# Zero to Hero, Math

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13 de junio de 2025

## 1. Introduction

The following PDF will be a very useful tool created by me to help me along my professional carreer. It will also help me review anything I might have forgotten over time abouth Math, and why not? Also help me brush up on my English writing. If you are reading this, maybe it´s just me, but if not. Just want to tell you that I´m shit at Math but I hope that with hard work, sweat, and many tears, me, but also you can learn everything you don't understand about math and be able to complete your college, high school, or whatever else is in a more enjoyable way, and not suffer as much as I did. With love, sergio_corona88 at Instagram.

## 2. Level 0: Absolute Fundamentals (Pre - Math)

### 2.1. Natural numbers

Natural numbers are the set of all the numbers from one to infinity excluding zero. (1 - $\infty$).The set of natural numbers is denoted by the symbol, N. So, the set of natural numbers is represented as $N = [1, 2, 3, 4, 5 \ldots \infty]$.

### 2.2. Addition and subtraction

The two simplest operations: addition is used to find the total between two numbers. $a = b + c$ or $4 + 2 = 6$ Subtraction, on the other hand, is used to find the difference between two numbers. $a = b - c$ or $6 - 4 = 2$

### 2.3. Multiplication and division

Multiplication and division are directly related because they are essentially inverse operations. Multiplication seeks to join equal groups, while division seeks to separate these equal groups.

Let's start with the most basic. If we have $4 \times 5 = 20$, their inverse relationships (in the form of division) would be the following:

$$20 \div 5 = 4$$

$$20 \div 4 = 5$$

De igual forma, si tomamos la división $30 \div 3 = 10$, sus relaciones inversas (en forma de multiplicación) serían las siguientes:

$$3 \times 10 = 30$$

$$10 \times 3 = 30$$

In both examples, we can see that we use the same three numbers. This is because when we multiply two numbers (which we call factors), we obtain a result that we call the product. If we divide that number by one of the factors, we obtain the other factor as the result.

### 2.4. Even and odd numbers

Basically, an even number is one that can be divisible by 2 and generates a remainder of 0. An even number can be easily divided into equal groups. $(2, 4, 6, 8, 10 \ldots)$. In the other hand, odd numbers are numbers that are not evenly divisible by 2. When divided by 2, even numbers leave a remainder of 1. $(1, 3, 4, 5, 7, 9 \ldots)$.

### 2.5. Number comparison

Comparing numbers in the process in which we can determine whether a number is smaller, greater, or equal to another number according to their values. The symbols used for comparing numbers are “>”, which means “greater than”; “<”, which means “less than”; and “=”, which means “equal to". We also have a subcategory type that allows us to determine whether a number is, for example, greater than another but also equal. This is defined by the following symbol "≥"which means "greater than or equal to". And finally, "less than or equal to,"which is defined by the following symbol "≤".

$$6 > 3$$

6 is greater than 3 wich is true.

$$2 > 9$$

2 is smaller than 9 wich is true.

$$5 = 5$$

5 is equal to 5 wich is also true.

### 2.6. Zero and negative numbers

Positive numbers represent an amount of something. Negative numbers represent taking away an amount of something. $(-1, -2, -3, -4, -5 \dots)$ For example if we acquire some amount of money we can represent it by a positive number. If we then spend some of that money we can represent it by a negative number.

Zero as a number represents a starting point when we have neither acquired something nor had any of it taken away. Is a digit that is crucial to place value number systems. It allows us to represent numbers that have none of a particular place value.

## 3. Level 1: Basic arithmetic

### 3.1. Whole numbers

The whole numbers are the part of the number system which includes all the positive integers from 0 to infinity. These numbers exist in the number line. Hence, they are all real numbers. $(0, 1, 2, 3, 4 \dots \infty)$

### 3.2. Fractional numbers

The fractional numbers are numbers that represent one or more parts of a unit that has been divided in equal parts. They are figured out by two whole numbers (the fraction terms) that are separated by a horizontal line (the fraction line). The number above the line (the numerator) can be every whole number and the number below the line (the denominator) should be different from zero.

There can be different types of fractional numbers which are named differently as follows.

**Proper Fraction:** the number is inferior to the denominator, for instance:

$$\frac{3}{4}$$

**Improper Fraction:** the numerator is superior to the denominator, for instance:

$$\frac{9}{2}$$

**Mixed Fraction or Mixed Numeral:** it is composed of a whole part and a fractional one, for instance:

$$2\frac{1}{3}$$

**Equivalent Fractions:** fractions that keep on the same proportion of another fraction, for instance:

$$\frac{5}{2} = \frac{10}{4}$$

**Irreducible Fraction:** it cannot be simplified, for instance:

$$\frac{4}{3}$$

**Decimal Fraction:** the denominator is a power whose base is $10 (10, 100, 1000 \dots)$, for instance:

$$\frac{8}{10}$$

Not every number written as a fraction is a fractional number,the reason is that fractional numbers represent one or more parts of a whole. For example, the fraction $\frac{10}{2}$ is written as a fraction, but it is not a fractional number because it simplifies to 5, which is a whole number and does not represent a part of a whole. Similarly, $\frac{\sqrt{2}}{3}$ is expressed as a fraction, but it is not a fractional number because the numerator $(\sqrt{2})$ is not an whole number.

## 3.3. Decimal numbers

Decimals are one of the types of numbers, which has a whole number and the fractional part separated by a decimal point. The dot present between the whole number and fractions part is called the decimal point. For example, 34,5 is a decimal number.

There can be different types of decimal numbers which are named differently as follows.

**Recurring Decimal Numbers:** (Repeating or Non-Terminating Decimals)

$$3{,}125125(Finite)$$

$$3{,}121212121212 \dots (Infinite)$$

**Non-Recurring Decimal Numbers:** (Non Repeating or Terminating Decimals)

$$3{,}2376(Finite)$$

$$3{,}137654 \dots (Infinite)$$

**Decimal Fraction:** (It represents the fraction whose denominator in powers of ten.)

$$81{,}75 = \frac{32425}{1000}$$

## 3.4. Percentages

A percentage is a number, or ratio, that expresses a fraction out of 100. Percentages are easy to recognize because they are always followed by a percent sign (%). A percentage is an alternative way to represent a fraction out of 100 instead of using a traditional fraction format. For example, we can write $\frac{1}{2}$ or $\frac{50}{100}$ to represent a half fraction, using percentage we can also write 50 %.

## 3.5. Proportions and ratios

A ratio compares two or more quantities, showing their relative sizes. It can be written in different ways:
**Colon notation:** $a : b$ (example, $2 : 3$)
**Fraction form:** $a/b$ (example, $2/3$)
**'to' phrasing:** $a/b$ (example, 2 to 3)

A proportion is a statement that two ratios (or fractions) are equal. It tells us that two different comparisons have the same relationship. If $\frac{a}{b}$ and $\frac{c}{d}$ represent the same relative amount, then:

$$\frac{a}{b} = \frac{c}{d}$$