Date: _____

Lesson 1: Factors and Multiples of Whole Numbers

Multiples of 12: 12, 24, 36, 48, 60, 72, 84, 96 ...

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

Prime number: a number that is only divisible by itself and 1 (2, 3, 5, 7, 11, 13, 17, 19, 23...)

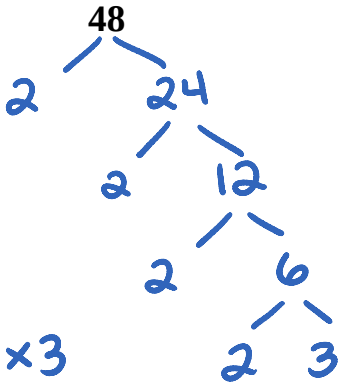
Composite number: any number that is not prime.

Prime factors: the factors of a number that are prime numbers

Prime factorization: writing a number as the product of prime numbers.

How to Determine the Prime Factor of a Number:

Factor tree method
(split composite factors)



$2 \times 2 \times 2 \times 2 \times 3$

$= 2^4 \times 3$

Hockey stick method
(repeated division by prime factors)

2 | 48
2 | 24
2 | 12
2 | 6
3

$= 2^4 \times 3$

Try these:

a) 108

2 | 108
2 | 54
3 | 27
3 | 9
3

$2 \times 2 \times 3 \times 3 \times 3$

$= 2^2 \times 3^3$

b) 252

2 | 252
2 | 126
3 | 63
3 | 21
7

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

$2^2 \cdot 3^2 \cdot 7$

Greatest Common Factor (GCF) - the largest factor of two or more numbers

Example 1: Determine the GCF of 24 and 42.

Method 1 – list all the factors of each number ("rainbow").

24 1, 2, 3, 4, 6, 8, 12, 24

42 1, 2, 3, 6, 7, 14, 21, 42

So the greatest common factor is 6.

Method 2 – Write the prime factorizations of each number.

2 | 24
2 | 12
2 | 6
3

2 | 42
3 | 21
7

24 = 2 × 2 × 2 × 3

42 = 2 × 3 × 7

1) Highlight the factors that appear in both factorizations.

2) Multiply them together: **GCF** = 2 × 3 = 6

Example 2: Determine the GCF of 27, 126 and 144.

3 | 27
3 | 9
3

2 | 126
3 | 63
3 | 21
7

2 | 144
2 | 72
2 | 36
2 | 18
3 | 9
3

27 = 3 × 3 × 3 = 3^3

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

144 = 2 × 2 × 2 × 2 × 3 × 3 = $2^4 \times 3^2$

Take common factor to lowest exponent.

GCF = 3 × 3 = 9

Least Common Multiple (LCM) - the smallest number that is a multiple of 2 or more numbers.

Example 3: Determine the LCM of 28, 42 and 63.

Method 1 – List multiples of each number until the same multiple appears on all lists

28: 28, 56, 84, 112, 140, 168, 196, 224, (252)

42: 42, 84, 126, 168, 210, (252)

63: 63, 126, 189, (252)

So the **LCM** is 252.

Method 2 – Write the prime factorizations of each number

28	42	63
2 | 28	2 | 42	3 | 63
2 | 14	3 | 21	3 | 21
7	7	7

28 = $2 \cdot 2 \cdot 7 = 2^2 \cdot 7$

42 = $2 \cdot 3 \cdot 7$

63 = $3 \cdot 3 \cdot 7 = 3^2 \cdot 7$

The greatest power of 2 in any list is 2^2.

The greatest power of 3 in any list is 3^2.

The greatest power of 7 in any list is 7^1.

1) Highlight the greatest power of each prime factor in any list.
2) Multiply them together.

LCM = $2^2 \cdot 3^2 \cdot 7^1 = 4 \cdot 9 \cdot 7 = 252$

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