Exponents

A **power** is a product of repeated factors.
The **base** of a power is the repeated factor.
The **exponent** of a power indicates the number of times the base is used as a factor.
The square of a whole number is a **perfect square**.

base → exponent

$$3^4 = 3 \cdot 3 \cdot 3 \cdot 3$$

power   3 is used as a factor 4 times.

Write 5 × 5 as a power.

Count the number of times 5 is used as a factor.
It is used 2 times. So, the exponent is 2.

▶ So, $5 \times 5 = 5^2$.

Write the power as repeated multiplication and simplify.

$5^4 = 5 \times 5 \times 5 \times 5$	Write as repeated multiplication.
$= 25 \times 5 \times 5$	Multiply 5 and 5.
$= 125 \times 5$	Multiply 25 and 5.
$= 625$	Multiply 125 and 5.

▶ So, $5^4 = 625$.

Determine whether each number is a perfect square.

a. 81

$$81 = 9 \times 9 = 9^2$$

▶ Because it is the square of a whole number, 81 is a perfect square.

b. 45

Test by finding a few perfect squares.

$$5^2 = 5 \times 5 = 25 \qquad 6^2 = 6 \times 6 = 36 \qquad 7^2 = 7 \times 7 = 49$$

Because 45 is between the perfect squares $6^2 = 36$ and $7^2 = 49$, you can see that there is no whole number you can square to get 45.

▶ So, 45 is *not* a perfect square.