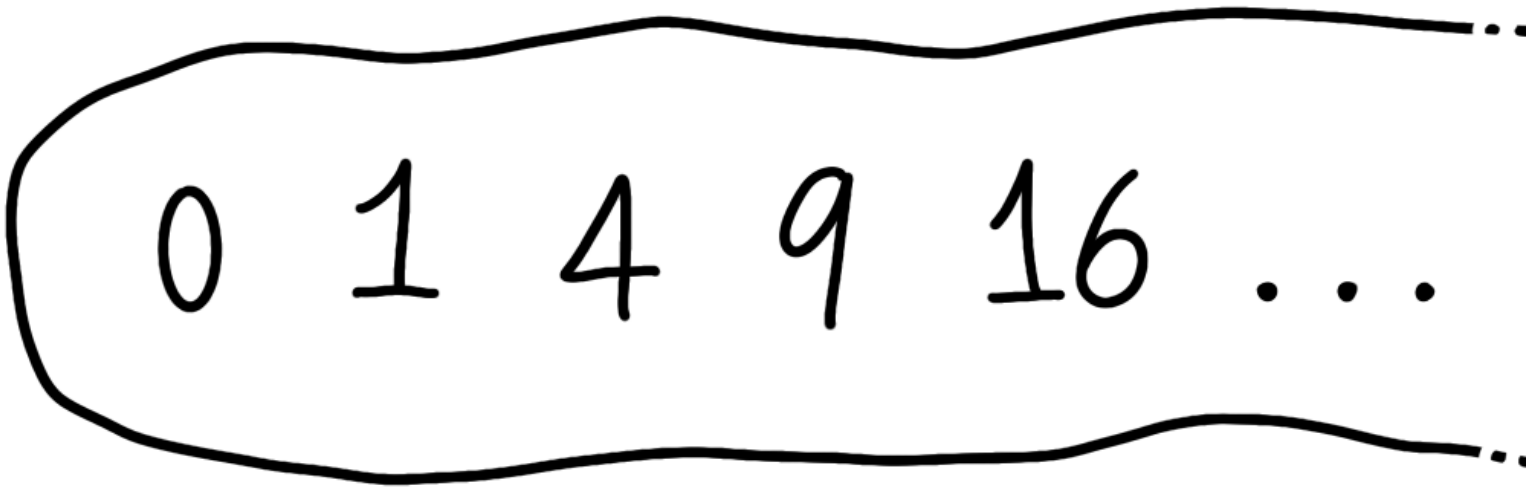
What the set theorists don't want you to know about sets

Silly sets like $\{\pi, \emptyset, \mathbb{R}, \{2, 4, 6\}, \ldots\}$ (we saw some like this in the first "set" video) *don't actually ever come up in practice* (unless you are doing Type-making, i.e., plumbing).

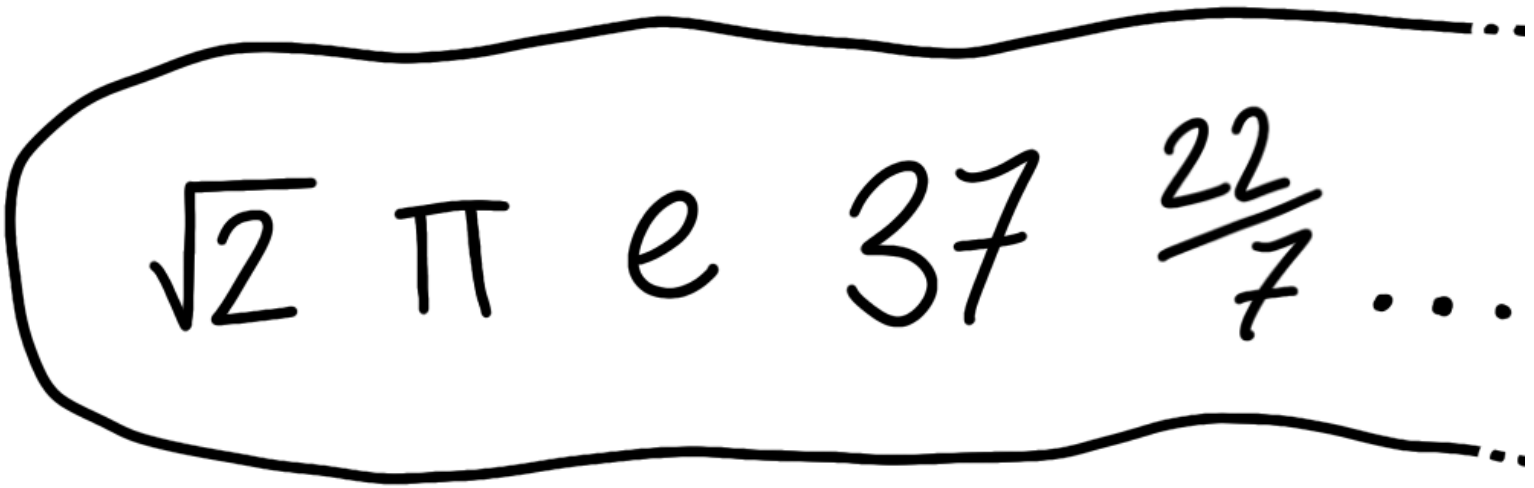
Here is a better example of a set: the set

$$\{0, 1, 4, 9, 16, \ldots\}$$

of integer squares.



Another example: the set $\{\sqrt{2}, \pi, e, 37, \frac{22}{7}, \ldots\}$ of real numbers.



Idle (off-syllabus) question: is that picture “right”?

Something you'll learn later on this year

Consider the set $\{\sqrt{2}, \pi, e, 37, \frac{22}{7}, \ldots\}$ of real numbers.

Whatever does that "..." even *mean*?

With $\{0, 1, 4, 9, 16, \ldots\}$ you *know what number comes next*.

Can you fix this, and list the reals using a function, so that every real number shows up exactly once in the list?

Of course your list doesn't have to be in order, e.g.

$$\{0, +1, -1, +2, -2, +3, -3, \ldots\}$$

is a perfectly good list of the integers.)

The truth about sets.

The truth is that profound mathematics by people such as Gauss and Riemann was going on long before the idea of a set was ever invented.

In practice, we will only see the following kinds of sets in this course.

1) "Number sets" like $\mathbb{N}$, $\mathbb{Z}$, $\mathbb{Q}$, $\mathbb{R}$ and $\mathbb{C}$.

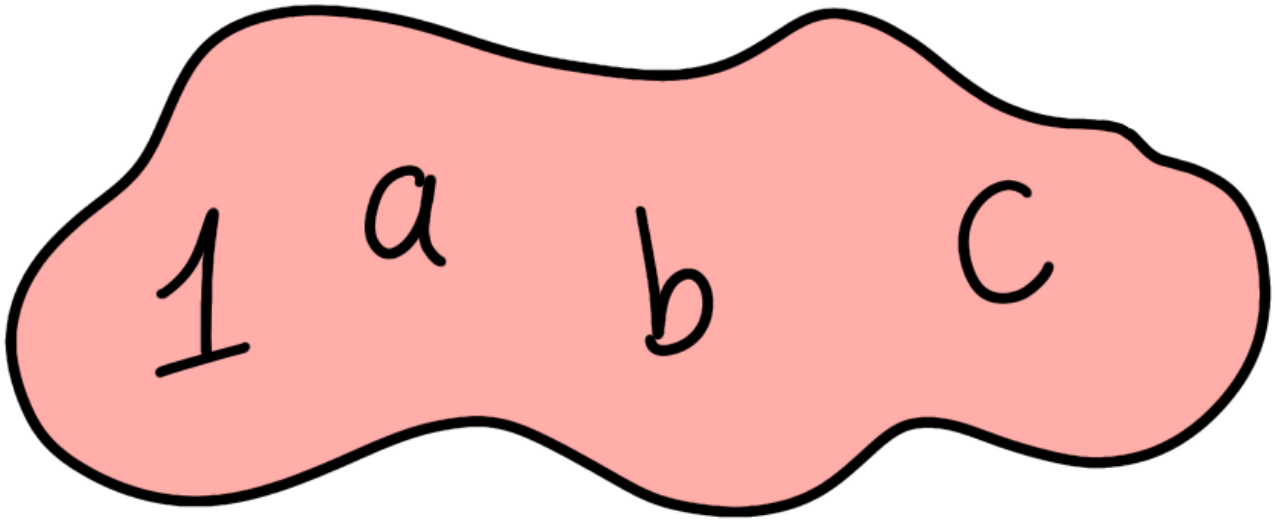
2) Truth values $\{\texttt{true}, \texttt{false}\}$, and "vector sets" like $\mathbb{R}^2$ or $\mathbb{R}^3$.

3) Subsets of these (like the set of prime numbers).

Later on in your mathematical career you will see some more abstract examples of sets.

Example: if you ever read something like “let G be a group”, then G is a set.

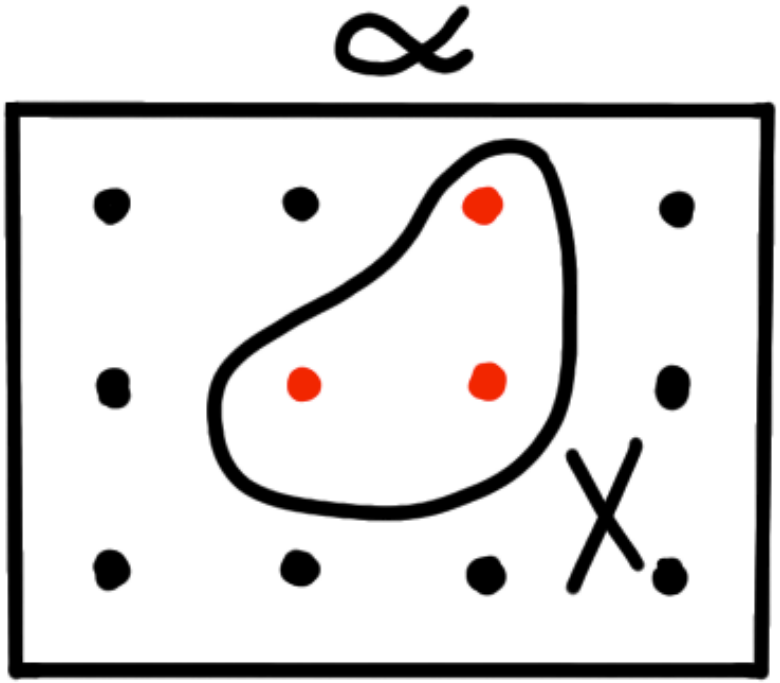
“Let $(G, *)$ be a group of order 4”.



Next time: Subsets

Let α be a big set (maybe a number set like $\mathbb{N}$ or $\mathbb{R}$).

In the next video we will talk about *subsets* of α.



Turns out that there's an entire "abstract science of operations" that one can do with subsets of α, as Lovelace envisaged.

For example, there are unions and intersections.

We will talk about these in the next video.