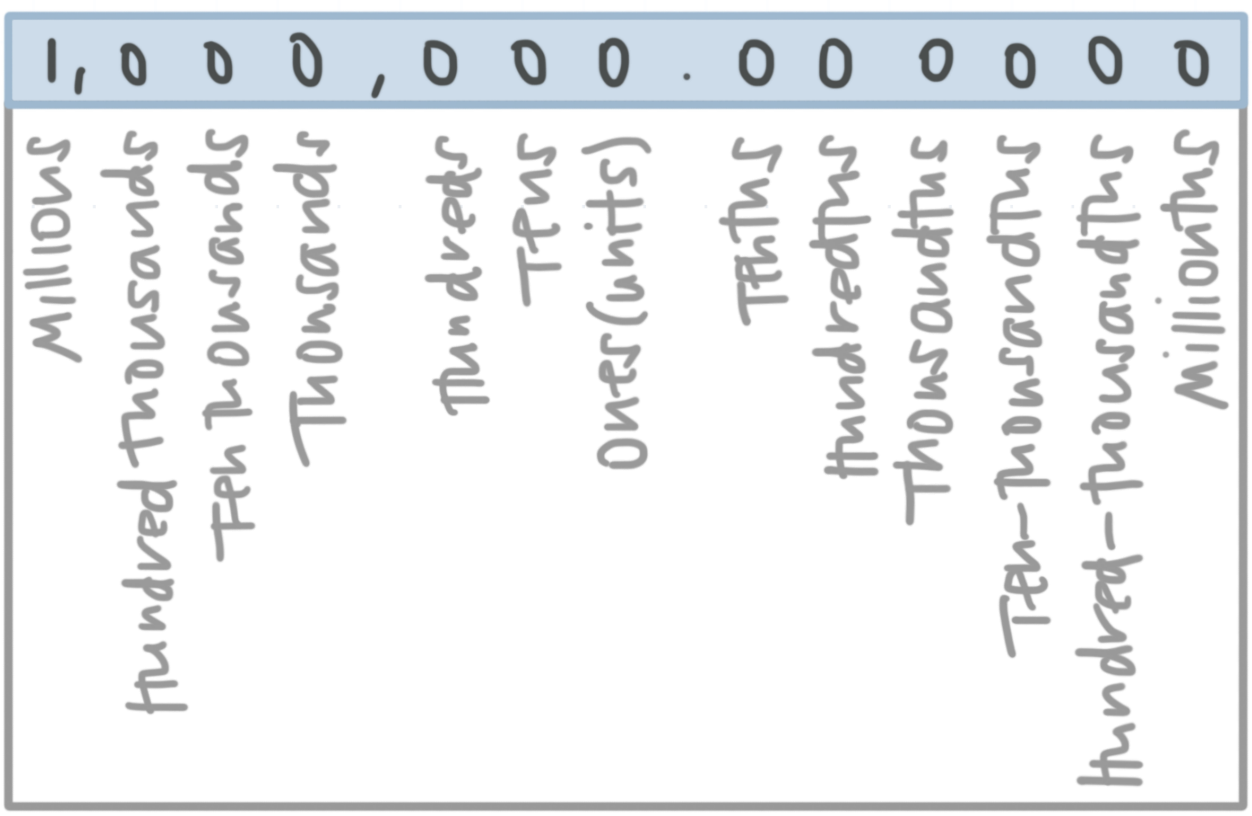
Place value

When we talk about **place value**, we're talking about the value of the location of a particular digit within a given number (the value of the place where that digit is located within that number). Given a number like 4.321, place value is what allows us to easily say where the 3 is located or where the 1 is located. In math, every digit in a number has its own place value.

Digits to the left of the decimal point

Below is a table of some place values, but we can extend this table further in both directions. The table centers around the **ones place**, or units place, which is the place of all single-digit integers.



From the ones place, if we move one place to the left we get to the "tens" place, and if we move one place to the right we get to the "tenths" place.

As we continue to move to the left we have the “hundreds” and “thousands” places, and as we move to the right we have the “hundredths” and “thousandths” places.

The ones place is separated from the tenths place by a symbol that looks like a period, but when we use that symbol in a decimal number we call it a **decimal point**.

Let’s do an example where we identify the place value of each digit in a whole number.

Example

Write out the place value of each digit in the number $12{,}854$.

Working from left to right through $12{,}854$, we can say that

- there’s a 1 in the ten thousands place, which represents $10{,}000$
- there’s a 2 in the thousands place, which represents $2{,}000$
- there’s an 8 in the hundreds, which represents 800
- there’s a 5 in the tens place, which represents 50
- there’s a 4 in the ones place, which represents 4

If we sum all these values, we see that they form our original number.

$$12{,}854 = 10{,}000 + 2{,}000 + 800 + 50 + 4$$

Digits to the right of the decimal point

Now let's look more at the digits to the right of the decimal point. These digits really just represent fractions with denominators of different powers of ten, where the digits to the left of the decimal point represented whole numbers. Each digit to the right of the decimal point is ten times smaller than the previous one.

For example, in the decimal number 17.546, 17 is a whole number in which 1 is in the tens place with a value of 10 and 7 is in the ones place with a value of 7. The three digits to the right of the decimal point can be expressed as

- 5 in the tenths place to represent 0.5 or $5/10$
- 4 in the hundredths place to represent 0.04 or $4/100$
- 6 in the thousandths place to represent 0.006 or $6/1{,}000$

We also want to know that the number **decimal places** in a decimal number is given by the number of digits to the right of the decimal point. So 47.603 has five digits (4, 7, 6, 0, and 3), but only three decimal places since there are only three digits to the right of its decimal point. The digits in the first, second, and third decimal places are 6, 0, and 3, respectively.

Let's do an example where we identify the place value of one digit in a decimal number.

Example

In which place is the 7 located?

$$32.18476$$

The 7 is four places to the right of the decimal point, which means it's in the ten-thousandths place. We could even break down each place in this number:

3	2	.	1	8	4	7	6
Tens	Ones (units)		Tenths	Hundredths	Thousandths	Ten-Thousandths	Hundred-Thousandths

The 7 therefore represents a value of

$$7\left(\frac{1}{10{,}000}\right)=\frac{7}{10{,}000}=0.0007$$

Let's do one more example with non-zero digits on both sides of the decimal point.

Example

Identify the value represented by each digit of $2{,}635.487$, then show that those values sum to the original number.

Let's make a table to summarize the value of each digit.

Digit	Place	Value	Description
2	$1{,}000$	$2 \times 1{,}000 = 2{,}000$	two thousand
6	100	$6 \times 100 = 600$	six hundred
3	10	$3 \times 10 = 30$	thirty
5	1	$5 \times 1 = 5$	five
4	0.1	$4 \times 0.1 = \frac{4}{10}$	four-tenths
8	0.01	$8 \times 0.01 = \frac{8}{100}$	eight-hundredths
7	0.001	$7 \times 0.001 = \frac{7}{1{,}000}$	seven-thousandths

If we sum all these values, we find the original number, $2{,}635.487$.

$$2{,}635.487 = 2{,}000 + 600 + 30 + 5 + 0.4 + 0.08 + 0.007$$