94

Prime Factorization

Given the prime factorization of a number, state the number being represented.

Ex. #1: State the number being represented by the following prime factorization.

$2^2 \bullet 3^1 \bullet 5^1 =$
$4 \bullet 3 \bullet 5 = 60$

Ex. #2: State the number being represented by the following prime factorization.

$2^3 \bullet 5^1$
$8 \bullet 5 = 40$

State the number being represented by the following prime factorizations.

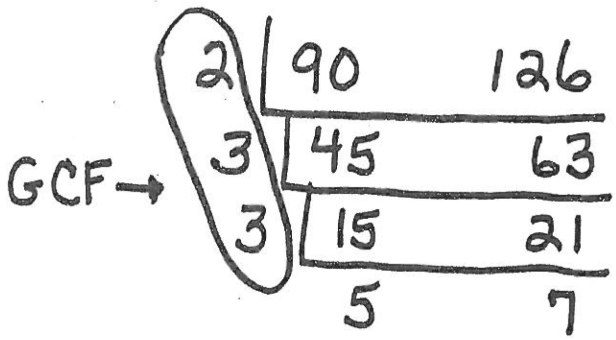
1. $3^2 \bullet 7^1 =$
2. $2^2 \bullet 5^2 \bullet 7^1 =$
3. $2^1 \bullet 5^3 =$
4. $2^2 \bullet 29^1 =$
5. $2^1 \bullet 3^2 \bullet 5^1 =$
6. $3^2 \bullet 11^1 =$
7. $2^1 \bullet 3^3 =$
8. $2^5 \bullet 3^1 =$
9. $2^2 \bullet 3^1 \bullet 5^2 =$
10. $2^1 \bullet 7^2 =$
11. $2^2 \bullet 3^1 \bullet 5^2 =$
12. $2^3 \bullet 5^1 \bullet 7^1 =$

Greatest Common Factor

Definition: The greatest common factor (GCF) of two numbers is the largest number that divides evenly into both numbers with no remainder.

Find the greatest common factor (GCF) of two numbers using subsequent division.

Ex. #1: Find the GCF of 90 and 126.



The GCF is 2 • 3 • 3 = 18.
This means that 18 is the largest number that divides into 90 *and* 126 with no remainder.

Procedure:

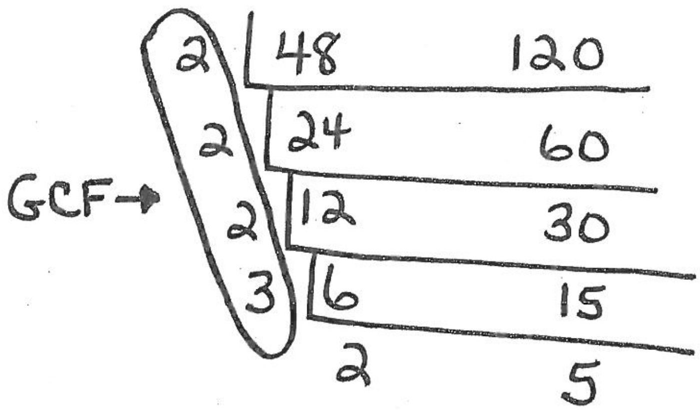
1. Use subsequent division on both numbers ***at the same time***.
2. Repeat the subsequent division process until the remaining numbers have no common factor other than the #1.
3. The product of the common factors is the GCF of the two original numbers.

Greatest Common Factor

Definition: The greatest common factor (GCF) of two numbers is the largest number that divides evenly into both numbers with no remainder.

Find the greatest common factor (GCF) of two numbers using subsequent division.

Ex. #2: Find the GCF of 48 and 120.



The GCF is 2 • 2 • 2 • 3 = 24.
This means that 24 is the largest number that divides into 48 *and* 120 with no remainder.

Procedure:

1. Use subsequent division on both numbers ***at the same time***.
2. Repeat the subsequent division process until the remaining numbers have no common factor other than the #1.
3. The product of the common factors is the GCF of the two original numbers.

Greatest Common Factor

Find the greatest common factor (GCF) of each pair of numbers.

1. 27 and 63

GCF = ______________________________

LCM = ______________________________

2. 16 and 36

GCF = ________________________

LCM = ________________________

3. 24 and 64

GCF = ______________________________

LCM = ______________________________

4. 36 and 90

GCF = ________________________

LCM = ________________________

5. 60 and 84

GCF = ______________________________

LCM = ______________________________

6. 17 and 19

GCF = ________________________

LCM = ________________________

7. 72 and 180

GCF = ______________________________

LCM = ______________________________

8. 64 and 96

GCF = ________________________

LCM = ________________________

9. 21 and 51

GCF = ______________________________

LCM = ______________________________

10. 56 and 98

GCF = ________________________

LCM = ________________________

11. 60 and 75

GCF = ______________________________

LCM = ______________________________

12. 17 and 19

GCF = ________________________

LCM = ________________________

13. 45 and 120

GCF = ______________________

LCM = ______________________

14. 37 and 74

GCF = ______________________

LCM = ______________________

15. 56 and 84

GCF = ______________________

LCM = ______________________

16. 23 and 31

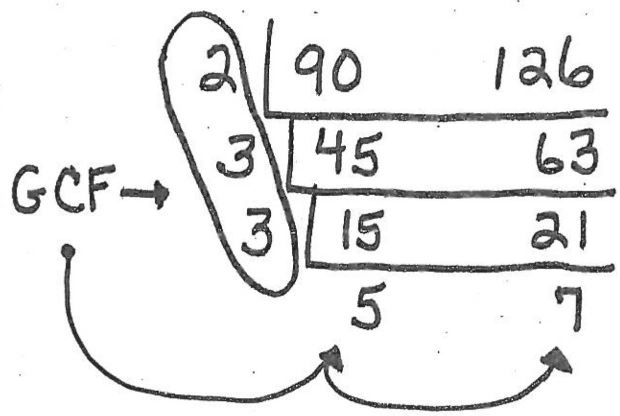
GCF = ______________________

LCM = ______________________

Least Common Multiple

Definition: The least common multiple (LCM) of two numbers is the smallest number that the two given numbers divide into evenly with no remainder.

Ex. #1: Find the LCM of 90 and 126.



The LCM is 2 • 3 • 3 • 5 • 7 = 630.
This means that 630 is the smallest number that 90 *and* 126 divide into evenly with no remainder. The LCM is equal to the product of the GCF and the remaining factors.

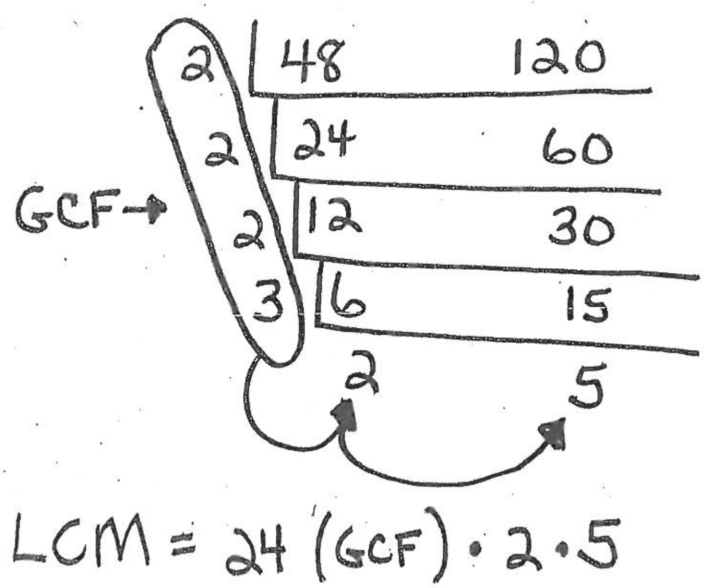
Procedure:

1. Determine the GCF of the two numbers using subsequent division.
2. Multiply the GCF by the remaining factors of the original two numbers.

Least Common Multiple

Definition: The least common multiple (LCM) of two numbers is the smallest number that the two given numbers divide into evenly with no remainder.

Ex. #2: Find the LCM of 48 and 120.



The LCM is 2 • 2 • 2 • 3 • 2 • 5 = 240.
This means that 240 is the smallest number that 48 *and* 120 divide into evenly with no remainder. The LCM is equal to the product of the GCF and the remaining factors.

Procedure:

1. Determine the GCF of the two numbers using subsequent division.
2. Multiply the GCF by the remaining factors of the original two numbers.

Least Common Multiple

1. Find the LCM of each of the pairs of numbers on pages 7-10.

Greatest Common Factor (GCF) and Least Common Multiple (LCM)

Find the greatest common factor (GCF) and least common multiple (LCM) of each pair of numbers.

1. 48 and 80

GCF = ____________________

LCM = ____________________

2. 19 and 23

GCF = ____________________

LCM = ____________________

3. 54 and 90

GCF = ____________________

LCM = ____________________

4. 17 and 51

GCF = ____________________

LCM = ____________________

5. 23 and 29

GCF = ______________________

LCM = ______________________

6. 72 and 96

GCF = ______________________

LCM = ______________________

7. 68 and 85

GCF = ______________________

LCM = ______________________

8. 19 and 38

GCF = ______________________

LCM = ______________________

9. 75 and 90

GCF = ____________________

LCM = ____________________

10. 31 and 93

GCF = ____________________

LCM = ____________________

11. 23 and 46

GCF = ____________________

LCM = ____________________

12. 70 and 98

GCF = ____________________

LCM = ____________________

13. 27 and 81

GCF = ______________________

LCM = ______________________

14. 86 and 215

GCF = ______________________

LCM = ______________________

15. 29 and 87

GCF = ______________________

LCM = ______________________

16. 26 and 65

GCF = ______________________

LCM = ______________________

Word Problems

Answer the following.

1. Grandma Smith takes different medicine for her health on specific days. Every third day, she takes a green pill and every fourth day, she takes a red pill.

   How many times during the last six months (180 days) did Grandma Smith take a green and a red pill on the same day? Explain your answer.

2. Paul works out at the YMCA on a regular basis. Every third day, he runs on the treadmill. Every fifth day, he swims laps in the pool. Every seventh day, he lifts weights.

   How many times during 2013 did Paul run on the treadmill, swim and lift weights on the same day at the YMCA? Explain your answer.

3. The citizens in Greenwood are very committed to recycling. Every fourth day, the town collects glass bottles for recycling. Every eighth day, the town collects plastic materials for recycling. Every seventh day, the town collects newspapers for recycling.

   How many times during the first 270 days of 2013 did the town collect glass bottles, plastic materials and newspapers all on the same day? Explain your answer.

4. The citizens in Blackwood are very committed to recycling. Every third day, the town collects glass bottles for recycling. Every sixth day, the town collects plastic materials for recycling. Every eleventh day, the town collects newspapers for recycling.

   How many times during 2013 did the town collect glass bottles, plastic materials and newspapers all on the same day? Explain your answer.

5. Susan likes to stay active by participating in a variety of sports. Every second day, she rides her bike. Every fourth day, she swims and every ninth day, she goes for a hike at the reservation.

   How many times during the first 300 days of 2013 did Susan ride her bike, swim and hike all on the same day? Explain your answer.

6. Bob likes to stay active by participating in a variety of sports. Every third day, he rides his bike. Every fifth day, he plays hockey and every fifteenth day, he plays tennis.

   How many times during 2013 did Bob ride his bike, play hockey and play tennis all on the same day? Explain your answer.