Prime Numbers Example

A step-by-step test for whether 37 is prime

WORKED EXAMPLE

A prime number is a whole number greater than 1 with exactly two positive factors: 1 and itself. To test 37 efficiently, check only prime divisors up to the square root of 37.

Problem

Is 37 a prime number?

KEY FACT	VALUE
Number	37
Square-root limit	sqrt(37) is about 6.08
Prime candidates to test	2, 3, and 5

Step-by-step solution

1. Find the square-root limit

Every composite number has a factor no greater than its square root. Since sqrt(37) is about 6.08, test the primes 2, 3, and 5.

sqrt(37) ~= 6.08

2. Test divisibility by 2 and 3

37 is odd, so it is not divisible by 2. Its digit sum is 3 + 7 = 10, which is not divisible by 3.

37 mod 2 = 1; 3 + 7 = 10

3. Test divisibility by 5

A number divisible by 5 ends in 0 or 5. The final digit of 37 is 7, so 5 is not a divisor.

37 mod 5 = 2

4. Conclude from the tests

No prime at or below the square-root limit divides 37. Therefore, no nontrivial factor pair exists.

Factors of 37: 1, 37

ANSWER

37 is prime. Its only positive factors are 1 and 37.

Check

The factorization 37 = 1 x 37 confirms the two factors. The square-root test ensures no divisor was missed.