Prime Factorisation

Prime factorization of any number means to represent that number as a product of prime numbers. For example, the prime factorization of 40 can be done in the following way:

Prime factorization of 40 = 2 × 2 × 2 × 5

$= 2^3 \times 5$

2	40
2	20
2	10
5	5
	1

The most common methods that are used for prime factorization are given below:

- Prime factorization by factor tree method
- Prime factorization by division method

Prime Factorization by Factor Tree Method

Let us understand the prime factorization of a number using the factor tree method with the help of the following example.

Example: Do the prime factorization of 850 using the factor tree.

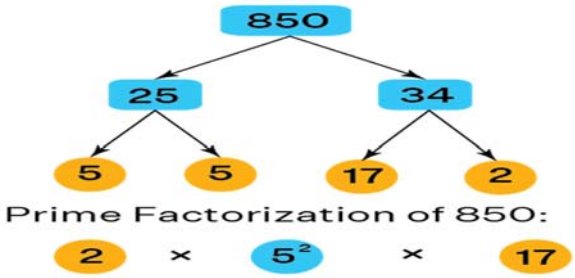
Solution: Let us get the prime factors of 850 using the factor tree given below.

Step 1: Place the number, 850, on top of the factor tree.

Step 2: Then, write down the corresponding pair of factors as the branches of the tree. Here, they are 25 and 34.

Step 3: Factorize the composite factors that are found in step 2, and write down the pair of factors as the next branches of the tree. Here, 25 can be further factorized into 5 × 5, and 34 can be factorized into 17 × 2.

Step 4: Repeat step 3, until we get the prime factors of all the composite factors. So, we get the prime factors of 850 = $2 \times 5^2 \times 17$



Prime Factorization by Division Method

The division method can also be used to find the prime factors of a large number by dividing the number by prime numbers. Let us learn how to find the prime factors of a number by the division method using the following example.

Example: Do the prime factorization of 60 with the division method.

Solution:

Step 1: Divide the number by the smallest prime number such that the smallest prime number should divide the number completely. Here we divide 60 by 2 to get 30.

Step 2: Again, divide the quotient of step 1 by the smallest prime number. So, 30 is again divided by 2 and we get 15.

Step 3: Repeat step 2, until the quotient becomes 1. Now, 15 is not divisible by 2, so we take the next prime number which is 3. And 15 ÷ 3 = 5. Then we divide 5 ÷ 5 = 1. Since we get 1 as the quotient, we stop here.

Step 4: Finally, multiply all the prime factors that are the divisors. Prime factorization of 60 = 2 × 2 × 3 × 5

2	60
2	30
3	15
5	5
	1

Therefore, the prime factors of 60 are 2, 3, and 5.