

## Square root of Prime Numbers and Square root of Composite Numbers.

### Prime Numbers

✓ Square root of all prime numbers are irrational which means they are non-terminating and non-repeating.

Examples:

1.  $\sqrt{2} = 1.4142135624\dots$
2.  $\sqrt{3} = 1.7320508076\dots$
3.  $\sqrt{5} = 2.2360679775\dots$

### Composite Numbers

✓ The square root of a composite number can be either rational or irrational depending on whether it's a perfect square or not.

Let's break it down with clear examples.

#### ◆ 1. Composite Numbers with Rational Square Roots

A composite number is a number that has more than two factors (not prime).

If the composite number is a perfect square, then its square root is rational.

📖 Example 1:  $\sqrt{4}$

4 is composite (factors: 1, 2, 4)

$\sqrt{4} = 2 \rightarrow$  ✓ Rational

📖 Example 2:  $\sqrt{36}$

36 is composite (factors: 1, 2, 3, 4, 6, 9, 12, 18, 36)

$\sqrt{36} = 6 \rightarrow$  ✓ Rational

These are perfect squares, so square root gives a whole number (which is rational).

#### ◆ 2. Composite Numbers with Irrational Square Roots

If the composite number is not a perfect square, its square root is irrational.

🔑 Example 3:  $\sqrt{8}$

8 is composite (factors: 1, 2, 4, 8)

$\sqrt{8} = 2.828\dots$  (non-terminating, non-repeating) → ✗ Not rational

So,  $\sqrt{8}$  is irrational

🔑 Example 4:  $\sqrt{20}$

20 is composite (factors: 1, 2, 4, 5, 10, 20)

$\sqrt{20} = 4.4721\dots$  → ✗ Irrational

You can simplify it:

$$\sqrt{20} = \sqrt{4 \times 5} = 2\sqrt{5}$$

Since  $\sqrt{5}$  is irrational,  $2\sqrt{5}$  is also irrational.

#### ☑ Summary

Composite Number	Perfect Square?	Square Root	Rational / Irrational
4	Yes	$\sqrt{4} = 2$	Rational
36	Yes	$\sqrt{36} = 6$	Rational
8	No	$\sqrt{8} \approx 2.828$	Irrational
20	No	$\sqrt{20} = 2\sqrt{5}$	Irrational

□ Final Point:

1. Square root of all prime numbers are irrational.
2. Perfect square composite number → Rational square root
3. Non-perfect square composite number → Irrational square root