



Xactika and Graphing. Exploring Bell Curves, Bar Graphs and Pie Charts.

This document illustrates how to use the Xactika Stats Card to teach graphing. Once your students have created their graphs, they can then use the visual aids to better understand the statistics and probabilities built into the deck enabling them to strategically play their cards.

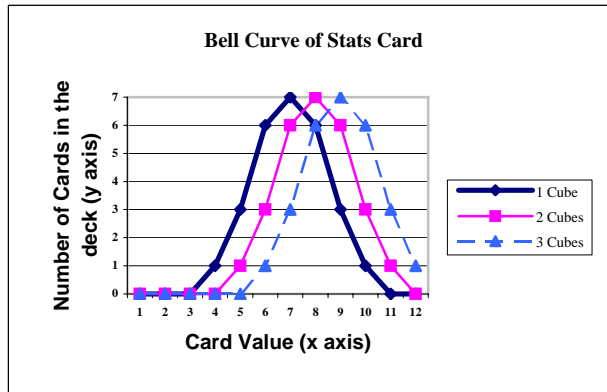
BELL CURVES

STATS CARD	Card Value	Total # of Cards	Shape Combinations		
			1 Cube	2 Cubes	3 Cubes
	4	1	1		
	5	4	3	1	
	6	10	6	3	1
	7	16	7	6	3
	8	19	6	7	6
	9	16	3	6	7
	10	10	1	3	6
	11	4		1	3
	12	1			1

Although shown for cubes, the same stats apply for all four of the shapes.

Let's make a graph that represents how many cards are in the deck for each card value within each of the shape combinations. Start by creating your X and Y axes and labeling them. The X axis is the card value. The Y axis is the number of cards in the deck per card value and shape combination. Thus, the highest number on the X axis will be 12 and the highest number on the Y axis will be 7.

Now it is time to begin plotting the points on the graph. Let's start with the values in the column representing the shape combination of 1 Cube. The lowest card value that has 1 cube is a 4, so we can plot the number of cards with numeric values of 1, 2 and 3 at zero because there are no cards with these values for 1 Cube. There is 1 card in the deck with a value of 4 that has 1 Cube, so we plot a point at the intersection of 4 on the X axis and 1 on the Y axis. There are 3 cards with a numeric value of 5 that have 1 Cube, so we move to 5 on the X axis and up to 3 on the Y axis and plot our next point. Follow this pattern and plot all of the points under the 1 Cube column.

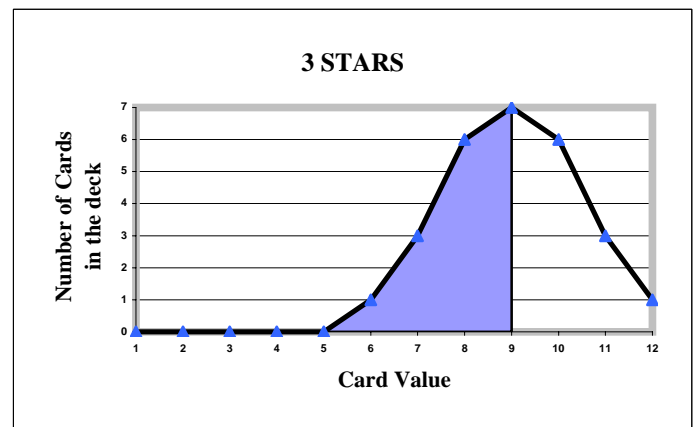
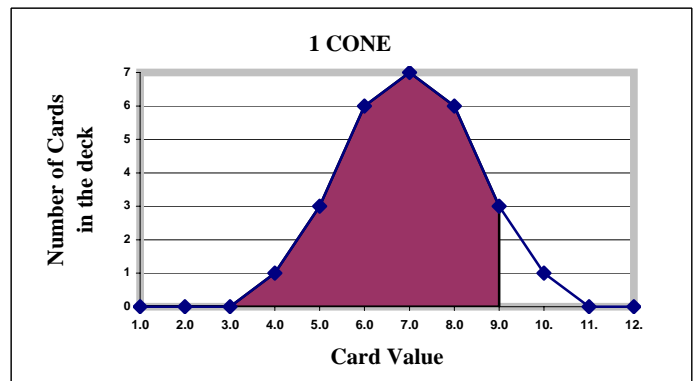
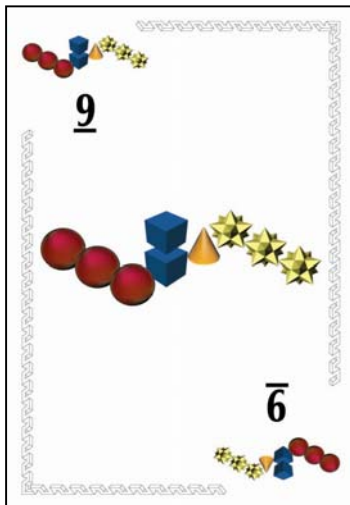


To finish your graph repeat the same steps as above for the 2 Cube and 3 Cube columns so your graph looks like the one to the left. You now have a graph that shows the distribution of cards across the different shape combinations.

Please note: the STATS CARD only shows Cubes but these same stats apply for each of the 4 shapes. So this graph would look identical for 1 Star, 2 Stars and 3 Stars, etc...

Each card in Xactika is made so that you can play it to win OR to lose a trick. For example, let's look at the #9 card below and the two associated bell curves to the right of it.

These two graphs show how the probability of winning increases or decreases depending on what shape combination is called. The shaded area in the 1 Cone graph to the right represents the number of cards that a #9 with 1 Cone would beat if the player leads this card and calls 1 Cone. The 3 Stars graph to the right shows how the player's probability of winning is reduced by calling 3 Stars when leading this card.



A player leading this card to win a trick should call 1 Cone, while a player leading this card to lose a trick should call 3 Stars or 3 Spheres.

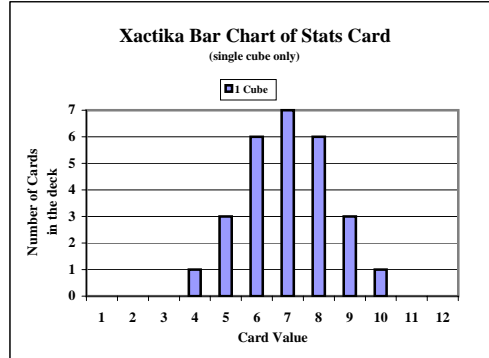


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BAR GRAPHS

Card Value	Total # of Cards	Shape Combinations		
		1 Cube	2 Cubes	3 Cubes
4	1	1		
5	4	3	1	
6	10	6	3	1
7	16	7	6	3
8	19	6	7	6
9	16	3	6	7
10	10	1	3	6
11	4		1	3
12	1			1

Label your graph axes the same way you labeled the bell curve. The X axis is the card value. The Y axis is the number of cards in the deck per card value and shape combination. Thus, the highest number on the X axis will be 12 and the highest number on the Y axis will be 7.

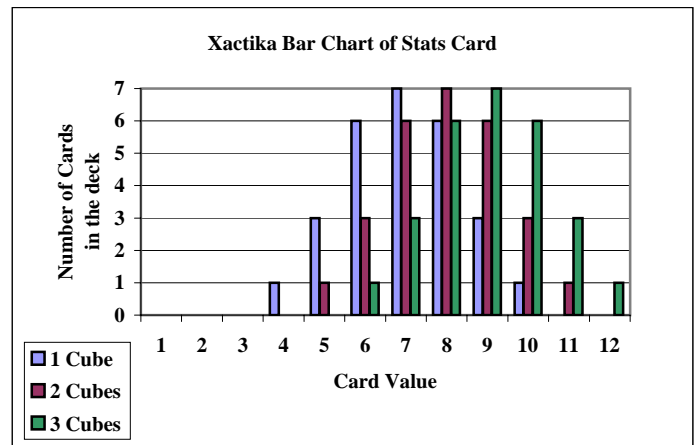


Let's start by creating the bars that represent the 1 Cube shape combination. The Stats Card shows that there is 1 card with a value of 4, so we move to the number 4 on the X axis and fill in a bar up to the number 1 on the Y axis. The 1 Cube column shows that there are 3 cards with a value of 5, so for the 5 card value we fill in the bar up to 3. Follow this pattern for the remaining card values until your graph looks like the one to the left.

Although shown for cubes, the same stats apply for all four of the shapes.

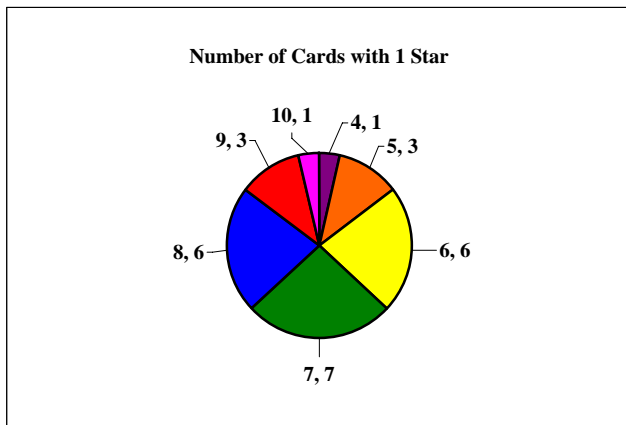
To finish your graph repeat the above steps for the 2 Cubes and 3 Cubes; your graph will look like the one to the right. You now have a bar graph that represents the distribution of the shape combinations per card value.

Bar charts and bell curves provide similar information. Where bell curves are great for comparing entire distributions to one another, bar charts allow for a comparison of a specific value within a distribution to the same value in another distribution. Lets say you wanted to compare the number of cards that have a value of 6 with 1, 2 and 3 Cubes. Simply move across the X axis to the card value of 6 where we see that there are 6 cards with 1 Cube, 3 cards with 2 Cubes and only 1 card with 3 Cubes within the card value of 6.



PIE CHARTS

When looking at the stats card you will notice that there are 9 different card values and 27 cards that have 1 Cube. To create a pie chart showing the distribution of cards with 1 Cube, divide your circle into 27 equal parts.



The next step is to begin shading the pieces of the pie with the number of cards per value in the 1 Cube column. Beginning with the number 4 we see that there is only 1 card with a value of 4 and 1 Cube, so shade in 1 of the 27 pieces (slice 4,1 in the chart to the left). There are 3 cards with a value of 5 and 1 cube, so shade 3 of the remaining 26 pieces in another color (slice 5,3 in the chart to the left). There are 6 cards with a value of 6 and 1 Cube, so shade 6 of the remaining pieces in yet another color (slice 6,6 in the chart to the left). Finish your pie chart for the card values from 7 to 10, when you are through all 27 pieces should be shaded.

Pie charts illustrate the proportion of a value to a whole distribution. Where bell curves compare entire distributions and bar charts compare specific values across many different distributions, pie charts allow for the comparison of values within the same distribution.

Xactika probability questions:

1. What is the probability that a player will have 3 or more cards with 1 Star in his or her hand?
2. What is the probability that a player will not have any cards with 1 Star in his or her hand?
3. If a player leads an 11 and calls 2 Cubes, what is the probability that he or she will win the trick?