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**crazy dice**

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It is a standard exercise in elementary combinatorics to find the number of ways of rolling any given value with 2 fair 6-sided dice (by taking the sum of the two rolls). The below table gives the number of such ways of rolling a given value  $n$ :

$n$	# of ways
2	1
3	2
4	3
5	4
6	5
7	6
8	5
9	4
10	3
11	2
12	1

A somewhat (un?)natural question is to ask whether or not there are any other ways of re-labeling the faces of the dice with positive integers that give these sums with the same frequencies. The surprising answer to this question is that there does indeed exist such a re-labeling, via the labeling

$$\text{Die 1} = \{1, 2, 2, 3, 3, 4\}$$

$$\text{Die 2} = \{1, 3, 4, 5, 6, 8\}$$

and a pair of dice with this labeling are called a set of *crazy dice*. It is straight-forward to verify that the various possible sums occur with the same frequencies as given by the above table.