Dice Bell Curve

Estimated Time: 30-40 minutes

SUMMARY
What you get depends on what you put in! This activity looks at averages and probability to see how the results of a die roll in your favorite board game is affected by how many dice you're using.

WHAT YOU'LL LEARN

- The average result of a situation depends on the *distribution* of the results.
- Rolling one die you have an equal chance of getting any of the six results, but rolling two dice you are more likely to get a 7 than anything else.

Materials Used	**Resources Used**
• Two six-sided dice • Pencil • Graph paper or lined paper	• The Bell Curve Explained in One Minute: https://www.youtube.com/watch?v=DJzmb7hGmeM

WHAT TO DO

1. Make a bar chart for recording your results. The y axis should go to at least 10 and the x-axis should record the possible results from a die: 1 through 6.
2. Roll one of your dice and record the result in your graph. If you rolled a 1 then color a square in that column, if it's a 2 then put a square in that column, and so on.
3. Repeat Step 2 a total of thirty times and take a look at your graph. Are there any patterns that you see or are the results even spread throughout the graph?
4. Make a new graph as you did in Step 1 but this time make it for two dice added together. That means the x-axis should record the possible results for two dice: 2 through 12.
5. Roll your two dice and record the result. If it was 2 and 3 then put a box in the 5 column, if it was 3 and 6 then put a box in the 9 column, and so on.
6. Repeat Step 5 a total of thirty times and take a look at your graph. Do you see a pattern this time? Draw a line across the tops of each of your bars to see what shape it makes.
7. What was different about your rolling this time? What does that say about the average result of two dice versus the average result of one die?

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

TIPS

- The first graph is an example of an even distribution with every number coming up more or less the same amount. Since there's a one in six chance of any of the numbers being rolled the numbers will on average be rolled the same amount.
- The second graph is an example of a bell curve, where one number has an increased chance of being rolled and other numbers come up very rarely. Looking at the chart above you can see that there is *not* a one in six chance of getting any particular result. For a 12 there's a one in *thirty-six* chance while for a 7 there's a six in thirty-six, which actually is equal to the one in chance from the first graph. The average of all of the rolls together in this case will be 7 or close to that since that's likely to come up the most.