

When you have mastered **numbers**, you will in fact no longer be reading **numbers**, any more than you read words when reading books. You will be reading meanings.

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Harold Geneen <sup>1</sup>

number  
set  
given  
describe  
real-world number

# Chapter 1

## Numbers

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In this chapter, we will be discussing several aspects of **numbers** that are usually not granted much attention in ARITHMETIC textbooks but which are at the heart of their relationship to the real world and therefore essential to understanding CALCULUS ACCORDING TO THE REAL WORLD.

*No, no, this is not going to be a Review Of Basic Stuff in disguise!*

### 1 What Kind of Numbers?

There are many different **sets** of **numbers**, each used for many different purposes, but the rest of us **give numbers** to **describe** what we *have* or what we *want*.

**DEFINITION 1.1** Real-world numbers are (signed decimal) **num-**  
**bers:**

▶ that are normal-size

*and*

▶ whose digits are all significant

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<sup>1</sup>

There seems to be no doubt about it being from Chapter Nine - The Numbers of his book, *Managing* (p.151), even though it is often attributed, without reference, to W.E.B. Dubois. <https://history.stackexchange.com/questions/45470/source-of-quote-attributed-to-w-e-b-du-bois-when-you-have-mastered-numbers?rq=1>,

**THEOREM 1.1** Sizes of *signed* reciprocal numbers

The larger-size a *signed* number, the smaller-size its reciprocal.

The smaller-size a *signed* number, the larger-size its reciprocal.

**NOTE 1.1** 0 is exceptional because:

- i. 0 describes nothing in the real world.

*That's no joke!*

## Conclusion

*The \$64,000 question*  
([https://en.wikipedia.org/wiki/The\\_\\$64,000\\_Question](https://en.wikipedia.org/wiki/The_$64,000_Question))

So we have now come full circle, from real numbers all the way back to signed decimal numbers and there is just one question left:

Why should people who want to *learn* CALCULUS have to learn real numbers when they will then have to *approximate* these real numbers with real world numbers anyhow?

The obvious answer of course—except possibly if you want to become a *mathematician* and, even then, really understanding signed decimal numbers will help you learn about real numbers (See Gowers' <https://www.dpmms.cam.ac.uk/~wtg10/decimals.html>)—is:

No reason at all.

If nothing else, this is because:

- As *engineers* are fond to say,

The *real* real numbers are the *decimal* numbers.

(And in fact, the quote from Gowers in ??, ?? (p.??) starts: “*Physical measurements* are not real numbers. *That is, a measurement of a physical quantity will ...*” )

but also because

- Just like people, “[m]ost calculators do not operate on real numbers. Instead, they work with finite-precision [decimal] approximations.” ([https://en.wikipedia.org/wiki/Real\\_number#In\\_computation](https://en.wikipedia.org/wiki/Real_number#In_computation).)

So, in this text, like for *engineers*, *scientists*, and *calculators*, (??, ??).

*And now, Ladies and Gentlemen, let the CALCULUS begin!*

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