FMPC 10

The Fundamental Theorem of Arithmetic

The Fundamental Theorem of Arithmetic states that every positive integer, except the number one, can be represented in exactly one way apart from rearrangement as a product of a one or more prime numbers.

This theorem is sometimes referred to as The Unique Factorization Theorem.

Example 1: Express 6825 as a product of its prime factors.

Example 2: Prime factorize 1768.

Example 3: Prime factorize 900.

APPLICATION OF PRIME FACORIZATION

A: Using prime factorization to determine whether a given number is a (perfect) square (number).

Example 1: Determine whether 8450 is a perfect square. Justify your answer.

Example 2: Determine whether 1764 is a perfect square number. Justify your answer.

B: Using prime factorization to determine whether a given number is a cube (number).

Note: A cube number can be expressed as a product of exactly three identical factors.
Examples of cube numbers:

Power	Number
0^3	0
1^3	1
2^3	8
3^3	27
4^3	64
5^3	125
6^3	216
7^3	343
8^3	512
9^3	729
10^3	1000

Example 1: Determine whether 2744 is a cube number. Justify your answer.

Example 2: Determine whether 1125 is a cube number. Justify your answer.

Example 3: Determine whether 1728 is a cube or a square number. Justify your answer.

Example 4: Determine whether 7 529 536 is a cube or a square number. Justify your answer using prime factorization.

C: Using prime factorization to determine the least common multiple (LCM) of a pair or a group of numbers

Note: It is very useful to know the least common multiple of a group of numbers in order to find a common denominator needed to add and/or subtract fractions.

Example 1: Find the least common multiple (LCM) of 378 and 396.

Example 2: Find the least common multiple (LCM) of 12, 18 and 54.

Example 3: Find the least common multiple (LCM) of 2904 and 2860.

D: Using prime factorization to determine the greatest common factor (GCF) of a pair or a group of numbers

Note: It is very useful to know the greatest common factor of a pair of a group of numbers when working with fractions because the greatest common factor can be factored out and the fractions can be simplified.

Note: If numbers do not have a prime factor in common, their greatest common factor is ___

Example 1: Find the greatest common factor (GCF) of 285 and 5445.

Example 2: Find the greatest common factor of 234 and 147.

Example 3: Find the greatest common factor of 660, 1650 and 19250.

Example 4: Find the greatest common factor (GCF) of84, 140 and 364.