Colloquium

Levels and sublevels of rings

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Abstract: The level (resp. sublevel) of a ring is the smallest number n such that -1 (resp. 0) can be written as a sum of n (resp. $n+1$) nonzero squares in the ring if such an n exists, otherwise it is defined to be infinity. A famous result by Pfister from the 1960s states that the level of a field, if finite, is always a 2-power, and each 2-power can in fact be realized as the level of a suitable field. This answered a question posed by van der Waerden in the 1930s. In the case of fields, level and sublevel coincide, but this need not be true for other types of rings. We will give a survey of various known results about levels and sublevels of rings and mention some open problems.

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Mathematics and Computer Science
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