Name: _____

The Sum of It All

Observed Outcomes Spreadsheet

There are hundreds of dice games out there … typically based on the sum of rolling 2 dice. What is the most likely outcome of rolling two dice? Which sums occur most often? Least often?
Let's roll the dice and find out!!! Roll a pair of dice 20 times and record their sum in the frequency table below.

YOUR Frequency Table

Sum	2	3	4	5	6	7	8	9	10	11	12
Tally											

Most frequent sum: _____ Least Frequent Sum: _____ Total Rolls: _____

YOUR GROUPS Frequency Table

Sum	2	3	4	5	6	7	8	9	10	11	12
Tally											

Most frequent sum: _____ Least Frequent Sum: _____ Total Rolls: _____

THE CLASSES OUR Frequency Table

Sum	2	3	4	5	6	7	8	9	10	11	12
Tally											

Most frequent sum: _____ Least Frequent Sum: _____ Total Rolls: _____

Look closer at the data … Do you see a pattern emerging?
Can you predict which SUM appears the most often?
What SUM do you think pays off (biggest winnings) the most at a casino?

Theoretically Expected Outcomes

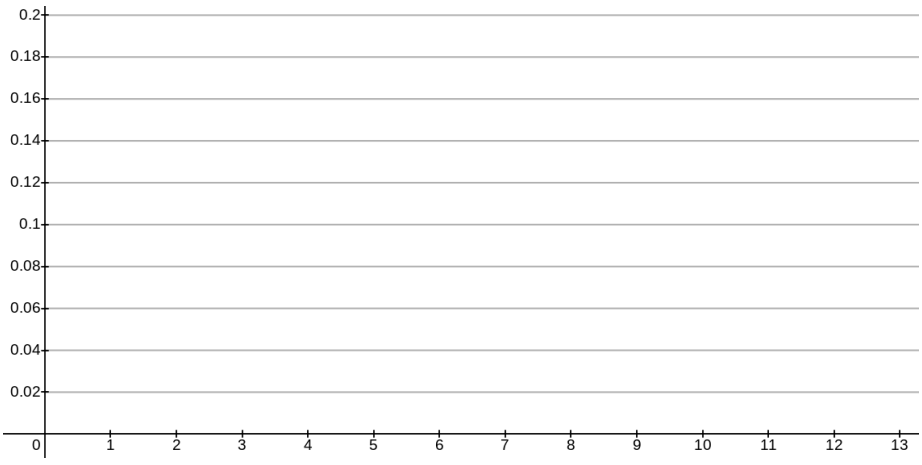
Data can be messy and rarely follows the theoretical outcomes precisely. So let's complete the table below and find out (given fair dice) how often we should expect to see each of the sums you found. In each of the cells write the sum of that (column and row) outcome.

Die 1\ Die 2	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Theoretical Frequency Table

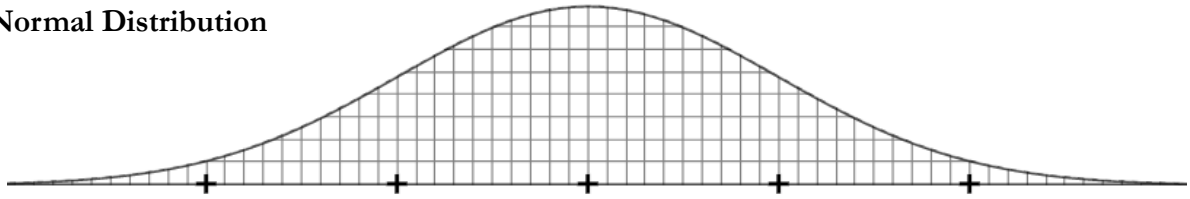
Sum	2	3	4	5	6	7	8	9	10	11	12
Tally											
Prob											

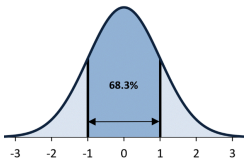
Theoretical Probability Distribution



Name: _____

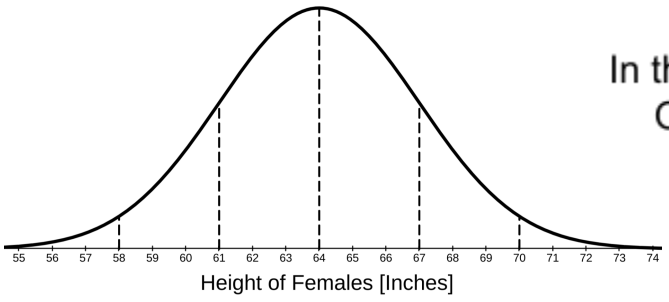
Normal Distribution



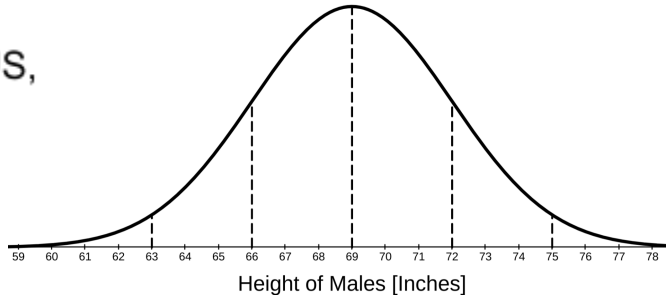


Life is like a giant, cosmic bell curve, where most of us fall somewhere near the middle of the pack. Imagine a group of friends where most are average height, but a few are towering giants or few shorties. Or picture a classroom where most students score around the average on a test, with a handful acing it and a few, let's say, not so much. This natural distribution isn't just about numbers—it's in how we all have our quirks and talents. So, whether you're a middling chef or a culinary genius, life's ultimate blend of traits and experiences forms a delightful, bell-shaped curve where being "average" just means you're in great company!

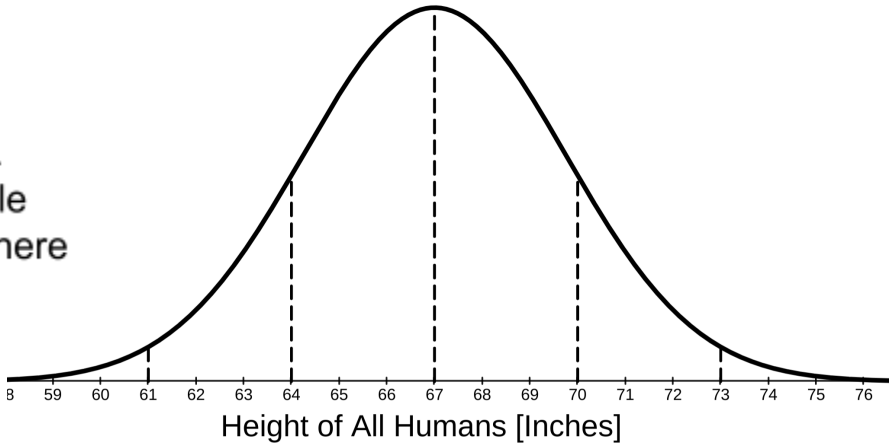
Where do you land?



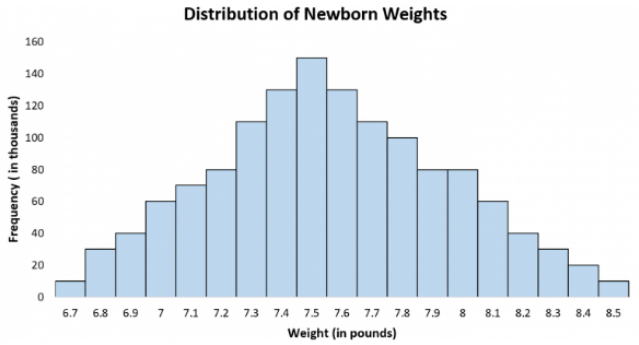
In the US, Only

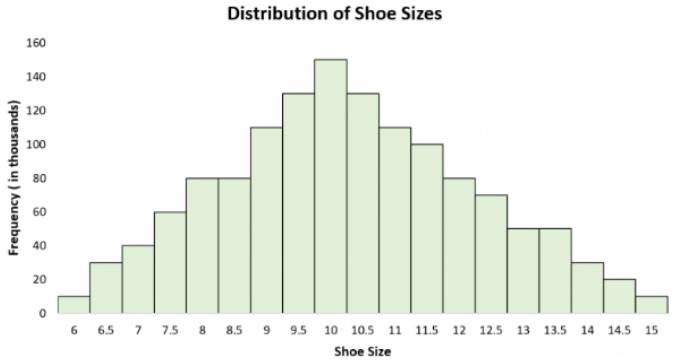


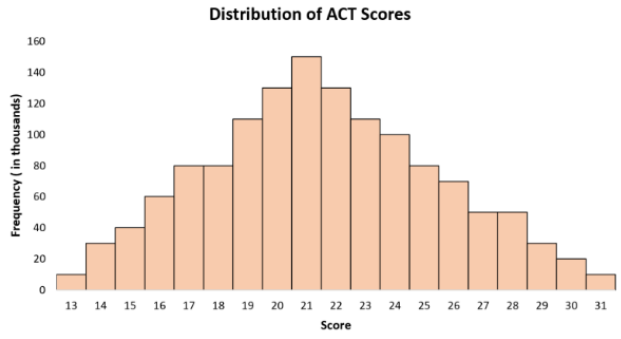
ALL People Everywhere

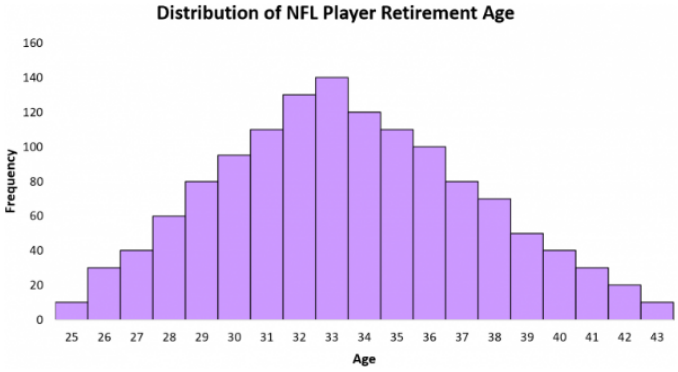


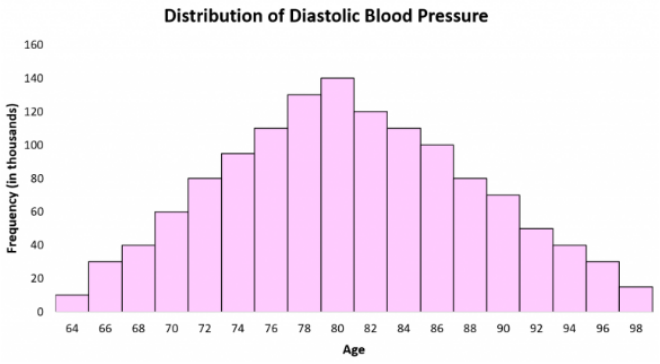
Various Examples of Other Normally Distributed Statistics

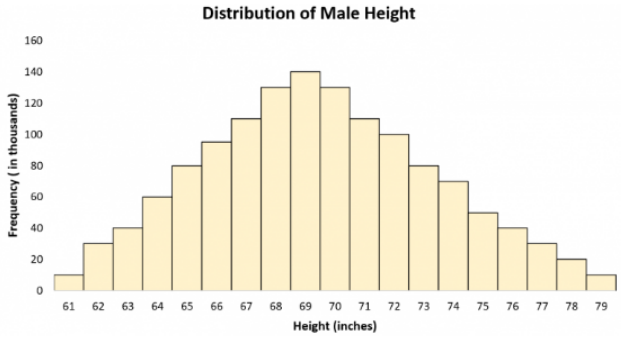












What else do you suspect is normally distributed?

Create a single table of data that compares the Observed data with the Expected data remember to use the expected percentages and the Total number of rolls from the observed data to compute the Expected number of times each sum should have appeared.

THEORETICAL Frequency Table

Sum	2	3	4	5	6	7	8	9	10	11	12
O											
E											

The Chi-Square Statistic

The formula for computing the Chi-Square Statistic: $$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$$

Table

Sum	2	3	4	5	6	7	8	9	10	11	12
O											
E											
(O-E)											
$(O-E)^2$											
$(O-E)^2/E$											
χ^2											

Degrees of Freedom

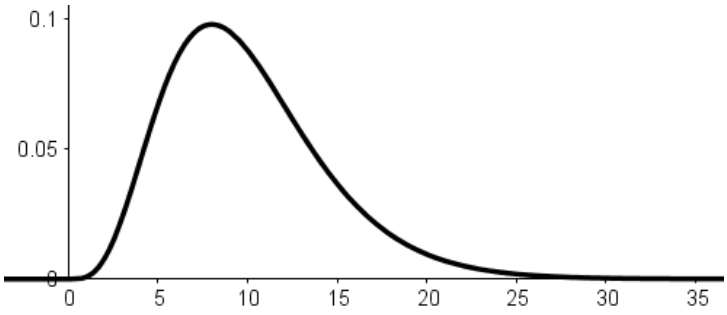
State the degrees of freedom for this particular data set: $df =$ _____

Determine the **Critical Value** for the Chi-Square test given a significance level of 5% ($\alpha = 0.05$) and for the degrees of freedom (df) for this study:

$CV =$_____

	Alpha										
DF	**0.995**	**0.975**	**0.2**	**0.1**	**0.05**	**0.025**	**0.02**	**0.01**	**0.005**	**0.002**	**0.001**
1	0.00004	0.0010	1.642	2.706	3.841	5.024	5.412	6.635	7.879	9.55	10.828
2	0.01	0.0506	3.219	4.605	5.991	7.378	7.824	9.21	10.597	12.429	13.816
3	0.0717	0.216	4.642	6.251	7.815	9.348	9.837	11.345	12.838	14.796	16.266
4	0.207	0.484	5.989	7.779	9.488	11.143	11.668	13.277	14.86	16.924	18.467
5	0.412	0.831	7.289	9.236	11.07	12.833	13.388	15.086	16.75	18.907	20.515
6	0.676	1.237	8.558	10.645	12.592	14.449	15.033	16.812	18.548	20.791	22.458
7	0.989	1.69	9.803	12.017	14.067	16.013	16.622	18.475	20.278	22.601	24.322
8	1.344	2.18	11.03	13.362	15.507	17.535	18.168	20.09	21.955	24.352	26.124
9	1.735	2.7	12.242	14.684	16.919	19.023	19.679	21.666	23.589	26.056	27.877
10	2.156	3.247	13.442	15.987	18.307	20.483	21.161	23.209	25.188	27.722	29.588

Mark and label the diagram (Chi-Square distribution) to show where the critical value is (CV), the χ^2 statistic, the significance level (α), and the p $-$value (p).



<u>Clearly State the conclusion of this study in reference to the null/alternative hypothesis.</u>

Now that you have completed the "Sum of It All" activity can you describe how you might design a study similar to this for you to use in writing your internal assessment?

1.) The Chi-Squared Test is used for what purpose?

2.) Create the title of a study and both a null hypothesis and an alternative hypothesis for it.

Title: _____

H_0: _____

H_A: _____

3.) Let's say that you were reviewing a friend's internal assessment in order to give each other some good feedback. Would you suggest that your friend …

Reject the Null Hypothesis

or

Fail to Reject the Null Hypothesis