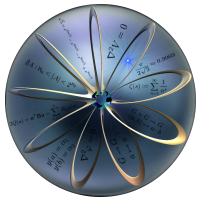

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topic entry on algebra

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The subject of algebra may be defined as the study of algebraic systems, where an algebraic system consists of a set together with a certain number of operations, which are functions (or partial functions) on this set. A prototypical example of an algebraic system is the ring of integers, which consists of the set of integers, $\{\ldots, -2, -1, 0, 1, 2, \ldots\}$ together with the operations $+$ and $\times$.

In addition to studying individual systems, algebraists consider classes of systems defined by common properties. For instance, the example cited above is an example of a ring, which is an algebraic system with two operations which satisfy certain axioms, such as distributivity of one operation over the other.

The reason for considering classes of systems is in order to save work by stating and proving theorems at the appropriate level of generality. For instance, while the statement that every integer equals the sum of four squares is specific to the ring of integers (there are many rings in which this is not the case) and its proof makes use of specific facts about integers, the proof of the fact that the product of two sums of integers equals the sum of all products of numbers appearing in the first sum by numbers appearing in the second sum only involves the distributive law, so an analogous theorem will hold for any ring. Clearly, it is wasteful to restate the same theorem and its proof for every ring so we state and prove it once as a theorem about rings, then apply it to specific instances of rings.

1. `http://planetmath.org/node/ConceptsInAbstractAlgebra`Concepts in abstract algebra
2. topics on group theory
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6. topics on homological algebra
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8. algebraic k-theory
9. Special notations in algebra

10. Topics on polynomials
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13. http://planetmath.org/node/2530Topic entry on linear algebra
14. http://planetmath.org/node/5663Concepts in linear algebra
15. Matrices of special form
16. http://planetmath.org/MatrixFactorizationMatrix decompositions
17. Bibliography for group theory
18. topics on universal algebra