1. (40 points) Throughout this problem Bill has a 2-sided dice with numbers 1, 2 and a 3-sided die with numbers 1, 2, 3.

(a) (15 points) Assume both dice are fair. Bill throws both of them. For $2 \leq i \leq 5$ give the prob that the sum is $i$.

(b) (20 points) Let $0 \leq p \leq \frac{1}{2}$. Assume the 2-sided dice is fair but the 3-sided dice has

- Prob of 1 = $p$
- Prob of 2 = $1 - 2p$
- Prob of 3 = $p$

Bill throws both of them. For $2 \leq i \leq 5$ give the prob that the sum is $i$.

(c) (5 points) Let $p$ be as in the last part. Is there a value of $p$ such that all of the sums 2, 3, 4, 5 come up with the same probability.

(d) (0 points but thing about it) Can you load two 6-sided dice to get fair sums?

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2. (60 points) On the planet Vorlon they play a game that is similar to what we call Poker but with a different deck of cards.

Every card has a rank from \{1, 2, \ldots, 7\}.

Every card has a suite from \{R, B\}.

Every player gets 3 cards.

In most of the questions we will ask for the prob of a certain type of hand. Give the answer to 4 places since the last question is to rank them.

(a) What is prob of a straight that is NOT a flush (e.g., 3R, 4R, 6B) 
   We DO allow wrap-around, so 7-1-2 counts.

(b) What is prob of a flush that is NOT a straight (e.g., 2R, 4R, 9R)

(c) What is prob of a straight flush (e.g., 3R, 4R, 6R) We DO allow wrap-around, so 7-1-2 counts.

(d) What is prob of a pair (e.g., 3R, 4B, 7R). Note that a pair cannot be a straight of a flush.

(e) What is prob of getting NOTHING- a hand that is neither a straight, nor a flush, nor does it contain 2 of a kind. (e.g., 3R, 5R, 6B)

(f) Rank the types of hands from most likely to least likely.