= p1p2 ? pm =
q1q2 ? qn .
Since each prime p divides L by assumption , it must also divide one of the q factors ; since each q is prime as well , it must be that p = q . Iteratively dividing by the p factors shows that each p has an equal counterpart q ; the two prime factorizations are identical except for their order . The unique factorization of numbers into primes has many applications in mathematical proofs , as shown below .

= = = Linear Diophantine equations = = =

Diophantine equations are equations in which the solutions are restricted to integers ; they are named after the 3rd @-@ century Alexandrian mathematician Diophantus . A typical linear Diophantine equation seeks integers x and y such that