In this experiment we roll a pair of fair dice, one red and one green. We can think of the sample space as consisting of ordered pairs: $(1, 1)$ represents a roll of 1 on both dice; $(1, 2)$ would represent a roll of 1 on the red die and 2 on the green die; $(2, 1)$ would be 2 on the red die and 1 on the green die.

1. What is the total number of possible rolls?

Of course the thing we're really interested in when rolling a pair of dice the the sum of the numbers shown on the dice. Let X be this sum. Then X is called a *random variable* because it is a number (i.e. $2, 3, 4, \ldots, 12$) and it's exact value depends on the outcome of a random process. For example, the outcomes $(1, 2)$ and $(2, 1)$ give $X = 3$. And these are the only outcomes that give $X = 3$. Thus it makes sense to use $X = 3$ as a way of denoting the event $\{(1, 2), (2, 1)\}$. Combining this with the answer from question 1 allows us to calculate $\mathrm{P}(X = 3)$, the probability that $X = 3$. Similarly, $X = 4$, $X = 5$, etc. each correspond to an event.

2. Finish filling out the table.

X	Probability	Number of rolls	Rolls
2		1	$(1, 1)$
3		2	$(1, 2)$ and $(2, 1)$
4			
5			
6			
7			
8			
9			
10			
11			
12			

3. Let A be the event that you roll a 3 on the red die. Let B be the event that you roll an even number on the green die.

a. Calculate $\mathrm{P}(A)$ and $\mathrm{P}(B)$.

b. Are A and B independent events? Why or why not? Calculate $\mathrm{P}(A \cap B)$ and $\mathrm{P}(A \cup B)$.

c. Calculate $\mathrm{P}(X = 5|A)$ and $\mathrm{P}(A|X = 5)$. Are A and $X = 5$ independent events?

d. Calculate $\mathrm{P}(X = 7|A)$ and $\mathrm{P}(A|X = 7)$. Are A and $X = 7$ independent events?

e. Calculate $\mathrm{P}(X = 5|B)$ and $\mathrm{P}(B|X = 5)$. Are these independent events?

e. Calculate $\mathrm{P}(X = 7|B)$ and $\mathrm{P}(B|X = 7)$. Are these independent events?

e. Find a number n such that the event $X = n$ is *dependent* on the event B.