

The Scene: In this activity we build and investigate some discrete probability models with dice.

- Consider 2 regular dice, a red one and a blue one. Let X denote the sum of the values if we roll them together.

- Convince yourself that the sample space for this random process is

$$S = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}.$$

Convinced? You may proceed.

- In the grid below, record the sum of the dice for each of the 36 possible outcomes (For instance, if the red die is 3 and the blue die is 5, the sum is 8.) Then, assuming each of these 36 outcomes is equally likely, determine a valid probability model for the sum of two dice in the table at right.

		blue die					
		1	2	3	4	5	6
red die	1						
	2						
	3					8	
	4						
	5						
	6						

x	2	3	4	5	6	7	8	9	10	11	12
$P(x)$											

- Consider two strange dice, a red die taking values 2, 2, 2, 2, 5, 5; and a blue die taking values 1, 3, 3, 5, 5, 6. Let X denote the sum of these two dice when rolled together.

- What is the sample space for this random process?

- In the grid below, record the sum of the dice, in each of the 36 possible outcomes. Then, assuming each of these 36 outcomes is equally likely, make a table at right that gives a valid probability model for this random process.

		blue die					
		1	3	3	5	5	6
red die	2						
	2						
	2						
	2						
	5						
	5						

3. Using the probability tables.

(a) For the dice in [2], what is the probability that a given roll produces a sum that is an even number?

(b) Which is more likely, that the dice in [1] give a sum greater than 8, or that the dice in [2] give a sum greater than 8? Explain.

4. Suppose we have three strange dice. The numbers on the blue die: 1, 1, 4, 4, 4, 4. The numbers on the red die: 2, 2, 2, 2, 5, 5. The numbers on the purple die: 3, 3, 3, 3, 3, 6.

(a) What is the probability that red beats blue if each is rolled once?

(b) What is the probability that blue beats purple if each is rolled once?

(c) What is the probability that purple beats red if each is rolled once?