Split-S Nim

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In this talk, we address a variant of the game of Nim based on some subset of the integers. In this variant, in addition to the standard moves, given some s in the subset S, a player has the alternate move to replace a heap of size n with two heaps each with size less than n, provided that the sum of the two heaps is equal to $n + s$.

We classify all sets that have the same winning strategy as some single element subset version of this game and also find the Sprague-Grundy numbers for the case when the set S is the set of all integers.