L3 PROBLEM 1 (10/10 points)

In this problem, we're going to calculate some probabilities of dice rolls. Imagine you have two fair four-sided dice (if you've never seen one, here's a picture. The result, a number between 1 and 4, is displayed at the top of the die on each of the 3 visible sides). 'Fair' here means that there is equal probability of rolling any of the four numbers.

You can answer the following questions in one of two ways - you can calculate the probability directly, or, if you're having trouble, you can simply write out the entire sample space for the problem. A sample space is defined as a listing of all possible outcomes of a problem, and it can be written in many ways - a tree or a grid are popular options. For example, here is a diagram of the sample space for 3 coin tosses.

Some vocabulary before we begin: an **event** is a subset of the sample space, or, a collection of possible outcomes. A **probability function** assigns an event, *A*, a probability *P(A)* that represents the likelihood of event *A* occuring.

As an example, let's say we flip a coin. Define the event *H* as the event that the coin comes up heads. We can assign the probability *P(H)* = 1/2; the likelihood that event *H* occurs.

The following problems will ask for the probability that a given event occurs.

1. What is the size of the sample space for one roll of a four sided die?

   4

2. What is the size of the sample space for two rolls of a four sided die?

   16

3. Assume we roll 2 four sided dice. What is P({sum of the rolls is even})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   1/2

4. Assume we roll 2 four sided dice. What is P({rolling a 2 followed by a 3})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   1/16

5. Assume we roll 2 four sided dice. What is P({rolling a 2 and a 3, in any order})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   1/8

6. Assume we roll 2 four sided dice. What is P({sum of the rolls is odd})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   1/2

7. Assume we roll 2 four sided dice. What is P({first roll equal to second roll})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

1/4

8. Assume we roll 2 four sided dice. What is P({first roll larger than second roll})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   3/8

9. Assume we roll 2 four sided dice. What is P({at least one roll is equal to 4})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

   7/16

10. Assume we roll 2 four sided dice. What is P({neither roll is equal to 4})? Answer in reduced fraction form - eg 1/5 instead of 2/10.

    9/16

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