Why

We are constantly thinking of the real numbers as the points of a line.[1]

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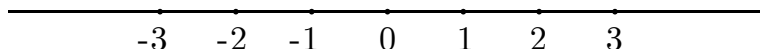
Principle 2 (Real Line Correspondence)**.** *Let P be the set of points for a line. There exists a one-to-one correspondence mapping elements of P onto elements of* **R***.*

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 $0 \in$ **R**. We can label it so. We then pick a unit length. We associate the points a unit length away from zero with $1 \in$ **R** (on the right) and $-1 \in$ **R** (on the left). We do the same for two and 2 and -2, 3 and -3, and then we say that we could continue the process indefinitely.

We can visualize the image below

$$-3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3$$

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[1]Future editions will modify this sheet.

Real Line

Real Order

Real Numbers   Rational Order

Integral Line

Rational Numbers

Integer Arithmetic

Integer Products   Natural Multiplicative Identity   Natural Additive Identity

Arithmetic   Identity Elements

Integer Sums   Integer Order   Natural Powers

Comparisons   Integer Numbers   Natural Products   Operations

Converse Relations   Equivalence Relations   Orders   Natural Sums   Functions

Relations   Natural Order   Recursion Theorem

Ordered Pair Projections   Peano Axioms

Set Products   Natural Induction

Ordered Pairs   Set Powers   Natural Numbers

Unordered Triples   Partitions   Successor Sets   Intersection of Empty Set

Pair Unions   Set Symmetric Differences   Set Intersections

Set Unions   Set Complements   Pair Intersections

Unordered Pairs   Empty Set   Set Differences

Geometry   Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Sets   Identities

Names

Letters   Objects