



## Problem of the Week

### Problem D

### Different Dice, Same Outcome

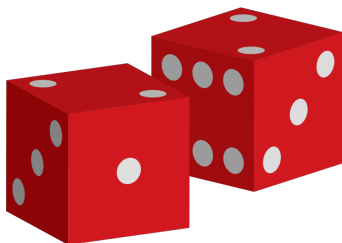
When a mathematician says ‘a fair die’, they mean there is an equally likely chance of landing on any face of the die.

A standard six-sided die has its faces marked with the numbers 1, 2, 3, 4, 5, and 6. The die is fair and each number is used exactly once.

A special six-sided die has its faces marked with the numbers 1, 3, 4, 5, 6, and 8. The die is fair and each number is used exactly once.

Is it possible to create a second fair, six-sided die marked so that this die and the first special die can be used together to play a board game like *Monopoly*? (Numbers on the faces of this new die may appear more than once.)

In other words, does another fair, six-sided die exist so that when this new die and the special die are thrown the sum of the numbers on the top faces of the two dice range from 2 to 12 and the probability of obtaining each sum is the same as it would be if two standard dice had been thrown? If it is possible, what numbers would be on the faces of this new die? If it is not possible, explain why not.



Two Standard Fair Dice

