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The Twelvefold Way with Greedy Gray Codes

According to Wikipedia "the twelvefold way is a classification of 12 enumerative problems concerning two finite sets including permutations, combinations, multisets, and partitions of a set or number." For example, the number of ways to put n labelled balls into n unlabeled bins is the n^{th} Bell number.

We show that simple greedy algorithms can generate Gray codes of the associated combinatorial objects. For example, greedily moving the largest possible ball into the bin containing the smallest possible ball creates the Gray code for set partitions originally due to Kaye in 1976.

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