



## Why

We are constantly thinking of the real numbers as the points of a line.<sup>1</sup>

## Discussion

We commonly associate elements of the real numbers (see [Real Numbers](#)) with points on a line (see [Geometry](#)).

**Principle 1** (Point Sets). *Given a line, there exists a set of its (infinite) points.*

**Principle 2** (Real Line Correspondence). *Let  $P$  be the set of points for a line. There exists a one-to-one correspondence mapping elements of  $P$  onto elements of  $\mathbf{R}$ .*

For this reason, we sometimes call elements of the real numbers *points*. We call the point associated with 0 the *origin*.

## Visualization

To visualize the correspondence we draw a line. We then associate a point of the line with the  $0 \in \mathbf{R}$ . We can label it so. We then pick a unit length. We associate the points a unit length away from zero with  $1 \in \mathbf{R}$  (on the right) and  $-1 \in \mathbf{R}$  (on the left). We do the same for two and  $-2$ , 3 and  $-3$ , and then we say that we could continue the process indefinitely. We can visualize the image in Figure 1.

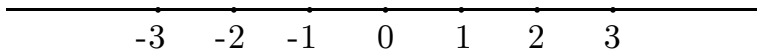


Figure 1: The real line

---

<sup>1</sup>Future editions will modify this sheet.



