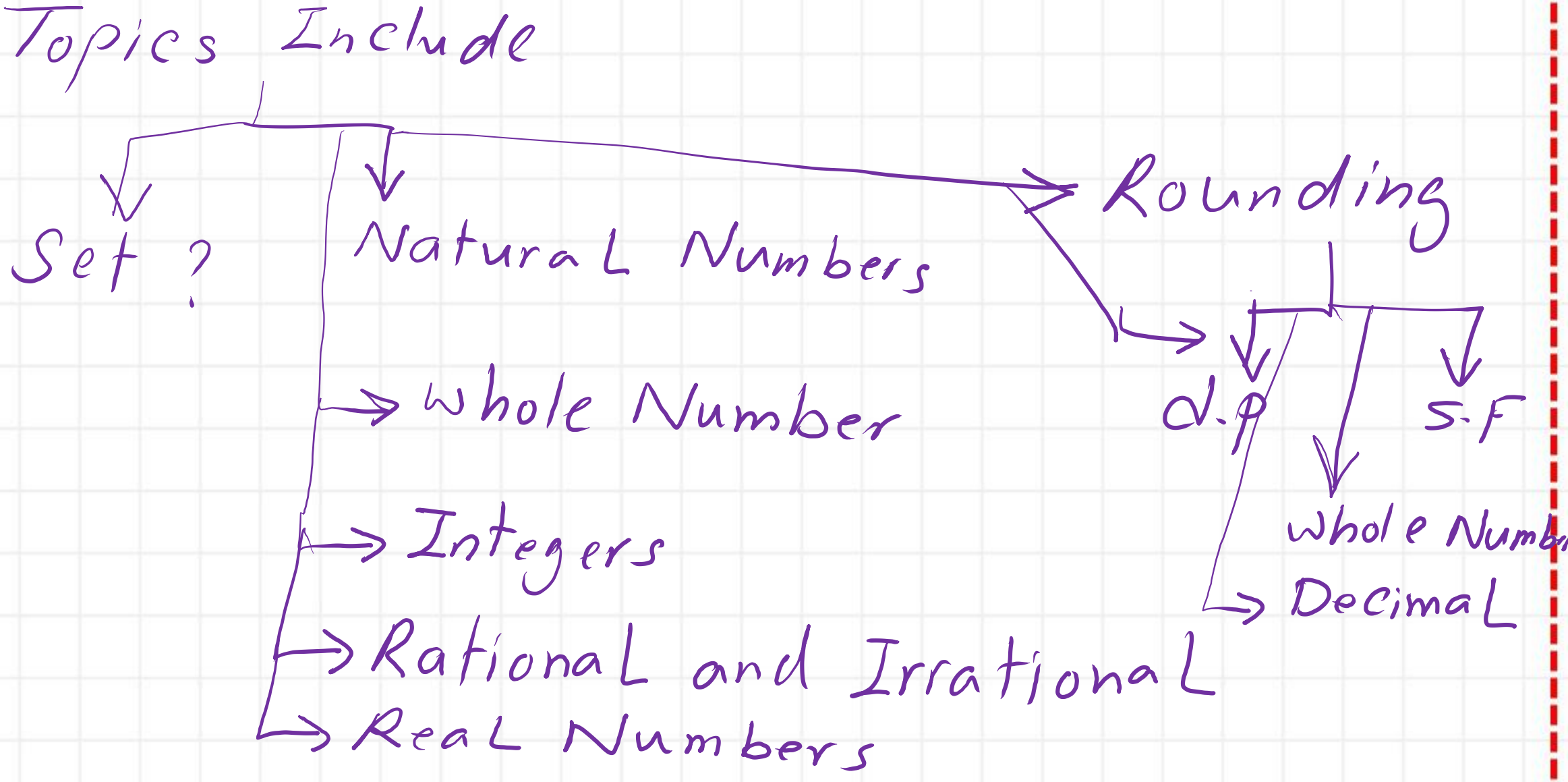


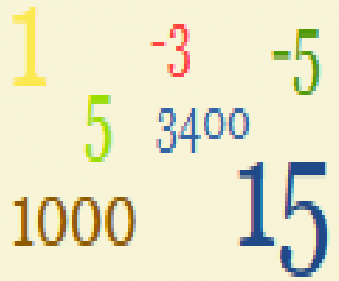
SETS

https://www.mathsisfun.com/sets/set-builder-notation.html

In mathematics, an expression is called well-defined or unambiguous if its definition assigns it a unique interpretation or value. Otherwise, the expression is said to be not well-defined, ill-defined or ambiguous.

A Set is **a collection of things** (usually numbers).

Example: {5, 7, 11} is a set.



Set Braces

The symbols { and } which are used to indicate sets.

For example, the items you wear: shoes, socks, hat, shirt, pants, and so on.

I'm sure you could come up with at least a hundred.

This is known as a **set**.

{ }

Curly Brackets
(also called
"Braces")

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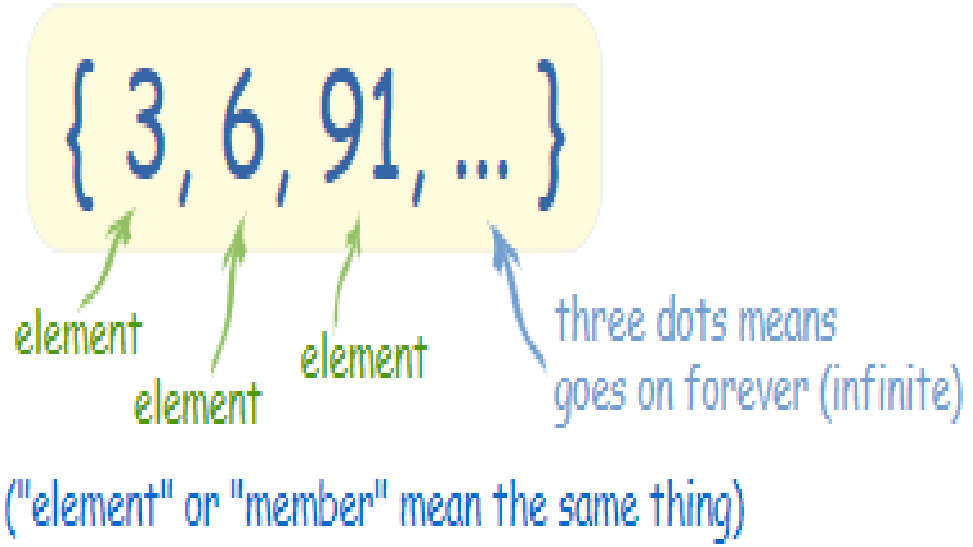
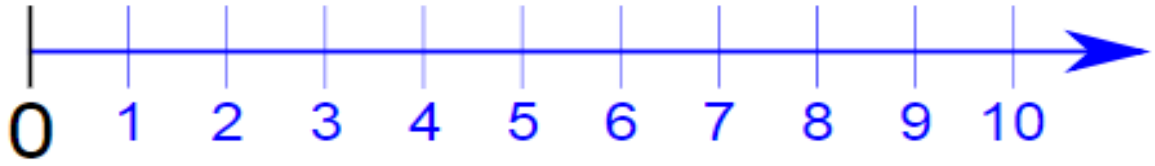
Notation

There is a fairly simple notation for sets. We simply list each element (or "member") separated by a comma, and then put some curly brackets around the whole thing:



Whole Numbers

Whole Numbers are simply the numbers **0, 1, 2, 3, 4, 5, ...** (and so on)



No Fractions!

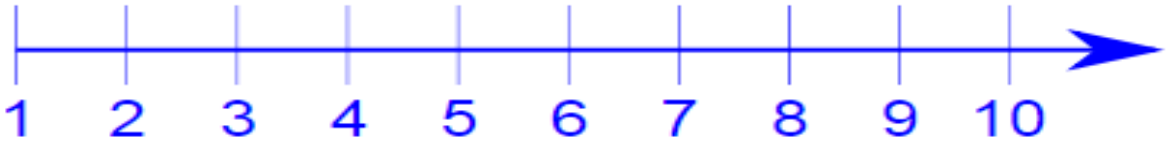
Examples: 0, 7, 212 and 1023 are all whole numbers

(But numbers like ½, 1.1 and 3.5 are **not** whole numbers.)

Counting Numbers

= Natural Numbers >0

Counting Numbers are Whole Numbers, but **without the zero**. Because you can't "count" zero.



So they are **1, 2, 3, 4, 5, ...** (and so on).

Whole numbers don't include negative numbers, fractions, or decimals.

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Integers are counting numbers, their opposites, and zero ... –3, –2, –1, 0, 1, 2, 3 ...

Rational number

A **rational number** is a number that can be written in the form p/q, where p and q are integers and $q \neq 0$.

Its decimal form stops or repeats.

All fractions, both positive and negative, are rational numbers. A few examples are

$45, -78, 134, \text{and} -203$

Real number

A **real number** is a number that is either rational or irrational.

Rational numbers : numbers with ratios

Rational Numbers		
	Fractions	**Integers**
Number	$\frac{4}{5}, -\frac{7}{8}, \frac{13}{4}, \frac{-20}{3}$	$-2, -1, 0, 1, 2, 3$
Ratio of Integer	$\frac{4}{5}, \frac{-7}{8}, \frac{13}{4}, \frac{-20}{3}$	$\frac{-2}{1}, \frac{-1}{1}, \frac{0}{1}, \frac{1}{1}, \frac{2}{1}, \frac{3}{1}$
Decimal number	$0.8, -0.875, 3.25, -6.\overline{6},$	$-2.0, -1.0, 0.0, 1.0, 2.0, 3.0$

- **Definition:** A real number that cannot be expressed as a simple fraction (a ratio of two integers).

Irrational

Irrational Numbers

Are there any decimals that do not stop or repeat? Yes. The number π (the Greek letter pi, pronounced 'pie'), which is very important in describing circles, has a decimal form that does not stop or repeat.

$$\pi = 3.141592654.....$$

Similarly, the decimal representations of square roots of whole numbers that are not perfect squares never stop and never repeat. For example,

$$\sqrt{5} = 2.236067978.....$$

A decimal that does not stop and does not repeat cannot be written as the ratio of integers. We call this kind of number an **irrational number**.

$Z^+ = \{ x \mid x \text{ is positive Integer} \}$

$\{1, 2, 3, 4, \dots\}$

Z : Integers $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$

$Z = \{ x \mid x \text{ is an Integer} \}$

$Q = \{ x \mid x \text{ is rational Number} \}$

$R = \{ x \mid x \text{ is Real Number} \}$

$\phi = \{\ \}$

$\{ x \mid x \in N, x < 10 \}$ (| : such that)

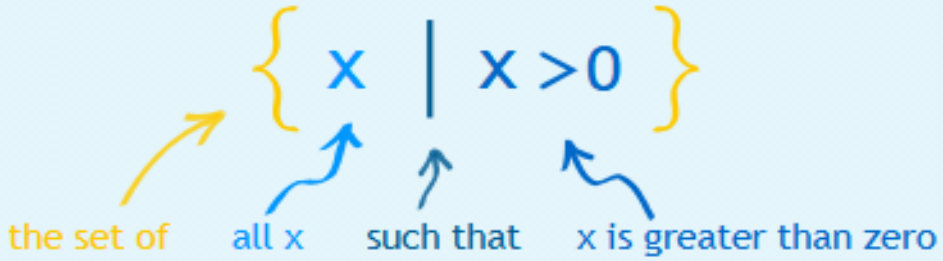
"The set of all x, such that, x is an element of the Natural Number and x is less than 10"

$\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$

SET Builder

https://www.mathsisfun.com/sets/set-builder-notation.html

Here is a simple example of set-builder notation:



It says ***"the set of all x's, such that x is greater than 0"***.

In other words **any value greater than 0**

Notes:

- The "x" is just a place-holder, it could be anything, such as **{ q | q > 0 }**
- Some people use **":"** instead of **"|"**, so they write **{ x : x > 0 }**

- **Counting numbers (also called natural numbers):** The set of numbers beginning 1, 2, 3, 4 ... and going on infinitely
- **Integers:** The set of counting numbers, zero, and negative counting numbers
- **Rational numbers:** The set of integers and fractions
- **Real numbers:** The set of rational and irrational numbers

  - $\mathbb{R}$ = real numbers, $\mathbb{Z}$ = integers, $\mathbb{N}$=natural numbers, $\mathbb{Q}$ = rational numbers, $\mathbb{P}$ = irrational numbers.
  - $\subset$= proper subset (not the whole thing) $\subseteq$=subset
  - $\exists$ = there exists
  - $\forall$ = for every
  - $\in$= element of
  - $\bigcup$ = union (or)
  - $\bigcap$ = intersection (and)