Sum of Two Dice

Name(s): _____

In many games, a player starts his or her turn by rolling two dice. The player sums what he or she gets on each die and then moves that many spaces on the board. For example, if one die shows a 4 and the other a 5, the player moves 9 spaces.

The number of spaces a player moves can be as small as two (1 + 1) or as large as twelve (6 + 6).

1. Imagine that we were to roll two dice thousands of times and plot the number of times we got each sum. Which of these plots would look most like our results?

   a.

   b.

   c.

   d.

   e.

2. List all possible simple outcomes that can result from rolling two dice.

In making a list of possible ways to get each sum of two dice, some of you may have come up with a list similar to this one. The bottom row shows the possible sums of two dice. The pairs of numbers in the stack above each sum are the possible ways to get each sum. For example, you can get a sum of 10 by rolling 5, 5 or 4, 6.

				3, 3	3, 4	4, 4				
		2, 2	2, 3	2, 4	2, 5	3, 5	4, 5	5, 5		
1, 1	1, 2	1, 3	1, 4	1, 5	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6
2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

Some of you may have come up with a different list, like this one:

				6, 1					
			5, 1	5, 2	6, 2				
		4, 1	4, 2	4, 3	5, 3	6, 3			
	3, 1	3, 2	3, 3	3, 4	4, 4	5, 4	6, 4		
2, 1	2, 2	2, 3	2, 4	2, 5	3, 5	4, 5	5, 5	6, 5	
1, 1	1, 2	1, 3	1, 4	1, 5	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6
2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**

3.   What is the main difference between these two lists?

4   Which list do you think is the list of all possible simple outcomes you could get from rolling two dice? Explain.

We'll call the top list the *step model* because it looks like steps leading up to a landing (6, 7, and 8) and then back down. We'll call the bottom list the *triangle model* because it looks like a triangle with its peak at 7.

5.   According to the step model, will you get more 11s than 12s, more 12s than 11s, or about the same number of 11s and 12s?

6.   According to the triangle model, will you get more 11s than 12s, more 12s than 11s, or about the same number of 11s and 12s?

7. Open a new document in TinkerPlots. Drag a sampler into the document. Add values to the device and name them so it draws from the numbers 1–6, like rolling a die.

8. Change Repeat to 1000. Now your sampler models rolling two dice 1000 times. Run the sampler.

9. Add a column to the results table that shows the sum of the two dice. To quickly add this column, choose **Result Options** from the **Sampler Options** menu. Then check the box for "Sum of Joined Values."
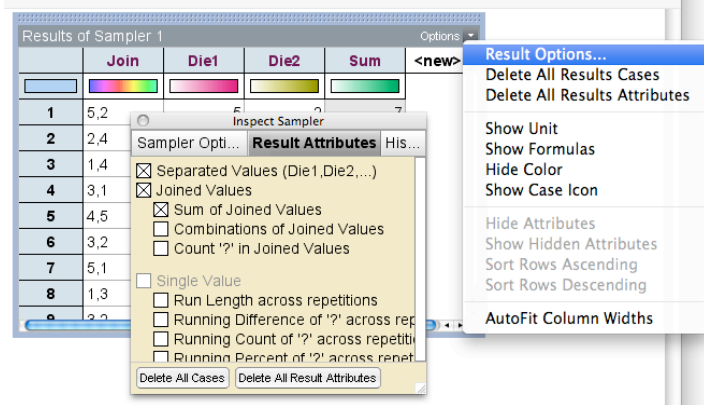
10. Drag a plot from the object shelf into your document and make a plot showing the number of times you got each sum.

11. Sketch and describe your results. Remember that your sketch should not include all of the details of the computer's plot, but it should give a sense of the general shape of the distribution.
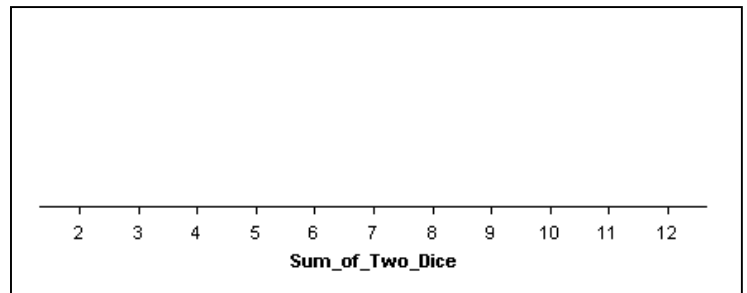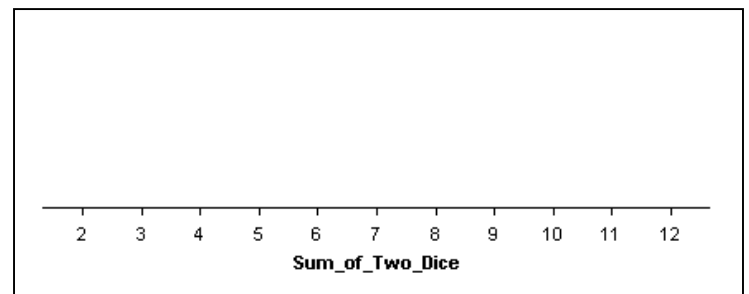
12. Run the sampler two more times, and sketch and describe the results of each run.

2nd Run
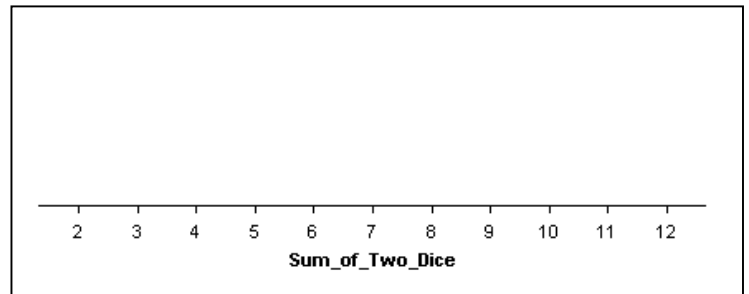
3rd Run

13. Do your overall results look more like the step model or the triangle model? Explain.

14. Did you get more 11s, more 12s, or about the same number of 11s and 12s?

15. Based on your results in Steps 11–14, which model is the best, the step model or the triangle model? Explain.

16. Use the list of simple outcomes from the appropriate model to find the probability of rolling each sum, 2–12, both as a fraction and as a decimal.