The theory of impartial games is well known. Given an impartial game $G$, we may associate to it its Grundy number $G(G)$, the smallest ordinal which does not appear among the Grundy numbers of $G$’s options. The impartial games which are losses for the next player to move are then exactly the impartial games with Grundy number 0. To find the Grundy number of a sum of multiple games (where a player’s turn consists of a move in exactly one of the component games), one may write the Grundy numbers of each component game in base 2, and then add without carry.

Making use of a new mechanic called a ”challenge”, we will define the ”$p$-adic” sum of impartial games for every prime $p$, where the Grundy numbers of each component game should be written in base $p$ and summed without carry. We will then present the winning strategies for a variety of impartial games played under the $p$-adic sum. (Received September 20, 2012)