

## How Many Primes Are There?

Inside the set of Natural numbers  $\mathbb{N}$ , when the multiplication is considered, there are some special kind of numbers that are called the multiplicative building blocks of natural numbers. These numbers which have only two natural distinct divisors are called prime numbers.

**Definition** A natural number  $p$  is called a *prime number* if the only divisors of  $p$  are 1 and  $p$ .

According to “The Fundamental Theorem of Arithmetic” every natural number, apart from rearrangement of factors, can be uniquely written as the product of prime numbers.

**Theorem** (The Fundamental Theorem of Arithmetic [1]). Let  $n$  be a natural number, then  $n$  can be written as a product

$$n = p_1^{\alpha_1} p_2^{\alpha_2} \dots p_k^{\alpha_k},$$

where  $p_i$ 's are prime numbers,  $\alpha_i$ 's are natural numbers and this representation is unique up to the permutation of the factors.

- According to the definition given here, is 1 a prime number?
- What about 2 and 4?
- A natural question is to ask how many primes are there. What do you think? Can we always find one more prime number or is there a finite number of primes?

Please send your answers to “ayse.bilge@khas.edu.tr”.

## References

- [1] Hardy, G. H., & Wright, E. M. (1979). An introduction to the theory of numbers. Oxford university press.