

Grade 5 - Place Value and Powers of Ten - Lesson

Common Core 5.NBT.A.1, 5.NBT.A.2 · maths-pdf.fr/en/

A power of 10 is 10 multiplied by itself, written with an exponent: 10 to the third power is $10 \times 10 \times 10 = 1,000$. Each place value is 10 times the place to its right. Multiplying by a power of 10 moves the decimal point right, and dividing moves it left, by the exponent.

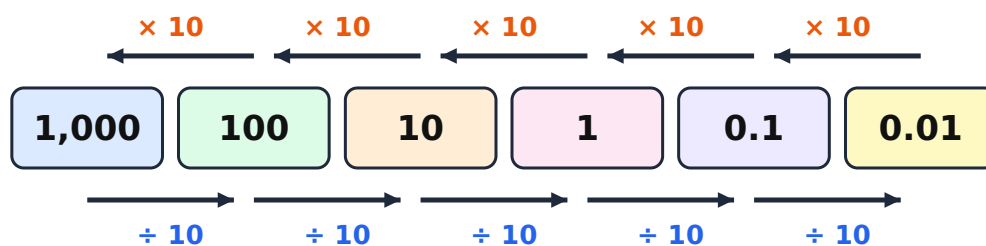
Grade 5 · Common Core State Standards: **5.NBT.A.1, 5.NBT.A.2**

Key facts

- Each place is 10 times the place to its right and $\frac{1}{10}$ of the place to its left.
- The exponent of a power of 10 tells how many 10s are multiplied and how many zeros the value has.
- Multiplying by a power of 10 moves the decimal point right by the exponent.
- Dividing by a power of 10 moves the decimal point left by the exponent.
- 10 to the third power means $10 \times 10 \times 10 = 1,000$, not 3×10 .

How are place values related?

Each place in our number system is **10 times** as much as the place to its right. Each place is also **$\frac{1}{10}$** as much as the place to its left. This is true for whole numbers and for decimals.



Moving left multiplies by 10. Moving right divides by 10.

Look at the number 550. The 5 in the hundreds place is worth 500. The 5 in the tens place is worth 50. Because $500 = 10 \times 50$, the left 5 is 10 times the right 5.

What is a power of 10?

A **power of 10** is 10 multiplied by itself several times. The small raised number is the **exponent**. It tells how many 10s are multiplied.

Power	Meaning	Value
10^1	10	10
10^2	10×10	100
10^3	$10 \times 10 \times 10$	1,000
10^4	$10 \times 10 \times 10 \times 10$	10,000

The exponent also tells you how many zeros the value has.

$$\boxed{10} \times \boxed{10} \times \boxed{10} = 1,000$$

10^3 means three 10s multiplied: $10 \times 10 \times 10$

$$10^3 = 10 \times 10 \times 10 = 1,000.$$

What happens when you multiply by a power of 10?

Look at the pattern: $5 \times 10 = 50$, $5 \times 10^2 = 500$, $5 \times 10^3 = 5,000$. Each digit moves to a place that is 10 times larger for every factor of 10. So the decimal point moves **right** the same number of places as the exponent.

3.45×10^2 : 2 places right



$$3.45 \times 100 = 345$$

Multiplying by 10^2 moves the point 2 places right.

What happens when you divide by a power of 10?

Dividing makes each digit move to a place that is 1/10 as large. The decimal point moves **left** the same number of places as the exponent. For example, $36 \div 10^2 = 0.36$.

$36 \div 10^2$: 2 places left



$$36 \div 100 = 0.36$$

Dividing by 10^2 moves the point 2 places left.

How do you multiply 5.6 by 10^3 ?

1. Read the exponent. It is 3, so the point moves 3 places right.
2. Start with 5.6. The point is after the 5.
3. Move one place: 56. You need two more places, so write two zeros: 5,600.
4. Check: $5.6 \times 1,000 = 5,600$.

The answer is **5,600**.

Questions about place value and powers of ten

How many zeros are in 10 to the fifth power?

There are 5 zeros. The exponent tells how many zeros follow the 1, so 10^5 is 100,000.

Why does the decimal point move when I multiply by 10?

Multiplying by 10 makes every digit 10 times as large, so each digit moves one place to the left. Because the digits shift, the decimal point looks like it moves one place to the right.

Which way does the decimal point move when I divide by 10?

It moves to the left, one place for each factor of 10. For example, $4.5 \div 10 = 0.45$ and $4.5 \div 10^2 = 0.045$.

What is the difference between 10 to the third power and 3 times 10?

10^3 means $10 \times 10 \times 10 = 1,000$. The expression 3×10 is only 30. The exponent counts the 10s, it is not a multiplier.

Is a digit in the tenths place larger than the same digit in the hundredths place?

Yes. A digit in the tenths place is worth 10 times as much as the same digit in the hundredths place. In 0.66, the first 6 is 0.6 and the second 6 is 0.06.