Why

We are constantly thinking of the elements of $\mathbf{R}^2$ as points of a plane.[1]

Discussion

We commonly associate elements of $\mathbf{R}^2$ with points on a plane. (see Geometry).

Principle 1 (Line Sets). *Given a plane, there exists a set of its (infinite) lines.*

Principle 2 (Real Plane Correspondence). *Let L be the set of lines of a plane. Then $\cup L$ is the set of points of the plane. There exists a one-to-one correspondence mapping elements of $\cup L$ onto elements of $\mathbf{R}^2$.*
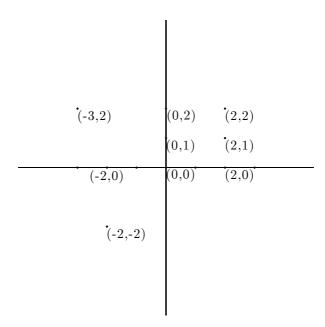
For this reason, we sometimes call elements of $\mathbf{R}^2$ *points*. We call the point associated with $(0,0)$ the *origin*. We call the element of $\mathbf{R}^2$ which corresponds to a point the *coordinates* of the point.

Visualization

To visualize the correspondence we draw two perpendicular lines. We then associate a point of the line with $(0,0) \in \mathbf{R}^2$. We can label it so. We then pick a unit length. And proceed as usual.[2]

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[1]Future editions will modify this sheet.

[2]Future editions will expand this.

Given that we have identified a plane with **R**^{2} in this way, we call $(x, y) \in$ **R**^{2} the *coordinates* of the point it corresponds to. Many authors refer to this identification as a *Cartesian coordinate system* (or *Rectangular coordinate system*, *x-y coordinate system*).

Real Plane

Real Order

Rational Order   Real Numbers

Rational Numbers   Lists

Integer Arithmetic   Natural Fractions   Set Numbers   Direct Products

Integer Products   Natural Additive Identity   Natural Multiplicative Identity   Finite Sets

Identity Elements   Natural Arithmetic   Equivalent Sets

Comparisons   Integer Order   Integer Sums   Natural Powers   Function Inverses   Family Unions and Intersections

Orders   Integer Numbers   Natural Products   Operations   Function Images   Function Composites   Families

Converse Relations   Natural Sums   Natural Order   Equivalence Relations   Functions

Relations   Recursion Theorem

Ordered Pair Projections   Peano Axioms

Set Products   Natural Induction

Set Powers   Natural Numbers   Generalized Set Dualities

Partitions   Unordered Triples   Successor Sets   Intersection of Empty Set   Set Symmetric Differences   Set Dualities   Set Unions and Intersections

Ordered Pairs   Set Intersections   Pair Unions   Set Complements

Set Unions   Set Differences   Pair Intersections

Unordered Pairs   Empty Set

Geometry   Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Sets   Identities

Names

Letters   Objects

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