

Weak lattices

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In logics, BCK-algebras $(A, \rightarrow, 0, 1)$ with 0 satisfying the double negation law $(x \rightarrow 0) \rightarrow 0 = x$ play an important role. They reflect certain properties of the implication operation. If one defines $x \sqcup y := (x \rightarrow y) \rightarrow y$, $x' := x \rightarrow 0$ and $x \sqcap y := (x' \sqcup y)'$ then (A, \sqcup, \sqcap) satisfies some natural axioms which are weaker than the usual axioms for lattices. We call these algebras weak lattices and show that they can be naturally characterized in an order-theoretical way. Also weak semilattices (A, \sqcup) , respectively (A, \sqcap) can be introduced and it is shown that bounded weak join-semilattices with sectionally antitone involutions are in a natural bijective correspondence with so-called skew basic algebras $(A, \oplus, \neg, 0)$, the latter generalizing the notion of a basic algebra.